

F-06 Thematic Poster - Bone and Integrative PhysiologyFriday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-101A**2708 Chair: Kelly Massey, Milledgeville, GA.**
(No relevant relationships reported)**2709 Board #1 May 31 1:00 PM - 3:00 PM**
Growth or Destruction: Bone Marrow Edema PathwaysArya Minaie, Karen Myrick, Bernadette Mele, Richard Feinn, Thomas Martin, Juan Garbalosa. *Quinnipiac University, Hamden, CT.*
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(No relevant relationships reported)**PURPOSE:** Bone Marrow Edema (BME) is a common incidental finding on MRI in athletes. While the etiology and composition are not well understood, it has been linked to potential long-term adverse events such as osteoarthritis. The purpose of this study was to 1) describe the fat fraction (FF) of BME lesions in female athletes and 2) establish if demographic risk factors can predict magnetic resonance spectroscopy (MRS) compositional results.**METHODS:** A prospective cohort of Division I female athletes, without previous ligamentous tears or surgery of the knee, were recruited to undergo a 1.5T screening MRI of each distal femur. Three readers assessed the MRI's separately for the presence of BME as well as a quantitative KOSS score. Subjects were invited two weeks later, to be scanned using a 3T MRI with Single-voxel 1H Spectra to evaluate the fat: water ratio of the BME lesions using the aid of the readers to guide voxel placement to avoid the femoral cortex and target the zone of maximal BME. Measured peaks were reported as FF = (Fat Content / (Fat Content + Water Content)) * 100. A multilevel linear mixed model was used to determine significant findings in bone marrow composition.**RESULTS:** Seven female athletes (mean age: 19.1 ± 1.2 years, weight: 69.7 ± 10.0 kg, height: 166.9 ± 5.0 cm, and BMI: 25.0 ± 3.3 kg/m²) met our inclusion criteria. Eight knees were positive for BME, with 6 negative, demonstrating a total KOSS distribution between 0-2 (median; 1.0). There were no differences in water or fat content by BME status, however, positive knees had a higher FF than negative knees (p=0.058; 12.4% ± 1.3% vs. 11.0% ± 0.8%). The effect size of the difference was very large (d=1.30). In two athletes with unilateral BME, the FF of the knee with BME was greater than that of the knee without BME. BMI, sport, leg dominance, and KOSS score were not significantly correlated with FF.**CONCLUSIONS:** To the best of our knowledge, this study is the first of its kind to describe the FF of knees with and without BME in female athletes. The increased FF found in BME-positive knees supports the case for the sequential development of fat metaplasia following acutely transient BME. Future research should be aimed at following individuals with BME over time with T1-weighted MRI imaging to look for non-age related changes in FF.**2710 Board #2 May 31 1:00 PM - 3:00 PM**
The Effects of Leptin and Estradiol Administration on Cancellous Bone Microarchitecture in Male RatsMatthew P. Golden¹, Isabelle Côté², Sara M. Green², Hale Z. Toklu², Nihal Tüme², Philip J. Scarpace², Joshua F. Yarrow¹.
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(No relevant relationships reported)Both leptin (Lep) and estradiol (E2) influence bone formation. However, the combinatory effects of Lep and E2 on bone microstructure require further elucidation. Purpose: To investigate whether central Lep gene expression and/or systemic E2 treatment alter cancellous bone microstructure in male rodents. Methods: 3-month-old male Sprague-Dawley rats (n=28) were assigned to the following groups: 1) Vehicle-Lep (Veh-Lep) (n=7), 2) E2-Lep (n=9), 3) Veh-green fluorescence protein control (Veh-GFP) (n=5), or 4) E2-GFP (n=7). Lep or GFP (control) were delivered into the third ventricle of the brain at a dose of 1 mL of rAAV1 (2.3 x 10¹³ vg/mL). E2 (25 µg/kg diluted in 0.5 ml/kg sesame oil) or Veh (sesame oil, 0.5 ml/kg) were injected subcutaneously on a daily basis. At day 24, femurs were excised and analyzed via ex vivo micro-CT. The outcomes reported were: 1) cancellous bone volume/total volume (cBV/TV, %), 2) trabecular thickness (Tb.Th, mm), 3) trabecular number (Tb.N, #/mm), 4) trabecular separation (Tb.Sp, mm), and 5) trabecular pattern factor (Tb.Pf). Separate One-Way ANOVAs were performed and Tukey's post hoc tests were used when appropriate. Results: Both E2 treated groups exhibited directionally higher cBV/TV when compared with Veh-GFP (controls), while Veh-Lep displayed

directionally lower cBV/TV vs controls, although, these values did not reach the level of statistical significance. In comparison, the Veh-Lep group exhibited 40% lower cBV/TV vs E2-GFP, characterized by 35% lower Tb.N and 64% higher Tb.Sp (all p<0.05). Veh-Lep also exhibited higher Tb.Pf than E2-GFP (p<0.01), indicating a less connected trabecular network. Correspondingly, Veh-Lep displayed 36% lower cBV/TV and higher Tb.Pf values compared to E2-Lep (p<0.05). No significant differences were observed between the E2-GFP and E2-Lep groups for any cancellous outcome. Conclusion: Our data indicate that neither the combination nor individual administration of E2 and Lep produced higher cancellous bone outcomes than Veh-GFP controls. However, E2 treated groups exhibited higher cBV/TV than Lep treated groups. Further investigation is necessary to determine whether E2 stimulated bone accretion and/or whether Lep suppressed bone gain in our male rodent model.

2711 Board #3 May 31 1:00 PM - 3:00 PM
Markers of Bone Formation Are Augmented Following Three Months of Ballistic TrainingAlexis A. Pihoker¹, Joseph R. Pierce², Jeffrey S. Staab², Dennis E. Scofield², Carl M. Maresh, FACSM³, William J. Kraemer, FACSM³, Brad C. Nindl, FACSM¹. ¹University of Pittsburgh, Pittsburgh, PA. ²Military Performance Division, USARIEM, Natick, MA. ³University of Connecticut, Storrs, CT. (Sponsor: Brad Nindl, FACSM)
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The osteogenic index (OI) has been used to estimate the potential effectiveness of an exercise protocol on bone adaptations. It is speculated that splitting a training program into multiple daily sessions while incorporating rest periods in between loading sessions is more advantageous than all loading occurring during a single bout of exercise.

PURPOSE: To test the hypothesis that two (2EX) vs one (1EX) session per day of ballistic resistance exercise produces greater adaptations in markers of bone turnover when equated for total exercise volume but differing in OI.**METHODS:** Seventeen healthy individuals (6M/11W; 21.7 ± 3.7 y (mean ±SD), body mass (kg): 67.3 ± 11.2; height (cm): 165.2 ± 11.6; body fat (%): 31.3 ± 9.0) volunteered for the study. Participants performed ballistic non-linear periodized resistance training three days per week in either the 1EX (3M/8W) or 2EX (3M/3W) group. An acute exercise test (AET; 10 sets of 10 plyo-jumps; Plyopress 625 III) was done at pre- (PreTr) and post-intervention (PostTr). Serum markers of bone turnover were analyzed immediately prior to (PreEx) and following (0 and 60 minutes PostEx) the AET using immunoassays. These included markers of bone formation (BAP, Osteocalcin, P1NP) and resorption (TRAP, CTx), and a hormonal marker (Vitamin D). PreTr vs PostTr changes in biomarker AET-induced responses were compared across groups using integrated area under the curve (AUC) analyses from the 90 minutes surrounding the AET (PreEx to 60 minutes PostEx) and 2x2 RMANOVA using GraphPad Prism software.**RESULTS:** There were no significant group × time interactions for any bone biomarker (p≥0.05). However, there were significant main training effects for BAP and P1NP, such that AUC concentrations increased by 9.9% and 14.3% respectively, following training (Mean ± SD; BAP PreTr: 2002 ± 1653 vs. PostTr: 2201 ± 1783 U/L*90min, p=0.01; P1NP PreTr: 5898 ± 7321 vs. PostTr: 6742 ± 7124 µg/L*90min, p=0.03).**CONCLUSION:** Exercise-induced markers of bone formation increased following 12 weeks of ballistic periodized resistance training, with no differences between exercise programs differing in OI. Markers of bone resorption did not change following training. This indicates that the ballistic exercise training program stimulated favorable changes in bone turnover, regardless of training frequency.**2712 Board #4 May 31 1:00 PM - 3:00 PM**
Cortical and Trabecular Bone Morphology in Response to Exercise and a Ketogenic DietMatthew C. Scott¹, Scott E. Fuller², James D. Watt³, Michelle L. Osborn⁴, Neil M. Johannsen¹, Brian A. Irving, FACSM¹, Robert C. Noland⁵. ¹Louisiana State University, Baton Rouge, LA. ²University of Louisiana at Lafayette, Lafayette, LA. ³Louisiana State University School of Medicine, New Orleans, LA. ⁴Louisiana State University School of Veterinary Medicine, Baton Rouge, LA. ⁵Pennington Biomedical Research Center, Baton Rouge, LA. (Sponsor: Brian Irving, FACSM)
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(No relevant relationships reported)Adopting a ketogenic diet (KD) is becoming increasingly popular, partly due to favorable impacts on blood glucose and body composition. Recent research has demonstrated possible negative effects of a KD on bone morphology in mice, but interactions with exercise, which sometimes accompanies health-oriented diet changes, have not been examined. **PURPOSE:** To determine the effects of a KD and aerobic

exercise on cortical and trabecular bone morphology in mice. **METHODS:** Forty C57BL6 mice were randomized into 4 groups (n=10/group); 2 groups were fed a low-fat control diet (16% protein, 72% carbohydrate, 12% fat) with one group performing vigorous intensity (blood lactate >4mM post-exercise) daily treadmill exercise (CEX), while the other served as sedentary controls (CSED). The remaining 2 groups were fed a high-fat, carbohydrate-deficient KD (16% protein, 84%fat) with one exercise group (KEX) and one sedentary control group (KSED). Treatment diets began 6 weeks pre-euthanasia and the exercise intervention occurred during the final 3 weeks. Femurs were analyzed for bone morphology using micro-computed tomography. Analysis variables included bone volume, ratio of bone to total volume, thickness, and bone mineral density (BMD) for both cortical and trabecular bone; trabecular number, spacing, and connectivity were also included. **RESULTS:** Two-way factorial ANOVA revealed an exercise effect on trabecular thickness (p=0.002) and an interaction between diet and exercise for trabecular BMD (p=0.038). Post-hoc analysis showed 5.8% thicker trabeculae in exercise groups, CEX & KEX, compared to sedentary groups, CSED & KSED, (47.7±0.6µm vs. 45.1±0.5µm, p<0.05). Trabecular BMD was 3.0% higher in CEX compared to CSED (776.7±5.8mgHA/cm³ vs. 754.0±5.2mgHA/cm³, p<0.05), whereas trabecular BMD was statistically similar between KEX and KSED (757.5±6.2mgHA/cm³ vs. 759.5±5.5mgHA/cm³, p=0.99). No other significant effects or interactions were found. **CONCLUSION:** The positive effect of exercise on bone morphology shown in this research is in line with that found in the literature. Our results did not identify any detriments in bone morphology in response to a ketogenic diet alone, but BMD changes induced by exercise in mice fed a control diet were negated by the ketogenic diet.

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2713 Board #5 May 31 1:00 PM - 3:00 PM
The Association between Quantified Training Load and Bone Adaptation

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PURPOSE: Habitual mechanical loading during pubertal stages has consistently been associated with current and future anabolic effects on bone characteristics. However, the specific aspects of mechanical loading that bring about anabolic effects are yet to be established. The present study investigated the relationship between soccer specific loading patterns and subsequent bone adaptation in youth soccer players.

METHODS: 17 elite adolescent soccer players (mean ± SD = age: 16.3±0.5 years; height: 1.79±0.07m; body mass: 74.9±6.7 kg) gave informed consent to take part in a study approved by the National Research Ethics Service. Peripheral quantitative computed tomography scans of the tibia of the dominant leg were taken at the beginning of pre-season training and 12-weeks later. Tibial mass (g), trabecular area (mm²), cortical area (mm²) and density (mg·cm⁻³), periosteal circumference (mm) and strength strain index (SSI) (mm³) at the 4, 14, 38 and 66% sites were measured. During the 12 week training period, workload was quantified using a global positioning system (GPS). The following metrics were analysed: session duration (min), total distance covered (m), and high-speed running distance (17.0 km·h⁻¹). Changes in bone characteristics were assessed using paired sample t-tests, and associations between GPS metrics and bone adaptation were assessed using Person's correlation coefficient. **RESULTS:** Tibial mass increased by 2.9, 1.2 and 0.7% at the 4, 14 and 38% tibial sites (P < .05). SSI (38%; 2337.1±340.9 compared to 2383.1±317.3, P = .05) and cortical area (38%; 380.9±23.2 mm² compared to 383.1±30.8 mm², P = .02) increased following 12-weeks of soccer specific training. Average session duration was positively correlated with increased trabecular area (4%; P=.02, r=0.61) and periosteal circumference (38%; P=.03, r=0.55). Average high-speed running was positively correlated with changes in SSI (14%; P=.05, r=0.51) and cortical density (38%; P=.05, r=0.52).

CONCLUSIONS: Soccer specific training increases tibial bone characteristics at the 4, 14 and 38% sites. Moreover, session duration and high-speed running were associated with increased tibial strength, size and density following 12-weeks of soccer specific training. These factors should be considered when recommending exercise for bone health.

2714 Board #6 May 31 1:00 PM - 3:00 PM
Circulating Sclerostin and MicroRNA-21 Are Predictors of Bone Mineral Density in Postmenopausal Women

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Sclerostin is a potent inhibitor of the Wnt signaling pathway, which inhibits osteoblasts to form new bone (Turner et al., 2009). MicroRNAs (miRNAs) are short, non-coding RNAs that fine tune posttranscriptional gene expression. Recent research has shown that some circulating miRNAs (c-miRNAs) are upregulated in osteoporotic fracture individuals (Seeliger et al., 2014). Since both sclerostin and miRNAs regulate signaling pathways in bone, together they may be potential biomarkers of bone health. **PURPOSE:** To examine the relationships between serum sclerostin and specific c-miRNAs and to predict bone mineral density (BMD) based on circulating sclerostin and miRNA levels. **METHODS:** Seventy-three postmenopausal women aged 60 to 85 years old participated in this study. Body composition and aBMD of the total body, lumbar spine and hips were measured by DXA. Osteoporosis was determined using aBMD T-scores at lumbar spine, femoral neck, or total hip according to WHO criteria (aBMD T-score ≤ -2.5). Serum levels of sclerostin and bone resorption markers (CTX, TRAP5b) were measured by ELISA. Total RNA was extracted from serum, and relative expression levels of c-miRNAs (miR-21, -23a, -24, -100, -125b) were analyzed using miRNA assays and real-time PCR. **RESULTS:** There were no significant correlations between serum sclerostin and c-miRNAs. Serum sclerostin was significantly negatively correlated with CTX (r = -0.252, p<0.05). Sclerostin levels were significantly lower in the osteoporotic group (n=10, 0.560 ± 0.158 ng/mL) compared to the normal BMD group (n=14, 0.776 ± 0.190 ng/mL) (p<0.05). Stepwise regression analysis showed that miR-21 and sclerostin levels were significant predictors of BMD at all sites (standardized coefficient β (sclerostin)= 0.398 to 0.520, standardized coefficient β (miR-21)= -0.248 to -0.317, adjusted R²= 0.238 to 0.332, p<0.001). **CONCLUSION:** Our results indicate that circulating sclerostin and miR-21 are significantly associated with bone mineral density in postmenopausal women. Further studies are needed to examine the common signaling pathways that sclerostin and miR-21 regulate in bone metabolism.

2715 Board #7 May 31 1:00 PM - 3:00 PM
The Effect of Running Vs Cycling on Bone Markers Response

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BACKGROUND: The Physical Activity Guidelines for American Adults recommend the equivalent of 150 minutes of moderate intensity aerobic activity each week without specifying the exercise modality. Running (weight bearing) and cycling (non-weight bearing) are common aerobic activities. However, they differ in their mechanical impact on the bone. Bone turnover (formation & resorption) can be reflected by circulating bone markers, bone specific hormones and cytokines (osteokines) released from the dynamic remodeling of bone. **PURPOSE:** To compare the bone marker response to running versus cycling at the same moderate-intensity target Heart Rate (HR). **METHODS:** 13 healthy male adults (23.7 ± 1.0 yr.) completed 4 laboratory visits. Participants performed two progressive exercise tests to exhaustion on cycling ergometer (CE) and treadmill (TM) to determine peak VO₂ and peak HR. On subsequent separate days, in a randomized order, participants performed a 30-min constant exercise challenge at 70% HR reserve (HRR) on CE and TM. Blood was drawn before (Pre), immediately post (IP) and 1h into recovery (Rec) and analyzed for lactate, osteocalcin, sclerostin and parathyroid hormone (PTH). Two-way ANOVA was used to evaluate within-person differences with time (Pre/IP/Rec) and exercise modalities.

RESULTS: 70% HRR was successfully clamped during CE and TM (CE 156.7 ± 0.4; TM 159.3 ± 0.7 bpm). Exercise on CE elicited higher IP lactate (6.2 ± 1.1 Vs 2.9 ± 1.1 nmol/l, p<0.01) and 13.7% lower O₂ uptake. At IP sclerostin increased significantly (p=0.0007) only in TM (49% Vs. 16% p=0.004). PTH had similar transient increase at IP in both modalities (p<0.001). No significant changes were observed in osteocalcin in both modalities.

CONCLUSIONS: 30 min of running and cycling at 70% HRR lead to a metabolic bone response immediately after the exercise in both modalities. While PTH, an essential factor for calcium metabolism and bone formation, increased significantly

and similarly at IP in both modalities, sclerostin (inhibitor of bone formation) increased significantly only in TM. This may reflect higher impact on the bone during running compared to cycling.

2716 Board #8 May 31 1:00 PM - 3:00 PM
Bone Mineral Density Comparisons Between Contact and Non-Contact Male and Female Collegiate Athletes

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(No relevant relationships reported)

Bone mineral density (BMD) and bone mineral content (BMC) have been suggested to be greater in athletes than non-athletes. However, less research has been done comparing the nature of the sport and the impact that has on BMD and BMC in male and female collegiate athletes. **PURPOSE:** To determine the effects of BMD and BMC between full contact (FC), limited contact (LC) and non-contact (NC) sports in male and female athletes. **METHODS:** Data from 45 male (FC [football]: 18, LC [basketball, baseball, soccer]: 21, NC [cheer, tennis, golf]: 6) and 33 female (FC: 0, LC [basketball, softball, soccer]: 16, NC [cheer, tennis, volleyball, swimming, rifle, track]: 17) Division I athletes was collected via whole body dual-energy x-ray absorptiometry (DXA). One-way ANOVAs (male and female) were run to compare BMD, BMC and, body fat percentage (BF%) between sports. **RESULTS:** A main effect significant difference was noted between BMD ($F(2,44) = 9.79, p < 0.01$) and BMC ($F(2,44) = 12.15, p < 0.01$) in male athletes. Post-hoc LSD analysis revealed that significance in all variables was between FC (BMD: 1.46 ± 0.09 g/cm³) compared to LC (1.36 ± 0.89 g/cm³, $p < 0.01$) and NC (1.31 ± 0.11 g/cm³, $p < 0.01$). Similarly, difference in BMC were between FC (4322.9 ± 564.3 g) compared to LC (3639.6 ± 485.0 g, $p < 0.01$) and NC (3403.3 ± 295.6 g, $p < 0.01$). BF% was not significantly different between any group ($p = 0.09$). No significant differences were noted with female athletes in any of the variables: BMD (LC: 1.22 ± 0.07 g/cm³, NC: 1.24 ± 0.07 g/cm³, $p = 0.29$); BMC (LC: 2797.6 ± 382.7 g, NC: 2883.8 ± 361.7 g, $p = 0.51$); BF% ($p = 0.29$). **CONCLUSION:** The nature of the sport may have an impact on an athlete's BMD and BMC, but only if the athlete competes in a FC sport, where sufficient sustained compression occurs to increase bone formation.

F-07 Thematic Poster - Brain, Performance and Concussions

Friday, May 31, 2019, 1:00 PM - 3:00 PM
 Room: CC-101B

2717 Chair: Dane B. Cook, FACSM. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

2718 Board #1 May 31 1:00 PM - 3:00 PM
Head Impact Exposure Alters Neural Synchrony and Complexity in Collegiate Athletes

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(No relevant relationships reported)

White matter connects neighboring and distant cortical regions and is the basis for brain circuits. Regular exercise strengthens these connections, but athletes participating in contact sports, including water polo, are at risk for repeated head impacts capable of damaging white matter and impairing brain circuit function. One way of measuring functional connectivity of these circuits is through resting-state electroencephalography (EEG). **PURPOSE:** To test the hypothesis that repeated head impact exposure reduces fast-rhythm ('gamma') synchrony and an associated increase in slow-rhythm complexity. **METHODS:** Intercollegiate water polo players (9 Men; 10 Women) were tested before and after the season. During the testing, each player sat with eyes closed for five minutes wearing a 32 dry-electrode EEG cap (sampling rate = 500 Hz). From the pre-processed EEG data, we computed debiased weighted phase lag index (dWPLI) as a measure of gamma (30-50 Hz) synchrony and multiscale entropy (MSE) as a measure of neural complexity. Athletes were monitored during competitions for head impacts using cap-worn inertial sensors to quantify peak linear acceleration (PLA), rotational acceleration (PRA), and rotational velocity (PRV). Cumulative exposure (twPCA) was computed per athlete by summing principal component 'magnitude' scores (representing PLA, PRA, and PRV) weighted by time (1/days) relative to post-season assessment. Mediation analysis was performed using

a series of linear regression analyses to test the relationships among twPCA, gamma dWPLI, and MSE at fine (500 Hz), moderate (33-250 Hz), and coarse (12-30 Hz) timescales. **RESULTS:** Greater twPCA was associated with a loss of gamma dWPLI [$r(17) = .709, p < .001$]. There was a significant indirect effect of twPCA on MSE across moderate time-scales [$\beta = 0.456; 95\% \text{ CI}(0.048, 1.0432), p = 0.04$]. Approximately 25% of the variance in MSE was accounted for by the mediator, gamma dWPLI ($R^2 = 0.247$). There was no mediation effect on MSE at fast or course time-scales ($p > .06$). **CONCLUSIONS:** One season of repeated head impact exposure altered brain dynamics in a dose dependent manner. The loss of fast-rhythm synchrony in athletes sustaining the greatest exposure contributed to a loss of complexity that could represent distributed and inefficient information processing at rest.

2719 Board #2 May 31 1:00 PM - 3:00 PM
Concussion History Impairs Cerebrovascular Reactivity in Special Operations Forces Personnel

Patricia R. Combs¹, Avinash S. Chandran¹, Nikki E. Barczak¹, Stephen M. DeLellis², Cassie B. Ford¹, Marshall L. Healy², Shawn F. Kane, FACSM², James H. Lynch, FACSM², Gary E. Means², Jason P. Mihalik¹. ¹*University of North Carolina at Chapel Hill, Chapel Hill, NC.* ²*United States Army Special Operations Command, Fort Bragg, NC.*

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(No relevant relationships reported)

Concussion has been an increasingly prevalent blast-related injury in Special Operations Forces (SOF) personnel over the last decade. Recent studies suggest physiological deficits, such as cerebrovascular function, may outlast clinical recovery following injury. Cerebrovascular reactivity (CVR) measures the cerebral blood flow response to variations in carbon dioxide partial pressures. Understanding how concussion history affects CVR may better inform physiological assessment and long-term outcome management following concussion. **PURPOSE:** To investigate how concussion history influences CVR in SOF personnel. **METHODS:** Thirty-nine SOF personnel completed a demographic survey self-reporting concussion history (concussion history = 22 (56.4%); age = 34.3yrs \pm 3.7 yrs) They were instrumented with transcranial Doppler (TCD) ultrasound to assess middle cerebral artery velocity (MCAv). Baseline TCD data were collected for 2 minutes. Changes in MCAv were measured in response to 5 breath-holding trials (30s breath-hold/30s rest) and 5 hyperventilation trials (30s hyperventilation/30s rest). We employed mixed effects models with quadratic mean structures to assess group differences in MCAv response to breath-holding and hyperventilation tasks. **RESULTS:** Baseline resting MCAv did not significantly differ ($t_{33} = -0.47, p = 0.64$) between those with (MCAv = 50.8 ± 7.7 cm/s) and those without (MCAv = 49.6 ± 8.1 cm/s) concussion history. The MCAv response did not differ between those with and without concussion history during breath-holding ($F_{1,1909} = 0.20, p = 0.90$) or hyperventilation ($F_{1,1909} = 0.31, p = 0.58$). Among SOF personnel with concussion history, those with ≥ 3 had significantly diminished CVR response relative to those with 1-2 concussions during the breath-holding ($F_{1,1125} = 4.84, p = 0.03$) and the hyperventilation ($F_{1,1125} = 5.07, p = 0.02$) tasks. **CONCLUSIONS:** Changes in MCAv did not differ under resting conditions; however, SOF personnel with a greater concussion history showed impaired CVR when tested with physiological breathing stressors. While long-term neurophysiological effects of blast-related injury are currently unknown, assessing CVR response may provide further insight into cerebrovascular function and overall physiological health following blast exposure.

2720 Board #3 May 31 1:00 PM - 3:00 PM
Prefrontal Cortex Neural Function and Decision-making Performance Following a Long Duration Incremental Exercise Protocol in the Heat while Wearing Personal Protective Equipment

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(No relevant relationships reported)

There is no research to date evaluating the effects of rapid and uncompensable core temperature (T_c) acquisition, as which occurs when one is wearing personal protective equipment (PPE), on neural function in prefrontal cortex and decision-making performance. **PURPOSE:** To study the effects of rapid and uncompensable T_c acquisition on neural function in prefrontal cortex and decision-making performance during a pre-and post-exercise Go/No-go test. **METHODS:** Fifteen male subjects (mean age, 32.7 \pm 12.2 years) performed an incremental exercise test to a termination criterion in CONTROL and GEAR. Electroencephalography (EEG) data was recorded during a Go/No-go test pre- and post-exercise. Decision-making performance was also monitored during the pre- and post-exercise Go/No-go test. Heart rate (HR), thermal comfort scale (TCS), thermal sensation (TS), and rating of perceived exertion (RPE) were recorded at each 0.5°C increase in T_c. **RESULTS:** There were significant differences in time to termination (TTT) (CONTROL = 77.3 \pm 12.6 min; GEAR = 50.3

± 6.9 min), pre-exercise HR (CONTROL = 76.8 ± 4.8 bpm; GEAR = 86.5 ± 5.1 bpm) and post-exercise HR (CONTROL = 161.1 ± 11.9 bpm; GEAR = 179.6 ± 6.8 bpm). Additionally, there were significant differences between CONTROL and GEAR end-exercise Tc (CONTROL = 38.57 ± 0.3°C; GEAR = 39.01 ± 0.3°C), TCS (CONTROL = 3.57 ± 0.6; GEAR = 4.63 ± 0.3), and TS (CONTROL = 7.57 ± 0.5; GEAR = 8.67 ± 0.3). Lastly, there was a 0.04°C/min increase in Tc during GEAR and 0.02°C/min increase in Tc during CONTROL. An analysis of frontal theta EEG power results showed a significant decrease when comparing pre- and post-exercise values during a Go/No-go test in GEAR ($F_{(1,14)} = 6.069$, $p = 0.027$). There was also a significant difference when evaluating incorrect responses between pre- and post-exercise values in GEAR ($F_{(1,14)} = 5.515$, $p = 0.026$). These differences were not observed during CONTROL. **CONCLUSION:** These data suggest that a long duration incremental exercise test while wearing PPE in the heat results in decreased cognitive control. This could have implications individuals in occupations that wear PPE and need to make critical decisions while experiencing rapid and uncompensable Tc heat storage.

2721 Board #4 May 31 1:00 PM - 3:00 PM

Concussion and the Pupillary Light Reflex: Implications for Special Operations Forces Personnel

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Pupillary light reflex (PLR) is regulated by smooth radial muscles differentially innervated by sympathetic and parasympathetic pathways. The PLR has been posited as an autonomic nervous system (ANS) function index and a concussion biomarker. Few studies have examined static and dynamic PLR parameters in Special Operations Forces (SOF) combat and combat support soldiers. **PURPOSE:** To examine cross-sectional relationships between concussion history and PLR parameters in SOF personnel with and without concussion history. **METHODS:** The SOF personnel self-reported age and concussion history (0, 1, 2, and ≥3), and completed an assessment battery including PLR. We measured seven PLR parameters including initial and final pupil diameters, constriction and dilation velocities, constriction latency, time to 75% initial diameter recovery, and average maximum constriction velocity. These parameters were averaged across both eyes and separately regressed on concussion frequency while controlling for age (*a priori* $\alpha = 0.05$). **RESULTS:** The SOF personnel ($n = 76$; mean age = 33.5 ± 3.6 years) reported the following concussion histories: ≥3 concussions ($n = 19$; 25%), two ($n = 8$; 10.5%), one ($n = 7$; 9.2%), and none ($n = 42$; 55.3%). Initial ($\beta = -0.07$; 95% CI: -0.13, -0.02) and final ($\beta = -0.05$; 95% CI: -0.09, -0.004) pupil diameters were smaller with age increases in SOF personnel, controlling for concussion history. Similarly, those who reported ≥3 concussions had significantly smaller initial pupil diameter compared to those without concussion history, controlling for age ($\beta = -0.53$; 95% CI: -0.98, -0.08). Those who reported ≥3 concussions also exhibited slower average ($\beta = 0.46$; 95% CI: 0.07, 0.84) and maximum ($\beta = 0.64$; 95% CI: 0.12, 1.15) constriction velocities than those without a concussion history, controlling for age. **CONCLUSIONS:** The SOF personnel with greater head injury history had altered static and dynamic pupillary light responsivity, which may indicate prolonged ANS dysfunction. Our group's previous neuroimaging findings demonstrate prolonged physiological deficits beyond self-reported symptom resolution and clinical recovery from concussion. The PLR is a rapid, non-invasive, cost effective tool that may assess deficits warranting further clinical investigation.

2722 Board #5 May 31 1:00 PM - 3:00 PM

Development of a Lower Body Negative Pressure Device to Reduce Intracranial Pressure in Hospitalized Patients with Traumatic Brain Injury

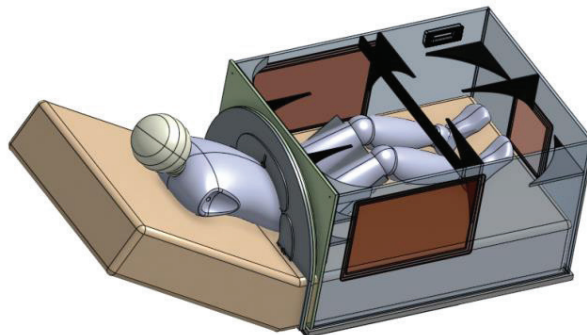
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(No relevant relationships reported)

Elevations of intracranial pressure (ICP) are common in patients with a severe traumatic brain injury (TBI) with sustained elevations predicting morbidity and mortality. Aggressive management of elevated ICP is recommended and there is a need for non-invasive treatments that are complementary to existing surgical options. Using direct invasive recordings of ICP in three healthy subjects via implanted Ommaya reservoirs, this laboratory observed a robust reduction in ICP during lower body negative pressure (LBNP) in the head-down tilt (HDT) position. **PURPOSE:** Develop a novel LBNP device that is suitable for use with hospitalized patients, which will be safe and well tolerated by patients with TBI, and will improve intracranial stability, patient disability and reduce the time from admission to discharge from the ICU. **METHODS:** Working with a team of ICU nurses, neurointensivists, engineers

and physiologists, a comfortable, stable LBNP chamber was developed with sufficient access to the patient to allow standard of care for severe TBI patients. Studies to test this device in the ICU are ongoing and will impose low level LBNP (-20mmHg) 8 hours/day for 3 days. Throughout all interventions, hemodynamics and cerebral perfusion pressure will be monitored to maintain perfusion greater than 60mmHg and ICP will be carefully monitored for changes in intracranial pulse pressure. **RESULTS:** See figure for ICU based LBNP chamber design.

CONCLUSION: Previous work by our group (Petersen et al, J Physiol 2018) showed that low level LBNP can reduce ICP safely in healthy controls. We have built a novel LBNP chamber for use with hospitalized patients that may lower ICP non-invasively in patients, thus improving patient outcomes.



2723 Board #6 May 31 1:00 PM - 3:00 PM

Locus of Control Ratings do not Predict Concussion Reporting Intentions in Intercollegiate Athletes

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(No relevant relationships reported)

Identification of all sport-related concussion continues to be challenging in part due to the lack of reporting by athletes. It is estimated that approximately 50% of all sport-related concussions at the collegiate level go unreported, however, reasons for failing to disclose a potential concussion are still unclear. In order to improve concussion reporting, we must identify factors that contribute to an athletes' intentions to report. Student-athletes that identify as having more control over the outcomes in their life may feel a stronger sense of control over whether they will report a suspected concussion to a medical professional.

PURPOSE: To examine the relationship between locus of control ratings and concussion reporting intentions in student-athletes.

METHODS: Student-athletes from three universities were invited to complete a Qualtrics survey ($n=206/498$ response rate = 41.36%, male=34.46%). The Levenson Multidimensional Locus of Control (LOC) scale is a 24 item survey that measures Internal Locus of Control (8 items), Powerful Others (8 items), and Chance (8 items). All items were answered on a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Three separate Spearman's rank-order correlations were used to determine whether LOC sub-scores (Internality, Powerful Others and Chance) correlated concussion reporting intentions ($\alpha=0.05$).

RESULTS: Locus of control sub-score ratings did not significantly correlate direct intentions; Internality ($r_s = .055$, $p = .545$), Powerful Others ($r_s = -.125$, $p = .169$), or Chance ($r_s = -.065$, $p = .474$). In addition, indirect intentions were not related to the LOC subscales; Internality ($r_s = .082$, $p = .367$), Powerful Others ($r_s = -.111$, $p = .223$), or Chance ($r_s = -.062$, $p = .497$).

CONCLUSION: Although LOC plays a role in predicting sport-related injuries risk and outcomes, it does not seem to significantly correlate with concussion reporting intentions in the current study. Results of this study suggest the importance of considering the multiple factors that may explain an athletes intentions to report concussions beyond just how much control they perceive to have over the outcomes in their life.

2724 Board #7 May 31 1:00 PM - 3:00 PM
Acute Exercise Effects on Fatigue in Individuals Living With Post-Traumatic Stress

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(No relevant relationships reported)

Evidence has emerged highlighting the beneficial effects of exercise in reducing symptoms of Post-Traumatic Stress (PTS) and comorbid psychological conditions (e.g., anxiety, depression). However, most of these studies fail to address the effects of exercise on other disabling symptoms of PTS. **Purpose:** Examine changes in self-reported fatigue following an acute bout of moderate intensity continuous aerobic exercise (MICE) and a bout of high-intensity interval exercise (HIIE), relative to a no-exercise inactive control (SED), in participants with subsyndromal PTS. **Methods:** Using a within-subjects design, participants [$N=25$, 16 females; age ($M \pm SD$); 25.6 ± 9.1 yrs] completed three randomly ordered 35-min conditions (HIIE, MICE, SED). Participants reported an average PCL-5 score of 47.64 (exceeds cut-point for probable PTS of 33). Additionally, participants reported having at least one symptom in each of the major DSM-5 clusters of PTS. Fatigue was assessed before (Pre), immediate after (Post0), 20-min after (Post20), and 40-min after (Post40) each condition. **Results:** Significant Condition, Time, and Condition x Time effects were seen [all $P < 0.001$]. For HIIE, fatigue increased from Pre to Post0 [Cohen's $d = 0.90$], decreased from Post0 to Post20 [$d = 0.67$], and decreased from Post20 to Post40 [$d = 0.42$]. Fatigue was not different Pre to Post40 HIIE [$P = 0.31$]. For MICE, Fatigue increased slightly from Pre to Post0 [$d = 0.33$], decreased from Post0 to Post20 [$d = 0.91$], and showed no change from Post20 to Post40 [$P = 0.36$]. Fatigue was reduced from Pre to Post40 MICE [$d = 0.29$]. Finally, fatigue decreased from Pre to Post0 SED [$d = 0.48$], showed no change from Post0 to Post20 or from Post20 to Post40, and was marginally reduced Pre to Post40 [$d = 0.32$]. **Conclusion:** Participants reported elevated fatigue Post0 HIIE, but fatigue returned to baseline by Post40. While fatigue was elevated Post0 MICE, at Post40 fatigue was reduced relative to Pre. The present study provides evidence that both HIIE and MICE result in immediate increases in fatigue in individuals living with PTS, but such increases are short-lived. Future studies need to assess chronic exercise effects on fatigue, as fatigue is a disabling symptom of PTS.

2725 Board #8 May 31 1:00 PM - 3:00 PM
Feasibility of Resistance Exercise Training in Gulf War Veterans with Widespread Pain

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(No relevant relationships reported)

Roughly 25-33% of US Veterans of Operations Desert Shield or Desert Storm report a constellation of chronic symptoms including fatigue, confusion and widespread pain. Although exercise is routinely prescribed, and found to be efficacious, for many chronic pain conditions; Veterans' reports of post-exertional exacerbation of symptoms complicates the question of whether exercise should be used as an adjunct treatment to standard care.

Purpose: To determine the safety and efficacy of a resistance exercise training (RET) program in Gulf War Veterans (GV) with chronic widespread musculoskeletal pain (CMP).

Methods: Gulf Veterans suffering medically unexplained CMP lasting at least 3 months ($N=50$) were randomized to either 16 weeks of twice weekly RET or wait-list control (WLC). Training was supervised by exercise specialists and consisted of 10 exercises targeting major muscle groups. The program started at a very low intensity [25-35% of estimated 1-repetition maximum (1-RM)] and progressed in small ($\leq 5\%$) increments. Thus, training was both individualized and standardized. Testing of 1-RM was completed at baseline and reevaluated at 16 weeks. The McGill Pain Questionnaire (MPQ) and Profile of Mood States (POMS) were completed at weeks 1, 6, 12 and 16. Exercisers not completing $>50\%$ of training were excluded from statistical analyses ($n=4$). Average 1-RM values were compared using dependent t-tests, and MPQ and POMS data were evaluated using repeated-measures ANOVAs.

Results: The final sample consisted of 22 GV in the RET group, with $>90\%$ adherence, and 20 WLC Veterans. No drop outs were due to negative complications with exercise. Following RET, participants on average lifted 67 kg/kg of body weight and significant ($p < 0.05$) 1-RM increases were observed in all 8 lifts. Estimated 1-RM increased by at least 20% for 7 of 8 lifts. Mood scores significantly improved in both groups over the course of the trial with no significant difference between groups. No time or group effects ($p > 0.05$) were observed in MPQ scores.

CONCLUSIONS: RET significantly increased strength in GV with CMP. It resulted in no exacerbation of pain symptoms and did not increase mood disturbance. Resistance exercise appears safe and efficacious for Gulf Veterans with widespread pain. Supported by Dept. of Veterans Affairs grant: IO1-CX000383.

F-08 Thematic Poster - Physiological Responses in Firefighters

Friday, May 31, 2019, 1:00 PM - 3:00 PM
 Room: CC-102A

2726 Chair: Emiel DenHartog. North Carolina State University, Raleigh, NC.

(No relevant relationships reported)

2727 Board #1 May 31 1:00 PM - 3:00 PM
Exploring Factors Related To Blood Pressure Increase After A 12-hour Shift-work In Firefighters

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(No relevant relationships reported)

Firefighters' job-related activities may expose firefighters (FF) to an elevated cardiac strain. **Purpose:** To evaluate the effect of a routine 12-hour shift work on blood pressure (BP) among career FF. **Methods:** We evaluated 30 male FF, aged 40 ± 3.2 yrs, BMI = 26.3 ± 3.1 kg/m². BP was measured in a basal condition on an off-duty day (Eva1) and before (Eva2) and after (Eva3) a 12-h shift work, in resting supine (SUP) and orthostatic (ORT) postures. A 3-way repeated measures ANOVA (BP, body position, time) with Bonferroni post-hoc was performed. A BP increase ≥ 4 mmHg was considered meaningful. To understand BP responsiveness we use independent T-tests between subgroups (overweight, obese, cardiorespiratory fitness (CRF) ≥ 12 METs and by age). On-duty task effect on BP was performed with a sub analysis on those who increased diastolic BP. **Results:** ANOVA showed a significant effect of time, BP and position with significant mean BP increase of 3.5 mmHg from Eva 2 to 3. FF >40 yrs had a larger mean systolic BP increase than younger (12 vs 1 mmHg; $p < 0.01$ -Table 1). No differences were observed for those who had CRF ≥ 12 METs, were overweight or obese. 5 FF (17%) had their systolic and diastolic BP meaningfully increased in SUP and ORT conditions: 12.2, 14.8, 10.2, 14.4 respectively. 4 of them (80%) participated in firefighting or emergency medical service (EMS). 16 FF showed a mean meaningful increase of 10.1 mmHg in diastolic BP during ORT condition, 14(88%) of them participated in EMS or firefighting. FF who performed fire fighting or a EMS had a 3.9 (95%CI 0.7-21.7) higher odds of having their diastolic BP meaningfully increased. **Conclusion:** There was an important relationship between FF on duty emergency tasks and cardiovascular strain. Older FF seemed more susceptible to present a negative cardiovascular response after 12-h shift work. The increase on BP was meaningful in most cases, especially diastolic BP, which could be associate to non-fatal cardiovascular events in susceptible firefighters.

		EVA 1	EVA 2	EVA 3
Age > 40	SBP SUP	125.4 ± 10.9	125.4 ± 11.6	129.0 ± 10.7
	SBP ORT	125.9 ± 14.1	120.7 ± 11.7	132.7 ± 18.5
	DBP SUP	79.0 ± 11.2	78.5 ± 6.0	78.8 ± 8.1
AGE ≤ 40	DBP ORT	83.5 ± 10.3	80.7 ± 8.2	85.3 ± 10.7
	SBP SUP	120.3 ± 9.6	119.1 ± 8.2	120.1 ± 11.6
	SBP ORT	116.6 ± 11.6	119.0 ± 12.2	117.8 ± 15.6
	DBP SUP	72.4 ± 8.7	69.5 ± 6.1	74.0 ± 7.1
	DBP ORT	76.4 ± 11.3	77.6 ± 12.7	80.7 ± 10.9

2728 Board #2 May 31 1:00 PM - 3:00 PM
Heart Rate Response Relative to Body Weight/Body Fat and Fire Gear During Walking Protocol

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 (No relevant relationships reported)

INTRODUCTION: Fire gear serves a specific purpose in protecting individuals from the harsh environments around them when combating fires. Little research has been done on how gear weight relative to an individual's lean body mass (LBM) and body fat (BF) affects heart rate (HR). Being conscious of how the encumbrance of gear affects one's HR is important because over-exertion from load carriage could possibly cause a decrease in performance and increase the risk of a cardiac event. **PURPOSE:** To assess HR response among individuals based on LBM and BF relative to the weight of different combinations of fire gear during a walking protocol.

METHODS: 22 recreationally trained college students (age 22±3 y/o, wt. 81±17kg, ht. 177±10 cm) performed a walking protocol in personal protective equipment (PPE 9.1 kg.), oxygen pack and mask (PM 11.3 kg.), and full gear (FG, combination of PM and PPE 20.4 kg.). Each subject completed 3 sessions total. Gear was determined using a randomized cross-over design. Subjects were tested for BF via air displacement plethysmography and weighed before the protocol. The original Bruce protocol was adjusted to (stage 1) 3 minutes (min) at 0.8 m/s and 0% grade (GR), (stage 2) 3 min at 0.76 m/s and 10% GR, (stage 3) 3 min at 1.1 m/s and 12% GR, (stage 4) 3 min at 1.5 m/s and 14% GR, and (stage 5) 4 min cool down at 0.8 m/s and 0% GR. HR was recorded during each minute of the protocol until completion. Results were analyzed using Linear Regression to identify the effect of BF and LBM on HR. Stage 4 HR's were selected because the intensity is most comparable to actual situations.

RESULTS: R² of change reported 0.47 for both LBM and BF in FG, .065 in PM, and 0.52 in PPE. For LBM only, R² of change reported 0.36 (P=0.003) for FG, 0.60 (P < 0.001) for PM, and 0.52 (P < 0.001) for PPE. BF only, reported 0.08 (P = 0.216) for FG, 0.02 (P = 0.529) in PM, and less than 0.01 (P = 0.908) for PPE.

CONCLUSIONS: The data suggests that more LBM and less BF can be advantageous in relation to HR during encumbered walking. Firefighters should focus on increasing their LBM to increase their overall performance during training or in real life high stress situations.

2729 Board #3 May 31 1:00 PM - 3:00 PM
Physiologic Strain of SCBA (Maze) Training Compared to Circuit Training and Live Fire Training

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 (No relevant relationships reported)

Firefighting is a dangerous occupation and even training carries substantial risk. In fact, about 10-12% of firefighter line of duty deaths occur in training—most due to sudden cardiac death. Self-contained breathing apparatus (SCBA) maze training (also known as SCBA confidence courses) are a common training exercise, and it is often assumed that this type of drill is less physically taxing because there is no “live-fire”. However, little is known about the physiologic strain associated with SCBA maze training.

Purpose: To compare the physiological strain of SCBA maze training to live fire training and circuit training among cadets at a training academy.

Methods: Cadets (N=40) wore physiologic status monitors to assess heart rate (HR) and estimated core temperature (ECT) during circuit training, live fire training and SCBA maze training. SCBA maze training occurred in full personal protective equipment (PPE) and took place in an air conditioned building. Live fire training occurred in a specialized training structure, and the circuit training workout occurred in a large equipment bay. Age-predicted maximum (APM) HR was calculated using the 220-age formula. Data were analyzed using repeated measures ANOVA and Bonferroni post-hoc.

Results: Data from 40 cadet firefighters (31±3 yrs. old) were analyzed. No significant difference (p>0.05) was observed between SCBA maze training and live fire training for HR or ECT (see Table 1). However, HR and ECT differed significantly between circuit training and both SCBA maze training and live fire training.

Conclusions: Even though SCBA maze training was performed under controlled environment it involved a physiological strain above circuit training and as high as live fire training, reaching age predicted maximum HR. SCBA maze training should be considered as physiologically stressful as live fire training of similar duration.

Table 1. Physiologic characteristics of academy training among cadets (N=40)

	Circuit Training	SCBA Maze	Live Fire Training
Duration (minutes)	33	38	36
Peak HR (bpm)	182 ± 9*	193 ± 10	194 ± 17
APMHR	82.6 ± 5.2*	103.0 ± 4.1	104.4 ± 12.1
Peak ECT (°C)	38.6 ± 0.4*	39.3 ± 0.7	39.3 ± 0.6

Variables are means ± SD; HR = heart rate; ECT = estimated core temperature; APMHR = Age predicted maximum heart rate.

* p<.05 vs SCBA and Live Fire Training
 Supported by FEMA AFG Grant EMW-1015-FP-00731

2730 Board #4 May 31 1:00 PM - 3:00 PM
Effects of Wearing a Self-Contained Breathing Apparatus on Blood Oxygen Saturation During Exercise in Firefighters

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PURPOSE: Firefighters face a number of risks as part of their occupation. The self-contained breathing apparatus (SCBA) protects from smoke inhalation; however, the effects of the SCBA on blood oxygen saturation during exercise are unclear. The purpose of this study was to look at the effects of the SCBA on blood oxygen saturation during exercise.

METHODS: Nine healthy male firefighters (35 ± 5 years, 180.2 ± 24.9 pounds, 69.8 ± 3.8 inches) completed a physical activity readiness questionnaire (PARQ+) to determine eligibility for the study. Participants performed an incremental treadmill test to estimate their VO₂ max. One week later, participants exercised at 50% of their VO₂ max wearing their SCBA (SCBA). One week later, participants exercised at 50% of their VO₂ max not wearing their SCBA for the same duration (CON). Blood oxygen saturation was recorded at the lowest point (SO₂Low) and at the end of each exercise session (SO₂End). Heart rate (HR), blood lactate (LA) and rating of perceived exertion (RPE) were also measured and the end of each exercise session. For all variables, paired samples t-tests were used to compare differences between exercise sessions.

RESULTS: There was a significant difference in SO₂Low between the exercise sessions (p = 0.006; SCBA: 90.6 ± 3.5%; CON: 94.1 ± 1.4%). There was no significant difference in SO₂End between the exercise sessions (p = 0.01; SCBA: 94.3 ± 2.3%; CON: 95.7 ± 1.1%). Although not significant, there was a large difference in LA between the exercise sessions (p = 0.06; SCBA: 4.0 ± 3.0 mmol/L; CON: 1.9 ± 1.0 mmol/L). There were no significant differences in HR (p = 0.82; SCBA: 165 ± 21 bpm; CON: 164 ± 22 bpm) and RPE (p = 0.8; SCBA: 13 ± 1; CON: 13 ± 1) between the exercise sessions.

CONCLUSIONS: During exercise blood oxygen saturation was significantly reduced while wearing SCBA compared to CON. It is possible that while wearing SCBA the partial pressure of respired oxygen is reduced, resulting in oxygen not being diffused as efficiently.

2731 Board #5 May 31 1:00 PM - 3:00 PM
Exertional Strain and Task Performance Consequences of a Reduction in Protection in Structural Fire Fighter PPE - A Pilot Study

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PURPOSE: A major concern for working in structural firefighter PPE is the heat strain that is caused by the heat protection it provides. This is a multi-faceted challenge that requires studying heat protection, firefighter strain and task performance. To initialize this a pilot study on the consequences of reducing firefighter heat and flame protection on thermal strain, task performance and overall experiences of user safety was conducted at a firefighter training facility in The Netherlands.

METHODS: Ten experienced firefighters between the ages of 25 and 50 participated in a protocol approved by the local ethical committee. They performed a simulated rescue of two dummies in a small kitchen fire in a current structural firefighters garment (S) and in a one layer FR coverall with Reduced protection (R), both with

full safety gear, including SCBA. Measurements were conducted on heart rate, skin temperatures (4 sites), core temperature, task performance (speed, rescue result), mood and comfort sensations.

RESULTS: In all conditions all firefighters were able to execute the rescue in the R-gear as well as in the S-gear with no differences in time, on average 8.5 min. There were significant reductions in heart rate in the R-gear versus the S-gear ($p=0.02$) and in core temperature increase: 1.69 (0.80 °C/hr) in R-gear versus 2.52 (1.20) °C/hr in S-gear ($p=0.04$). Mean skin temperature was slightly higher in the R-gear, possibly due to the reduction in protection (35.1°C (R) versus 34.3°C (S), $p=0.009$). But it did not reach dangerous levels, none of the maximum skin temperatures was higher than 37°C. Comfort and strain ratings were lower in the R-gear, but there was an increase in the R-gear just prior to entering the room with the fire.

CONCLUSIONS: This pilot study addressed multiple aspects of the balance strain, protection and performance, all crucial to ensure safety and health for structural firefighters. The results showed that a small fire scenario could be addressed by the gear as effectively as the current gear, which was unexpected. The R-gear is expected to further reduce strain in most of the firefighter day-to-day work activities. The results also indicated that experienced firefighters would need to build confidence in the activities that can be executed safely in this clothing.

2732 Board #6 May 31 1:00 PM - 3:00 PM
Firefighters Do Not Exhibit Postexercise Hypotension Following a Bout of Vigorous Exercise

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(No relevant relationships reported)

Firefighters have a higher than normal prevalence of cardiovascular disease (CVD) and accompanying risk factors such as hypertension. These CVD risk factors may increase the risk of sudden cardiac death (SCD), which accounts for 45% of all on-duty firefighter deaths. Exercise confers protection against CVD risk, in part due to the immediate blood pressure (BP) reductions of 5-7 mmHg following exercise, termed *postexercise hypotension* (PEH). PEH in firefighters has not been studied. **PURPOSE:** To examine PEH after sudden vigorous physical exertion simulated by a maximal cardiopulmonary stress test (GEST) among career firefighters. **METHODS:** Firefighters ($n=19$ men) performed non-exercise control (CONTROL) and GEST on separate days followed by attachment to an ambulatory blood pressure (ABP) monitor for 19hr. Ambulatory systolic BP (ASBP) and diastolic BP (ADBP) were recorded at hourly intervals over awake (11hr), sleep (8hr), and 19hr. Additionally, other CVD risk factors and SCD biomarkers were measured as possible correlates of PEH. **RESULTS:** Firefighters were middle-aged (39.5±8.9yr) and overweight (29.2±4.0kg·m⁻²) men with high resting BP (123.1±9.6/79.8±10.4mmHg). Compared to CONTROL, ASBP after the GEST increased over awake (18.2±12.9mmHg, $p<0.01$), sleep (14.6±10.3mmHg, $p<0.01$), and 19hr (16.5±11.7 mmHg, $p<0.01$). Compared to CONTROL, ADBP increased after the GEST over awake (4.4±3.1mmHg, $p=0.02$), sleep (7.6±5.4mmHg, $p<0.01$), and 19hr (5.9±4.1mmHg, $p<0.01$). Resting SBP explained up to 25.6% of variance in the ASBP response over awake ($r=0.51$, $p=0.03$) and up to 30.0% over 19hr ($r=0.55$, $p=0.02$), while blood glucose levels explained up to 72.8% of variance over sleep ($r=0.85$, $p<0.01$). Resting DBP explained up to 52.9% of variance in the ADBP response over sleep ($r=0.73$, $p<0.01$), while resting DBP and medication use explained up to 76.1% of variance over awake ($r=0.87$, $p<0.01$) and up to 76.5% over 19hr ($r=0.88$, $p=0.02$). **CONCLUSIONS:** Sudden vigorous exertion evoked *postexercise hypertension* as opposed to PEH among firefighters with elevated resting BP, which was largely explained by the positive relationship between resting BP and the increase in ABP following exercise. These unexpected findings indicate that reducing hypertension is critically important to the CVD health of career firefighters.

2733 Board #7 May 31 1:00 PM - 3:00 PM
The Effect of Rapid and Slow Heat Acquisition on Heart Rate Variability

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(No relevant relationships reported)

Autonomic tone (AT), measured by heart rate variability (HRV), has shown to be linked to the risk of cardiovascular and other diseases. Firefighters are chronically exposed to environments and tasks that put them under acute bouts of thermal and cardiovascular stress, acutely affecting AT. HRV has been shown to respond to both heat stress and heavy exercise though it is not known if rapid heat acquisition caused by the microclimate of personal protective equipment (PPE) affects tonal response magnitude during exercise. **PURPOSE:** The aim of this study was to determine if PPE-induced rapid heat acquisition affected HRV differently than standard heat acquisition. **METHODS:** 15 healthy male subjects (mean age, 31.3 ± 11.7 years)

completed an incremental graded treadmill walking test until a core temperature of 39.5°C, volitional maximum, or a 2-hour time limit was obtained in both an experimental (PPE) and a control (CON) test in a random crossover design. Pre- and post-exercise, participants completed a 10-minute supine rest period, during which heart rate and R-R intervals were continuously collected. HRV data was filtered and analyzed in the frequency domain. Low (LF) and high frequencies (HF) were reported in normalized units (nu) along with the VLF (very-low frequency), LF, HF, and LF/HF ratio as a unit of power (ms²). **RESULTS:** Post-exercise LFnu was significantly increased in both CON (pre=73.3±3.5, post= 80.7±3.6, $p<0.05$) and PPE (pre=7.4±230.1, post=84.2±2.4, $p<0.01$) conditions while HFnu was significantly lower (CON; pre=26.7±3.5, post= 19.2±3.6, $p<0.05$ and PPE; pre= 31.6±4.5, post= 15.7±2.4, $p<0.01$). LF/HF ratios were also significantly different pre- to post-exercise in both conditions (CON; pre= 3.9±0.7 ms², post= 7.3±1.2 ms², $p<0.05$; PPE: pre= 3.9±0.6 ms², post= 7.7±1.0 ms² $p<0.01$). There was no difference between the two conditions either pre- or post-exercise for any of the variables measured in ms² except for post-exercise VLF which was significantly higher in PPE compared to CON. **CONCLUSION:** Results from the current study suggest that regardless of the rate of thermal acquisition, HRV response is similar, however the shift of HRV into the VLF domain during the PPE condition may have masked the magnitude of sympathetic response by lowering the LF frequency domain.

F-09 Thematic Poster - Pregnancy, Hormones and Gender

Friday, May 31, 2019, 1:00 PM - 3:00 PM
 Room: CC-102B

2734 Chair: Linda E. May, FACSM. East Carolina University, Greenville, NC.

(No relevant relationships reported)

2735 Board #1 May 31 1:00 PM - 3:00 PM

Validity of the Pregnancy Physical Activity Questionnaire for Maternal Physical Activity Recall

Michelle R. Conway¹, Mallory R. Marshall², Rebecca A. Schlaff³, Nicole M. Talge³, Karin A. Pfeiffer, FACSM⁴, James M. Pivarnik, FACSM⁴. ¹Western State Colorado University, Gunnison, CO. ²Samsford University, Birmingham, AL. ³Saginaw Valley State University, University Center, MI. ⁴Michigan State University, East Lansing, MI.

(No relevant relationships reported)

The Pregnancy Physical Activity Questionnaire (PPAQ) is a commonly utilized self-report assessment of physical activity (PA) during pregnancy, but its validity when evaluating women's PA historically after the pregnancy ends is unknown. **PURPOSE:** To evaluate the validity of the PPAQ for long-term recall of PA at two time points during pregnancy and once postpartum. **METHODS:** Between 2010 and 2018, 48 women completed the PPAQ at 21 and 32 weeks gestation and 12 weeks postpartum about their previous week's PA. These same women were emailed three separate PPAQs between two months and eight years after originally completing the questionnaires to recall their PA during those same time periods. Of these 48 women, 40 completed the follow up recall questionnaires (83%). Total number of metabolic (MET) minutes per week and percent time spent in light, moderate, and vigorous activity were compared between the original and long-term recall PPAQ values using paired sample t-tests or Wilcoxon Rank tests and Spearman correlation coefficients (SCC). The participants were then separated into two groups via a median split: those who originally completed the PPAQs ≥ five years ago and < five years ago. The paired sample t-tests, Wilcoxon Sign Rank tests, and SCC were repeated. **RESULTS:** Total MET-minutes per week and percent time spent in moderate activity were underestimated by 3000 – 4000 MET-minutes per week and 6%, respectively, and percent time in light activity was overestimated by 4-6%, when comparing long-term recall to original values. Women reported spending little time in vigorous intensity activity at both time points during pregnancy (2-4%). Twenty-one of the 36 comparisons were significantly different (58%). SCC values were lower for women who recalled PA ≥ five years postpartum compared to women who recalled their PA < five years postpartum for most time points and intensities. **CONCLUSION:** It is important to continue to assess the long-term validity of self-report methods, such as the PPAQ. On average, participants tend to underestimate total and moderate PA and overestimate light PA, but by relatively small amounts (3561 MET-minutes per week, 6%, 4-6%, respectively) when recalling their activity up to eight years previously.

2736 Board #2 May 31 1:00 PM - 3:00 PM
Morphometric Response of Overweight and Obese Women to Resistance Training during Pregnancy
 Olga Roldan-Reoyo¹, Christy Isler², Kelley Haven², Edward Newton², Linda E. May². ¹Swansea University, Swansea, United Kingdom. ²East Carolina University, Greenville, NC.
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 (No relevant relationships reported)

Resistance exercise (RE) has increased in popularity among pregnant women being the third most popular activity in previously active women. However, most of the RE interventions have been focused on birth outcomes from normal weight (NW) pregnant women or in overweight or obese (OWOB) pregnant women with pregnancy-related disease. Currently, we do not know how RE can influence morphometric measures in healthy OWOB pregnant women. **PURPOSE:** To determine the effect of RE during pregnancy of OWOB women on maternal morphometric measures. **METHODS:** 33 OWOB (25-Control group (CG) vs 8-RE group (REG)) healthy, low-risk, women with a singleton pregnancy have been analyzed for this study. All women signed an informed consent and agreed to participate in the study, which involves 3-exercise protocols (aerobics, resistance and aerobics+resistance) and a CG. Participants in the REG trained 3x/week, 50min, moderate intensity for ~20 weeks using machines, free weights and swiss balls. Maternal skinfolds and anthropometric measures were collected at 16 and 36 weeks of gestation. Student t test was performed to determine differences between groups. **RESULTS:** Analysis does not show significant differences in most variables measured at 16 and 36weeks ($p > 0.05$): weight16 (CG=86,9kg vs REG=85kg), weight36 (CG=96,7kg vs REG=94,1kg), percentage of body fat16 (%BF) (CG=36,2 vs REG=36,3), %BF36 (CG=37,1 vs REG=39,2), gestational weight gain (GWG) (CG=10kg vs REG=9,2kg), waist to hip ratio (WHR) at 16 (CG=0,79 vs REG=0,82). Significant differences were found in WHR36 weeks (CG=0,84 vs REG=0,77). 40% percent of the women in the CG exceeded their GWG recommendation vs 37,5% of REG women ($p > 0.05$). Birth weight was not significantly different between groups ($p > 0.05$): (CG=3,6kg vs REG=3,5kg). **CONCLUSION:** RE was not effective to prevent excessive GWG or to decrease %BF for OWOB pregnant women. The data suggest that, another exercise protocols should be evaluated between this population to test for the best efficacy. American Heart Association #15GRNT24470029

2737 Board #3 May 31 1:00 PM - 3:00 PM
Oxygen Uptake Kinetics During the Different Phases of the Menstrual and Oral Contraceptive Cycles
 Anmol T. Mattu, Danilo Iannetta, Patricia K. Doyle-Baker, Juan M. Murias. University of Calgary, Calgary, AB, Canada.
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 (No relevant relationships reported)

PURPOSE: To examine whether oxygen uptake ($\dot{V}O_2$) kinetics changes across the phases of the menstrual and oral contraceptive cycles. **METHODS:** Fourteen highly active women who were either non-oral contraceptive users ($n=7$, 28 ± 6 yrs.) or monophasic oral contraceptive users ($n=7$, 22 ± 3 yrs.) participated in the study. The time-constant of the $\dot{V}O_2$ kinetics response ($\tau\dot{V}O_2$) was determined by ensemble-averaging the $\dot{V}O_2$ response measured during three consecutive step-transitions in work rate, from 20 Watts (W) to a moderate-intensity work rate of 80 W. Each step was six minutes in duration. The test was completed during the menstruation phase of the cycles (follicular phase for non-oral contraceptive users or "inactive pill" phase for oral contraceptive users) and repeated during the respective non-menstruating phase (luteal phase or "active pill" phase). An ovulation test was used to validate the menstrual cycle phase. A metabolic cart was used to continuously measure expired gas concentrations and ventilatory rates. A one-way repeated-measures ANOVA was used to compare the differences in $\dot{V}O_2$ kinetics across cycle phases between non-oral contraceptive and oral contraceptive users. Statistical significance was set at $p < 0.05$. **RESULTS:** The time constant for the adjustment of $\dot{V}O_2$ was affected by cycle phases, regardless of contraception use, whereby $\tau\dot{V}O_2$ was greater in the menstruation phases of the non-oral contraceptive and oral contraceptive cycles (24 ± 7 s) compared to the non-menstruating phases (19 ± 5 s) ($p < 0.05$). **CONCLUSION:** The speed of the $\dot{V}O_2$ kinetics response is affected by the phases of the menstrual and oral contraceptive cycles, such that a greater $\tau\dot{V}O_2$ is observed during the menstruation phase. Anmol T. Mattu was supported by the NSERC Alexander Graham Bell Canada Graduate Scholarship.

2738 Board #4 May 31 1:00 PM - 3:00 PM
The Impact Of Pms And Pmdd On Physical Performance In Female Track And Field Athletes
 Reiko Momma¹, Yuriko Tochigi¹, Ai Hamasaki¹, Koichiro Tanahashi¹, Akari Takahashi², Tomohito Sato¹, Atsumu Yokota¹, Noboru Mesaki¹, Seiji Maeda¹. ¹University of Tsukuba, Tsukuba, Japan. ²Japan Sport Council, Kita-ku, Japan.
 (No relevant relationships reported)

Previous studies showed that menstrual cycle is associated with physical performance and subjective condition in female athletes. It is also known that premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) affect subjective condition in female athletes. However, the relationships among PMS, PMDD and physical performance in female athletes are not clarified yet. **Purpose** To investigate the impact of PMS and PMDD on physical performance in female track and field athletes. **Methods** Sixteen female track and field athletes with regular menstrual cycles participated in this study. Participants were measured body composition and physical performance test in follicular phase (no PMS and PMDD phase) and luteal phase (PMS and PMDD phase). As a physical performance test, Counter Movement Jump: CMJ, Rebound Jump: RJ, and Wingate test were performed. PMS and PMDD were evaluated by questionnaire survey of premenstrual syndrome (ACOG practice bulletin, 2000) and premenstrual dysphoric disorder (DSM-5, APA, 2013). **Results** In all subjects, there were no significant differences in body composition and physical performance between follicular phase and luteal phase. However, subjects who had breast tenderness of PMS decreased more greatly than non-symptom subjects in jump height of CMJ ($p=0.038$) and RJ index ($p=0.015$). Also, subjects who had anxiety of PMS decreased more greatly than non-symptom subjects in jump height of CMJ ($p=0.05$). Moreover, subjects who had overeating of PMDD increased more greatly than non-symptom subjects in HR max during Wingate test ($p=0.042$). **Conclusions** In this study, we showed that some symptoms of PMS and PMDD were associated with suppressed physical performance in female track and field athletes. Thus, PMS and PMDD may lead to decrease the physical performance in female track and field athletes.

2739 Board #5 May 31 1:00 PM - 3:00 PM
Physical Activity Influences the Relationship between BMI and Adiposity Differently in College Males and Females
 Ginny M. Frederick¹, Bhibha M. Das², Michael V. Fedewa³, Rachele M. Reed¹, Rachel E. Salyer¹, Michael D. Schmidt¹, Ellen M. Evans, FACS¹. ¹University of Georgia, Athens, GA. ²East Carolina University, Greenville, NC. ³University of Alabama, Tuscaloosa, AL. (Sponsor: Ellen M. Evans, FACS)
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 (No relevant relationships reported)

G.M. Frederick¹, B.M. Das², M.V. Fedewa³, R.M. Reed¹, R.E. Salyer¹, M.D. Schmidt¹, E.M. Evans¹, FACS¹. ¹University of Georgia, Athens, GA 30602. ²East Carolina University, Greenville, NC 27858. ³University of Alabama, Tuscaloosa, AL 35487. **PURPOSE:** Body mass index (BMI) is often used as a surrogate measure of adiposity (%Fat). It is well-established that physical activity (PA) influences body composition. In addition to the well-established sex differences in body composition, college-age males also typically engage in more PA than their female counterparts. This difference in PA could potentially impact the relationship between BMI and %Fat. Therefore, the aim of this study was to determine if PA differentially influences the relationship between BMI and %Fat in college-age males compared to females. **METHODS:** BMI was calculated from weight and height measured using standard clinical protocols. PA was measured in steps/day using the NL-1000 accelerometer. %Fat was measured via DEXA. **RESULTS:** Males ($N = 124$; 18.4 ± 0.5 yrs, 23.2 kg/m^2) and females ($N = 282$; 18.3 ± 0.5 yrs, 23.0 kg/m^2) were nearly identical in age and BMI (both $p > 0.05$). As expected, males were leaner (18.4 ± 5.1 %Fat vs. 32.2 ± 5.7 %Fat, $p < 0.001$) and accumulated more PA ($11,625 \pm 2930$ vs. $10,866 \pm 3467$ steps/day, $p = 0.03$) compared to females. Because of the known sex difference in %Fat, separate linear regression models were evaluated to explore the prediction of %Fat from BMI, PA, and BMI x PA. BMI explained 50.2% of the variance in %Fat among females and only 18.3% of the variance in males ($p < 0.001$ for both). Adding PA to the model significantly increased the variance in %Fat explained in both females and males ($\Delta R^2 = 3.4\%$ and 3.5% , respectively, both $p < 0.05$). The addition of the BMI x PA interaction term improved the model in females ($\Delta R^2 = 1.3\%$, $p = 0.005$), but not males ($\Delta R^2 = 0.0\%$, $p = 0.933$). **CONCLUSION:** Weight management is of high public health importance, especially for young adults who have an increasing risk for obesity during this stage of life. While many health promotion efforts focus on weight management with BMI as a primary outcome, it is important to account for sex differences with respect to the relationships among BMI, PA, and %Fat when using BMI for program evaluation in the young adult population.

Character Count (1,741/2000)

2740 Board #6 May 31 1:00 PM - 3:00 PM
Percentage Body Fat Predicted by Body Mass Index, Waist Circumference & Age in Different Racial & Gender Groups

Yaozong He, Yan Yang, Weimo Zhu, FACSM. *University of Illinois at Urbana-Champaign, Urbana, IL.*
(No relevant relationships reported)

Percentage Body Fat Predicted by Body Mass Index, Waist Circumference and Age in Different Racial and Gender Groups
 Studies have shown that percentage body fat (%BF) is highly correlated with the body-mass index (BMI) and waist circumferences (WC) in different age, race, and gender. However, taking ethnicity factor into account to predict %BF has not been established. **PURPOSE:** We explored the equations of %BF predicted by BMI, WC, and age in different racial and gender groups. **METHODS:** We use National Health and Nutrition Examination Survey (NHANES 2003-2004) data with sample weighing 488058396 in five race groups including Mexican American (MA), other Hispanic (OH), Non-Hispanic White (NHW), Non-Hispanic Black (NHB), and other Race - including Multi-Racial (OR). %BF was measured by dual-energy X-ray absorptiometry (DXA). Prediction equation of %BF was developed based on different race and gender groups with predictors of WC, BMI, and age (20 and older). **RESULTS:** There was a statistically significant interaction between groups. The results of the regression equation in different race and gender groups are as the following table:

Race	MA	OH	NHW	NHB	OR	
Gender	Male					
%BF (Mean, SD)	28.276, 4.848	27.280, 5.602	28.640, 5.942	26.152, 6.663	27.726, 5.485	
R-square	0.675	0.766	0.704	0.717	0.585	
Standardized CoefficientsBeta	WC	0.766	0.845	0.855	0.812	1.146
	BMI	0.061	-0.042	-0.054	0.022	-0.442
	Age	-0.004	0.139	0.109	0.057	0.074
Gender	Female					
%BF (Mean, SD)	41.362, 5.738	39.991, 5.302	40.006, 6.849	40.872, 6.765	38.182, 6.193	
R-square	0.633	0.566	0.689	0.678	0.709	
Standardized CoefficientsBeta	WC	0.187	0.113	0.199	0.165	0.239
	BMI	0.586	0.569	0.594	0.644	0.600
	Age	0.159	0.326	0.207	0.160	0.082

For all, $p = 0.000$
CONCLUSION: Formulating prediction equations in different gender and race groups does not improve the prediction of %BF. Further analyses such as cross-validation based on split training and testing datasets are needed.

2741 Board #7 May 31 1:00 PM - 3:00 PM
Differences in Determining Exercise Intensity in Males and Females

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(No relevant relationships reported)

Even though there are physiological differences between males and females, heart rate (HR), rate of perceived exertion (RPE), power output (PO), oxygen consumption (VO₂), and blood lactate (BL) levels have been used as measures of exercise intensity independently of the sex. **PURPOSE:** To determine if there are differences between sexes in different exercise intensity models. **METHODS:** Thirty (15 females) young, healthy individuals (age range 19-33 y) were scheduled for two testing visits 48-72 hours apart. During the first testing visit, a graded exercise test (GXT) was administered on a stationary bicycle. HR, RPE, PO, VO₂, and BL were obtained at the end of each exercise step and peak PO and VO₂max were recorded at the end of the test. BL during the GXT was used to determine 3 5-min steady-state workloads (low: 0-2 mmol/l; medium: 2-4 mmol/l; and high: >4 mmol/l) for the second test. HR, %HRmax (HR/(220-age)), RPE, PO, %POmax, VO₂, %VO₂max, and BL were also obtained at the end of each steady-state workload. A two-way repeated measures ANOVA was performed to compare all exercise intensity variables obtained during the second test between males and females ($\alpha=0.05$).

RESULTS: Only RPE, %PO, and BL did not differ between sexes on all 3 exercise intensities (Table). HR, %HR, and PO differ between sexes on at least 2 exercise intensities. VO₂ and %VO₂max differ between sexes on at least 1 exercise intensity.

Workload	Variable	Females (n=15)	Males (n=15)	p
Low (0-2 mmol/l)	HR (bpm)	115.9 ± 14.4	96.8 ± 14.2	0.004
	%HR (%)	68.7 ± 7.5	59.4 ± 8.8	0.002
	RPE	7.7 ± 2.0	7.5 ± 1.6	0.796
	PO (Watts)	61.3 ± 20.3	67.3 ± 15.3	0.440
	%PO (%)	44.1 ± 11.2	36.4 ± 9.7	0.051
	VO ₂ (ml/Kg/min)	15.1 ± 3.7	15.7 ± 3.6	0.731
	%VO ₂ max (%)	54.0 ± 9.8	45.6 ± 8.4	0.010
Medium (2-4 mmol/l)	BL (mmol/l)	1.5 ± 0.4	1.3 ± 0.4	0.439
	HR (bpm)	143.4 ± 15.8	127.9 ± 19.9	0.053
	%HR (%)	84.9 ± 6.2	75.4 ± 6.7	0.000
	RPE	10.5 ± 2.4	10.8 ± 2.4	0.711
	PO (Watts)	93.3 ± 22.0	116.7 ± 19.5	0.017
	%PO (%)	67.6 ± 10.3	32.1 ± 8.3	0.086
	VO ₂ (ml/Kg/min)	20.1 ± 4.2	24.7 ± 5.1	0.034
High (>4 mmol/l)	%VO ₂ max (%)	71.9 ± 10.0	71.3 ± 6.7	0.760
	BL (mmol/l)	2.6 ± 0.6	2.8 ± 0.7	0.367
	HR (bpm)	164.0 ± 15.6	149.0 ± 17.0	0.016
	%HR (%)	97.0 ± 3.7	91.1 ± 7.3	0.017
	RPE	13.7 ± 2.4	14.1 ± 2.4	0.594
	PO (Watts)	123.7 ± 23.0	166.0 ± 29.2	0.001
	%PO (%)	89.9 ± 8.6	37.8 ± 8.2	0.414
High (>4 mmol/l)	VO ₂ (ml/Kg/min)	26.3 ± 5.5	31.0 ± 5.6	0.074
	%VO ₂ max (%)	93.3 ± 7.4	39.6 ± 5.5	0.212
	BL (mmol/l)	4.7 ± 0.7	4.8 ± 1.1	0.657

CONCLUSIONS: As previously reported, females have higher HR and %HR than males for similar %PO. However, and contradicting previous reports, RPE was similar between males and females for similar %PO. Based on the current results, traditional exercise intensity models are different between males and females. BL and %PO appear to be the models that might be used independently of sex.

2742 Board #8 May 31 1:00 PM - 3:00 PM
The Relationship Between Maternal Physical Activity during Late Pregnancy and Infant Motor Development

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(No relevant relationships reported)

BACKGROUND: Physical activity is beneficial for pregnant women and their offspring. Exercise during pregnancy may elicit improvements in the brain/ neurodevelopment of offspring; however, it is unknown whether or not physical activity during pregnancy is connected to infant motor development. The purpose of this study was to determine the relationship between maternal physical activity during late pregnancy and infant motor development at four months of age. **METHODS:** Physical activity was objectively assessed during late pregnancy (32-39 weeks gestation) via a wrist worn accelerometer. The amount of time spent sedentary and participating in light and moderate exercises were calculated for one week. Within 48 hours of birth, surveys were given to participants to complete prospectively with information on time their infant spends in different positions (supine, prone, supported sitting and standing), infant feeding practices (breastfed vs. formula-fed), and other factors that could contribute to infant motor development during the first 4 months of life. Between 4 and 4.5 months of age, the motor development of the child was assessed by a board-certified pediatric physical therapist using the well-validated Alberta Infant Motor Scale (AIMS). **RESULTS:** Thirty women-infant pairs participated in the study (n=30). Infant motor development percentiles were not correlated to time spent sedentary ($r=-.02$, $p=.94$), time spent participating in light activity ($r=-.03$, $p=.88$), or time spent participating in moderate activity during late pregnancy ($r=.04$, $p=.85$). In addition, there was not a significant relationship between infant motor scores and the total time an infant spent in prone ("tummy time") ($r=-.06$, $p=.81$). Interestingly, infants who were exclusively breastfed at 4 months had a significantly higher mean motor score percentiles compared to those who were on formula (19.0 vs. 15.8, $p=0.003$). **CONCLUSIONS:** There was no relationship between maternal physical activity levels during late pregnancy and infant motor development at four months of age. However, infants who were still breastfed at 4 months of age had higher motor development percentiles. The long-term implications of these data are substantial as motor performance in infancy is linked to an improved-cognitive function in school-age children.

F-10 Thematic Poster - Sports Injury: New Epidemiological Insights

Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-104B

2743 Chair: Alpa V. Patel, FACS. *American Cancer Society, Atlanta, GA.*

(No relevant relationships reported)

2744 Board #1 May 31 1:00 PM - 3:00 PM
Sport-Specific Associations of Sport Specialization and Sport Volume with Overuse Injury in Youth Athletes

Eric G. Post¹, Kevin M. Biese², Daniel A. Schaefer², Andrew M. Watson², Timothy A. McGuine², M. Alison Brooks², David R. Bell². ¹San Diego State University, San Diego, CA. ²University of Wisconsin-Madison, Madison, WI.
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(No relevant relationships reported)

Year-round participation in a single sport at the exclusion of other sports, also known as sport specialization, is associated with increased risk of overuse injury in youth athletes. To reduce this risk, several recommendations for participation volume have been developed. However, risk of overuse injuries may be dependent on specific movement profiles required by a given sport.

PURPOSE: To examine sport-specific associations of sport specialization and exceeding sport volume recommendations with overuse injuries in adolescent basketball, soccer, and volleyball athletes.

METHODS: 716 youth athletes (70.8% female, age 14.21.5 years old, 43.2% basketball, 19.4% soccer, 37.4% volleyball) were recruited to complete an anonymous questionnaire regarding their sport participation patterns and previous injury history. Sport specialization status was classified as low, moderate, or high using a widely utilized 3-point scale. Self-reported sport volume was used to classify athletes as either meeting or exceeding sport volume recommendations (playing their primary sport >8 months/year, hours/week of organized sport > age, days of sport participation per week >5). Multivariable logistic regression analyses were utilized to examine associations between variables of interest and overuse injury in the previous year.

RESULTS: Highly specialized volleyball athletes were more likely to report an overuse injury compared to low specialization volleyball athletes (OR [95% CI]: 2.3 [1.1-4.8], p<.01). Volleyball athletes who trained: more than 8 months per year (OR [95% CI]: 2.0 [1.1-3.5], p<.05), more hours per week than their age (OR [95% CI]: 2.0 [1.2-3.4], p<.01), or more than 5 days per week (OR [95% CI]: 2.1 [1.2-3.9], p<.05) were more likely to report an overuse injury compared to volleyball athletes who did not violate these recommendations. No significant associations were observed in soccer or basketball athletes (P>0.05).

CONCLUSIONS: The association between sport specialization, excessive sport volume, and overuse injuries may be specific to sports that are more repetitive or technical in nature, such as volleyball. Dissemination of sport-volume recommendations should be focused towards athletes, parents, and coaches in these sports.

2745 Board #2 May 31 1:00 PM - 3:00 PM
A Seven-year Epidemiological Analysis Of Ankle Injuries In U.S. Rugby-7s

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Reported Relationships: V. Lopez Jr: Salary; Officer Salary. Industry contracted research; Grant National Operating Committee on Standards for Athletic Equipment (ID 44-16), Chapel Hill, NC, USA., Grant USA Rugby's Empire and New England Geographic Union Rugby Football

Unions.

PURPOSE: There is a lack of injury data on the collision sport of U.S. Rugby-7s, the aim was to determine match ankle injury-incidence and risk-factors in U.S. Rugby-7s. **METHODS:** This was a prospective epidemiology study of players at USA Rugby Club 7-a-side competitive regional circuits and USA Rugby-7s Championships (2011-2016). Injury data were captured via the Rugby Injury Survey & Evaluation (RISE) Report. **RESULTS:** Overall injuries were found at 9.9/1000ph (n=313) (time-loss 2.5/1000ph, n=78; medical attention 7.4/1000ph, n=235; P<0.001). Females (3.5/1000ph; 12.3%; n=112) encountered fewer overall ankle injuries than males (7.6/1000ph; 10.8%; n=239; P=0.477). Backs (59%) more frequently than forwards (35%). Ankle injury severity, days absent was found at 41.5 days mean severity (CI: 24.4-58.6) with 68% follow-up. Overall injuries acutely (95%), occurred during the tackle (61%, 5.2/1000ph) and open play (29%, 2.5/1000ph). Lateral ligament sprains (3.7/1000ph) occurred more frequently than medial (0.9/1000ph). Risk factors among time-loss injuries and impact were frequent (direct-contact=1.7/1000ph, 68%; n=53; non-contact=0.8/1000ph; 32%; n=25; p=0.002). Contact injuries were higher among women (64%). New time-loss injuries (71.8%) occurred more often than recurrent-time-loss ankle injuries (28.2%). Recurrent ankle injuries occurred more frequently at greater-than-12-months (delayed-recurrence=12.8%) followed by a 2-month (early-recurrence=10.3%). Recurrent injuries occurred most frequently among elite players at a late-recurrence rate (2-12-months=28.6%) as compared to non-elite players at a delayed-recurrence (>12-months=14.1%). **CONCLUSIONS:** Ankle injuries are a frequent concern in collision sports. This is compounded when return-to-sport protocols are not adhered and may be a risk-factor for subsequent injury. U.S. Rugby-7s community ankle injury rates were lower compared to International elite Rugby-7s play at 7.1-25/1000ph (time-loss). Appropriate proprioception and agility training awareness, would benefit all levels of play. This emerging population may benefit from education on return-to-sport protocols and post-tournament injury care which would decrease recurrent injury rates seen in this U.S. amateur population.

2746 Board #3 May 31 1:00 PM - 3:00 PM
Prospective Injury Surveillance during the Wheelchair Basketball World Championships 2018

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(No relevant relationships reported)

Standardized injury surveillance projects have been conducted in several Olympic sports, and the information has been used to develop preventive strategies to reduce injury risk. In contrast, injury surveillance in Paralympic sports has been executed rarely, and in depth information on injury epidemiology of specific elite Paralympic sports are scarce. **PURPOSE:** To investigate the rate and characteristics of injuries prospectively during the 2018 Wheelchair Basketball World Championships in Hamburg (Germany). **METHODS:** The physicians or physiotherapists of all participating female and male teams were asked to report daily all newly incurred injuries on a standardized injury report form during the 11 days of the tournament. Incidence rates were calculated, and injury characteristics compared using chi-squared tests. **RESULTS:** A total of 100 injuries were reported from 132 players, equivalent to 77.2 injuries per 1000 athlete days (95%CI: 62.1 to 92.3). About two thirds of the injuries occurred during matches, and 32 during training sessions. The rate of match injuries was 76.6 (95%CI 61.6 to 91.6) per 1000 athlete-days, the rate of training injuries 78.4 (95%CI 63.0 to 93.8) per 1000 athlete-days. Eight time-loss injuries were documented, equivalent to 6.2 (95%CI 5.0 to 7.4) time-loss injuries per 1000 athlete-days, all were classified as minor. Most injuries occurred at the upper limb (shoulder 14%, elbow 11%, hand/fingers 10%) and back (cervical spine 16%; thoracic spine 15%). The predominant injury types were muscle spasms (25%) and contusions (16%). About half of the injuries were classified as overuse injuries (52%). Injury mechanisms differed between training and match (p<0.05), and between female and male players (p<0.05). **CONCLUSIONS:** The injury rates were higher than reported during other major tournaments (Paralympic Games) or during regular wheelchair basketball seasons. Reasons are most probably due to the high number of reported non-time-loss injuries. Possible preventive strategies should focus on shoulder, hand and back. Muscle spasms could be prevented using adequate rehydration and electrolyte substitution, while the special requirements of players' disabilities need to be considered. Future research should include illnesses in the prospective monitoring.

2747 Board #4 May 31 1:00 PM - 3:00 PM
Gender Differences In The Risk Of Head, Neck & Face Injuries In US Rugby-7s

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A high incidence of head injuries, including concussions, has been documented in a growing US rugby playing population. However, few studies have focused on describing common risk factors associated with head injuries. **PURPOSE:** The purpose of this study was to identify risk factors associated with head, neck, and face injuries (HNFI) among amateur U.S. rugby-7s players and investigate risk differences between genders. **METHODS:** Data were used from the Rugby Research and Injury Prevention Group's injury registry (January 2010-2016). Anthropometric data, mechanism of injury, and other injury risk factors were tabulated by HNFI and gender. Logistic regression determined the relation between gender and HNFI. The final multivariable model was used to calculate the probability of HNFI and highlight gender differences. **RESULTS:** The final study sample consisted of 1,307 (68.2% men, 31.8% women) U.S. rugby-7s players and 1,679 (68.1% men, 31.9% women) injuries. From 2010-2016, 474 (28.2%) HNFI were documented. The most commonly injured body part and injury type were the head (47.7%) and concussions (40.3%), respectively. The final model revealed gender, age, position during contact, contact surface, and play legality were significantly associated with HNFI. Controlling for play legality and position during contact, under 18 (U18) boys injured during contact with an opposing player had the highest probability of HNFI (51%) and a higher probability than U18 girls (p=0.004). However, women 18-24 (p=0.019) and over 30 (p=0.042), injured during contact with the ground, had a higher probability of HNFI than men. **CONCLUSIONS:** Identifying gender-specific risk factors of injury will allow for a more effective injury prevention plan that addresses the specific needs of men and women of different levels of competitive play. Our analyses suggest there are differences in risk of HNFI in amateur Rugby-7s as it relates to player age, gender, and play legality. Age group analyses may help identify gender-specific HNFI risk factors within each age group.

2748 Board #5 May 31 1:00 PM - 3:00 PM
Gender Differences In Match Contact Injuries In U.S. Rugby-7s.

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Rugby-7s is a popular collision sport that is played by both sexes in the U.S. Collisions that occurs during Rugby are responsible for the majority of injuries during competition. **PURPOSE:** The objective of this study is to evaluate gender differences in match injuries among men and women amateur U.S. Rugby-7 athletes. **METHODS:** A prospective epidemiology study on Rugby-7s competitions (USA Rugby and USA Sevens tournaments) over 2010-2015 was performed. Injury rate (per 1000 player-hour (ph)) and biomechanism of injuries were recorded using the Rugby Injury Survey & Evaluation (RISE) report. Direct (injury from collision with an opposing player) and indirect mechanism (injury from the body part making contact with another factor such as playing surface) were recorded. Severity of injuries (days (d) absent from play) were determined. Comparative analysis between sexes were performed with statistical significance set a P<0.05. **RESULTS:** A total of 1223 contact match injuries were seen during the study period (men: 852 injuries; women: 371 injuries). There was no significant differences in incidence of contact injuries for U.S. men vs. women Rugby-7 athletes (men: 55.4/1000ph; women: 59.0/1000ph; P=0.31). Female players however had a higher incidence of indirect injuries than males (women: 23.1/1000ph; men: 17.4/1000 ph, P=0.007). Female Rugby-7s players also sustained more severe contact injuries than males (women: 56.7d; men: 40.1d, P=0.03). In terms of incidence of injury per body region, female players had a higher incidence of lower extremity injuries than males (women: 24.2/1000ph; men: 18.0/1000 ph, P=0.004). Female Rugby-7s athletes also missed a significant more time with contact head/neck (women:

55.1/1000ph; men: 29.4/1000 ph, P<0.009) and lower extremity injuries (women: 70.7/1000ph; men: 41.2/1000 ph, P=0.01). **CONCLUSIONS:** Significant differences in rate and mechanism of injuries exist between U.S. men and women Rugby-7 athletes in our study population. Female players are more likely to sustain certain types of injuries and missed substantially more time after an injury when compared to their male counterparts. Gender differences in sports are important to consider when evaluating injury risk and formulating population-specific prevention programs.

2749 Board #6 May 31 1:00 PM - 3:00 PM
Evaluation Of The Rate Of Orthopedic Injuries Of Concussed And Non-concussed Players In The NFL

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 (No relevant relationships reported)

Evaluation of the Rate of Orthopedic Injuries of Concussed and Non-Concussed Players in the NFL

Concussions may increase the risk of musculoskeletal injury during the 90 day period after return to play. Previous work has evaluated this effect in collegiate players with consistent results. **PURPOSE:** To examine possible increased risk of orthopedic injury among National Football League players 12 weeks (90 days) after return to play from an incident concussion compared to an incident orthopedic injury. **METHODS:** Weekly NFL injury data from 2012 through 2017 was collected from public websites and weeks 3-10 of the regular season were analyzed. Players with upper extremity (UE) and lower extremity (LE) orthopedic injuries were matched to each concussed player on position, team, and week of return to play. Concussed players were excluded if they sustained an orthopedic injury concurrently with a concussion or if there was no matched orthopedic control. Additional players were excluded from the study if they were on the injury logs for any other reason. This study analyzed 194 concussed players, comparing them with 187 LE and 105 UE injuries. An additional 444 non-injured controls with no injuries spanning 3 weeks prior were also evaluated. The rate of orthopedic injury was calculated as the number of orthopedic injuries during the 12 week period following return to play from their initial injury divided by 12 weeks. UE and LE injuries were evaluated separately against the concussion group using a Wilcoxon Rank Sum test. **RESULTS:** In the 12 week period following return to play from injury, players who sustained a concussion had an average of 0.030.06 orthopedic injuries, while players who sustained a LE injury or uninjured controls had a rate of 0.010.04 and 0.002 0.01 orthopedic injuries respectively. There was a significant difference between the orthopedic injury rate among the concussed and LE injury groups (Z = 2.22, p-value = 0.03). In addition, the difference in orthopedic injury rate between the controls and concussed groups was significant (Z=9.79, p-value = 1.55e-22). No relationship between concussed and UE injury was found. **CONCLUSION:** The results of this study suggest a relationship between concussions and subsequent orthopedic injuries in NFL players compared to those with an incident LE injury or no incident injury.

2750 Board #7 May 31 1:00 PM - 3:00 PM
Volleyball-Related Injuries in Adolescent Female Players

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Purpose: This study determined the prevalence and type of musculoskeletal injuries and potential contributing risk factors to injury among adolescent volleyball players. **Methods:** Female volleyball players (n=300; 10-18 yrs), with any level of volleyball experience were recruited. Participants completed a study-specific survey about their overall sport training type and volume, volleyball experience level (beginner, intermediate, advanced) and position, annual volume of volleyball play and injuries accrued during volleyball. **Results:** Over 65% of participants reported sustaining one or more injuries, with ankle (38.8%), knee (19.7%), finger (18.8%), and shoulder (14.5%) injuries being most frequently-reported. Among injured players, 21.1% reported missing more than one month of play. Annual volume of volleyball play increased as skill level progressed from beginner to advanced (179.7 units to 478.1 units p<0.05). Also, the prevalence of injuries sustained by players increased as skill level increased from beginner to advanced (7.7% to 72.3%; p<0.05). Players who ranked themselves as 'intermediate' experience had higher odds of sustaining an elbow injury compared to other skill levels (OR 6.59; p=0.02). Outside hitters, defensive specialists, and those who play multiple positions were more likely to participate in multiple conditioning methods such as weight training, endurance and flexibility (OR 1.81, 1.93, 1.74, respectively; p<0.05) with advanced players indicating a trend to higher odds of participating in multiple conditioning methods (OR 1.49, p=0.085). Only 46.1% of participants

reported playing other sports, with those participating in basketball indicating a 49% decreased odds of sustaining an injury compared to participating in other sports (OR 0.510, $p < 0.05$)

Conclusion: An interpretation of these data is that adolescent players may incur injuries due to underdeveloped neuromuscular systems capable of sustaining progressively higher volumes of play as experience and competition level increase. Participation in a secondary sport like basketball may protect against injury by conferring cross-sport benefits of jump-landing, cutting and body positioning. Position-specific injuries suggest technique-driven risk factors that should be further investigated biomechanically.

2751 Board #8 May 31 1:00 PM - 3:00 PM

Determinants of Concussion Symptomology and Resolution Time in US High School Soccer Players

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Reported Relationships: A. Chandran: Other (please describe): The National Athletic Treatment, Injury and Outcomes Network (HS NATION) data were provided by the Datalys Center for Sports Injury Research and Prevention., HS NATION was funded by the National Athletic Trainers' Association Research and Education Foundation (NATA REF), and the Central Indiana Corporate Partnership (CICP) Foundation.

Concussions are a concern among soccer players of all ages. However, determinants of concussion symptomology and other sequelae have not been examined in high school soccer players.

Purpose: Examine the impact of sex, injury history, injury mechanism, and setting on concussion symptomology and resolution time among HS soccer players.

Methods: The NATION-SP captured soccer-related injury data collected by athletic trainers (ATs) during the 2011/12-2013/14 academic years. We specifically examined injuries diagnosed as concussions. Outcomes of interest included symptoms reported with concussions as well as resolution time, categorized as resolved in 7 days, 14 days, 28 days and > 28 days. Exposures of interest included sex, injury history, injury mechanism associated with concussion, and setting (competition vs. practice). We used multivariate logistic regression models to assess the odds of reporting specific symptoms as a function of exposures, as well as other observed symptoms. We then used ordinal logistic regression models to assess exposure effects on the odds of reporting a longer symptom resolution time. Odds Ratio (OR) estimates with 95% confidence intervals (CI) excluding 1.00 were deemed significant.

Results: A total of 189 concussions were reported, with most observed in girls (56%). Symptoms resolved within 7 days in 41% of reported concussions. Interestingly, we detected several symptom dependencies, such as higher odds of light sensitivity (OR=20.71, 95% CI: 8.58, 50.00) with concurrent noise sensitivity, and higher odds of irritability (OR=9.04, 95% CI: 3.74, 21.85) and drowsiness (OR=7.46, 95% CI: 3.48, 15.98) with concurrent insomnia. We also observed lower odds of longer symptom resolution time in concussions due to player contact mechanisms than those due to non-player-contact mechanisms (Adj. OR=0.33, 95% CI: 0.18, 0.59).

Conclusions: Determinants of soccer-related concussions and their sequelae appear to be multifactorial. The observed symptom dependencies may encourage clinicians to evaluate players for specific symptoms in the presence of others while also indicating common neurological pathways affected by trauma in this context. Injury mechanism may also be associated with concussion outcomes, although future investigation is warranted.

F-11 Free Communication/Slide - Carbohydrate Metabolism

Friday, May 31, 2019, 1:00 PM - 3:00 PM

Room: CC-105A

2752 **Chair:** Trent Stellingwerf, FACSM. *Canadian Sport Institute Pacific, Victoria, BC, Canada.*

(No relevant relationships reported)

2753 May 31 1:00 PM - 1:15 PM
Sport Specific Substrate Utilization During a Maximal Oxygen Consumption Test

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(No relevant relationships reported)

Substrate utilization as an indicator of exercise performance is a growing topic of interest for athletes. Athletes and sports science professionals are using substrate utilization to determine appropriate exercise programs and dietary interventions. However, evidence supporting the "typical" sports-specific metabolic profile is lacking.

PURPOSE: To predict time of substrate change using respiratory exchange ratio (RER) >0.85 from heart rate (HR), percent $\dot{V}O_{2max}$ (% $\dot{V}O_{2max}$), sex, carbohydrate intake (CHO), fat intake (FAT) and protein intake (PRO). We also explored whether differences in substrate utilization existed among sport types during a $\dot{V}O_{2max}$ test in Masters Athletes. **METHODS:** This was a cross-sectional study where 70 Masters Athletes (35 women; 35 men; 39±11 years of age) were measured for RER during a $\dot{V}O_{2max}$ treadmill test. A food frequency questionnaire (FFQ) was completed to determine average nutrient intake. Athletes from four sport types were included in our analyses: runners (20), triathletes (20), rowers (19) and CrossFit athletes (11). A multivariate linear regression model of least squares was used to predict time to RER of >0.85 from HR, % $\dot{V}O_{2max}$, sex, CHO, FAT and PRO. A one-way ANOVA was used to determine whether differences existed among sport types. Bonferroni correction procedures were used to control the familywise error rate and maintain alpha levels at $p < 0.05$. **RESULTS:** Significant correlations were found between time and HR ($r=0.632$, $p < 0.001$), time and % $\dot{V}O_{2max}$ ($r=0.616$, $p < 0.001$), time and sex ($r=0.257$, $p=0.021$), time and CHO ($r=-0.290$, $p=0.010$), time and FAT ($r=-0.272$, $p=0.015$), time and PRO ($r=-0.270$, $p=0.016$) and were included in our multivariate model. HR, % $\dot{V}O_{2max}$, sex, CHO, FAT, PRO significantly predicted time to RER ($R^2=0.467$, $p < 0.001$). We also found significant differences in time to RER >0.85 between runners (4:16 ± 0:58) and CrossFit athletes (2:52 ± 1:03) ($p=0.014$), posthoc. **CONCLUSION:** We found a significant relationship between HR, % $\dot{V}O_{2max}$, sex, CHO, FAT, PRO and time to RER in Masters Athletes of various sports. We also found that significant differences existed in time to RER >0.85 between runners and CrossFit athletes. Future studies that are prospective and include diverse exercise intensities are needed. This study was not funded

2754 May 31 1:15 PM - 1:30 PM

Transcriptional Regulation Of Substrate Metabolism Following Carbohydrate Ingestion During Exercise Initiated With Different Glycogen Concentrations

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(No relevant relationships reported)

BACKGROUND: Starting aerobic exercise with low muscle glycogen content elicits greater fat and less carbohydrate utilization than exercise started with high muscle glycogen content, even when exogenous carbohydrate is ingested during exercise. The mechanisms contributing to greater fat utilization despite ingesting carbohydrate during exercise initiated with low glycogen are not delineated.

PURPOSE: Characterize transcriptional regulation of substrate metabolism in response to carbohydrate ingestion during steady-state exercise initiated with low muscle glycogen.

METHODS: In a randomized, crossover design, 12 men (mean ± SD, age, 21 ± 4 y; body mass, 83 ± 11 kg; $\dot{V}O_{2peak}$, 44 ± 3 mL/kg/min) completed two cycle ergometry glycogen depletion trials, followed by a 24 h period of either high fat (1.5 g/kg carbohydrate, 3.0 g/kg fat) or high carbohydrate (6.0 g/kg carbohydrate, 1.0 g/kg fat) isocaloric refeeding to elicit low (LOW) or adequate (AD) glycogen content the following morning before initiating 80-min of cycle ergometry (64 ± 3% $\dot{V}O_{2peak}$) while

ingesting 146 g of carbohydrate. Transcriptional regulation of substrate metabolism was assessed using RT-qPCR in vastus lateralis biopsy samples obtained before (PRE) and after (POST) the 80-min exercise bout.

RESULTS: PRE glycogen synthase kinase 3 α expression was 40% lower ($P<0.05$; time-by-treatment interaction) in LOW than AD. GLUT4, hexokinase 2, phosphofructokinase, and pyruvate kinase expression were not different between LOW and AD. PRE fatty acid translocase was 40% higher ($P<0.05$; time-by-treatment interaction) in LOW than AD. Independent of time, fatty acid binding protein, carnitine palmitoyltransferase 1A, and hydroxyacyl-CoA dehydrogenase/3-ketoacyl-CoA expression were each ~40% higher ($P<0.05$; time effect) in LOW than AD. In LOW, POST peroxisome proliferator-activated receptor δ was 177% higher ($P<0.05$ time-by-treatment interaction) than PRE, with no change in AD.

CONCLUSION: Initiating aerobic exercise with low muscle glycogen content upregulates the transcriptional control of fat oxidation without modulating intramuscular regulation of glucose metabolism, even when exogenous glucose is ingested during exercise.

2755 May 31 1:30 PM - 1:45 PM

Effect Of Breaking-up Sedentary Activity On Metabolic Flexibility And Glycemia In Free-living Overweight/obese Adults

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(No relevant relationships reported)

PURPOSE: Sedentary behavior (SB) triggers an inability to adjust substrate use to substrate availability (metabolic flexibility, MF), which may precede glucose intolerance in the pathogenesis of insulin resistance. We and others have shown that frequent interruptions in SB leads to improved glycemic control, however the underlying role of MF in this process is unknown. This study examined the effects of breaking up SB on MF and glucose metabolism in free-living overweight and obese adults. To distinguish effects of breaking up SB from being physically active, we also studied a group where participants performed a single energy matched continuous bout of exercise. **METHODS:** Physically inactive, adults (12F/7M, mean \pm SD; 33 \pm 8 yrs, BMI = 29.5 \pm 3.3kg/m²) were randomly assigned to a 4 week intervention consisting of brisk walking for 5 min each hour for 10h, 5 d/wk (MICRO), or 4 weeks of an intervention consisting of one continuous 45 min bout of exercise per day, 5d/wk (ONE). Outcomes assessed at baseline and after each intervention included: MF (waking respiratory quotient, RQ, minus sleeping RQ as measured in a whole room calorimeter), insulin sensitivity (SI, IVGTT), 24h glycaemia (continuous glucose monitor), 24h glucose oxidation (U13C glucose tracer), SB, time spent stepping, and performing moderate to vigorous activity (MVPA; ActivPAL and ActiGraph). Groups were similar on all outcome variables at baseline. Linear mixed models evaluated intervention and intervention-by-group effects. **RESULTS:** MICRO and ONE decreased time sitting (-43.5 \pm 93.4 min), increased time stepping (+26.3 \pm 44.0 min) and time spent in MVPA (+9.8 \pm 17.6 min) ($p<0.05$ for all). No significant changes were observed in SI, but both interventions decreased fasting insulin and HOMA IR ($p<0.05$ for both). Compared to ONE, MICRO improved the acute insulin response to glucose (AIRg), lowered 24h glycemic variability, maintained exogenous glucose oxidation, and improved MF (interaction: $p<0.05$ for all). Improvements in MF were positively associated with changes in SI ($r=0.59$, $p=0.02$). **CONCLUSIONS:** Independent of time sitting and stepping, breaking up SB improves glucose homeostasis and MF. The effects of such an intervention in persons with type 2 diabetes warrants further study.

2756 May 31 1:45 PM - 2:00 PM

Low Muscle Glycogen Content Does Not Alter Exogenous Carbohydrate Oxidation During Aerobic Exercise

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(No relevant relationships reported)

BACKGROUND: Initiating aerobic exercise with low muscle glycogen content promotes greater fat and less endogenous carbohydrate oxidation during exercise. However, whether oxidation of exogenous carbohydrate increases when exercise is initiated with low muscle glycogen is not well defined.

PURPOSE: Determine if exogenous carbohydrate oxidation during aerobic exercise is affected by the level of muscle glycogen at the onset of exercise.

METHODS: Using a randomized, crossover design, 12 men (mean \pm SD, age: 21 \pm 4 y; body mass: 83 \pm 11 kg; VO_{2peak} : 44 \pm 3 mL/kg/min) completed 2 cycle ergometry glycogen depletion trials separated by 7-d, followed by a 24-h period of high fat (1.5 g/kg carbohydrate, 3.0 g/kg fat) or high carbohydrate (6.0 g/kg carbohydrate, 1.0 g/kg fat) refeeding to elicit low (LOW) or adequate (AD) glycogen stores. Participants then performed 80-min of steady-state cycle ergometry (64 \pm 3% VO_{2peak}) while ingesting 146 g of carbohydrate (95 g glucose + 51 g fructose; 1.8 g/min). Substrate oxidation (g/min) during exercise was determined by indirect calorimetry and tracer techniques with ¹³C-glucose and ¹³C-fructose. Muscle glycogen (mmol/kg dry wt) was determined by fluorimetric assays from vastus lateralis biopsies obtained before and after glycogen depletion and before (PRE) and after (POST) steady-state exercise trials.

RESULTS: Muscle glycogen concentrations were the same between treatments before (LOW: 467 \pm 95, AD: 472 \pm 109) and after both depletion exercise bouts (LOW: 207 \pm 99, AD: 210 \pm 145). Following 24-h refeeding, PRE glycogen was lower in LOW (217 \pm 103) compared AD (396 \pm 70; $P<0.05$). POST glycogen in AD (229 \pm 94; $P<0.05$) was lower than PRE but remained higher than LOW (137 \pm 131; $P<0.05$). Glycogen did not change PRE to POST in LOW. Exogenous carbohydrate oxidation rate was not different between LOW (0.84 \pm 0.14) and AD (0.87 \pm 0.16; $P>0.05$). Fat oxidation was higher, and total and endogenous carbohydrate oxidation was lower in LOW (0.55 \pm 0.10, 1.59 \pm 0.40, and 0.75 \pm 0.29) compared to AD (0.38 \pm 0.13, 2.03 \pm 0.36, 1.17 \pm 0.29; all $P<0.05$).

CONCLUSION: These data show that initiating steady-state aerobic exercise with low muscle glycogen content does not cause greater reliance on exogenous carbohydrate for fuel.

2757 May 31 2:00 PM - 2:15 PM

Energy Metabolism With Or Without Slow Or Rapid Absorption Carbohydrate In Trained Endurance Runners

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(No relevant relationships reported)

The ability for carbohydrate (CHO) to provide sustained energy availability and stable blood glucose is important in prolonged endurance. **PURPOSE:** To examine energy metabolism, total and exogenous CHO utilization, blood glucose and performance after consuming different isocaloric glucose beverages before a sustained treadmill run. **METHODS:** 10 male experienced endurance runners (32.4 \pm 1.9 yr; 73.5 \pm 3.1 kg; %bf 15.3 \pm 2.1; VO_{2max} = 55.9 \pm 1.5 mL/kg/min) participated in a crossover-designed study, on 3 occasions: Slow digestion CHO (S), Fast digestion (F), and Water (C). Participants consumed a single 50g dose of either S or F prior to running 3hrs at 58% VO_{2max} . Pulmonary gas exchange and plasma glucose were assessed at -15, 0 (run-start), 30, 60, 90, 135, 180 min for glucose, metabolic rate, and CHOox. Breath CO_2 was analyzed for exogenous C13 rate of appearance. Immediately post-run participants completed a time-to-fatigue test at 110% VO_{2max} . **RESULTS:** There were no significant differences in VO_2 between groups during the run ($p=0.46$). There was a significant difference in CHOox for C vs. S and F (C 1.0; S 1.33; F 1.45 \pm 0.1 g/min) ($p=0.12$). There was a significant difference in breath $^{13}CO_2$ appearance for C vs. S and F, as well as S vs. F (C 0.0002; S 0.0012; F 0.0009 \pm 0.0001 mmol/min) ($p<0.001$), in addition to a significant time x trial for C and S vs. F ($p<0.001$). There was a significant difference in AUC CHO dose oxidized to CO_2 for S vs. F (S 1.09; F 1.41 \pm 0.2 mmol) ($p=0.03$). There was a significant difference in plasma glucose for C vs. S, but not for F (C 89.1; S 95.9; F 93.5 \pm 1.9 mg/dL) ($p=0.001$), in addition to a significant time x trial difference for C and S vs. F ($p<0.001$). There was no significant time-to-fatigue between any trial (C 161.1; S 223.7; F 156.1 \pm 34.4 sec) ($p=0.18$). **CONCLUSION:** The consumption of a single bolus of CHO beverage prior to a 3hr run elicits significant alterations in energy metabolism compared to just water, with S CHO burning significantly less total carbohydrate and more fat than a rapidly digested carbohydrate. The S CHO provided a more stable and consistent energy metabolism profile, in addition to the most stable glucose concentration during the run. These findings provide evidence that S CHO provides a consistent blood glucose and sustained exogenous energy supply during a sustained endurance run.

2758 May 31 2:15 PM - 2:30 PM

The Addition Of A Sodium Alginate-pectin Hydrogel To A Carbohydrate Beverage Significantly Enhances Gastric Emptying In Humans

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(No relevant relationships reported)

PURPOSE: To investigate the effect of CHO encapsulation and osmolarity on the rate of gastric emptying while at rest

METHODS: Eight healthy males were recruited to take part in this randomised, double blind, cross-over study. A 500 mL bolus of an experimental drink was instilled while seated, and gastric emptying measured using the double aspiration method every 10 min for 90 min. The three drinks consisted of 180 gL⁻¹ maltodextrin and fructose (POLY, ~700 mOsm kg⁻¹), 180 gL⁻¹ glucose and fructose (MON, ~1300 mOsm kg⁻¹) and 180 gL⁻¹ maltodextrin, fructose, sodium alginate and pectin (ENCAP, ~700 mOsm kg⁻¹). All drinks also contained 1.5 gL⁻¹ of sodium and had a CHO ratio of 1:0.8 (maltodextrin/glucose:fructose). Arterialised venous blood samples were collected prior to drink instillation and at regular intervals thereafter and analysed for glucose and non-esterified fatty acid (NEFA) concentration.

RESULTS: Time to empty half of the ingested bolus was faster for ENCAP (21.2 ± 8.5 min) than for POLY (36.3 ± 8.0 min, *P*<0.003), which was faster than for MON (52.4 ± 16.5 min, *P*<0.03). During the first 10 min, ENCAP emptied more than MON (ENCAP: 157 ± 50 vs MON: 41 ± 50 mL, *P*<0.05) but not more than POLY (108 ± 58 mL, *P*=0.28). Thereafter, ENCAP emptied more than POLY and MON, reaching significance at 20 min (ENCAP: 258 ± 68, POLY: 182 ± 44 and MON: 141 ± 42 mL, *P*<0.05) and 30 min (ENCAP: 307 ± 58, POLY: 196 ± 37, MON: 177 ± 50 mL, *P*<0.01) after instillation. After 40 minutes, there were no longer significant differences between ENCAP and POLY. ENCAP and MON remained significantly different until 70 min but were not significantly different thereafter (458 ± 34 vs 406 ± 51 mL, respectively, *P*=0.07). After 60 min, POLY had emptied significantly more than MON (380 ± 39 vs 290 ± 82, respectively, *P*<0.05). Serum glucose concentration increased to a similar level on all trials, while serum NEFA concentration continually decreased over the 90 min to a similar extent on all trials.

CONCLUSIONS: These findings suggest that encapsulating CHO in alginate hydrogel is an effective method to enhance gastric emptying.

2759 May 31 2:30 PM - 2:45 PM

Acute Carbohydrate Consumption On The Iron-regulatory Response To Exercise In Elite Keto-adapted Endurance Athletes

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(No relevant relationships reported)

It has been demonstrated adherence to a low carbohydrate (CHO) high fat (LCHF) diet can alter markers of iron metabolism in endurance athletes. **PURPOSE:** To investigate the impact of CHO re-introduction in athletes previously adapted to a LCHF diet on subsequent inflammatory and hepcidin responses to exercise. **METHODS:** In the three weeks prior to the exercise trials, twenty-three elite race walkers adhered to either a CHO-rich (n=14) or LCHF diet (n=9). A 19-25 km race walking protocol was performed while the race walkers were still adhering to their allocated dietary intervention (Adapt). A second exercise test was performed three days later, where the LCHF consumed CHO 2 h prior to, and during the exercise protocol (in line with sports nutrition guidelines) for the first time in 3.5 weeks (CHO Restoration). Venous blood samples were collected pre-, post- and 3 h post-exercise and analysed for serum ferritin, interleukin-6 (IL-6) and hepcidin-25. **RESULTS:** Serum ferritin concentration was similar between trials (p=0.48) and dietary groups (p=0.93). The post-exercise IL-6 increase was greater in LCHF (p<0.001) during both Adapt (LCHF: 13.1-fold increase; CHO: 8.0-fold increase) and CHO Restoration (LCHF: 18.5-fold increase, CHO: 6.3-fold increase); outcomes were not different between trials (p=0.84). Hepcidin-25 levels increased 3 h post-exercise (p<0.001), however, they

did not differ between trials (p=0.46) or diets (p=0.84). **CONCLUSIONS:** Strenuous exercise undertaken following chronic adaptation to a LCHF diet is associated with a greater post-exercise IL-6 response than when exercise is undertaken with high CHO availability. The elevated IL-6 response in athletes adapted to a LCHF diet is not attenuated by an acute increase in exogenous CHO availability. Despite diet-induced differences in IL-6 responses, no differences in hepcidin levels were evident, suggesting IL-6 is likely not the primary factor determining the magnitude of post-exercise hepcidin levels. Baseline iron status may be a more dominant factor regulating this response. Increased IL-6 levels may negatively influence other body processes, and the long-term impact of adhering to LCHF on other health outcomes warrants further investigation. Funded by the ACU Research Fund and the AIS High Performance Sport Research Fund.

2760 May 31 2:45 PM - 3:00 PM

No Correlations Between Gastrointestinal Complaints, Gut Injury Markers, And Carbohydrate Ingestion During a 60 Km Ultramarathon

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PURPOSE: It has been speculated that exercise-induced GI injury is associated with gastro-intestinal complaints. Ingesting carbohydrates (CHO) have been shown to blunt GI injury, although high CHO intakes also have been associated with GI complaints. The aim of this study was to investigate the relation between GI injury, -complaints and CHO intake.

METHODS: As part of a cross-sectional observation study 33 runners (28 males, 5 females) participating in a 60 km ultramarathon (4 April 2017, Texel, the Netherlands) provided a pre- and a post-race blood sample, and nutritional intake and (GI) complaints were assessed using a questionnaire after the race. Plasma intestinal fatty acid binding protein (I-FABP) levels, as a marker for GI injury, and inflammatory markers (CRP, IL-6, IL-8 and TNFα) were compared between pre- and post-race blood samples. GI complaints were scored on a 10-point scale and categorized as serious if scored ≥5. CHO intake (g/h) was calculated using predefined product ingredient declarations. Data were analyzed (SPSS 24.0) using Wilcoxon signed-rank tests and Spearman correlations tests and were presented as median [IQR]. Statistical significance was set at *P*<0.05.

RESULTS: Plasma I-FABP levels did not significantly change pre- to post-race (1375 [1264-2073] to 1726 [985-3287] pg/mL; *P*=0.33). CRP, IL-6, IL-8 and TNFα all increased from pre- to post-race (*P*<0.001). GI complaints were reported by 73% of the runners, of which 20% reported serious complaints. CHO intake was 60 [37-90] g/h. There were no significant correlations between ΔI-FABP levels and the sum of GI complaints (*r*_{sp}: -0.05; *P*=0.79), or between GI complaints and CHO intake (*r*_{sp}: 0.21; *P*=0.26). No correlation was found between ΔI-FABP and CHO intake (*r*_{sp}: -0.32; *P*=0.080), but dividing subjects into tertiles for ΔI-FABP levels revealed a significant difference in CHO intake between groups (*P*=0.027).

CONCLUSION: Despite substantial GI complaints during the ultramarathon, there were no evident signs of GI injury indicated by a minimal change in plasma IFABP levels. Prevalence of GI complaints were not correlated with change in I-FABP levels or CHO ingestion during exercise, but higher CHO intakes may potentially attenuate the degree of GI injury.

The project was supported by Eat2Move and Friesland Campina.

F-12 Free Communication/Slide - Changing Physical Activity Behaviors Across the Life-Course

Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-105B

2761 **Chair:** Eric C. Conchola. *Oklahoma State University, Stillwater, OK.*

(No relevant relationships reported)

2762 May 31 1:00 PM - 1:15 PM

Are Lower-leg and Thigh Muscle Resistance Training Methods Equally Effective to Dynamic Balance for Community-Dwelling Elderly Females?

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(No relevant relationships reported)

PURPOSE: To compare the magnitude of lower-leg training program and thigh muscle training program to dynamic balance ability changes for community-dwelling elderly Japanese women.

METHODS: After giving written informed consent, the subjects, unable to stand on one leg for more than 25 seconds with their eyes open, were divided into a lower-leg training group (LLG; 10 females, 72.9±4.2 yrs, BMI 22.1±1.8) and a thigh muscle training group (TMG; 10 females, 70.6±2.5 yrs, BMI 22.1±1.2). The program was 60min. two times per week for 16 weeks. Each training program consisted of three parts. At first, participants learned about management skills for their physical stiffness. Secondly, they learned each resistance program. LLG participated in the program using unstable disk and elastic band. TMG learned program was to strengthen their thigh muscles with elastic band. Finally, both groups learned a three-minute arm and leg combined exercise program with music. Participants were asked to follow their learned management skill program and resistance program every day and check it on the card. Dynamic balance ability was measured by one-leg standing time with their eyes open, the area covering and total length of the center of gravity sway(COP) with eyes open or close by stabilometer. Knee extension strength was evaluated. Each measurement items were assessed before and after the intervention period. Student's t-test and two-way repeated measures ANOVA were used to test the effectiveness.

RESULTS: The class participation rates were 82± 4% and 81± 8% and home participation rates were 76± 10% and 72± 15% respectively. One-leg standing time with their eyes open (LLG: 14.0±3.0 to 19.9±2.2 sec., TMG: 12.4±2.5 to 15.9±2.2sec, F=5.01, P=0.038), area covering of COP with eyes open (LLG: 14.1±41 to 8.2±6.5 cm², TMG: 15.1±3.3 to 18.8±9.0cm², F=8.54, P=0.009), total length of COP (LLG: 143.1±33.1 to 95.6±18.9 cm., TMG: 144.9±26.4 to 135.7±37.2cm, F=3.92, P=0.046) improved significantly in LLG. TMG knee extension strength improved significantly (P=0.029).

CONCLUSIONS: Lower-leg muscle training was found more effective to improve dynamic balance ability than thigh muscle training for community-dwelling females.

2763 May 31 1:15 PM - 1:30 PM

Using Gamification to Enhance Student Participation in Classroom Activity Breaks

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PURPOSE: Classroom-based interventions implemented in elementary schools have the potential to establish life-long physical activity habits in children. However, lower rates of participation have been observed among children in socioeconomically disadvantaged schools. The purpose of this study was to test the effectiveness of gamifying activity breaks (AB) to enhance student participation, enjoyment, and confidence during AB in low-income schools. **METHODS:** Nine, 3rd through 6th-grade classrooms (approximately 300 students) in one elementary-middle school in Detroit, Michigan (79% Hispanic; 80% qualified for free/reduced lunch) participated in this 20-week intervention where teachers implemented 5, 4-minute AB/day (100 minutes/week). Gamification of AB occurred during weeks 13-20 of the intervention and included the use of game design elements and classroom goals for the percentage of students engaging in moderate-to-vigorous physical activity (MVPA). Students had the opportunity to win daily, weekly, and post-intervention prizes for meeting

their classroom goal. Student AB participation was measured via direct observation. Student AB enjoyment was measured via the Physical Activity Enjoyment Scale questionnaire. Student AB confidence was measured via a single-item question from the Physical Activity Self-Efficacy Scale. **RESULTS:** Compared to the standard intervention (weeks 6-12), the gamified intervention resulted in a significant increase in student MVPA (standard: 38±2.3% vs. gamified: 60±2.1%, p=0.01) and student enjoyment (standard: 3.6±0.1 vs. gamified: 3.8±0.1, p=0.01) during an AB, with no change in student confidence (standard: 7.1±0.2 vs. gamified: 7.2±0.2, p=0.90). **CONCLUSIONS:** Gamification increased student MVPA participation by 86% and enjoyment of AB by 6%. This equated to students accumulating approximately 21 minutes of classroom activity per day, 13 of which were MVPA. These findings suggest gamification may be a key tool to increasing classroom activity and physical activity enjoyment in children attending low-income schools.

2764 May 31 1:30 PM - 1:45 PM

Comparing Health Improvements Achieved Through Different Pathways Of A Community-based Motivational Interviewing Physical Activity Programme

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(No relevant relationships reported)

Benefits of regular physical activity (PA) are well documented, however physical inactivity remains a global public health challenge. The National Institute for Health and Care Excellence recommend brief advice to elicit positive PA behaviour change. **PURPOSE:** Assess PA and mental wellbeing impact of signposting [SP] and Social Action [SA] group pathways of a motivational interviewing (MI) community-based PA intervention. **METHODS:** Participants (18-74 years, BMI of 28-35 kg/m²) from Essex, UK, were invited to take part in a community-based, primary care PA programme which uses MI techniques. Self-reported PA (IPAQ) and mental wellbeing (Short Warwick Edinburgh Mental Wellbeing Scale) data were collected at baseline (following an initial 30 minute MI appointment), 12 weeks, 6 months, and 12 months. Participants were assigned to receive activity SP after the initial MI appointment or attend a SA group (weekly healthy lifestyle support for 12 weeks) depending on their GP surgery. Multilevel modelling were used to derive point estimates and 95% CIs for each time point and change scores (i.e. time x - time y). **RESULTS:** 2084 participants attended a baseline appointment (61% women, mean age 61 years (SD 12), 95% White or White British, 68% disabled). Mean total PA (MET-min/week) was significantly greater at baseline for the SP group (SP: 1439, 95%CI [1323-1556]; SA: 1126, 95%CI [1045-1207]). Both pathways significantly increased the amount of total PA at 12 weeks, 6 months, and 12 months. However, there were no significant differences in the changes between pathways. No significant differences in mental wellbeing between pathways at any of the four time points. Mental wellbeing significantly increased for both pathways from baseline to 12 weeks, remaining constant at 6 months. Non-significant reduction in mental wellbeing from 6 months to 12 months for the SP pathway (-1.1, 95%CI [-2.5-0.4]), but a significant increase for the SA pathway (1.3, 95%CI [0.1-2.4]). No significant differences in the changes between pathways. **CONCLUSION:** Both pathways produced similar improvements in PA and mental wellbeing suggesting MI based PA interventions with SP or SA are both effective in improving health outcomes. However, no difference in the results indicate SP should be recommended, especially as the SA group requires more resource.

2765 May 31 1:45 PM - 2:00 PM

Effects Of A Teacher-led Movement-training Program On Physical Fitness, Motor Skills, And Physical Activity In Third And Fourth Grade Students

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(No relevant relationships reported)

PURPOSE: Fundamental Integrative Training (FIT) is a circuit-style strength training approach designed to be implemented in conjunction with a physical education program. The purpose of this study was to evaluate the effects of a 12-week, FIT program on physical fitness, fundamental movement skills, physical activity, and psychosocial mediators among children in third and fourth grade classrooms. **METHODS:** A total of seven classrooms in one school were randomly assigned to the intervention (INT, n=4) or control (CON, n=3) group. The INT classrooms received a 12-week, teacher-led FIT intervention. The CON group continued participation in regular physical education. At baseline, mid-point, and immediately post intervention, physical fitness (curl-up, push-up, sit & reach), motor skills (hop, jump, throw, catch), objectively measured weekly physical activity and sedentary time, and psychosocial factors (self-efficacy, enjoyment, social support) were measured for all participants.

Kruskal-Wallis rank-sum tests were used to compare pre-post changes between the INT and CON groups for all variables. **RESULTS:** Sedentary time decreased for the INT group (-19 minutes) and increased slightly for the CON group ($p=0.04$). No significant differences were observed between groups for any of the physical fitness, motor skill, or physical activity variables. **CONCLUSIONS:** The current study adds valuable insight into the efficacy of delivering a FIT intervention into an existing PE curriculum. Future studies should continue to explore the relationships between physical activity, fitness, and motor skills in children to identify causal pathways and intervene appropriately.

2766 May 31 2:00 PM - 2:15 PM

Changes On Non-exercise Physical Activity Are Related To Improvements In Mitochondrial Function Independently Of Structured Intentional Exercise

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(No relevant relationships reported)

Whether exercise interventions increase or reduce non-exercise physical activity (NEPA) is controversial. Few studies have examined this potential effect on relevant physiological outcomes, particularly in the context of randomized controlled trials. **PURPOSE:** To determine the effects of a structured exercise program on NEPA, and the independent association between NEPA and both cardiorespiratory fitness (VO_{2max}) and mitochondrial capacity within skeletal muscle. **METHODS:** Thirty-seven older (age=69±5yrs) obese ($BMI=35±3kg/m^2$) adults were randomized to one of the following 6-month interventions: Health education (CON: n=12), diet induced weight-loss (DIWL: n=12, or Weight-loss and exercise (WLEX: n=15). CRWL and WLEX participants had a goal of 10% weight-loss through calorie restriction. Subjects in the WLEX group completed a supervised combined aerobic and resistance exercise program. We quantified components of PA by a multisensory device. VO_{2max} was determined by cycle ergometry. Maximal oxidative phosphorylation (OXPHOS) and maximal uncoupled respiration (ETS) of permeabilized myofibers from biopsies was evaluated by high-resolution respirometry. Repeated measures analysis was performed to compare differences between the three groups pre and post intervention. Adjusted correlations to weight loss (WL) between NEPA and VO_{2max} , ETS and OXPHOS were performed. **RESULTS:** After the intervention WLEX increased significantly NEPA compared with the other groups (NEPA: WLEX= 89.6±84.5 min/day; DIWL= 3.7±42.4 min/day; CON= -10.5±63.6 min/day; $F=8.87$ for time x group interaction, $P<0.001$). Change in NEPA was positively correlated with change in mitochondrial capacity (OXPHOS, $r=0.453$ and $r=0.468$; $P<0.05$ for both) and absolute VO_{2max} ($r=0.453$, $P<0.05$). Both DIWL and WLEX experienced a significant WL (WLEX= -10.1±5.0 min/day and DIWL= -7.2±5.5 min/day; $P<0.05$). **CONCLUSIONS:** In addition to the beneficial effects of structured intentional exercise on cardiorespiratory fitness and mitochondrial capacity within muscle, exercise programs in older obese adults may also increase non-exercise physical activity, which in turn appears to independently correlate with improved aerobic capacity. These results highlight the concurrent effect of exercise and NEPA to improve health outcomes.

2767 May 31 2:15 PM - 2:30 PM

Intervention Effects Of A Kindergarten-based Health-promotion Programme On Physical Activity, Bmi Percentiles And Endurance Capacity

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(No relevant relationships reported)

PURPOSE: In recent decades, the prevalence of childhood overweight has increased worldwide and became a public health concern. One reason for this is children's insufficient engagement in physical activity (PA) which may lead to deficient motor skills, which are interdependent. Therefore, early health promotion such as the kindergarten-based health promotion programme "Join the Healthy Boat" is necessary. **METHODS:** In order to evaluate the programme's effectiveness on children's BMI percentiles (BMIPCT), PA and endurance capacity, a randomised controlled trial including intervention (IG) and control group (CG) was conducted. 973 kindergarten children (3.6±0.6 years; 47.1% male) in 57 kindergartens were assessed at baseline and 558 of them at follow-up. Anthropometrics and endurance capability (3-minute-run) were assessed on site. PA behaviour and socio-economic data were assessed using parental report. Linear regression models were used to determine intervention effects for all health outcomes, adjusting for baseline values, age, gender, BMIPCT and socio-economic variables. **RESULTS:** After one year, a significant positive intervention effect on children's BMIPCT was found ($p<0.04$). Further, children in the IG spent significantly more

days in sufficient PA than children in the CG (3.1±2.1 days vs. 2.5±1.9 days; $p<0.005$). Children in the IG also performed significantly better in the three minute endurance run than their counterparts in the CG (305.8±46.2m vs. 286.9±43.2m; $p<0.001$). **CONCLUSIONS:** This teacher-centred health promotion using a low-dose bottom-up approach with action alternatives achieved significant positive effects in the reduction of BMIPCT and significant increases in endurance capacity and daily PA. The programme is therefore ideal for integrating health promotion more intensively into the everyday life of children.

2768 May 31 2:30 PM - 2:45 PM

Comparing Physical Activity Levels across Differing Physical Education Class Modules in Middle Schools using SOFIT

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(No relevant relationships reported)

Over 1/3rd of school-age children are overweight or obese. To address this problem, school-age children are recommended to take part in 60 minutes of daily moderate-to-vigorous physical activity (MVPA), with 30 minutes of this daily MVPA being in-school. Physical education (PE) classes offer ideal opportunities for physical activity (PA) as they utilize varying modules including team sports, general fitness, and social (e.g. dance). Yet, how much overall PA and MVPA occurs over these differing PE class modules remains unclear. The System for Observing Fitness Instruction Time (SOFIT) is a simple observational tool that PE instructors can use to calculate PA.

PURPOSE: To observe student PA levels across multiple PE modules using SOFIT. **METHODS:** A modified SOFIT was used to assess PA over 15, 90-minute PE classes ($N=124$) across 3 modules: team sports (8 sessions), general fitness (3 sessions), and dance (4 sessions) in a single middle school. PA was coded from 1-5 corresponding to lying down, sitting, standing, walking, and vigorous, respectively. The same observer recorded PA in the last minute of a 5-minute interval based on activity in the prior 4 minutes. Separate 1-way ANOVA examined differences in MVPA (i.e. scores ³4) and overall PA across modules with Tukey-Kramer post hoc analyses as appropriate. **RESULTS:** Overall PA differed significantly across modules ($p=.02$), with team sports producing higher PA (3.80±.36) than dance (3.19±.39; $p=.04$). MVPA was similar across all modules (team sports: 4.29±.43, general fitness: 4.06±.28, dance: 3.70±.41; $F_{2,12}=2.83$; $p=.09$).

CONCLUSION: Although team sports produced greater overall PA, all modules (team sports, fitness, and dance) produced similar MVPA. As MVPA is suggested to be the preferred component of overall PA for improving overall health, all these modules are viable options for producing MVPA during PE classes in this population. To improve adherence to these different activities, future researchers should compare enjoyment levels for students across these activities. Overall, as PE classes are the greatest contribution to in-school PA for students, PE instructors and school health administrators can use our findings to choose appropriate modules to teach children PE and, concurrently, positively address the childhood obesity epidemic.

2769 May 31 2:45 PM - 3:00 PM

Cardiovascular, Metabolic, and Perceived Effort In A Simulated Commute On A Regular And Electric Bicycle

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(No relevant relationships reported)

Use of electric bicycles (e-bikes) with battery powered assist when pedaling, may incentivize active transport for people who may not be fit enough to ride several miles to school, work, or for leisure. E-bikes may enhance one's daily physical activity levels, possibly create a cardiovascular and metabolic health benefit and be an environmentally friendly transportation option. **PURPOSE:** To compare metabolic, cardiovascular, and ratings of perceived effort (RPE) when riding an e-bike for 3 miles at two different assist levels (boosts that vary in intensity), in comparison with a regular bicycle. **METHODS:** Male ($n=16$) and female ($n=14$) subjects, aged 19-61 yr, completed a YMCA submaximal test and three outdoor 3-mile bike rides, simulating a typical commute, at their own pace on a standard bicycle and on an e-bike at both E-2 assist, and E-3 assist levels. Participants wore a heart rate (HR) monitor and COSMED that recorded HR and oxygen consumption (VO_2). RPE on a 6-20 Borg scale was reported at the end of each 3-mile ride. A linear mixed effects model estimated the differences within subjects and between bicycle types on variables of interest at the 95% confidence level. **RESULTS:** In every model, for every variable, a significant difference ($p<0.05$) existed between riding a regular bicycle compared with an e-bike at both assist levels: HR (Reg=133 vs E-2=124 and E-3=114 beats·min⁻¹), % of VO_2

max (Reg=56 vs E-2=48 and E-3=40%, RPE (Reg=12.3 vs E-2=9.8 and E-3=8.4, respiratory quotient (Reg=.89 vs E-2=.85 and E-3=.85), METS (Reg=6.7 vs E-2=5.8 and E-3=4.8), caloric expenditure (Reg=519 vs E-2=436 and E-3=359 kcal•hr⁻¹), time (Reg=13.7 vs E-2=11.8 and E-3=10.3 min) and VO₂ (Reg=23.6 vs E-2=20.3 and E-3=16.8 ml•kg⁻¹•min⁻¹). CONCLUSIONS: Compared with regular bicycles, riding e-bikes at assist levels 2 and 3 resulted in 2.5 - 3.9 min faster 3-mile times and lower perceived efforts from somewhat hard for regular bicycle to very light for either e-bike assist levels. Speed and lower RPE may incentivize people to ride e-bikes which may contribute to environmentally friendly active transport. Compared with regular bicycling, 10-20% lower metabolic and cardiovascular responses associated with e-bikes, if performed regularly, may still benefit fitness and health.

F-13 Free Communication/Slide - Foot and Ankle

Friday, May 31, 2019, 1:00 PM - 3:00 PM
Room: CC-202C

2770 Chair: Robert Gregory, Southern Connecticut State University, New Haven, CT.
(No relevant relationships reported)

2771 May 31 1:00 PM - 1:15 PM Differences In Foot Kinematics Between Forefoot Strikers In Minimalist And Conventional Running Shoes

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(No relevant relationships reported)

Forefoot strike (FFS) runners in conventional shoes exhibit higher posterior and medial ground reaction force loadrates than FFS runners in minimal shoes. This results in higher resultant loadrates when forefoot striking in conventional shoes. The elevated cushioned heel and lateral outsole flare of a conventional shoe may predispose the foot to greater plantarflexion (PF) and inversion (INV) at footstrike. This position may result in the increase in posterior and medial loading. PURPOSE: To determine the foot kinematic differences in the sagittal and frontal planes of FFS runners who are habituated to either conventional shoes (FFS-C) or minimal shoes (FFS-M). METHODS: This is an ongoing study of which 9 FFS-M and 15 FFS-C have been recruited to date. Kinematic and kinetic data were collected as runners traversed a 30-m runway at 3.31 (±5%) m/s, while wearing their habitual type of shoe. Foot and ankle kinematics at footstrike as well as ground reaction force loadrates were compared between groups, using Mann-Whitney U tests. Pearson correlations between kinematics and instantaneous load rates (ILR) in posterior and medial directions were calculated. RESULTS: FFS-C exhibited more plantarflexion at footstrike in the foot and ankle compared to FFS-M (Table 1). There were moderate correlations between the posterior ILR and the amount plantarflexion at footstrike in the foot and ankle (r=-0.511, p=0.011 and r=-0.582, p=0.003 respectively), where more PF resulted in a higher posterior ILR. There were no differences between FFS-C and FFS-M in the frontal plane at footstrike. Additionally, inversion at footstrike was not correlated with medial ILR (r=0.220, p=0.301). CONCLUSION: Based upon these preliminary results, running with a FFS pattern in conventional shoes promotes greater PF at footstrike, which is associated with greater posterior load rates. While greater INV at footstrike was not noted, medial load rates were greater.

Table 1. Mean (SD) comparison of kinematic and kinetic variables between FFS-M and FFS-C

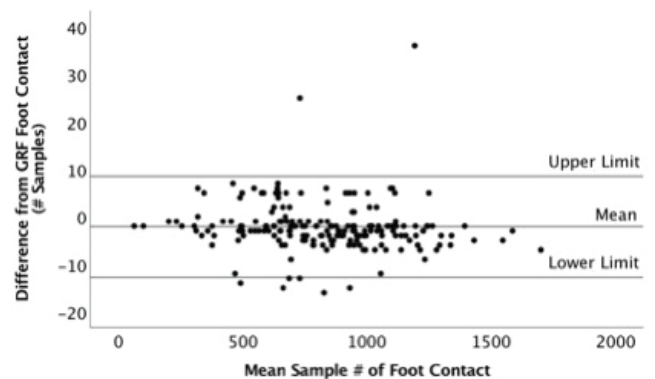
	FFS-M	FFS-C	p value
	(n=9)	(n=15)	
Foot PF at initial contact (°)	-3.41 (2.4)	-8.94 (3.4)	<0.001
Ankle PF at initial contact (°)	-6.05 (4.1)	-15.3 (5.5)	<0.001
Peak ankle DF velocity (°/s)	444 (90.0)	579 (87.1)	0.004
Foot INV at initial contact (°)	16.7 (4.6)	16.0 (5.7)	0.861
Ankle INV at initial contact (°)	12.5 (4.5)	12.9 (5.5)	0.976
Peak ankle EV velocity (°/s)	-333 (86.7)	-465 (124.0)	0.012
Peak posterior load rate (BW/s)	15.5 (5.7)	26.5 (10.8)	0.022
Peak medial load rate (BW/s)	7.12 (2.5)	9.51 (2.7)	0.055
Peak resultant load rate (BW/s)	55.7 (12.0)	66.4 (17.8)	0.114

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Foot Contact Identification Using A Tibial Mounted Accelerometer During Running

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(No relevant relationships reported)

It is often necessary to identify foot contact when analyzing running biomechanics data, but most techniques are restricted to use in the laboratory. The accurate identification of foot contact from a single triaxial accelerometer mounted on the tibia may be useful for in-field measurements of gait. PURPOSE: To determine criterion-related validity of a new technique for determining foot contact from the resultant acceleration of the distal tibia compared to foot contact determined from vertical ground reaction force. METHODS: As part of a larger study, 19 runners (10 female, 9 male; 31 ± 6 years; 1.70 ± 0.08 m; 68.6 ± 11.6 kg) participated. Synchronous tibial acceleration and ground reaction force data were recorded at 1000 Hz using a triaxial accelerometer mounted to the skin over the distal antero-medial tibia and a force plate embedded in the floor. Participants completed 10 running trials at 3.0 m/s. Resultant acceleration was calculated and foot contact was determined using a custom algorithm that identified a minimum prior to peak resultant acceleration. Foot contact was also determined as the time at which vertical ground reaction force exceeded a threshold of 20 N. 95% limits of agreement between the two methods were calculated. RESULTS: On average the resultant acceleration identified foot contact 2.1 ± 5.4 ms earlier than ground reaction force. The 95% limits of agreement were -8.5 to 12.8 ms. With this approach 95% of foot contacts identified from resultant acceleration were within 10 ms of foot contact identified from ground reaction force. CONCLUSION: Identifying foot strike from resultant tibial acceleration measured using a single triaxial accelerometer is a valid technique for foot contact identification in the field. Study funded by College of Nursing and Health Professions Research Award



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Impact Of Reduced Plantar Sensation On Balance Control

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PURPOSE: Balance control has often been used to examine neural function. Given the robustness of balance control, perturbation is often needed to allow for more sensitive measurement. Our previous work has shown that balance is perturbed when a participant is placed in a moving virtual reality environment (VR). This situation creates a sensory mismatch between plantar sensation and visual feedback. The purpose of this study was to examine balance control when plantar sensation was reduced by cooling the plantar sole. We hypothesized that reducing plantar sensation would increase sway displacement, velocity and approximate entropy in a moving VR. **METHODS:** Six healthy young adults completed baseline balance tests: quiet standing (QS) and challenged by an anterior-posterior sinusoidal movement of a 360° projected picture of the lab within the VR headset. After the baseline balance test, participants placed the bottom of their feet in an ice bath until the plantar sole reached a temperature of 10-15°C. Reduced plantar sensation (RPS) was confirmed using a monofilament test. Balance tests were then repeated with participants standing on a cold steel plate with a temperature below 15°C to ensure consistent temperature of the plantar sole. Statistical analysis was performed on anterior-posterior center of pressure displacement, velocity and approximate entropy to determine differences between baseline and RPS balance tests within each balance condition ($\alpha=0.05$). **RESULTS:** Displacement increased when plantar sensation was reduced during the VR condition ($p = 0.04$, Baseline = 1.8 ± 0.8 cm, RPS = 2.4 ± 0.9 cm). There were similar trends that velocity ($p = 0.08$, Baseline = 5.1 ± 2.0 cm/s, RPS = 6.5 ± 2.6 cm/s) and approximate entropy ($p = 0.1$, Baseline = 0.13 ± 0.06 , RPS = 0.10 ± 0.03) were greater when plantar sensation was reduced during the VR condition. There was no difference between reduced plantar sensation and baseline balance during QS. **CONCLUSIONS:** Reducing plantar sensation elicited increased sway with a more consistent pattern (increased approximate entropy) when balance was perturbed by a moving visual environment, suggesting that participants had reduced balance control capabilities due to the sensory mismatch. Funding provided by the Office of Naval Research (N00014-17-1-272).

2774 May 31 1:45 PM - 2:00 PM

The Effects of Ankle Taping on Double Leg Balance after Plyometric Exercises

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(No relevant relationships reported)

Ankle taping (AT) is a common preventative method to decrease the likelihood of ankle ligament injuries. Many athletic trainers use AT for athletes involved in high volume jumping sports to increase ankle stability. Ankle proprioception and postural control can be altered due to the restriction caused by AT and therefore, athletes need to be aware of the potential changes. **PURPOSE:** To compare AT center of pressure displacement (COPDsp) vs no ankle taping (NT) COPDsp, in the X- and Y- direction, before and after a fatiguing plyometric protocol. **METHODS:** Descriptive data (Ht. = 178.67 ± 8.88 , Wt. = 79.69 ± 9.55 , BF% = 12.20 ± 4.38 , age = 22.81 ± 2.56) was measured for 16 averagely fit college-age males. AT and NT sessions were prescribed in a counterbalanced order. Both sessions were separated by no less than 72 hours and no more than 96 hours of recovery. Each subject completed the same plyometric protocol and balance testing on a force plate pre- and post- fatigue with eyes closed (EC) and open (EO) trials. Significant differences for COPDsp between pre- and post- fatigue and both taping sessions were measured using a 2x2x2 repeated-measures ANOVA. Statistical significance was set at $p \leq 0.05$ for all analyses. **RESULTS:** The interaction between AT PRE EC (.137 cm) and AT POST EC (.166 cm) trials in the X direction were significant, $p = .041$. Significant differences also occurred between AT PRE EO (.133 cm) and AT POST EO (.175 cm) trials in the X direction, $p = .039$. No significant differences occurred in the Y direction for AT PRE-POST EC trials ($p = .507$) or AT PRE-POST EO trials ($p = .196$). No significant differences occurred in all NT PRE-POST EC and EO trials, $p > .05$. **CONCLUSIONS:** The current results suggest AT caused an increase in the COPDsp X direction, while there was no difference in the Y direction. Future studies may seek to evaluate collegiate athletes with experience wearing AT and the resulting effects during a dynamic balance test.

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Effects of Shock Pad and Synthetic Turf on Ankle Biomechanics in a 90° Cutting Movement

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(No relevant relationships reported)

Shock pad (PAD) is a popular choice underlayment installed under a synthetic turf (TURF) field. The effects of PAD on impact attenuation and injury risks of human movements are still relatively unknown.

PURPOSE: To examine impact attenuation related ankle biomechanical characteristics of a 90° cutting movement on synthetic turf with shock pad compared to synthetic turf only.

METHODS: Twelve recreational football and soccer players performed five successful trials of 90° cutting movement in each of two approaching speed conditions: 3.0 ± 0.3 (SLOW) and 4.0 ± 0.4 (FAST) m/s on each of TURF and PAD surface conditions. Three-dimensional kinematic and ground reaction force (GRF) data were collected simultaneously. A 2" monofilament synthetic turf with 1/2" stitch gauge was used in TURF and PAD conditions. A foam-based shock pad was used in PAD condition.

RESULTS: No significant surface main effect or surface by speed interactions were found for any ankle kinematic and kinetic variables and peak GRFs ($p > 0.05$). Increased peak ankle eversion moment (0.65 vs. 0.84 Nm/kg, $p < 0.001$) and inversion loading range of motion (ROM, 13.7 vs. 18.6 deg, $p = 0.001$) were seen in FAST compared to SLOW. Increases for peak ankle sagittal-plane concentric pushoff power, and frontal-plane eccentric and concentric power were also observed in FAST compared to SLOW. Peak vertical (2.04 vs. 2.31 BW, $p = 0.023$) and medial loading (0.79 vs. 1.11 BW, $p = 0.002$) GRFs were higher in FAST than SLOW. Additionally, peak pushoff medial GRFs were increased from SLOW to FAST (0.91 vs. 1.20 BW, $p = 0.025$), but pushoff vertical GRFs were decreased slightly (2.24 vs. 2.11 BW, $p = 0.011$).

CONCLUSIONS: The lack of significant differences between TURF and PAD and their interactions for examined ankle and GRF variables suggest that adding a form-based shock pad does not impede cutting performance. These results also seem to indicate there is a neuromuscular accommodation in cutting mechanics on PAD surface, which cannot be reflected loading variables using inverse dynamics. As cutting speed increased, greater increases in medial peak GRFs, and frontal-plane peak ankle moment and ROM were observed compared to those in sagittal-plane, suggesting increased mediolateral loading to ankle complex in fast cut movement. Supported in part by Brock International.

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Gluteus Medius Activation During Gait Is Altered With Chronic Ankle Instability: An Ultrasound Imaging Study

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(No relevant relationships reported)

Altered gait mechanics are frequently reported in individuals with chronic ankle instability (CAI), and increasing information suggests proximal muscle adaptations occur in this population. Ultrasound imaging (USI) offers a visual means to evaluate muscle activation during movement, and overcomes limitations of electromyography to detect hip muscle activity.

PURPOSE: To identify gluteus maximus (GMAX) and medius (GMED) muscle activation using USI throughout walking gait in individuals with and without CAI.

METHODS: A descriptive laboratory study was conducted to evaluate gluteal muscle activation throughout walking on 40 total participants during a single session. Twenty young adults with CAI (21.6 ± 2.4 years, 10 males) and 20 healthy participants (21.2 ± 2.8 years, 10 males) walked on a treadmill at 1.35 m/s while researchers obtained 10-second clips of bilateral USI of the GMAX and GMED. USI clips were reduced to 55 frames consisting of 11-points over five full gait cycles. Muscle thickness values during walking were normalized to quiet bipedal standing USI images to obtain functional activation ratios (FARs). FARs with 90% confidence intervals (CI) were plotted at 10% intercludes from 0-100% of the gait cycle to compare groups and limbs. Group mean differences and Cohen's *d* effect sizes were used to assess the extent of differences.

RESULTS: The CAI group had decreased GMED activation bilaterally from 0-40% of walking gait compared to healthy counterparts with large effect sizes ($d: 0.62-0.95$). CAI group FARs were below quiet stance levels (FARs < 1.0) throughout the entire gait cycle. There were no differences noted between groups or limbs for GMAX measures. **CONCLUSIONS:** Proximal stabilizing musculature was altered bilaterally in CAI individuals compared to healthy counterparts, which may contribute to movement

dysfunction through centrally mediated adaptations. Previous studies using electromyography have not detected gluteal muscle alterations in CAI groups during stance phases of gait, however these findings suggest USI was able to detect proximal alterations during walking in this population.

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The Effect Of Persistent Pain Following Ankle Sprain On Lower Extremity Kinematics During Walking

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(No relevant relationships reported)

Persistent pain is the most common complaint reported by those with chronic symptoms following ankle sprain with its prevalence peaking in middle-aged adults. Despite the high prevalence rate and associated adverse effects on mobility, quality of life, and physical activity, the influence of persistent ankle pain on lower extremity function during gait in middle-aged adults has not been examined. **PURPOSE:**

To identify the modifiable lower extremity kinematic dysfunction during walking gait associated with persistent ankle pain in middle-aged adults. **METHODS:** Ten individuals with persistent ankle pain (9F, 1M; 55.4 ± 6.52 years; 166.80 ± 6.73 cm; 78.24 ± 25.05 kg) and nine matched uninjured controls (8F, 1M; 53.0 ± 5.79 years; 168.2 ± 6.06 cm; 75.81 ± 24.46 kg) volunteered for the study. Three-dimensional lower extremity kinematics and kinetics were collected during five barefoot walking trials at a self-selected speed. Lower extremity sagittal and frontal joint positions were used to calculate joint ROM and maximum joint position during 1st double-limb support, single-limb support, and 2nd double-limb support. Position at initial contact in the sagittal and frontal plane was also calculated. MANOVA tests assessed group differences with an alpha level of $p < 0.05$. Significant tests were followed by independent t-tests with Bonferroni corrections. **RESULTS:** Rearfoot ankle inversion is significantly increased in those with persistent ankle pain compared to controls during overground walking ($p < 0.05$). Persistent ankle pain subjects were in an inverted position at initial contact ($2.91 \pm 4.32^\circ$), while controls were in an everted position at initial contact ($-3.75 \pm 3.25^\circ$). No other group differences were noted. **CONCLUSIONS:** Persistent ankle pain subjects demonstrate significant increases in rearfoot inversion at initial contact compared to controls. This altered movement pattern may result in further stress of the ankle joint structures, which may contribute to their persistent ankle pain. Additional research with a larger sample size and greater male representation is needed to further explore the effects of ankle pain on gait. This project was supported by the College of Health Sciences Student Research Grant Award at University of Wisconsin-Milwaukee.

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Subjects with Chronic Ankle Instability Exhibit Less Loading Absorption After Drop Jump and Drop Landing

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(No relevant relationships reported)

Chronic Ankle Instability (CAI) is a condition characterized by neuromuscular, range of motion, and postural control deficits that predispose subjects to reinjure. Different kinematic landing strategies have been identified in people with CAI when compared to healthy controls. Whether these adaptations result in similar loading patterns than those without CAI, has not been documented. This knowledge would be of much use for programming physical rehabilitation protocols to prevent the progression of CAI. **PURPOSE:** To compare ground reaction force (GRF) parameters between subjects with and without CAI, after a drop jump (DJ) and a drop landing (DL). **METHODS:** After informed consent was obtained, 19 young participants (height 164.8 ± 7.4 cm; body mass 68.1 ± 12.0 Kg) were assessed, classified in a group of subjects with CAI (CAI, $n = 14$) and a control group (CON, $n = 5$), according to the recommendations of the International Ankle Consortium. Groups were similar in height, body mass and gender distribution. Each participant performed 5 DJ and 5 DL from a platform of 40 cm height, landing on a force plate recording GRF at a frequency of 100 Hz. The order of all 10 jumps for each subject was determined by an online random generator. The signal corresponding to the vertical GRF was low pass filtered (4th order Butterworth, 20 Hz), normalized to body weight, and then processed to calculate the maximal GRF (FMax) and the loading rate (LR) from the time of initial contact to when FMax was achieved. Comparisons among groups were performed using unpaired t test with normal distributed data; otherwise Mann-Whitney test was used. A p value < 0.05 was considered as significant.

RESULTS: FMax was larger for CAI after DJ (CAI: 3.35 ± 0.57 N*N⁻¹ v/s CON: 3.03 ± 0.29 N*N⁻¹; $p < 0.01$), but was not different from CON after DL (CAI: $3.50 \pm$

0.59 N*N⁻¹ v/s CON: 3.39 ± 0.39 N*N⁻¹; $p = 0.57$). LR was larger for CAI after both DJ (CAI: 35.74 ± 13.26 N*N⁻¹*s⁻¹ v/s CON: 24.54 ± 10.01 N*N⁻¹*s⁻¹; $p < 0.01$) and DL (CAI: 41.33 ± 10.43 N*N⁻¹*s⁻¹ v/s CON: 35.03 ± 5.94 N*N⁻¹*s⁻¹; $p < 0.01$)

CONCLUSION: According to our preliminary results, subjects with CAI exhibit less GRF absorption after dropping from a medium altitude, which might contribute as a risk factor for ankle reinjure. Patients with CAI might benefit from including loading absorption strategies in their rehabilitation protocols.

F-14 Rapid Fire Platform - Mental Health & Athletic Performance

Friday, May 31, 2019, 1:00 PM - 2:20 PM

Room: CC-Hall WA2

2779 **Chair:** Aaron J. Stegner. Univ. of Wisconsin, Madison, WI.
(No relevant relationships reported)

2780 May 31 1:00 PM - 1:10 PM

Changing the Tide: Psychological Outcomes Among Active Duty Service Members Following a Surf Therapy Program

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(No relevant relationships reported)

Surf programs for individuals with psychological conditions exist; however, data evaluating such programs are limited. **PURPOSE:** This study examined psychological outcomes among active duty service members participating in a surf therapy program at Naval Medical Center San Diego. **METHODS:** Seventy-four active duty service members completed self-report questionnaires before and after the 6-week program and before and after each surf therapy session. **RESULTS:** Multilevel modeling results demonstrated that total scores for symptoms of depression ($\beta = -2.31$, $p < .01$), anxiety ($\beta = -3.55$, $p < .001$), posttraumatic stress disorder (probable PTSD subgroup only; $\beta = -14.55$, $p < .001$), and negative affect ($\beta = -6.40$, $p < .001$) significantly decreased from pre- to post-program, while positive affect significantly increased ($\beta = 9.46$, $p < .001$). Within each session, depression/anxiety symptoms significantly lessened ($\beta = -3.35$, $p < .001$) and positive affect significantly improved ($\beta = 8.97$, $p < .001$). Within-session changes did not differ across sessions ($p > .05$). Results for subgroups with probable PTSD or major depressive disorder were comparable to those of the full sample. **CONCLUSION:** Immediate benefits of surf therapy included significantly reduced depression/anxiety and increased positive affect. As a complementary intervention, surf therapy may improve depression, anxiety, and PTSD symptoms, with potentially unique benefits on affect.

2781 May 31 1:10 PM - 1:20 PM

Resilience and Mental Health Screening in Collegiate Athletes

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(No relevant relationships reported)

Screening for mental health disorders common in collegiate athletes can be challenging due to time constraints and concerns about the willingness of athletes to report given the need for multiple screening tools to cover the broad spectrum and concerning stigma surrounding mental health. **PURPOSE:** This study evaluates the Brief Resilience Scale (BRS) as a tool to identify mental health conditions in collegiate athletes. The BRS is a 6-question screening tool assessing one's ability to recover from stress.

METHODS: Collegiate athletes were anonymously surveyed completing BRS and mental health screening tools including the Patient Health Questionnaire-2 (PHQ-2) for depression, Generalized Anxiety Disorder Assessment (GAD-7), Adult ADHD Self-Report Scale (ASRS), SCOFF eating disorders questionnaire and Pittsburgh Sleep Quality Index (PSQI). Correlations between BRS and the screening tools were determined using Pearson's correlation. Mean BRS scores among athletes screening positive or negative with the screening tools were compared by t-test. **RESULTS:** 468 athletes (67.1% male, 34.6% division I, 37.4% division II, 39.3% division III) participated in the survey with 392 (84%) completing all 6 screening tools. Significant differences in the mean BRS were seen among athletes screening negative vs. positive on 4/5 mental health screening instruments (PHQ-2: 3.08 ± 0.70 v

3.56 ± 0.65, $p=0.01$; GAD-7: 3.20 ± 0.57 v 3.57 ± 0.66, $p=0.0002$; ASRS: 3.05 ± 0.54 v 3.56 ± 0.66, $p=0.00004$; PSQI: 3.27 ± 0.63 v 3.81 ± 0.60, $p=5.2 \times 10^{-16}$). A significant difference was not seen with the SCOFF tool (3.30 ± 0.63 v 3.55 ± 0.66, $p=0.06$). Significant correlations were seen between BRS and all 5 screening instruments (GAD-7 $r=-.303$, $p=1.02 \times 10^{-9}$; PHQ-2 $r=-.221$, $p=1 \times 10^{-5}$; ASRS $r=-.244$, $p=1 \times 10^{-6}$; SCOFF $r=-.157$, $p=0.002$; PSQI $r=-.400$, $p=1 \times 10^{-15}$). Overall, the BRS had a sensitivity of 26% and specificity of 98% for individuals that screened positive on at least 1 screening instrument.

CONCLUSIONS: Resilience (BRS) shows significant correlation with mental health screening instruments in athletes. As a short survey that avoids the stigma of many mental health questions, BRS may provide an efficient and effective alternative screening instrument to identify those athletes most at risk and in need of further specific screening.

2782 May 31 1:20 PM - 1:30 PM

Examination of Anger Prevalence In Ncaa Division I Student-athletes

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(No relevant relationships reported)

Anger may have an impact on performance. Once anger is triggered, it may not allow an athlete to move beyond whatever prompted the anger and in turn may decrease their concentration and focus on continued performance. Research is limited in the collegiate athletic population. **Purpose:** To examine the prevalence of anger in collegiate NCAA Division I athletes; and to investigate differences between sex, academic status (i.e., freshman, senior) and sport type (e.g., football, soccer, cheerleading). **Methods:** As part of a larger study, collegiate athletes ($N=616$, age: 19.5±1.3 years; males: $n=234$, height: 183.5±14.3 cm, weight: 91.2±19.5 kg; females: $n=382$, height: 168.6±7.4 cm, weight: 63.4±9.8 kg) were recruited over a 3-year period from a NCAA Division I institution. Demographic information (e.g., age, self-reported height and weight, sex, academic status, sport type) and the Anger Index Self-Test were collected via SurveyMonkey. **Results:** Chi-squared analysis revealed a significant difference between the anger index and sex [$X^2(2, N=613) = 20.3, P \leq 0.01$]. Overall 37.7% ($N=232/616$) reported high risk for anger with males 47.9% ($n=112/234$) and females 31.4% ($n=120/382$). Chi-squared analysis revealed a significant difference between the anger index and sport type [$X^2(42, N=616) = 61.3, P \leq 0.03$], with the highest percentages reporting high risk for anger within football 55.2% ($n=64/116$) and baseball 50% ($n=19/38$). Overall, 54.7% ($N=337/616$) revealed moderate risk for anger and sport type. No significant differences were found for anger risk and academic status [$X^2(10, N=616) = 5.220, P > 0.88$]. **Conclusions:** Male collegiate athletes demonstrated a higher risk for anger than female collegiate athletes; however, most athletes displayed moderate risk for anger across different sports. Anger across academic status was not significant, therefore, this may imply anger management and/or coping skills were not learned or taught throughout college. Further examination is necessary to investigate the prevalence of risky behaviors in combination with anger among this population. Considering the high prevalence of anger among collegiate athletes; institutions should work to establish a screening for all student-athletes and direct those at risk to a qualified mental health professional for intervention.

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Examination of Mental Health Risks and Injury Prevalence in NCAA Division I Collegiate Athletes

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(No relevant relationships reported)

Research in mental health for student-athletes is a growing topic among healthcare professionals. Studies examining pre-existing mental illness risk (e.g., depression (DEP), anxiety, attention deficit hyperactivity disorder (ADHD)) and injuries are limited. **Purpose:** To examine the effects of psychoaffective (PA) disorders (DEP, anxiety) and neurodevelopmental (ND) disorder (ADHD) risks and injury status (yes/no), injury type (acute/chronic), and multiple injury status (yes/no) in NCAA Division I student-athletes. **Methods:** A retrospective analysis of student-athlete medical records from 2013-2014 ($n=218$) and 2015-2016 ($n=174$) academic years was used from a NCAA Division I institution. Mental health screening medical records from pre-participation exams (e.g., Center for Epidemiologic Studies Depression Scale, State-Trait Anxiety Inventory, Behavioral and Emotional Screening System) identified mental health risks. Athena electronic medical records identified injury data. Descriptive statistics and chi-square analysis were used to identify the distribution of "at risk" and injury status, multiple injuries and injury type. **Results:** Student-athletes (34.7%) were at risk for at least 1 neuropsychiatric disorder (PA disorders: 17.6%, $n=69$; ND disorders: 8.9%, $n=35$; comorbid disorders: 7.9%, $n=31$). Student-athletes (34.4%) reported at least 1 injury throughout the respective academic year. Of those at risk for PA disorders (46.4%), ND disorders (25.7%) and comorbid disorders (29%)

also reported sustaining an injury. Those at risk for PA disorders (14.5%) and ND disorders (8.6%) had a higher prevalence of sustaining multiple injuries than those not at risk (7.8%). Acute injuries were sustained more commonly across all groups regardless of mental health status. PA risk group sustained 29.0% ($n=20$) acute and 17.4% ($n=12$) chronic injuries, the ND group sustained 14.3% ($n=5$) acute and 11.4% ($n=4$) chronic injuries, and the comorbid group sustained 19.4% ($n=6$) acute and 9.7% ($n=3$) chronic injuries. **Conclusions:** Neuropsychiatric disorder risks may affect injuries in NCAA Division I student-athletes, especially those with a PA disorder risk. Student-athletes at risk for neuropsychiatric disorders during preseason should be referred to a mental health professional for further evaluation.

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Examination of Eating Disorder Risk among Recreational Athletes

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(No relevant relationships reported)

With fitness becoming a new trend (e.g., Pure Barre, Zumba, CrossFit, Mudrun, marathons, etc.) the general adult recreational athlete may be engaging in the same physical demands and mental stressors associated with organized sport. In turn, this may predispose the recreational athlete to being at risk for disordered eating (DE)/eating disorders (ED).

Purpose: To examine the prevalence of Eating Disorder (ED) risk across gender in male and female recreational athletes.

Methods: Data from a larger cross sectional study was used. A convenience sample of male and female recreational athletes ($n=58$; age: 26.4±6.1 years; males: $n=34$; height: 179.1±6.2 cm; weight: 78.3±10.4 kg; females: $n=24$, height: 164.9±6.6 cm, weight: 65.4±9.0 kg) from the southeastern region of the United States participated in the study. Participants completed a basic demographic survey, the Eating Disorder Inventory-3 (EDI-3), and the EDI-3 Symptoms Checklist (SC). Basic descriptive statistics were used for demographic information. Cross-tabulations were used to examine the proportion of participants classified as "at risk for EDI-3 and EDI-3 SC" across gender.

Results: Significant differences were found between ED risk and gender [$X^2(3, N=58) = 11.8, P=0.008$]: within gender groups for EDI-3 (males: 17.6%, $n=6$; females: 4.2%, $n=1$), EDI-3 SC (males: 17.6%, $n=6$; females: 45.8%, $n=11$), and both EDI-3 and EDI-3 SC (males: 26.5%, $n=9$; females: 41.7%, $n=10$). Overall, significant differences were found between pathogenic behaviors and gender for dieting (males: 20.7%, $n=12$; females: 29.3%, $n=17, P=0.008$) and purging (males: 0.0%, $n=0$; females: 5.2%, $n=3, P=0.034$). No significant differences were found for exercise 50-100% of the time to lose weight (males: 3.4%, $n=2$; females: 5.2%, $n=3$); binge eating (males: 15.5%, $n=9$; females: 15.5%, $n=9$), laxatives (males: 3.4%, $n=2$; females: 0.0%, $n=0$), diet pill use (males: 5.2%, $n=3$; females: 8.6%, $n=5$), and use of diuretics (males: 1.7%, $n=1$; females: 1.7%, $n=1$).

Conclusion: ED risk was prevalent for both male and female recreational athletes; however females displayed an overall higher risk for EDs and pathogenic behaviors such as dieting and purging. In this new and growing population education, prevention, and clinical interventions from qualified healthcare professionals should be accessible.

2785 May 31 1:50 PM - 2:00 PM

Sport Differences In Resiliency Development Of Men's NCAA Football And Basketball Athletes

Justin R. Geijer, Connie A. Mettill. *Winona State University, Winona, MN.*

(No relevant relationships reported)

The National Collegiate Athletic Association (NCAA) has recently identified mental health as a primary health concern for student-athletes. Each sport contains its own unique stressors, which may require sport-specific stress reduction and resiliency-building techniques.

PURPOSE: The purpose of this investigation was to identify the differences in stress impacts and resiliency in men's NCAA football and basketball athletes.

METHODS: Thirteen NCAA Division II men's basketball athletes 32 NCAA Division II men's football athletes were surveyed before and after the 2016-2017 competition season. The survey contained 35 questions, which were selected from the College Student Health Survey (Boynnton Health, University of Minnesota, Minneapolis, MN). The survey addressed aspects of physical health, drug and alcohol use, screen time, relationships, sleep, stress management, and resiliency. Post-season surveys were analyzed to determine differences between sports in stress management and resiliency. Independent t-tests were used to determine differences between survey question responses. Alpha levels were set at 0.05.

RESULTS: Football athletes reported significantly better ability to respond to adversity ($p < 0.001$), and withstand difficult situations ($p < 0.001$). No significant difference existed between the sports in regards to the number of days their physical health ($p = 0.58$) or mental health ($p = 0.95$) was negatively impacted in the past 30 days. **CONCLUSIONS:** While no significant differences existed in the number of days in which mental or physical health was negatively impacted, significant differences were found in the football and basketball athletes' perceived abilities to respond to stressful situations. Future research should investigate the development and efficacy of sport-specific resiliency-building techniques.

2786 May 31 2:00 PM - 2:10 PM

A Comparison Of Depression, Anxiety, And Stress Levels Of Basketball Athletes In Different Collegiate Divisions

Jessica E. Jochum, Lauren Blyly, Kendall Beckstein, Mallory Meyers. *University of Indianapolis, Indianapolis, IN.* (Sponsor: Amy Jo Sutterluety, FACSM)
Email: jochumj@uindy.edu
(No relevant relationships reported)

Participating in sports helps to promote a healthy lifestyle. However, as competition level increases so do physical, emotional, and mental demands placed on the athletes. These increased demands could also increase susceptibility to depression, anxiety, and stress. **PURPOSE** To investigate differences in self-reported in-season levels of stress, anxiety and depression in collegiate men's and women's basketball players from collegiate levels of NCAA Division I, II, III and the NAIA. **METHODS** 102 collegiate basketball players completed the Depression Anxiety and Stress Scale 42 (DASS-42) and demographic information questionnaire including variables measuring hours of sleep, credit hours enrolled and history of injury. The DASS-42 is a self-reported questionnaire that uses three scales to measure an individual's emotional state of depression, anxiety, and stress; each scale has fourteen items. Of the 102 athletes, 26 were from a NCAA Division I, 31 from Division II, 23 from Division III, and 22 from the NAIA, ($n_{male} = 54$ (52.9%), $n_{female} = 48$ (47.1%)). An alpha level of $p \leq .05$ was set for statistical significance. The Kruskal-Wallis test was used to compare by division level and the Mann-Whitney *U* test was used to compare gender and credit hours. The Pearson chi-square test was used to compare gender and hours of sleep. **RESULTS** There was not a statistically significant difference in stress, anxiety and depression scores by division levels (DI, DII, DIII and NAIA), $p = .965$, $p = .383$, $p = .729$, respectively. However, differences were found between males and females, with females reporting higher levels of stress compared to males (median score 4.0 and 13.0, respectively; $p < .001$), anxiety (median score 3.0 and 6.0, respectively; $p < .001$) and depression (2.0 and 5.0, respectively; $p = .003$). A comparison of hours of sleep by gender revealed males were likely to get more sleep, however the difference was not statistically significant ($p = .182$). Similarly there was also not a statistically significant difference between males and females for the number of credit hours currently taken ($p = .221$), but females were more likely to take more credit hours. **CONCLUSION** Comparison revealed no statistical difference between collegiate settings. However, female athletes are at greater risk of depression, anxiety, and stress than males.

2787 May 31 2:10 PM - 2:20 PM

Screening Athletes For Disordered Eating: Are We Asking The Right Questions?

Franklin Sease, FACSM, Vicki Nelson. *Greenville Health System, Greenville, SC.*
(No relevant relationships reported)

PURPOSE: Little data is available to evaluate the performance of preparticipation screening questions in practice. The performance of consensus PPE questions was examined in comparison to the validated 5-question SCOFF screening tool to detect eating disorders. **METHODS:** 230 collegiate athletes (194 male) completed an anonymous survey including 3 consensus PPE questions regarding eating habits (prior history of eating disorder, adherence to a special diet, and current attempts to gain or lose weight) and the SCOFF screening tool. **RESULTS:** 10 athletes (4.3%, 3.6% of males, 8.3% of females) screened positive for an eating disorder using the SCOFF tool. The standard PPE questions combined to identify 43% of athletes as having concerning dietary habits (sensitivity 50%, specificity 59%, positive predictive value 5%, negative predictive value 98%). One athlete self-reported a diagnosed eating disorder. This individual was detected using the SCOFF tool and was not detected using the PPE questions. An analysis of the component questions identified the single question "Do you worry that you have lost control over how much you eat?" from the SCOFF tool to be the most sensitive and specific (70%, 100%) to detect disordered eating in collegiate athletes. **CONCLUSIONS:** Our results suggest that the current consensus PPE screening questions are neither sensitive nor specific to detect eating disorders in collegiate athletes. Further studies are needed to determine the appropriate questions for screening in the collegiate athlete population.

F-31 Thematic Poster - Baseball

Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-101A

2843 **Chair:** Ajit Mohan Worthen Chaudhari, FACSM. *The Ohio State University, Columbus, OH.*
(No relevant relationships reported)

2844 Board #1 May 31 3:15 PM - 5:15 PM
Quantification of Ground Reaction Forces for Skilled Versus Recreational Baseball Hitting

Ethan Stewart¹, Megan Smidebush¹, Jeffrey Simpson², Adam Knight¹, Harish Chander¹, Robert Shapiro³. ¹Mississippi State University, Mississippi State, MS. ²University of West Florida, Pensacola, FL. ³University of Kentucky, Lexington, KY.
Email: ems664@msstate.edu
(No relevant relationships reported)

PURPOSE: Successfully hitting a baseball requires the hitter to properly use ground reaction forces (GRFs) in all three directions. The normal pattern of the GRFs during the baseball swing and the importance of the timing of those GRFs have been identified, but have not been compared among hitters across various competition levels. Therefore, the purpose of this study was to investigate how the peak GRFs in the medial-lateral direction (GRFx), anterior-posterior direction (GRFy), and vertical direction (GRFz), as well as time to reach peak GRFs for the lead and trail legs may vary between athletes who play at the collegiate level and those who have not. **METHODS:** Active baseball players were recruited and separated into two groups, recreational ($n = 6$) and skilled ($n = 6$), with the skilled players competing at the NCAA level. Each athlete performed three swing trials while standing in their normal hitting stance on two force platforms sampling at 1000 Hz. The dependent variables included the peak GRFx, GRFy, and GRFz normalized to bodyweight, and the time to peak GRFx, GRFy, and GRFz in milliseconds before ball contact for the lead and trail legs, as determined by Visual3D software. Values were averaged for each respective group and compared using independent sample t-tests ($p \leq 0.05$). **RESULTS:** The skilled group demonstrated a significantly lower posterior peak GRF (Recreational = -0.26 ± 0.03 BW, Skilled = -0.23 ± 0.03 BW, $p = 0.02$), a significantly higher vertical peak GRF (Recreational = 0.97 ± 0.03 BW, Skilled = 1.03 ± 0.02 BW, $p = 0.005$) and a reduction in time to vertical peak GRF in the trail leg (Recreational = -0.40 ± 0.06 ms, Skilled = -0.54 ± 0.11 ms, $p = 0.028$) in comparison to the recreational group. **CONCLUSION:** The ability of the skilled athletes to control their trail leg peak GRFy, while creating a significantly higher peak GRFz and reaching the peak GRFz faster helps to both facilitate velocity of the swing and control their body movement. Combining these three distinct kinetic differences in the swing could lead to differences in bat velocity and skill level between these two groups.

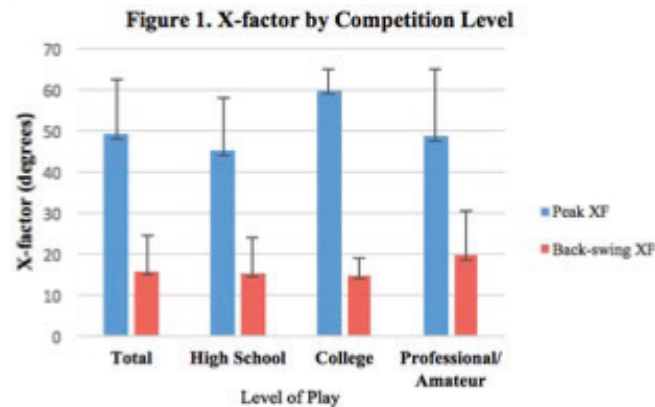
2845 Board #2 May 31 3:15 PM - 5:15 PM
Performance and Injury Correlates of X-Factor Among Baseball Hitters

Eric M. Berkson, James Michaud, Shannon Linderman, Robert C. McCunney, Donna M. Scarborough. *Massachusetts General Hospital, Boston, MA.*
Email: eberkson@mgh.harvard.edu
(No relevant relationships reported)

PURPOSE: Abdominal strains related to trunk torsional forces commonly occur during baseball batting. A large degree of trunk rotation, or X factor (XF), is proposed to increase bat speed. However, baseball swing initiation is driven by pelvis rotation, which requires adequate hip joint mobility. This study investigates the correlations between XF, bat speed, passive hip range of motion, and dynamic hip rotation during the baseball swing. **METHODS:** 22 players (3 professional, 1 amateur, 5 college, 13 high school), mean age 18.09 ± 3.90 years, underwent 3D biomechanical baseball swing analysis. XF (resultant transverse angle of the intersecting rays through both shoulder joints and the pelvis midpoint) and lead and trail hip rotation angles were measured for 1 swing. Passive, prone hip rotation was assessed via goniometer. Spearman rho correlations and one-way ANOVA were performed. **RESULTS:** Peak XF and XF at the top of the back swing did not correlate with peak bat speed ($p = 0.088$ and $p = 0.832$). There was no significant difference in peak XF across level of play [$F(2,19) = 2.637$, $p = 0.098$] (Figure 1). Passive internal trail hip rotation differed between college and high school players ($p = 0.049$) and was inversely correlated with bat speed at ball contact ($r_s = -0.526$, 0.029). Peak bat speed positively

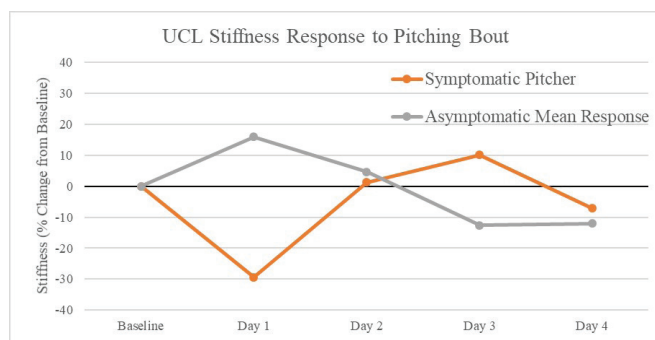
correlated with max trail hip rotation angle during the swing ($r_s=0.570$, $p=0.006$). No correlation of peak XF and passive hip rotation measures or hip rotation angles during the swing reached significance set at $p < 0.05$.

CONCLUSIONS: Findings do not support the use of XF as an indicator of bat speed. The variation in XF values may result from coaching differences or joint mobility compensation patterns. Athletes with limited hip rotation may attempt to compensate through generation of a large XF, possibly increasing the risk of back and oblique abdominus injuries. Clinicians caring for baseball players should screen for trail hip joint rotational mobility limitations.



2846 Board #3 May 31 3:15 PM - 5:15 PM
UCL Stiffness Response to a Moderate Pitching Bout
 Christopher J. Curran, Henry W. Zale, Patrick M. Rider, Anthony S. Kulas, Zachary J. Domire. *East Carolina University, Greenville, NC.*
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 (No relevant relationships reported)

Purpose: The effect of a single pitching bout on the material stiffness of the ulnar collateral ligament (UCL) was investigated in five competitive baseball pitchers (age: 20.0 ± 2.6 years). Differences in the response were compared between one pitcher with arm trouble and four asymptomatic pitchers. **Methods:** Shearwave ultrasound elastography was used to measure the material stiffness of the UCL prior to, and on the four days following, a moderately-intense pitching bout. The pitching bout consisted of a minimum of 50 full-effort pitches in either a practice or game situation. Pitch velocity was measured and maintained within 10% of expected maximum velocity to ensure full effort was given. Participant arm health was measured using the Kerlan-Jobe Orthopaedic Clinic Shoulder and Elbow Score (KJOC) prior to the first imaging session. **Results:** Four pitchers reported “playing without any arm trouble” with a mean KJOC score of 90.4 out of 100.0. One pitcher reported “playing, but with arm trouble” and had a KJOC score of 60.2. Each of the asymptomatic pitchers showed an immediate increase in UCL stiffness (mean increase = $+15.99\%$) compared to baseline followed by a marked decrease and trend towards returning to baseline values on days 2-4. The UCL stiffness of the symptomatic pitcher showed a different immediate response (-29.47%) before returning towards baseline values on days 2-4. **Conclusions:** UCL material stiffness in a pitcher with arm trouble responded differently to a moderate pitching bout compared to a small sample of asymptomatic pitchers. A decrease in material stiffness of the UCL immediately following a pitching bout may be evidence of elbow distress and be useful in the identification of pitchers with increased injury risk.



2847 Board #4 May 31 3:15 PM - 5:15 PM
Does The Kinematic Sequence Of A Curveball Pitch Vary Within Baseball Pitchers?

Donna M. Scarborough, Shannon Linderman, Pablo Colon, Eric M. Berkson. *Massachusetts General Hospital, Boston, MA.*
 Email: dscarborough@mgh.harvard.edu
 Reported Relationships: D.M. Scarborough: Salary; figur8.

PURPOSE: The performance of a proximal-to-distal transfer of segmental angular velocity (or kinematic sequence) is reported to reduce stress on musculoskeletal structures of the overhand baseball pitcher’s throwing arm and maximize ball velocity. The commonly asserted risk for injury of curveball pitching has not been demonstrated biomechanically. This study evaluates the kinematic sequence (KS), and their variability, of a curveball pitch in an effort to better characterize the stress on the arm during this pitch.

METHODS: 3D biomechanical pitch analyses using high-speed motion capture cameras (360Hz) were performed on 71 curveball pitches (5-6 pitches per pitchers) from 14 baseball pitchers (4 high school, 8 collegiate and 2 professional) with a mean age 19.21 ± 2.94 years. The peak angular velocity of five body segments: pelvis, trunk, arm, forearm and hand were analyzed to determine the kinematic sequence patterns for each curveball pitch.

RESULTS: None of the 71 pitches demonstrated the proximal-to-distal KS order. Eleven different KS patterns were demonstrated, and the most prevalent order was pelvis-> trunk-> arm and hand segments peaking simultaneously -> forearm. No players performed only 1 KS pattern among the curveball pitches. An average of 3 different KSs were observed per pitcher.

CONCLUSIONS: Deviation from the proximal-to-distal KS during pitch delivery results in an inefficient movement. The KS patterns of the fastball pitch have recently been described. This study evaluated the KS patterns of the curveball pitch. The most frequently performed KS during the curveball is with the forearm segment generating peak velocity simultaneously after the hand and shoulder velocity peaks. It is not known how the stresses across the shoulder and elbow are associated with this KS. Variation in KSs performed throwing curveballs may help prevent injury to the throwing arm, in particular if some KS patterns create more stress on the throwing arm than others.

Table 1. Pitcher characteristics and number of curveball kinematic sequences performed per pitcher. *LOP- Level of Play (P- professional, C- collegiate, HS- high school)

ID	LOP	Throwing hand	Ball speed (MPH)	# pitch trials	# of KS
1	P	Right	68.64	3	5
2	P	Left	71.68	4	5
3	C	Right	59.24	3	5
4	C	Right	63.96	4	5
5	C	Right	72.26	2	5
6	C	Right	62.36	2	5
7	C	Right	63.14	2	5
8	C	Right	70.06	2	5
9	C	Left	65.62	4	6
10	C	Left	66.68	3	5
11	HS	Right	64.62	2	5
12	HS	Left	61.04	2	5
13	HS	Left	57.4	2	5
14	HS	Left	59.4	3	5

2848 Board #5 May 31 3:15 PM - 5:15 PM
Induced Power Analysis Of Sequential Body Motion And Elbow Valgus Load During Baseball Pitching

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 (No relevant relationships reported)

The flow of mechanical energy of segmental motion provides a mechanism by which the throwing arm is accelerated during baseball pitching. Muscles can indirectly influence the energy level of distal segments to which they are not attached by way of the interaction torques transferring energy up the kinetic chain. No study to date, however, has addressed these causal components of mechanical power, specifically in relation to valgus loading at the elbow, which is prone to pitching-related injuries.

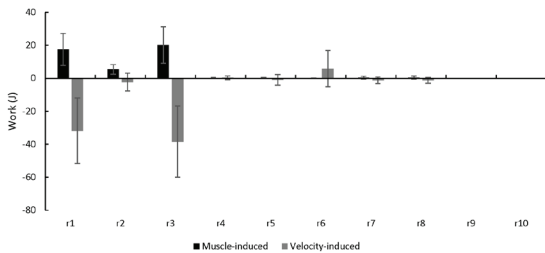
PURPOSE: To determine the components of muscle and velocity-dependent torques that contribute to the power of throwing arm segments when the elbow is under valgus load during pitching.

METHODS: The throwing motions of 10 adult pitchers (age = 22.9 ± 4.1 years, height = 1.87 ± 4.93 m, and mass = 86.5 ± 7.4 kg) were biomechanically measured using 3D motion capture after written informed consents were provided by the participants.

The resulting kinematic and kinetic data were included in a state-space power analysis using a 10-DOF model. The contributions of the torque-induced components to the mechanical work of the forearm were determined by integrating the power curves in time between the instants of front foot contact (FC) and maximum external rotation (MER) of the throwing shoulder.

RESULTS: Pitchers threw with a maximum elbow valgus torque of $70.1 \pm 2.2 \text{ N}\cdot\text{m}$. The trunk flexion (r1) and rotation (r3) components of the muscle-induced torque were the greatest positive contributors to the work of the forearm. Muscle torques contributed a total of $44.5 \pm 23.4 \text{ J}$ while velocity-dependent torques absorbed $69.6 \pm 37.1 \text{ J}$, representing 61% of the total work (114.1 J) of the distal arm segments during the arm-cocking phase (Figure 1).

CONCLUSIONS: Trunk motion in the early part of the arm-cocking phase appears to drive the power of accelerating the throwing elbow in valgus via velocity-dependent torques.



2849 Board #6 May 31 3:15 PM - 5:15 PM
Glenohumeral-Rotation-Deficits In High School, College, And Professional Baseball Pitchers With And Without An Mucl Injury
 Rafael F. Escamilla, FACSM. *California State University, Sacramento, Sacramento, CA.*
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 (No relevant relationships reported)

PURPOSE: To assess if a glenohumeral-internal-rotation-(IR)-Loss (GIRLoss), a glenohumeral-external-rotation-(ER)-gain (GERGain) or a total-rotational-motion-(TRM)-deficit (TRMD) predict medial ulnar-collateral-ligament (MUCL) injury-risk among high-school (HS), college (COLL), and professional (PRO) baseball-pitchers with-and-without-MUCL-injury. It was hypothesized that pitchers with MUCL injury would have >GIRLoss and TRMD compared to pitchers without MUCL injury, with no differences in IR, ER, TRM, GIRLoss, GERGain, and TRMD. **METHODS:** Two-hundred-sixteen-male HS, COLL, and PRO pitchers were equally divided into MUCL-injury-group (n=108) and control-group (n=108) without MUCL injury. Control-group was matched with the MUCL-injury-group according to number, level & age. Bilateral shoulder passive IR/ER were measured and GIRLoss, GERGain, TRM, and TRMD calculated. A two-way-analysis-of-variance ($p < 0.05$) was employed to assess shoulder-rotational-differences among the two-groups and three-pitching-levels. **RESULTS:** Compared to control-group, MUCL-injured-group had >GIRLoss ($21^\circ \pm 14^\circ$ -versus- $13^\circ \pm 8^\circ$; $p < 0.001$), GERGain ($14^\circ \pm 9^\circ$ -versus- $10^\circ \pm 9^\circ$; $p = 0.004$), and TRMD ($7^\circ \pm 13^\circ$ -versus- $3^\circ \pm 9^\circ$; $p = 0.008$). For all pitching levels ~60% of subjects in MUCL-injury-group had GIRLoss > 18° , compared to ~30% of subjects in control-group. ~60% of subjects in MUCL-injury-group had TRMD > 5° , compared to 50% of subjects in control group. No differences were observed among HS, COLL, and PRO pitchers for GIRLoss ($16^\circ \pm 12^\circ, 17^\circ \pm 11^\circ, 19^\circ \pm 13^\circ$, respectively; $p = 0.131$), GERGain ($11^\circ \pm 9^\circ, 11^\circ \pm 10^\circ, 13^\circ \pm 10^\circ$, respectively; $p = 0.171$), TRMD ($5^\circ \pm 11^\circ, 6^\circ \pm 11^\circ, 5^\circ \pm 14^\circ$, respectively; $p = 0.711$), throwing shoulder ER ($111^\circ \pm 10^\circ, 111^\circ \pm 11^\circ, 113^\circ \pm 9^\circ$, respectively; $p = 0.427$), throwing shoulder IR ($50^\circ \pm 11^\circ, 49^\circ \pm 11^\circ, 48^\circ \pm 10^\circ$, respectively; $p = 0.121$), & throwing shoulder TRM ($162^\circ \pm 14^\circ, 160^\circ \pm 15^\circ, 161^\circ \pm 14^\circ$, respectively; $p = 0.770$). **CONCLUSIONS:** Greater GIRLoss, GERGain, and TRMD in MUCL-injured-pitchers compared to uninjured-pitchers implies these variables may be related to increased-MUCL-injury-risk, especially since GIRLoss > 18° and TRMD > 5° demonstrate an increased MUCL injury risk. Shoulder rotational motion and deficits do not vary among HS, COLL, and PRO levels of pitchers.

2850 Board #7 May 31 3:15 PM - 5:15 PM
Kinematic Factors that Contribute to Batting Performance in Collegiate Baseball
 Alexia E. Amo, William P. Lydon, Nathaniel J. Holmgren, J. Mark VanNess, Courtney D. Jensen. *University of the Pacific, Stockton, CA.*
 Email: l_amo@u.pacific.edu
 (No relevant relationships reported)

To remain competitive in collegiate athletics, sports teams now employ advanced analytical tools to identify improvable domains. In baseball, technological limitations have precluded comprehensive interpretation of swing mechanics. Recent developments in technology now permit more complex assessments. **PURPOSE:** To test how kinematic factors of bat swing associate with in-season batting performance in college athletes. **METHODS:** We enrolled 13 batters from a D1 baseball team in Northern California and used Proteus (Boston Biomotion, USA) to conduct three-dimensional analyses of swing mechanics. Each athlete performed six five-repetition sets of swings at increasing loads of magnetic resistance: 1lb, 2lb, 3lb, 5lb, 7lb, and 9lb. Proteus software computed explosiveness (rate of power production) and endurance (replication of power production in successive swings). Players were tracked through the 2017 season and all batting statistics were recorded. Linear regressions tested the effects of explosiveness and endurance on in-season batting performance. Significance was set at $p < 0.05$; owing to a small sample and the novel equipment, trends ($p < 0.08$) were considered. **RESULTS:** 11 of 13 players had a base hit during the study season; these 11 constituted the study sample. They played 40.1 ± 13.2 games and batted $.264 \pm .048$. Mean swing explosiveness was 313.7 ± 59.3 and endurance was 97.7 ± 1.4 . Batting average was positively related to swing endurance ($R = 0.638$); an additional point of endurance predicted an 8.7% increase in batting average ($p = 0.047$). Runs ($R = 0.869$), triples ($R = 0.628$), and home runs ($R = 0.585$) per at-bat were positively correlated with swing explosiveness; in each at-bat, an additional point of explosiveness predicted a 0.2% increase in runs ($p = 0.001$), 1.3% increase in triples ($p = 0.052$), and 0.8% increase in homeruns ($p = 0.075$). Neither explosiveness ($p = 0.121$) nor endurance ($p = 0.529$) associated with games played. **CONCLUSIONS:** In three-dimensional analyses of swing mechanics, increased explosiveness and endurance predicted an improved batting average, more extra base hits, and more runs scored per at-bat. Scouts may be wise to consider swing mechanics in their estimations of a player's value. Likewise, players and coaches may choose training programs that optimize mechanics accordingly.

2851 Board #8 May 31 3:15 PM - 5:15 PM
Relationship Between Ground Reaction Force and Wrist Velocity in Skilled and Novice Baseball Pitchers
 Kurt Kornatz, Christopher Wendt, Kevin Ritsche. *Winston-Salem State University, Winston-Salem, NC.* (Sponsor: Mike McKenzie, FACSM)
 (No relevant relationships reported)

While throwing, skilled performers transmit forces in a precisely coordinated manner from the foot through the kinetic chain ultimately manifesting in a large velocity of the wrist. Accordingly, stride-leg ground reaction forces have been used to predict wrist velocity in skilled baseball pitchers. However, the relationship between ground reaction force and wrist velocity in novice pitchers is less clear. **PURPOSE:** The purpose of this study is to compare the relationship between peak vertical ground reaction forces of the stride leg (Fzpeak) and wrist velocity in skilled and age-matched novice baseball pitchers. **METHODS:** Ten collegiate baseball pitchers and ten recreationally active college-aged novice throwers completed one laboratory testing session in which they were asked to throw a baseball as fast and accurately as possible after a standardized instruction and warmup. Each subject performed a total of 15 throws, collected as part of a larger study in which stride-length was altered (comfortable $\pm 10\%$), on a dimensionally correct pitching mound equipped with a force platform (1200 Hz). Marker trajectory data (32 reflective markers) was tracked from 10 high-speed cameras at 240 frames/sec. Fzpeak was normalized for body weight (N/BW); wrist velocity (m/s) was measured at ball release. **RESULTS:** Skilled pitchers demonstrated larger FzPeak (1.61 ± 0.19 vs. 1.34 ± 0.13 N/BW, 16% difference, $p < 0.01$) and higher wrist velocity (18.11 ± 0.94 vs. 13.96 ± 1.04 m/s, 23% difference, $p < 0.01$) compared to novice participants. Furthermore, Fzpeak and wrist velocity were correlated for skilled pitchers only ($r = 0.47$, $p < 0.01$ vs. $r = -0.18$, $p > 0.1$). **CONCLUSIONS:** Skilled pitchers are more efficient than novice throwers at generating and transmitting ground reaction force through the kinetic chain in order to maximize wrist velocity.

F-32 Thematic Poster - Exercise and Neuroscience

Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-101B

2852 Chair: J. Carson Smith, FACSM. University of Maryland, College Park, MD.

(No relevant relationships reported)

**2853 Board #1 May 31 3:15 PM - 5:15 PM
The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus**

Darrin Lenhart. *East Stroudsburg University, Seton Hall University, East Stroudsburg, PA.* (Sponsor: Shala Davis, FACSM)

Email: dlenhart@esu.edu

(No relevant relationships reported)

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

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

**2854 Board #2 May 31 3:15 PM - 5:15 PM
Not Just for Joints: Physical Activity is Associated with Greater Cortical Thickness among Adults with Osteoarthritis**

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(No relevant relationships reported)

PURPOSE: Preliminary evidence suggests osteoarthritis (OA) is a risk factor for dementia. One potential reason is 87% of adults with OA are inactive, and low moderate-to-vigorous physical activity (MVPA) and high sedentary behaviour (SB) are each risk factors for brain atrophy. While regular MVPA and low SB are thus critical for brain health, it is unclear 1) what aspects of brain structure are associated with these behaviours among adults with OA; and 2) whether the relationships of MVPA and SB with brain structure are independent of each other. Hence, we investigated the independent relationships of MVPA and SB with brain structure in adults with knee OA. **METHODS:** This was a secondary cross-sectional analysis of a six month, proof-of-concept randomized controlled trial (RCT) to promote MVPA and reduce SB among adults with knee OA. At study entry, we objectively measured MVPA and SB for 7 days using the SenseWear Mini. Following this observation period, participants (N= 30) underwent a 3T magnetic resonance image (MRI) scan, wherein T₁-weighted structural MRIs were performed to measure cortical thickness. We performed regression analyses using a surface-based cluster size exclusion method for multiple

comparisons within the FreeSurfer neuroimaging software to determine if 1) MVPA was associated with greater cortical thickness independent of SB; and 2) SB was associated with less cortical thickness independent of MVPA.

RESULTS: Participants had a mean age of 61 years (SD= 9 years), and 80% were female. Higher MVPA was associated with greater cortical thickness in the temporal pole (cluster size= 855 mm²; $p< 0.05$) and superior frontal area (cluster size= 1204 mm²; $p< 0.05$) of the left hemisphere independent of SB. SB was not associated with greater cortical thickness in any region independent of MVPA.

CONCLUSIONS: Higher MVPA is associated with greater cortical thickness in adults with OA, however SB does not appear to be strongly associated with brain structure. Promoting MVPA among adults with OA may thus be an important strategy for maintaining cognitive health among this population.

**2855 Board #3 May 31 3:15 PM - 5:15 PM
Fitness Trumps Fatness: An Examination of Cognition and Cerebral Volume**

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(No relevant relationships reported)

PURPOSE: To determine whether cardiorespiratory fitness (VO_{2peak}) is related to cognition and cerebral volume in the presence of fatness in a late-middle-aged cohort at risk for Alzheimer's disease (AD). **METHODS:** 127 enrollees in the Wisconsin Registry for Alzheimer's Prevention (age = 64.1 ± 5.8 years, N = 127, 43 male) underwent a graded maximal exercise test, anthropometric measurement, neuropsychological examination, a structural brain MRI scan, fasting venipuncture to assess insulin resistance (HOMA-IR), and APOE genotyping. Subjects were categorized as high vs low on VO_{2peak} using age- and sex- specific cutoffs from normative data and high vs low on waist-to-height ratio using sex-specific cutoffs. This resulted in four groups: Low fit/High fat (Lofit-Hifat; n = 43); Low fit/Low fat (Lofit-Lofat; n = 11); High fit/High fat (Hifit-Hifat; n = 28); High fit/Low fat (Hifit-Lofat; n = 41). Four cognitive domains were examined: Verbal Learning & Memory, Immediate Memory, Speed & Flexibility, and Working Memory. Cerebral volume was computed from MRI scans as the ratio of cerebrospinal fluid to the sum of gray and white matter. MANCOVA and follow-up ANCOVAs (adjusted for HOMA-IR, APOE, and in a secondary analysis, sex) were used to test whether fitness/fatness group associated with cognition and cerebral volume. **RESULTS:** There was a significant main effect of group on Verbal Learning & Memory ($p = .003$). Compared to the Lofit-Hifat group, Hifit-Lofat and Hifit-Hifat ($\beta = 0.476$, $p = .013$; $\beta = 0.719$, $p = .001$) performed better, whereas Lofit-Lofat did not ($\beta = 0.023$, $p = .939$). There was a significant main effect of group on cerebral volume ($p = .012$). Relative to the Lofit-Hifat group, Hifit-Hifat had significantly greater cerebral volume ($\beta = -0.052$, $p = .007$) while Hifit-Lofat and Lofit-Lofat were not different ($\beta = -0.027$, $p = .151$; $\beta = 0.020$, $p = .451$). When sex was added to the statistical models, there was no longer an effect of group on cognition or cerebral volume. **CONCLUSION:** In a cohort at risk for AD, cardiorespiratory fitness is associated with better cognition in Verbal Learning & Memory and greater cerebral volume even in the presence of high fatness, while sex may impact the relationships. Cardiorespiratory fitness may be more important than achieving a favorable body habitus for preserving cognition and brain health.

**2856 Board #4 May 31 3:15 PM - 5:15 PM
Brain Activity For Food Inhibition In Children With Higher Cardiorespiratory Fitness: An Fmri Study**

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(No relevant relationships reported)

Inhibitory cognitive control in children has been associated with future educational attainment, healthy body composition and eating behavior. Regular practice of aerobic exercise has shown to improve inhibitory cognitive control in children, however the brain areas involved in this cognitive domain, in particular those related to the inhibition of high caloric food, are unclear. **PURPOSE:** To identify the effects of enhanced cardiorespiratory fitness on brain activity involved in food-specific inhibitory control in children. **METHODS:** 22 children (10±1.4 years old) participated in this study by completing general anthropometric assessments, a graded shuttle run test to estimate cardiorespiratory fitness (VO_{2max}) and a food-specific cognitive task while acquiring functional magnetic resonance imaging (fMRI) data by a 1.5 T MRI scanner.

During the scanner children performed a Go/No-go task. Pictures of objects (neutral) were used as Go stimulus and caloric food and toys pictures as No-go stimulus. The entire protocol consisted in three blocks No-go food, and three No-go toy. Each block contained 50 trials (80% Go stimulus). Children were divided in two groups (Lower fitness x Higher Fitness) separated by the median value of VO_{2max} . Unpaired Student's t-tests were used to compare cognitive performance between groups. Food specific-inhibitory control was assessed comparing which brain areas were more activated during No-Go conditions (Food) between groups by a two sample t-test. **RESULTS:** No differences were found between groups for the cognitive performance (number of errors) and general anthropometric variables ($p>0.05$). However, children with higher cardiorespiratory fitness during the food-specific cognitive task had greater activation of areas related to cognition (prefrontal cortex and inferior parietal lobule), motor control (primary motor cortex and primary somatosensory cortex) and homeostatic regulation (insular cortex) ($T=2.89$; $p<0.005$). **CONCLUSION:** Cardiorespiratory fitness might influence the brain activity during inhibition control of high caloric food in children. This finding suggests that regularly performed aerobic exercise by children may promote functional adaptations on the brain that could affect future eating behaviors.

2857 Board #5 May 31 3:15 PM - 5:15 PM
Prefrontal Hemodynamics And Affective Responses To Incremental Exercise
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Neuroimaging investigations in non-exercise contexts have shown that the dorsolateral prefrontal cortex (dlPFC), medial PFC and anterior cingulate, are engaged when individuals attempt to cognitively control negative affect. Moreover, there are indications that aversive interoceptive stimuli preferentially activate the right hemisphere. We theorized that affective responses to incremental exercise would be regulated by the same prefrontal network implicated in non-exercise affect regulation. We hypothesized that there would be preferential right-dlPFC activation, among individuals with low tolerance to exercise intensity and, therefore, less positive affective responses to challenging intensities of exercise (i.e., above ventilatory threshold, VT). **PURPOSE:** To investigate dlPFC activation and affective responses during incremental exercise. **METHODS:** Thirty-eight participants (15M, 21F, Age: 23.7 ± 6.9 y; BMI: 24.0 ± 4.8 kg·m⁻²; VO_{2max} : 32.8 ± 7.8 ml·kg⁻¹·min⁻¹) completed an incremental cycling test to volitional termination. They were divided into low- and high-Tolerance groups based on a median split of their Tolerance scores (Preference for and Tolerance of the Intensity of Exercise Questionnaire). Near-infrared spectroscopy was used to assess changes from rest in the Tissue Oxygenation Index (ΔTOI) in the left (AF3) and right (AF4) dlPFC. Affective valence ratings (Feeling Scale; FS) were collected each min. **RESULTS:** Tolerance scores were positively correlated with FS ratings above VT ($r = 0.33$, $p = .04$), such that lower-Tolerance individuals reported lower FS ratings. For ΔTOI , a significant interaction was found between Tolerance group (low-high) and Hemisphere (left-right), $p = .02$, $\eta_p^2 = .129$. ΔTOI in the right dlPFC was larger for low- vs high-Tolerance individuals ($p = .03$). **CONCLUSION:** Low self-reported tolerance for exercise intensity is associated with lower ratings of affective valence above VT and larger increases in right-dlPFC oxygenation from rest. These results suggest that the prefrontal regulation of negative affective responses to increasing exercise intensity may exhibit similarities to the regulation of negative affective responses in non-exercise contexts.

2858 Board #6 May 31 3:15 PM - 5:15 PM
Acute Exercise Alters Brain Activation In Older Adults: What Is The Role Of Sleep?
 Alfonso J. Alfini¹, Adam P. Spira¹, Lauren R. Weiss², Junyeon Won², Casandra Nyhuis¹, Corey S. Michelson², Caroline Simon², Daniel D. Callow², J. Carson Smith, FACSM. ¹*Johns Hopkins University, Baltimore, MD.* ²*University of Maryland, College Park, MD.* (Sponsor: J. Carson Smith, FACSM)
 (No relevant relationships reported)

Insufficient sleep is associated with altered brain activation and poor cognitive performance. Aerobic exercise training enhances neural efficiency and improves cognition. **Purpose:** To examine sleep's role in the effect of acute aerobic exercise on brain functional activation and cognitive performance. **Methods:** We studied healthy, physically active older adults ($n = 31$; mean age = 66.2 ± 7.4 years (range = 55-81); 74.2% women; 93.6% > high school education; body mass index = 25.7 ± 4.2). During two counterbalanced study visits, participants engaged in 30 minutes of moderate-intensity bicycle exercise or seated rest, followed by a functional MRI scan. While in the scanner, participants completed the Erikson Flanker Task. Prior to the first study visit they also completed 7.9 ± 3.3 nights of wrist actigraphy. Actigraphic sleep indices

included total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), and average wake bout length (WBL). **Results:** Compared to rest, acute exercise significantly increased functional activation in the right superior parietal lobule (SPL; beta = 0.14, $p = 0.011$) and decreased activation in the left anterior cingulate cortex (ACC; beta = -0.09, $p = 0.012$). After adjustment for age, sex, race, and education, greater WASO was associated with less exercise-induced change in SPL activation (beta = -0.05, $p = 0.001$). There were no significant associations between TST, SE, or WBL and exercise-induced changes in functional activation. Acute exercise did not significantly affect Flanker Task performance. **Conclusions:** Acute moderate-intensity exercise alters functional activation in brain regions involved in executive function and inhibitory control, which align with previous exercise studies showing a conflict-related shift from ACC to SPL activity. Our findings suggest that the short-term effects of acute exercise may accumulate and promote the cognitive improvements linked to exercise training. Moreover, our findings suggest that greater time awake after initial sleep onset (i.e., sleep fragmentation) may attenuate the benefits of aerobic exercise on functional activation in the aging brain. Randomized controlled trials are necessary to further evaluate the interactive effects of sleep and acute exercise in older adults.

2859 Board #7 May 31 3:15 PM - 5:15 PM
The Effect of Exercise on Neural Activation in Older Adults
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Acute exercise (EX) affects neural activation, assessed with functional magnetic resonance imaging (fMRI), and is a suggested mechanism in the effects of EX on behavioral measures of cognition. **PURPOSE:** We investigated the effect of EX on neural activation during a set switching task (SST). **METHODS:** Six healthy, right-handed older adults ($M=71.4 \pm 5.1$) completed two separate visits [EX; 30-min of cycling at 55-65%Heart Rate Reserve and rest (RS); 30-min of seated rest]. After EX or RS participants completed a SST during an fMRI. SSTs are a measure of executive function where participants shift attention between sets of rules during the task. Switch cost (cost) is the performance difference between switching (i.e. A, B, A) and repeat trials (i.e. A, A, A). The conditions included rest, a high switching block [70% switching, 30% repeat trials (HS)], and a low switching block [20% switching, 80% repeat trials (LS)]. fMRI analyses using FSL included assessment of main effects of activation during HS and LS blocks during EX and RS and a comparison of activation with reaction time cost. **RESULTS:** Across both HS and LS and EX and RS, participants similarly activated the lateral occipital cortex and frontopolar area. In addition, there was significant activation of the superior and inferior frontal gyri, middle frontal gyrus, cerebellum VIIb, thalamus, caudate, and insula following RS in HS and LS. There were no unique areas of activation in HS following EX, however in LS there was activation in the temporal occipital fusiform gyrus, inferior frontal gyrus, and middle frontal gyrus. In relation to performance, cost during HS was associated with activation of the cerebellum VIIb following EX and activation of the thalamus and occipital pole following RS. Further, cost during LS was associated with activation in the frontopolar area after EX and activation in the thalamus following RS. **CONCLUSION:** Similar activation during HS and LS following rest and EX suggests a common network for SSTs. During the HS blocks, EX did not elicit additional unique activation, as seen following RS or the LS block, suggesting EX-induced efficiency. More research is needed to better understand the implication of differential activation. Results presented at ACSM will include additional participants; findings and conclusions will reflect the final analyses.

2860 Board #8 May 31 3:15 PM - 5:15 PM
Association of Sleep Duration with Exercise-Induced Reductions in Default Mode Network Connectivity in Healthy Older Adults
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Exercise promotes neuroprotective effects in several large-scale brain networks that are vulnerable to dysregulation in aging and disease. Aging-related changes in sleep may also disrupt functional connectivity within these networks, including the default mode network (DMN), in which beta-amyloid aggregates in Alzheimer's disease (AD). **PURPOSE:** To determine the effect of moderate-intensity acute exercise on resting-state DMN functional connectivity (DMN-rSFC) in the brains of healthy older adults, and how this might be altered by poor sleep.

METHODS: On separate days, 32 physically active older adults (24F, 66.3 ± 7.3 years) completed 30 minutes of moderate-intensity cycling (RPE 14-15) or rest in a counterbalanced order prior to resting-state BOLD fMRI data acquisition. Actigraphic sleep indices, including total sleep time (TST) and sleep efficiency (SE; proportion of time in bed spent asleep), were calculated using wrist actigraphy data from 8 ± 3.5 nights prior to the first study visit. We utilized a seed-based correlation analysis (seed: left posterior cingulate cortex [PCC], MNI 2 -54 26) to determine the effect of exercise on DMN-rsFC. We tested the association of TST and SE with residualized exercise-induced change in DMN-rsFC (Δ DMN-rsFC) with multiple linear regression.

RESULTS: A paired-samples *t*-test revealed decreased DMN-rsFC in the left inferior parietal lobule (IPL; MNI -41 -51 45, $k = 108$, 864 mm³) after exercise compared to rest. TST and SE explained 25% of the variance in exercise-induced Δ DMN-rsFC ($R^2 = .253$, $F(29) = 4.91$, $p = .015$). Every 30-minute increase in TST was associated with a $\beta = 0.019$ -unit decrease in DMN-rsFC between the left PCC and left IPL ($t(29) = -3.13$, $p = .004$).

CONCLUSION: Our findings suggest that acute moderate-intensity cycling exercise reduces functional connectivity between the left PCC and left IPL, two core DMN regions. Shorter sleep duration was associated with attenuated exercise-induced reduction in functional connectivity between these regions. Given the vulnerability of DMN regions to beta-amyloid deposition, our finding that exercise-induced effects on DMN-rsFC are modulated by sleep duration may have implications for optimizing results of exercise-based interventions aimed at preventing AD. Further research is needed to investigate this possibility.

F-33 Thematic Poster - New Findings in Children and Youth

Friday, May 31, 2019, 3:15 PM - 5:15 PM
Room: CC-104B

2861 Chair: Russell R. Pate, FACSM. *University of South Carolina, Columbia, SC.*

(No relevant relationships reported)

2862 Board #1 May 31 3:15 PM - 5:15 PM
Neighborhood Resources Supporting Physical Activity: Perceived Access and Weight-Related Health Status in Youth

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(No relevant relationships reported)

Previous authors have demonstrated that the availability of neighborhood parks and greenspace is positively associated with physical activity engagement and health outcomes in youth. Yet, given the documented influence of *perceptions* of neighborhood safety, cleanliness, and traffic calming measures on physical activity participation in youth, further investigation is needed to consider the impact of perceived park access on youth health outcomes. **PURPOSE:** To examine the relationship between perceived access to neighborhood resources supporting physical activity and weight-related health status in youth. **METHODS:** Data from 17 urban public elementary schools, representing 733 students (mean age = 7.32 ± 1.78 years; males = 372, females = 361) was collected from the 2016-2017 Roanoke Valley Community Healthy Living Index. A correlation analysis examined the relationship between perceived access to resources supporting physical activity and BMI-for-age *z*-scores. **RESULTS:** A significant negative relationship was found between perceived access to resources supporting physical activity and weight-related health status in youth, $r(731) = -0.08$, $p = .01$. **CONCLUSIONS:** As perceptions of access to neighborhood-level resources supporting physical activity increased, weight-related health status in youth improved. These findings contribute to the existing literature on neighborhood-level correlates to health by considering the impact of family perceptions of access to healthy-living resources on youth health outcomes.

2863 Board #2 May 31 3:15 PM - 5:15 PM

The Association Between School Gardens and Physical Activity: A Way to Increase Youth Physical Activity

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(No relevant relationships reported)

The benefits of school garden programs are far-reaching; however, few studies have assessed the impact of school gardens on PA levels in a youth population.

PURPOSE: To assess the impact of school gardens on physical activity (PA) levels in a youth population. **METHODS:** Data were obtained from 62 low-income 4th grade students in a central Texas school participating in TX Sprouts—a large, school-based gardening, nutrition, and cooking randomized controlled trial. A wall-mounted stadiometer and Tanita scale were used to measure students' height, weight, and body fat percentage, respectively. ActiGraph wGT3X+BT accelerometers captured student PA on garden days and non-garden days. Evenson (2008) cut points were used to calculate time spent in sedentary (SED) and in moderate-to-vigorous PA (MVPA). Total step counts (TLSC), and energy expenditure (kcal) were also obtained. Linear mixed modeling was used to determine the effect of TX Sprouts on PA, controlling for age, sex, and BMI. **RESULTS:** Students were 60.3% female, 59.7% Hispanic with a mean age of 9.2 ± 0.4 years, and 45% of students were affected by overweight/obesity. When compared to non-garden days, on garden days students demonstrated greater MVPA ($\beta = 2.96$, $p < 0.001$), TLSC ($\beta = 551.45$, $p < 0.001$), kcal ($\beta = 18.04$, $p < 0.001$), and a reduction in SED ($\beta = -9.21$, $p < 0.0001$). This equates to an increase of approximately 3 minutes MVPA, 549 steps, 17.6 kcal, and a decrease of 9.4 minutes TMESD.

CONCLUSION: Results showed increased PA for students on garden days vs. non-garden days. While findings reflect PA during one hour of a school day, garden lessons could have a substantial and meaningful impact on children's PA if incorporated multiple times throughout the school week.

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2864 Board #3 May 31 3:15 PM - 5:15 PM

Independent And Combined Associations Of Sedentary Time And Physical Activity With Executive Function Among Children

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(No relevant relationships reported)

Previous studies have suggested that sedentary behaviors and physical inactivity might be independent risk factors for executive dysfunction.

PURPOSE: To examine the independent and combined relationships of after-school sedentary time (ST) and daily physical activity (PA) with executive function in children and tentatively explore which these two behaviors had greater impact on children's executive function. **METHODS:** A total of 4,304 children aged 6-12 years were recruited in 2017. ST, PA and executive function were assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF) and the Behavior Rating Inventory of Executive Function (BRIEF), respectively. Subgroups were identified as: low ST, after-school ST < 2 hours/day; high ST, after-school ST ≥ 2 hours/day; low PA, moderate-to-vigorous physical activity (MVPA) < 60 minutes/day; high PA, MVPA ≥ 60 minutes/day. Participants were categorized into 4 groups: 1) low ST, high PA; 2) low ST, low PA; 3) high ST, high PA; 4) high ST, low PA. **RESULTS:** The mean age of the participants was 9.01 ± 1.72 years. Children in group 4 had the highest T-scores of BRIEF indices (48.23 ± 8.44, increased symptom), followed by those in group 3 (47.10 ± 8.05), group 2 (45.81 ± 7.78), and group 1 (44.41 ± 7.31), with $P < 0.05$ for each pairwise comparisons except for that between group 1 and 2. Multiple linear regressions showed that ST was positively related to the T-score of all indices, independent of MVPA ($P < 0.05$). However, MVPA was negatively associated with the T-score of metacognition index (MI) and global executive composite (GEC) only in the high ST subgroup ($P < 0.05$). **CONCLUSION:** Children with both low ST and high PA may have beneficial influence on their executive function. Notably, children with high ST and low PA demonstrated more significant deficits on the BRIEF than those with low ST and low PA, which suggested that intervention efforts should be paid more on reducing ST in addition to promoting PA.

2865 Board #4 May 31 3:15 PM - 5:15 PM
Age for Onset of Walking May Predict Physical Activity in Childhood; The Norwegian Mother and Child Cohort Study

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Physical activity (PA) is associated with a wide range of health benefits in children and youth. Identifying factors that might influence activity level is important to aim future public health strategies. Cross-sectional studies have demonstrated an association between motor skills and PA in childhood, however few studies have examined whether early motor development in infancy is associated with PA in childhood. **PURPOSE:** To examine whether age for onset of walking predicts PA in 7 year olds. **METHODS:** We used data from the Norwegian Mother and Child Cohort Study (MoBa), which is an ongoing population-based birth cohort study. The mothers reported age for onset of walking (months) and PA at 7 years (frequency of participation per week in moderate-to- vigorous PA [MVPA]) through questionnaires. The PA-questionnaire's validity is tested against accelerometer assessed MVPA (spearman's rho=0.38). We used multiple regression analyses and adjusted the analyses for gestational age, sex and weight at 1 year and parental education as a marker for socio-economic status. A formal test showed no evidence of an interaction by sex. **RESULTS:** A total of 33013 participants are included in the analysis (49% girls), and the mean age (sd) were 7.1 (0.14) years at follow-up. The average age (sd) for onset of walking were 12.9 (1.86) months, and average participation rate (sd) were 4.3 (2.45) times/week in MVPA. We observed a negative association between age for onset of walking and participation in MVPA in childhood ($B=-0.08$, 95%CI=-0.10, -0.07) independent of confounding factors. **CONCLUSION:** This finding indicate that earlier age for onset of walking may predict PA in childhood. However, while the association may be considered weak, i.e. each month earlier onset of walking is associated with 0.08 higher participation rate in MVPA (frequency per week), self-reported PA is likely prone to random measurement error attenuating the true association.

2866 Board #5 May 31 3:15 PM - 5:15 PM
An 8-week Fundamental Motor Skill Program Improves Skill Proficiency and Reduces Sedentary Time in Pre-schoolers

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 (No relevant relationships reported)

PURPOSE: Fundamental motor skills (FMS) are the building blocks for physical activity (PA), with higher FMS proficiency associated with increased PA. Time spent in sedentary behaviours (SB) are increasing, and PA levels declining in children leading to higher rates of adult onset lifestyle diseases. This study aims to assess the effectiveness of an 8-week FMS program on FMS, PA and SB in children. We hypothesised that an 8-week supervised FMS program will improve object control and locomotor skills in children aged 3-5 years, and that improvements will be associated with improvements in PA and/or SB. **METHODS:** Children aged 3-5 years were recruited from a FMS program and child care centres. Children from the FMS program participated in a supervised program aimed at developing FMS through sporting activities and games. This involved one-hour training sessions, once a week for 8 weeks. Children in the control group (CG) continued usual pre-school activities. FMS were assessed using the Test for Gross Motor Skill Development-2 and PA levels using the parent completed Pre-school Physical Activity Questionnaire at baseline, and 8 weeks. An analysis of variance was used to assess between group differences. Simple linear regression was used to identify any relationships between FMS and PA. **RESULTS:** Forty-six children participated in the study with 24 allocated to the CG (mean age 4.2±0.6 yrs) and 22 to the intervention group (IG) (mean age 3.9±0.7 yrs). After 8 weeks of FMS training the children in the IG were significantly better than the CG in the gallop ($p=0.04$) and strike ($p=0.02$), as well as locomotor ($p=0.01$), object control ($p=0.01$) and gross motor quotient ($p=0.007$) percentiles. In addition, children in the IG spent reduced time in SB ($p=0.03$), with the change being inversely and significantly associated with gallop skill performance ($r=-0.34$, $p=0.04$) and gross motor quotient ($r=-0.35$, $p=0.03$). **CONCLUSIONS:** An 8-week supervised FMS program is associated with an improvement in locomotor and object control skill proficiency, and improvements are associated with a reduction in time spent in SB. Further research is needed to explore if the improvements made during the program are maintained over time and whether children who attended the program are more likely to remain physically active throughout childhood.

2867 Board #6 May 31 3:15 PM - 5:15 PM
The Effect Of Exercise In Addition To A Lifestyle-intervention On Hepatic Fat In Overweight Children

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 (No relevant relationships reported)

PURPOSE: To compare the prevalence of responders (R) and non-responders (NR) for hepatic fat content and liver enzyme levels between overweight children participating in a family-based lifestyle intervention (LS) or in a family-based lifestyle plus exercise intervention (LS+Ex).

METHODS: This study included 102 overweight children (8-12 y; 55% girls; 57% with obesity according WOF criteria) that completed the 22 weeks of the EFIGRO (ClinicalTrials.gov ID: NCT02258126) two arms parallel intervention trial. The LS group (N=53; 10.6±1.1 y; 55% girls; 55% with obesity) attended a family-based lifestyle-and psycho-educational program composed by 11 sessions of 90 minutes. The LS+Ex group (N=49, 10.5±1.1 y; 55% girls; 59% with obesity) attended the same educational program and additionally participated in an exercise program that included aerobic and strength exercises, 3 days/week, 90 mins/session. Before and after the intervention, hepatic fat content was measured by magnetic resonance imaging, and alanine aminotransferase (ALT), aspartate aminotransferase (AST) and gamma-GT were measured in fasting plasma samples. Children were categorized as R when the effect size (d-cohen) was ≥ 0.2 , and as NR when d-cohen was < 0.2 .

RESULTS: Regarding hepatic fat content, there was a significantly higher prevalence of R ($P=0.035$) in the LS+Ex group (54%), than in the LS group (34%). Moreover, the difference in the prevalence of R between the two groups was also significant for GGT (69% and 38% of R, for the LS+Ex and LS groups, respectively, $P=0.002$), while there were no significant difference in the prevalence of R in changes in ALT (45% vs. 37% of R, for the LS+Ex and LS groups) and AST/ALT (40% vs. 35% of R, for the LS+Ex and LS groups) between the two groups (all $P>0.05$).

CONCLUSIONS: There was a higher prevalence of responders for hepatic fat content and GTT levels in the group of children with overweight that participated in the family-based multicomponent intervention program that included exercise. These results suggest that lifestyle intervention programs for improving obesity associated comorbidities in children should include exercise training to improve their hepatic health.

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2868 Board #7 May 31 3:15 PM - 5:15 PM
Parental Perceptions of Their Children's Physical Activity

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 (No relevant relationships reported)

Despite known health benefits, most children are not meeting the recommended physical activity (PA) guidelines. Parents play a critical role in supporting and encouraging their children's PA and it is essential to understand parents' perceptions of the factors that may influence their children's PA. **PURPOSE:** To describe, in a representative, statewide sample, South Carolina parents' perceptions of their children's PA behaviors. **METHODS:** Items from the 2013 statewide Children's Health Assessment Survey pertaining to children's PA, sport participation, outdoor activity, screen time, recreational time and coordination were analyzed for a total of 711 parent-reported children (342 males, 369 females) ages 5-17 years. Weighted percentages were calculated for the total sample and population subgroups (age, parent education, race, and weight status) and for the children's health-related PA behaviors items; weighted percentages for reported children's health-related PA behaviors stratified by meeting PA requirements. Age, parent education, race, and weight status were controlled in the analyses. **RESULTS:** Over half of the youth were reported as being active on ≥ 5 d/wk. Males were reported accumulating ≥ 60 min/d of PA as compared to females (80.5% and 72%). The 5-10-year-old age group reportedly had the highest percentage of accumulating ≥ 60 min/d of PA (90%), choosing PA during recreational time (64%), and a higher percentage (80%) spent < 120 min/d engaged in screen time compared to the other age groups. For the total group, those reportedly meeting the guideline were more likely to be active ≥ 5 d/wk (47%), choose PA during recreational time (44%), participate in sports and/or PA classes (52%), spend

≥ 60 min outside on weekdays (70%), and weekend days (64%) than the alternative behaviors. Both the younger (74% vs 16%) and middle age groups (64% vs 11%) who reportedly met the 60 min of PA guideline were more likely to spend ≥ 60 min outside on weekends. **CONCLUSIONS:** Children reportedly meeting the PA guidelines, are more likely to engage in other PA behaviors, as perceived by their parents. Active encouragement of parents and their children to be more physically active, engage in sports and outdoor time, as well as decreasing time using electronics and other sedentary behaviors should be advocated.

2869 Board #8 May 31 3:15 PM - 5:15 PM
Association Between Meeting Physical Activity, Sleep, And Dietary Guidelines And Cardiometabolic Risk Factors And Adiposity In Adolescents
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 (No relevant relationships reported)

INTRODUCTION: Obesity is a complex disease that may be influenced by physical activity (PA), sleep, and diet; though little is known if individual behavior guidelines are related to cardiometabolic risk factors. **PURPOSE:** To examine the association between meeting PA, sleep, and dietary guidelines and cardiometabolic risk factors and adiposity in adolescents. **METHODS:** Adolescents, ages 10 to 16 years, wore an accelerometer for 7 days, including overnight to capture PA and sleep. The PA guideline was defined as ≥ 60 minutes of moderate-to-vigorous PA per day. The sleep guideline was 9-11 hours (10-13 years of age) or 8-10 hours (14-16 years of age) per night. The dietary guideline was based on the Healthy Eating Index 2015 score calculated from a self-administered dietary recall. Scores ≥70 were classified as meeting guideline. Cardiometabolic risk factors were assessed in a clinical setting including body mass index percentile (BMIP); waist circumference (WC); DXA for total body fat; abdominal MRI for visceral adipose tissue (VAT); resting blood pressure (BP); and a fasting blood draw for high-density lipoprotein cholesterol, triglycerides, and glucose. Generalized linear regression was used to assess meeting the guidelines and cardiometabolic risk factors, with adjustment for age, sex, race, and other guidelines. **RESULTS:** Of the 342 participants, 239 (69%) provided complete measures. Adolescents were 12.4 ± 1.9 years of age, most were white (61%), had overweight or obesity (47%), and slightly more were girls (53%). Many met the sleep guideline (50%), but few met the PA (11%) or dietary (3%) guidelines. Most met 1 (50%) or no guidelines (43%), and few met 2 or more guidelines (6%). In adjusted models, meeting the PA guideline was associated with a lower BMIP, diastolic BP, WC, VAT, and total body fat; and meeting the sleep guideline was associated with a lower WC ($p < 0.05$ for all). Meeting one guideline was associated with a lower BMIP, WC, VAT, and total body fat; and meeting 2 guidelines was associated with lower diastolic BP ($p < 0.05$ for all). There were no other associations between meeting guidelines and risk factors. **CONCLUSIONS:** Adiposity was lower for those who met the PA or sleep guidelines, and very few met the dietary guideline. Multidisciplinary strategies are needed to ensure healthy behaviors for all adolescents.

F-34 Thematic Poster - Protein Metabolism

Friday, May 31, 2019, 3:15 PM - 5:15 PM
 Room: CC-102A

2870 Chair: Floris Wardenaar. *Arizona State University, Phoenix, AZ.*
 (No relevant relationships reported)

2871 Board #1 May 31 3:15 PM - 5:15 PM
The Association of Protein Intake and Change in Lean Mass During 9-mos. of Resistance Training
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 (No relevant relationships reported)

PURPOSE: The purpose of the study was to assess the association of protein intake with change in lean mass (LM) during a 9-mo. resistance training (RT) protocol.

METHODS: Normal/overweight sedentary, previously untrained young adults ($n = 78$, age ~22 yrs. BMI ~ 25 kg/m²) completed a 9-mo., supervised efficacy trial (1 or 3-sets RT, 9 exercises, 3 d/wk.) Participants were required to complete ≥80% scheduled RT sessions and asked maintain usual ad-libitum diets. Body composition (DEXA) and dietary intake (digital photography plus recall) were assessed at baseline, 4.5 and 9 mos. Multiple linear regression models were used to examine the associations between protein intake and changes in LM. Intake variables from the assessment periods were aggregated over the 9-month intervention. Protein intake was examined by using the nutrient residual energy-adjustment method, in which the protein residuals obtained by regressing absolute protein intake on total energy intake are added to mean protein intake and used as the independent variables. Models were adjusted for age, sex, race, randomization group, baseline LM, and height. To allow determination of whether the associations were independent of change in overall mass, models were also adjusted for changes in FM.

RESULTS: Participants completed 92 ± 6% of scheduled RT sessions. LM increased significantly from baseline to 9 mos. (1.2 ± 1.7 kg, $p < 0.0001$) with high inter-individual variability (range = - 2.0 to 6.2 kg). Grams of total protein ($\beta = 0.01$ SE=0.01, $p = 0.34$), animal protein ($\beta = 0.02$ SE= 0.02, $p = 0.15$), vegetable protein ($\beta = -0.03$ SE=0.04, $p = 0.44$), and isoleucine ($\beta = 3.4$ SE=1.97, $p = 0.09$), were not associated with changes in total LM per unit of energy-adjusted protein intake. However, leucine ($\beta = 1.8$ SE=1.2, $p = 0.03$) and valine ($\beta = 3.7$ SE=1.4, $p = 0.01$) were positively associated with changes in total LM per unit of energy-adjusted protein intake.

CONCLUSIONS: There was no association with total protein intake and changes in LM in young adults enrolled in a 9-month RT intervention. However, there was a positive association with two of the branch chain amino acids, leucine and valine. Thus, the type of protein may be more important than total protein intake for increasing LM during a long-term RT intervention.

2872 Board #2 May 31 3:15 PM - 5:15 PM
Whey Protein Consumption Before, Rather than Within a Post-Exercise Meal Increases the Postprandial Aminoacidemia

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 (No relevant relationships reported)

Rapidly digested and absorbed proteins enhance the muscle protein synthesis response following resistance exercise, with the degree of hyperaminoacidemia suggested to be an important consideration. However, most studies have used supplemental protein sources, with little focus on how consumption of protein within a mixed meal influences postprandial amino acid (AA) responses. **PURPOSE:** To examine the pattern of postprandial AA responses to consuming whey protein isolate before or within a mixed meal after resistance exercise. **METHODS:** Eight resistance trained men (age 21 (1) y; body mass 80.2 (8.4) kg; body fat 13 (6) %) completed two trials in a randomized order. Trials consisted of ~1 h lower-body resistance exercise, a 30 min post-exercise feeding period and a further 150 min supine rest period. Post-exercise nutrition was identical in composition (400 mL water at 0 min; an oat flapjack + 600 mL water at 15-30 min) and included 20 g of whey protein isolate, which was either consumed in the drink at 0 min (SUPP) or mixed into the oat flapjack consumed at 15-30 min (MEAL). Blood samples were taken every 15-30 min post-exercise to determine amino acid, glucose and insulin concentrations. **RESULTS:** Compared to MEAL, leucine and essential AA (EAA) concentrations were higher at 15-50 min and lower at 120-180 min in SUPP ($P < 0.05$), whilst total AA (TAA) concentrations were higher at 30-50 min and lower at 150 min in SUPP. Peak leucine (SUPP 414 (70) mmol/L; MEAL 216 (40) mmol/L; $P < 0.001$), EAA (SUPP 2404 (411) mmol/L; MEAL 1502 (235) mmol/L; $P < 0.001$) and TAA (SUPP 4860 (759) mmol/L; MEAL 3450 (467) mmol/L; $P < 0.01$) concentrations were all greater during SUPP vs MEAL, with peak concentrations also achieved earlier in SUPP. Total postprandial area under the curve for leucine, EAA and TAA concentrations were all greater during SUPP ($P < 0.05$). There were no between-trial differences for glucose or insulin responses ($P > 0.05$). **CONCLUSIONS:** Consumption of protein in supplemental form prior to, rather than within a mixed meal, facilitates a more rapid and pronounced postprandial aminoacidemia following resistance exercise. This might offer some advantage where maximizing the anabolic effect of resistance exercise is desirable. This project received no funding. The whey protein isolate was provided by Volac International Ltd.

2873 Board #3 May 31 3:15 PM - 5:15 PM
Does Exclusive Consumption of Plant-based Dietary Protein Impair Resistance Training-induced Muscle Adaptations?

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(No relevant relationships reported)

Dietary protein consumption maximizes the anabolic response during resistance training (RT) by triggering muscle protein synthesis and providing the indispensable amino acids for a net positive protein balance. Leucine is considered the key amino acid in this process, suggesting that differences in protein quality may influence RT-induced gains in muscle mass and strength. In this respect, despite acute evidence on lower anabolic properties of plant- vs. animal-based protein, the effects of an exclusive plant-based dietary protein diet on RT-induced adaptations are currently unknown. **PURPOSE:** To investigate the impact of dietary protein source (plant- vs. mixed diet-based protein) on RT-induced changes in muscle mass and strength in total protein-matched young healthy men. **METHODS:** Nineteen vegan (VEG 26±5 y; 72.7±7.1 kg, 1.78±0.05 m) and nineteen omnivorous (OMN 26±4 y; 73.3±7.8 kg, 1.76±0.06 m) physically active young men were enrolled in a 12-week, twice weekly, lower-limb RT program. Daily protein intake was adjusted to 1.6g/kg/day in both groups via supplementing either soy (VEG) or whey (OMN) protein. Leg lean mass (LLM, by DXA) and lower-limb maximal strength (leg-press one-repetition-maximum, 1-RM) were determined PRE and POST intervention. Six 24-hour dietary recalls were performed at baseline (for habitual protein intake determination) and three during the intervention, for monitoring purposes. **RESULTS:** Significant increases in LLM were observed in both VEG (PRE=18.9±2.2 kg and POST=20.1±2.2 kg, Δ%=6.4±5.8 %, p<0.0001) and OMN (PRE=19.1±2.4 kg and POST=20.3±2.7 kg, Δ%=6.1±3.9 %, p<0.0001). Similarly, 1-RM was significantly increased in both VEG (PRE=258±59 kg and POST=354±81 kg, Δ%=38.1±5.9 %, p<0.0001) and OMN (PRE=261±63 kg and POST=381±73 kg, Δ%=49.0±21.6 %, p<0.0001). No group by time interactions were found. Finally, total protein intake was similar between groups (VEG=1.68±0.14g/kg/d and OMN=1.72±0.10g/kg/d, p=0.30). **CONCLUSION:** A higher protein-content (~1.6g/kg/day) exclusive plant-based (including soy) protein diet is similarly effective as a mixed-diet in supporting RT-induced muscle adaptations, suggesting that total protein, rather than protein quality, may be more important for muscle adaptation in young individuals. Supported by FAPESP grant 2016/22083-3.

2874 Board #4 May 31 3:15 PM - 5:15 PM
Leucine Co-Ingestion Augments the Muscle Protein Synthetic Response to the Ingestion of 15 g Protein During Recovery from Resistance Exercise in Older Men

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(No relevant relationships reported)

PURPOSE: Older adults have shown an attenuated post-exercise increase in muscle protein synthesis rates following ingestion of smaller amounts of protein when compared to younger adults. Consequently, more protein may be required to increase post-exercise muscle protein synthesis rates in older as compared to younger men. The present study investigated whether co-ingestion of 1.5 g free leucine with a single, 15 g bolus of protein augments the muscle protein synthetic response during recovery from resistance-type exercise in older men. **METHODS:** Twenty-four healthy older men (67±1 y) were randomly assigned to ingest 15 g milk protein concentrate (MPC80) with (15G+LEU; n=12) or without (15G; n=12) 1.5 g free leucine after performing a single bout of resistance-type exercise. Post-prandial protein digestion and amino acid absorption kinetics, whole body protein metabolism, and post-prandial myofibrillar protein synthesis rates were assessed using primed, continuous infusions with L-[ring-2H5]-phenylalanine, L-[ring-2H2]-tyrosine and L-[1-13C]-leucine combined with the ingestion of intrinsically L-[1-13C]-phenylalanine labeled milk protein. **RESULTS:** A total of 70±1% (10.5±0.2 g) and 75±2% (11.2±0.3 g) of the protein-derived amino acids were released in the circulation during the 6-h post-exercise recovery phase in 15G+LEU and 15G, respectively (P<0.05). Post-exercise myofibrillar protein synthesis rates were 16% (0.058±0.003 vs 0.049±0.002 %·h⁻¹; P<0.05; based upon L-[ring-2H₅]-phenylalanine) and 19% (0.071±0.003 vs 0.060±0.003 %·h⁻¹; P<0.05; based upon L-[1-¹³C]-leucine) greater in 15G+LEU when compared with 15G. **CONCLUSIONS:** Leucine co-ingestion augments the post-exercise muscle protein synthetic response to the ingestion of a single 15 g bolus of protein in older men.

2875 Board #5 May 31 3:15 PM - 5:15 PM
Pre-Sleep Consumption of Casein Protein on Resting Metabolic Rate and Appetite in Premenopausal Women

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 (No relevant relationships reported)

PRE-SLEEP CONSUMPTION OF CASEIN PROTEIN ON RESTING METABOLIC RATE AND APPETITE IN PREMENOPAUSAL WOMEN

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PURPOSE: To determine the acute effects of nighttime pre-sleep consumption of casein protein (CP) and a placebo (PLA) supplement on next-morning measures of resting metabolic rate (RMR) and appetite in sedentary premenopausal women. **METHODS:** This study was a randomized crossover double-blind placebo-controlled trial. Seven premenopausal (age: 19.9±1.2 yrs, BMI= 23.1±2.6 kg/m²) women participated. Subjects had body composition (DXA), RMR (indirect calorimetry), and appetite (visual analog scale; VAS) measured. Subjects consumed either CP (35 g, 130 kcal) or PLA (7.2g, 10 kcal) 30 min prior to bed time on two separate occasions separated by 48-hours. RMR and measures of hunger, desire to eat, and satiety were analyzed using Paired T-tests. Significance was accepted at p<0.05. **RESULTS:** RMR (CP:1383±162; PLA:1340±159 kcal/day) and relative oxygen consumption (CP:3.41±0.44; PLA 3.36±0.38 ml/kg/min) were not different between CP and PLA. There were also no effects of CP and PLA on measures of appetite (Hunger: CP: 3.8±3.0; PLA: 3.1±2.7 cm; Satiety: CP: 4.1±3.4; PLA: 4.7±2.7 cm; Desire to Eat: CP:3.7±3.4; PLA:2.8±2.1 cm). **CONCLUSION:** There were no differences in RMR and measures of appetite between CP and PLA. There is growing evidence that a small snack before sleep (150-200 kcal) is not harmful to metabolism or appetite. This study was supported with product by Dymatize Nutrition.

2876 Board #6 May 31 3:15 PM - 5:15 PM
Protein Supplementation Does Not Further Augment Physiological Adaptations to Prolonged Endurance Exercise Training

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PURPOSE: It has recently been speculated that protein supplementation may further augment the adaptations to prolonged endurance exercise training. We assessed the impact of protein supplementation during prolonged endurance exercise training on whole-body oxidative capacity (VO_{2max}) and endurance exercise performance.

METHODS: Sixty recreationally active males (age: 27±6 y; BMI: 23.8±2.6 kg·m⁻², VO_{2max} 47±6 mL·min⁻¹·kg⁻¹) were subjected to 12 weeks of triweekly endurance exercise training. After each session and each night prior to sleep, participants ingested either a protein supplement (PRO; 29 g casein protein) or an isocaloric carbohydrate placebo (PLA). Before and after the 12 weeks of training, VO_{2max} and endurance exercise performance (~10-km time-trial) were assessed on a cycle ergometer. Muscular endurance (total workload achieved during 30 reciprocal isokinetic contractions) was assessed by isokinetic dynamometry and body composition by DXA. Dietary intake was assessed at baseline and during the intervention period. Repeated measures ANOVA was applied to assess whether training adaptations were different between groups.

RESULTS: Protein intake increased in PRO (1.2±0.4 to 1.6±0.3 g·kg⁻¹), but not in PLA (1.3±0.4 to 1.2±0.3 g·kg⁻¹, time x treatment interaction, P<0.001). Endurance exercise training induced an 11±6% increase in VO_{2max} (time effect, P<0.001), with no differences between groups (PRO: 48±6 to 53±7 mL·min⁻¹·kg⁻¹; PLA: 46±5 to 51±6 mL·min⁻¹·kg⁻¹; time x treatment interaction, P=0.50). Time to complete the time-trial was reduced by 14±7% (time effect, P<0.001), with no differences between groups (time x treatment interaction, P=0.15). Muscular endurance increased by 6±7% (time effect, P<0.001), with no differences between groups (time x treatment interaction, P=0.84). Whole body lean mass was unchanged over time (P=0.097). However, leg lean mass showed an increase following endurance exercise training (P<0.001), which tended to be greater in PRO (PRO: 0.5±0.7 kg; PLA: 0.2±0.6 kg; time x treatment interaction, P=0.073).

CONCLUSION: Protein supplementation after exercise and before sleep does not further augment the gains in whole-body oxidative capacity and endurance exercise performance following prolonged endurance exercise training in healthy, young males.

2877 Board #7 May 31 3:15 PM - 5:15 PM
Higher Protein Intake does Not Potentiate Resistance Training-Induced Muscular Adaptations in Middle-aged Adults

Rafael A. Alamilla, Colleen F. McKenna, Amadeo F. Salvador, Susannah Scaroni, Isabel G. Martinez, Joseph W. Beals, Scott A. Paluska, FACSM, Nicholas A. Burd. *University of Illinois at Urbana/Champaign, Urbana, IL.* (Sponsor: Scott A. Paluska, FACSM)

(No relevant relationships reported)

Maintenance of muscle strength helps preserve functional capacity and independence in aging populations. Protein intake above the current recommended dietary allowance (RDA) is believed to optimally facilitate resistance training adaptations; however, the suitability of consuming these protein amounts for middle-aged adults remains unclear. **PURPOSE:** To determine whether dietary protein ingestion above the RDA modulates muscle strength and body composition to resistance exercise training in middle-aged adults. **METHODS:** 27 participants were randomly assigned to consume either the RDA of protein (0.8-1.0 g/kg/d; 50 ± 2 y, BMI = 27.9 ± 0.1 kg/m²) or twice the RDA (1.6-1.8 g/kg/d; 52 ± 2 y, BMI = 28.1 ± 0.9 kg/m²) during a 10-wk progressive resistance training program. Participants were counseled on equal distribution of protein, and consumed either 15g or 30g protein in the immediate post-exercise period and nightly before sleep, respectively. Body composition was assessed by dual-energy x-ray absorptiometry. One repetition maximum assessments were used to determine muscular strength for both lower and upper body exercises. Strength assessments were performed at baseline and after the 10-wk intervention. **RESULTS:** There was a significant increase ($P < 0.05$) in muscle strength in all exercises for both groups across time (Table 1). However, there was no significant difference in strength between groups ($P > 0.05$) after the intervention. Body fat % was not significantly different from baseline in either group ($P > 0.05$), or after intervention ($P > 0.05$). Lower body lean body mass significantly improved ($P < 0.05$) with resistance training in both groups with no group differences ($P > 0.05$). **CONCLUSION:** Dietary protein intake comparable to the RDA coupled with moderate post-exercise and nightly protein doses is adequate to support training-induced muscle strength and mass gains in middle-aged adults.

Supported by USA National Cattlemen's Beef Association (NCBA)

Table 1

RDA (n = 14) 2x RDA (n = 13)				
	Baseline	Post-intervention	Baseline	Post-intervention
Body Fat (%)	34.9 ± 2.3	34.0 ± 2.3	31.7 ± 2.4	31.9 ± 2.4
Lower Body Lean Body Mass (kg)	16.2 ± 1.4	17.2 ± 1.4*	18.1 ± 1.4	18.8 ± 1.4*
One Repetition Maximum (kg)				
Leg Press	100.8 ± 9.9	151.1 ± 18.8*	100.5 ± 10.1	149.3 ± 17.1*
Leg Curl	57.1 ± 4.5	72.5 ± 6.5*	65.6 ± 6.04	85.8 ± 7.2*
Leg Extension	63.3 ± 5.0	94.4 ± 10.3*	66.1 ± 5.4	97.4 ± 13.2*
Chest Press	39.6 ± 5.4	48.4 ± 6.2*	41.4 ± 5.5	55.2 ± 5.9*
Shoulder Press	16.9 ± 3.17	25.3 ± 3.9*	16.7 ± 2.3	28.6 ± 3.3*
Seated Row	41.5 ± 4.2	53.6 ± 4.3*	46.2 ± 5.1	57.0 ± 4.9*
Bicep Curl	16.4 ± 1.3	22.1 ± 2.2*	19.6 ± 2.1	28.2 ± 2.6*

F-35 Thematic Poster - Running

Friday, May 31, 2019, 3:15 PM - 5:15 PM
 Room: CC-102B

2878 **Chair:** Christopher J. Lundstrom. *University of Minnesota, Minneapolis, MN.*

(No relevant relationships reported)

2879 Board #1 May 31 3:15 PM - 5:15 PM
Are Changes In Running Economy Associated With Changes In Performance In Runners? A Systematic Review and Meta Analysis

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(No relevant relationships reported)

Improvements in running economy (RE) are thought to lead to improvements in running performance (P). The identification of modifiable factors that affect RE and by association, P has been the focus of a significant body of research in recent years. Modifiable factors affecting RE are broadly classified as, biomechanical, anthropometric, physiological, extrinsic and training related. Interventions have been used to alter one or more of these factors with a view to improving RE. The underlying assumption is that an improvement in RE will also lead to an improvement in P. **PURPOSE:** The aim of this study was to assess the effect of interventions of at least 2-weeks' duration on RE and P and to determine whether there is a relationship between changes in RE (Δ RE) and changes in running performance (Δ P). **METHODS:** A database search was carried out in Web of Science, Scopus and SPORTDiscus. In accordance with a PRISMA checklist 10 studies reporting 12 comparisons between interventions and controls were included in the review. **RESULTS:** There was no correlation between percentage Δ RE and percentage Δ P ($r = 0.46$, $P = 0.936$, 12 comparisons). There was a low risk of reporting bias in relation to incomplete data sets. There was an unclear risk of selection bias associated with random allocation to intervention and control groups and reporting of baseline differences in RE and P between intervention and control groups. There was also an unclear risk of performance bias relating to the monitoring of non-intervention training, detection bias associated with differences in determination of the performance outcome measure and attrition bias associated with reporting of participant dropout. Meta-analyses found no statistically significant differences between interventions and control for RE (SMD (95% CI) = -0.37 (-1.43, 0.69), 204 participants, $p = 0.49$) or for P (SMD (95% CI) = -0.65 (-26.02, 24.72), 204 participants, $p = 0.99$). **CONCLUSIONS:** Methodologies for subject allocation to intervention and control groups and the reporting of differences in baseline characteristics of control and intervention groups and reporting of participant dropout were infrequently applied in the included studies. Studies of greater statistical power, with standardised measures of performance and greater control of non-intervention training are required.

2880 Board #2 May 31 3:15 PM - 5:15 PM
Running Economy Strongly Related to Ground Contact Time Imbalances

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(No relevant relationships reported)

Running economy (RE) can be defined as the oxygen consumption or caloric unit cost required to move at a specific velocity. In addition to a runner's maximal oxygen uptake (VO₂max) and lactate threshold (LT), RE is a key endurance performance determinant. Better RE is advantageous as it represents the ability to run at a lower relative percentage of VO₂max at a given speed and reduces the rate of energy depletion. Ground contact time (GCT) has been associated with RE, however it has not been established how GCT imbalances between feet impact economy. **Purpose:** Determine the relationship between cadence, GCT, and GCT imbalances and RE. **Methods:** 11 NCAA Division I distance runners (7 male: 21±2 years, 15.8±3.4% fat; 4 female: 19±1 years, 22.1±5.2% fat) completed a graded exercise test on a treadmill to determine LT and VO₂max. Subjects ran with a heart rate monitor capable of measuring cadence, GCT, and GCT balance between left and right feet. VO₂ and the respiratory exchange ratio (RER) were monitored continuously, and the average VO₂ and RER over the last minute of the 5 minute stages was used for determining caloric cost. Caloric unit cost (kcal·kg⁻¹·km⁻¹) was calculated for the stage determined to be just below the LT (prior to >4mmol/L), and the relationship between this measure of

RE was correlated with cadence, GCT, and GCT imbalance by Pearson correlations. **Results:** The average VO₂max among the runners was 68.6±4.9 ml·kg⁻¹·min⁻¹ and 59.3±1.1 ml·kg⁻¹·min⁻¹, and the average LT was 80±8% and 83±5% VO₂max for men and women, respectively. The relationship between RE at the LT and the measured running dynamics is displayed in Table 1. There was a very strong, positive correlation between GCT imbalances and the caloric cost of running. **Conclusion:** GCT imbalances were a stronger determinant of RE than GCT or cadence. Future research should determine how to improve GCT imbalances and if doing so can improve economy and performance.

		Cadence	GCT	GCT Imbalance
Caloric Cost kcal·kg ⁻¹ ·km ⁻¹	Pearson Correlation	-.454	.492	.874*
	Sig. (2-tailed)	.161	.124	<.001
	N	11	11	11

GCT = Ground Contact Time; *p < 0.001

2881 Board #3 May 31 3:15 PM - 5:15 PM
Reactive Strength And Leg Stiffness Correlates Running Economy In Well-Trained Long Distance Runners

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 (No relevant relationships reported)

Purpose: Neuromuscular factors play critical role in running economy (RE), the present study was to investigate the relationship between leg stiffness, relative maximal strength, Counter movement jump height (CMJ), drop jump height (DJ), reactive strength index (RSI) and RE.

Methods: Twenty-eight male long-distance runners (23.1±3.8years; BMI:20.5±2.6kg·m⁻²; VO₂max: 66.4±7.0 mlO₂·kg⁻¹·min⁻¹) were participated in this study. Each subject performed two-day test including 12, 14 and 16km·h⁻¹ RE test, 1RM back squat test, CMJ and DJ test on the first day, and performed leg stiffness measurement using three-dimensional (3D) motion capture experiments on the second day. The data were analyzed using Pearson correlation coefficients.

Results: A statistically significant negative correlation was found between DJ and 16km·h⁻¹ RE (r=-0.67, p<0.01). RSI was related to RE at 14 and 16km·h⁻¹ speeds (r=-0.72 and -0.76, p<0.01, respectively). In addition, there were a significant negative correlations (r=-0.81 and -0.84, p<0.01, respectively) observed between leg stiffness and RE at 14 and 16km·h⁻¹ speeds. There were no significant correlations between relative maximal strength, CMJ and RE.

Conclusions: The present data highlight that reactive strength and leg stiffness maybe most important neuromuscular factors related to the better RE. Strength training such as heavy resistance training and plyometric exercises should be considered as a component to neuromuscular function for developing RE in long-distance runners.

2882 Board #4 May 31 3:15 PM - 5:15 PM
Cardiometabolic and Perceptual Responses to Maximal Exercise: Comparing Graded Walking to Ungraded Running

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Graded exercise testing for determination of aerobic capacity can be conducted in numerous ways with treadmill testing representing the primary modality. Achieving maximal effort on a treadmill can be accomplished by increasing speed and/or grade. Research to date comparing graded walking maximal tests to ungraded running tests is limited. **PURPOSE:** Compare the cardiometabolic responses to two treadmill-based maximal tests, namely graded walking and ungraded running. **METHODS:** 20 healthy participants (11 females, 9 males; mean BMI = 25; mean age = 24) completed two counterbalanced cardiometabolic exercise tests. The WALK trial started with a brisk and comfortable walking speed and increased grade by 2% every minute until exhaustion and the RUN trial started with a comfortable walking speed and increased by 0.5 mph every minute until exhaustion. Expired gases, HR, overall RPE (RPE-O), and legs only RPE (RPE-L) were assessed during the test. **RESULTS:** Data was analyzed using dependent t-tests. The RUN and WALK trials produced similar maximal values for RPE-O, RPE-L, and VO₂ (all p-values > 0.05; all ES values < 0.2), though HR was significantly higher in the RUN trial (p < 0.05; ES = 0.4), and RER was significantly higher in the WALK trial (p < 0.01; ES = 0.8). **CONCLUSIONS:**

Findings indicate that both walk-based and run-based exercise tests produce similar perceptual responses that indicate maximal effort, and similar VO₂max values despite very different approaches to creating intense work. The observed difference in HR suggests that a run-based maximal exercise test produces a greater cardiovascular response, while the higher RER value within the walk-based maximal exercise test suggests greater metabolic acidosis. Results support treadmill exercise testing as a flexible multiple assessment modality.

2883 Board #5 May 31 3:15 PM - 5:15 PM
Effects of Marathon Training on Maximal Aerobic Capacity and Running Economy in Experienced Marathon Runners

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 (No relevant relationships reported)

Maximal aerobic capacity (VO₂max) and running economy (RE) are markers of running performance. A valid evaluation of RE may occur through allometric scaling of body mass (alloVO₂; ml kg^{-0.66} min⁻¹), energy cost (EC; kcal kg⁻¹ km⁻¹), or percent of VO₂max (%VO₂max). Little is known about physiological changes that occur in competitive runners over a marathon training cycle. The VDOT score, incorporating VO₂max and RE, enables comparison of race performances under different temperature conditions. **PURPOSE:** To determine whether VO₂max and measures of RE change with marathon training; to evaluate the relationship between these variables and VDOT. **METHODS:** Eight runners (age 34±2 years; marathon <3:00 males, <3:30 females; five females) completed treadmill marathon-intensity-effort (MIE) and VO₂max tests at 10 and 1-2 weeks pre-marathon. Body composition (%BF) was determined using hydrostatic weighing. Paired t-tests were used to compare pre- and post-training values. The alpha level for significance was set at 0.05. **RESULTS:** Body fat decreased from 18.7±1.5% to 16.7±1.6%, VO₂max increased from 51.6±2.4 to 63.9±1.1 ml kg⁻¹ min⁻¹, and %VO₂max during the MIE decreased from 82.1±2.0 to 72.3±3.2% (p < 0.05 for all). VDOT was significantly associated with alloVO₂ (r = -0.779, p = 0.039) but not with VO₂max (r = 0.071, p = 0.867). **CONCLUSIONS:** Experienced competitive runners may increase VO₂max and decrease %BF after a marathon-specific training cycle. The decrease in %VO₂max in a MIE is likely due to a higher VO₂max, as other measures of RE did not change significantly. In this cohort, alloVO₂ was negatively related to race performance.

2884 Board #6 May 31 3:15 PM - 5:15 PM
The Influence of AlterG Treadmill Training on Cardiorespiratory Performance in Cross Country Runners

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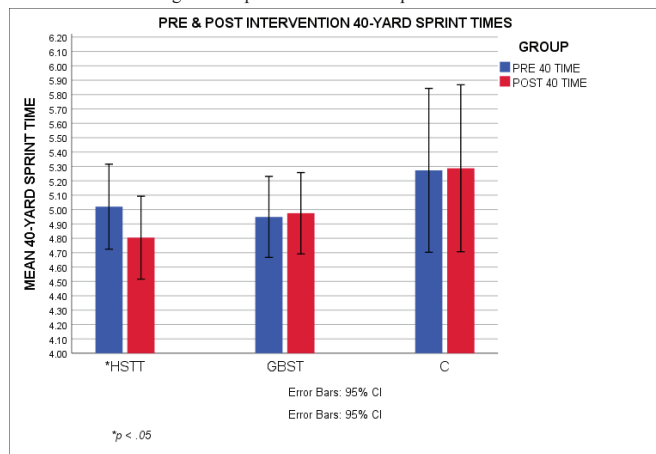
Running on an AlterG® Treadmill (AGT) at reduced bodyweight allows runners to aerobically train with reduced orthopedic stress. However, to maintain the training stimulus, the speed must be increased if heart rate (HR) response is to match overground running. This allows one to run at faster speeds for longer durations, without increasing impact forces or HR intensity beyond typical training. Yet it is unknown how this speed intensity chronically influences cardiorespiratory performance. **PURPOSE:** Investigate the effect of an AGT training program on cardiorespiratory performance. **METHODS:** As an offseason supplement, 19 healthy uninjured high school boy cross country runners replaced 2 overground running sessions/week for 6 weeks with AGT runs at 80-85% of bodyweight. Speed was increased to elicit a HR intensity and distance/time consistent with each runner's mile pace for that day. Pulmonary gas exchange and HR data were collected during treadmill graded exercise tests (GXT) at pre and post AGT training program. Paired t-test were used to assess pre-post changes in cardiorespiratory and HR variables from the GXT (p<0.05). **RESULTS:** The mean speed of AGT runs was 9.0 ± 0.5 mph at a mean distance of 4.2 ± 0.6 miles. The mean of the fastest speed for each runner was 9.8 ± 0.6 mph (range 8.6-11.4) at a mean run time of 27.6 ± 8.4 min. (range 16-40 minutes). HR [180 ± 9 vs. 167 ± 10 bpm] significantly decreased while oxygen uptake remained unchanged [46.6 ± 3.6 vs. 47.0 ± 3.2 ml/kg/min] at the anaerobic threshold (AT) post AGT training. However, peak oxygen uptake [60.8 ± 6.4 vs. 62.7 ± 5.0 ml/kg/min], peak minute ventilation [124.7 ± 22.6 vs. 132.2 ± 24.9 L/min], and peak respiratory frequency [61 ± 10 vs. 64 ± 11 breaths/min] significantly improved post AGT training, while peak HR remained unchanged [196 ± 20 vs. 192 ± 12 bpm]. **CONCLUSION:** AGT training with reduced bodyweight at faster speeds had little influence on cardiorespiratory performance variables occurring at lower levels of

intensity (AT). However, all peak cardiorespiratory performance variables at higher levels of intensity improved, likely due to training at faster than normal speeds. This would benefit runners by allowing training to occur with reduced orthopedic loading at typical HR intensities, and yet still concurrently improve peak cardiorespiratory performance.

2885 Board #7 May 31 3:15 PM - 5:15 PM
High-Speed Treadmill vs Ground-Based Training for Sprint Speed Among College Athletes

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 (No relevant relationships reported)

Introduction: Practitioners often debate as to which speed-training method is most effective for improving speed. Ground-Based Speed Training (GBST) has been the predominant method, however with technological advances, High Speed Treadmill Training (HSTT) has been implemented and used (Hauschildt, 2010; Jerome-Koral, Herrera, & Millet, 2018; Johnson, Eastman, Feland, Mitchell, Mortensen, & Egget, 2013; Ross et al., 2009). **Purpose:** This study compared HSTT and GBST for improving speed and reducing 40-yard sprint times among collegiate athletes. **Methods:** Twenty-one collegiate football and baseball players were randomly assigned to HSTT ($n = 7$), GBST ($n = 7$) or control group ($n = 7$). Experimental groups completed 8 specialized training sessions 2 times a week for 4 weeks. HSTT group trained using PerformX Tred-X30 high-speed treadmill in each session with inclines of 5% to 30%. GBST group performed sprints that involved resisted and assisted training modalities: tow sled, uphill running, partner runs and downhill running. **Results:** Pre-test 40-yard sprint-time scores indicated no significant difference between groups prior to intervention ($F(2,18) = 1.059, p = .367, \eta^2 = .105$). Post-intervention indicated there was a 19.3% difference in times between the three groups ($F(2,18) = 2.152, p = .145, \eta^2 = .193$). HSTT group exhibited a significant difference among pre-intervention 40-yard sprint time ($M = 5.02, SD = .320$) to post-intervention ($M = 4.80, SD = .312$), $t(6) = 5.418, p = .002$ while GBST group did not; pre-intervention ($M = 4.95, SD = .305$) to post-intervention ($M = 4.97, SD = .306$), $t(6) = -0.488, p = .67$. **Conclusions:** HSTT group increased linear speed and decreased sprint times over GBST and control groups. HSTT may be an effective way to improve sprint speed for times over various distances in a shorter period of training time than GBST and these improvements can be transferred to collegiate and professional athletic performance.



2886 Board #8 May 31 3:15 PM - 5:15 PM
Correction Factor to Improve the Accuracy of Iso-Efficient Treadmill Velocity During Inclined Treadmill Running

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 (No relevant relationships reported)

As inclined treadmill running becomes more popular among trained runners, the ability to maintain a metabolic iso-efficient velocity has gained importance. Treadmill velocity (TMV) for a specific incline and intensity can be determined by solving the ACSM running equation for speed as opposed to relative VO_2 , but this may underestimate iso-efficient TMV in trained runners as they may respond to speed and grade differently from the general population. **Purpose:** The purpose of this study was to identify

an appropriate correction factor to improve iso-efficient TMV identification during inclined running in trained runners. **Methods:** 11 collegiate distance runners (7 male, 4 female; 63.2 ± 9.5 kg; 174.8 ± 7.5 cm; 64.6 ± 6.5 mlO₂/kg/min) completed three 4-min treadmill runs at 0%, 4%, and 8% incline with a 4 min recovery period between runs. Expired gases were collected during the final minute of each run to determine relative VO_2 . Actual TMV at 0% was inserted into the ACSM running equation to determine predicted VO_2 for the 0% run [$\text{VO}_2 = (\text{Sx}0.2) + (\text{SxGx}0.9) + 3.5$]. That value was then divided by the actual VO_2 measured at 0% to develop a correction factor. TMV for the 4% and 8% trials was determined by inserting the measured 0% VO_2 value into the ACSM equation [$\text{S} = (\text{VO}_2 - 3.5) / (0.2 + 0.9\text{G})$] and multiplying the resultant velocity by the correction factor to maintain iso-efficiency. Differences within 0%, 4%, and 8% values were assessed using a paired sample t-test, while a one-way ANOVA compared VO_2 values between grades ($p < 0.05$). **Results:** Actual VO_2 at 0% grade was 15% lower than predicted by the ACSM equation (55.2 ± 2.7 vs. 46.8 ± 5.0 mlO₂/kg/min; $p < 0.05$), resulting in a correction factor of 1.2 ± 0.1 . Predicted TMV at 4% (183.6 ± 21 m/min) and 8% (159.3 ± 18.3 m/min) was 18% lower ($p < 0.05$) than the corrected velocities for each grade (216.9 ± 2 and 188.2 ± 10.4 m/min). VO_2 values for each grade were 46.8 ± 5 , 46.6 ± 4.8 , and 48.0 ± 4.9 mlO₂/kg/min, respectively, with the 8% VO_2 being greater than 4% ($p < 0.05$). **Conclusion:** The ACSM running equation may underestimate TMV when attempting to maintain metabolic iso-efficiency during incline running. These data suggest that application of a correction factor to the TMV derived from the ACSM equation may provide a closer approximation of TMV to maintain iso-efficiency during incline running.

F-36 Free Communication/Slide - Energy Balance-Weight Control

Friday, May 31, 2019, 3:15 PM - 5:15 PM
 Room: CC-105A

2887 Chair: Edward L. Melanson, FACSM. *University of Colorado Denver, Denver, CO.*

(No relevant relationships reported)

2888 May 31 3:15 PM - 3:30 PM
Randomized Trial Examining the Effect of a 12-week Exercise Program on Eating Behaviors

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Overeating and emotional eating can lead to weight gain. While exercise may help protect against weight gain, the mechanisms through which exercise aids in weight control are poorly understood. **PURPOSE:** This efficacy trial tests the hypothesis that exercise training impacts eating behaviors, specifically through a reduction in overeating and internal disinhibition (the tendency to eat in response to cognitive or emotional cues), in a sample of women who are overweight or obese. **METHODS:** Participants were inactive at baseline and self-identified as 'stress eaters' (eating more than usual when 'moderately' or 'extremely' stressed). They were randomized to 12 weeks of exercise training (EX) or to a no-exercise control (CON). EX participants were given an exercise goal of 200 min/wk of combined supervised and home-based exercise (30% supervised; home-based exercise was confirmed via accelerometry). No dietary instructions were provided to any participants. Assessments occurred at baseline and 12 weeks. Overeating episodes were measured over 14 days at each assessment using ecological momentary assessment (EMA; 5 surveys/day delivered randomly via smartphone). Internal disinhibition was assessed questionnaire. **RESULTS:** 39 participants (EX: $n = 19$, CON: $n = 20$) completed the study (age: 40.8 ± 10.3 years BMI: 31.6 ± 3.9 kg/m²). Adherence to the exercise intervention was high (99.4% of all prescribed exercise was confirmed via accelerometry) and 12-week weight change did not differ by condition (EX: $-1.1 \pm 3.5\%$ vs. $0.4 \pm 2.0\%$, $p = 0.11$). At week 12, the proportion of eating episodes that were characterized as overeating episodes was 18.4% in EX vs. 24.5% in CON ($p = .01$). The odds of an overeating episode were lower in EX relative to CON and became more pronounced over time (condition*time = $-.005$, SE = $.002$, $p = .01$). Specifically at week 12, the odds of having an overeating episode among EX participants was 0.58 times the odds of having an overeating episode within CON's. Internal disinhibition decreased in EX (pre: 4.1 ± 2.2 , post: 2.8 ± 1.8), but not CON (4.3 ± 2.6 to 4.2 ± 2.3 , $p = .02$). **CONCLUSIONS:** Exercise

training reduced the likelihood of overeating, and eating in response to emotional or cognitive cues, in women who self-identified as stress eaters. Thus, this may be one pathway by which exercise impacts body weight.

2889 May 31 3:30 PM - 3:45 PM

Compensatory Reduction in Non-Exercise Energy Expenditure Among Weight-Stable Overweight and Obese Adults

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(No relevant relationships reported)

PURPOSE: Increasing total daily energy expenditure is a critical component of weight management strategy. There is disagreement as to a potential compensatory reduction in non-exercise energy expenditure that could blunt the anticipated increase in total daily energy expenditure (TDEE) resulting from exercise participation. The purpose of the present study was to examine the effect of varying doses of exercise energy expenditure (EEex) on TDEE and non-exercise energy expenditure when body weight is maintained. **METHODS:** Seventy healthy, but overweight or obese, young adult women and men participated in a 26-week exercise intervention. Based on the individual daily EEex, participants were stratified into tertiles (T1, T2, T3) of increasing EEex. Paired sample t-tests determined significant within-tertile differences between pre/post data for each variable. Linear regression models, adjusted for age, sex and race, determined the significance of changes over time in selected variables. **RESULTS:** Average daily EEex was different among tertiles (39.9±9.7, 175.5±9.8, 282.9±9.8 kcal, respectively; $p < 0.001$). No main effect of tertile was found for change in sedentary activity EE ($p = 0.228$), moderate/vigorous EE ($p = 0.698$), or TDEE ($p = 0.762$). A negative main effect of tertile was found for a change in light activity EE ($p = 0.016$) and for non-exercise energy expenditure ($p = 0.012$), with a greater decrease in non-exercise energy expenditure in T3 ($p = .009$). **CONCLUSION:** These data indicate that, when body weight is maintained, participation in the exercise program resulted in a compensatory reduction in light and non-exercise moderate/vigorous energy expenditure, as well as a less-than-expected increase in TDEE. These findings suggest that maintenance of non-exercise energy expenditure is critical for correctly estimating the caloric deficit anticipated from participation in exercise as part of a weight loss program. Supported by an unrestricted grant from the Coca Cola Company.

2890 May 31 3:45 PM - 4:00 PM

The Effects of Steady State and High Intensity Exercise on Compensatory Eating Behaviors and Appetite

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Exercise is often prescribed for weight control; however, it is not uncommon that weight loss is less than expected. Unexpected results may be influenced by compensatory eating behaviors following exercise. **PURPOSE:** The aim of this study was to examine differences in eating behaviors after steady state (SS) and high intensity (HI) active females. **METHODS:** Nine, recreationally active college-aged females participated in this study. Prior to testing, subjects completed a VO_{2max} test to individualize exercise. Subjects completed three trials in a randomized order: control (CON), HI exercise, or SS exercise. Each trial took place during the first week of the luteal phase of their menstrual cycle. During the CON trial, subjects remained seated for 30 minutes. During SS, subjects ran on a treadmill at 70% VO_{2max} for 33 minutes. During the HI, trial subjects ran on a treadmill at 90% VO_{2max} for 1 minute then 50% VO_{2max} for 1 minute for 34 minutes. Food intake was recorded 24 hours before and up to 72 hours after each trial. Resting metabolic rate (RMR) was measured prior to and 24, 48, and 72 hours following each trial. A visual analog scale was used to assess appetite before and immediately following each trial. **RESULTS:** Caloric expenditure was higher during SS (302.78±28.40kcal) and HI (278.39±24.94kcal) compared to CON (68.10±2.94kcal) ($p < 0.001$); however, no differences existed between exercise trials ($p = 0.53$). Caloric intake was not different ($p = 0.82$) between SS (1505.56±135.41kcal), HI (1562.67±118.91kcal), and CON (1485.89±136.52kcal) 24 hours post exercise. Differences in caloric intake were not observed 48 ($p = 0.42$) and 72 hours ($p = 0.60$) post exercise. There were no differences ($p = 0.55$) in RMR 24 hours after SS (1598.98±197.80 kcal), HI (1426.57±66.23 kcal), or CON (1430.83±68.93 kcal). Differences were not observed ($p = 0.72$) in change in appetite following SS (2.89±7.13 mm), HI (8.22±10.57 mm), and CON (0.11±3.74 mm). **CONCLUSION:** Caloric intake and RMR were not different after SS or HI exercise. Appetite did not significantly change after exercise though large individual variability was observed; the

largest change in appetite was observed following HI exercise. Compensatory eating may be highly individualistic and appetite following exercise should be considered further, particularly following HI exercise.

2891 May 31 4:00 PM - 4:15 PM

The Energy Cost Of Sitting versus standing In Man.

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(No relevant relationships reported)

Abstract

PURPOSE: Prolonged sitting is a major health concern, targeted via government policy and the proliferation of height-adjustable workstations and wearable technologies to encourage standing. Such interventions have the potential to influence energy balance and thus facilitate effective management of body/fat mass. It is therefore remarkable that the energy cost of sitting versus standing naturally remains unknown. **METHODS:** Metabolic requirements were quantified via indirect calorimetry from expired gases in 46 healthy men and women (age 27±12 y, mass 79.3±14.7 kg, body mass index 24.7±3.1 kg·m⁻², waist:hip 0.81±0.06) under basal conditions (i.e. resting metabolic rate; RMR) and then, in a randomized and counterbalanced sequence, during lying, sitting and standing. Critically, no restrictions were placed on natural/spontaneous bodily movements (i.e. fidgeting) to reveal the fundamental contrast between sitting and standing *in situ* whilst maintaining a comfortable posture. **RESULTS:** The mean [95% CI] increment in energy expenditure was 0.18 [0.06 to 0.31] kJ·min⁻¹ from RMR to lying, 0.15 [0.03 to 0.27] kJ·min⁻¹ from lying to sitting and 0.65 [0.53 to 0.77] kJ·min⁻¹ from sitting to standing. The observed energy cost of each posture above basal metabolic requirements exhibited marked inter-individual variance, which was inversely correlated with resting heart rate for all postures ($r = -0.5$ [-0.7 to -0.1]) and positively correlated with self-reported physical activity levels for lying ($r = 0.4$ [0.1 to 0.7]) and standing ($r = 0.6$ [0.3 to 0.8]). **CONCLUSION:** Interventions designed to reduce sitting typically encourage 30-120 min·d⁻¹ more standing *in situ* (rather than perambulation), so the 12 % difference from sitting to standing reported here does not represent an effective strategy for the treatment of obesity but may have a role in primary prevention by maintaining long-term energy balance.

2892 May 31 4:15 PM - 4:30 PM

Change in Visceral Adiposity with a 12-Month Behavioral Weight Loss Intervention with Varying Doses of Physical Activity: The Heart Health Study

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Visceral adipose tissue (VAT) is considered to have biochemical characteristics that influence several pathophysiological processes of the body and high levels are associated with increased risk for metabolic syndrome, cardiovascular disease, and certain cancers. There is data to suggest that supervised aerobic exercise may reduce VAT in the absence of caloric restriction.

PURPOSE: To examine whether VAT is reduced within the context of a comprehensive weight management program, varied by prescribed levels of home-based moderate-to-vigorous physical activity (MVPA) in adults who were overweight or obese across 12 months.

METHODS: Data were examined from sedentary adults (N=309; BMI: 32.3±3.8 kg/m²; age=45.1±7.9 years) enrolled in a behavioral program and randomized to a reduced calorie diet (DIET, N=107), diet plus a moderate dose of MVPA (MOD-EX, N=101), or diet plus a high dose of MVPA (HIGH-EX, N=101). All groups received weekly intervention sessions in months 1-6 followed by 2 group and 2 telephone contacts per month in months 7-12, and were prescribed a diet to reduce energy intake (1200-1800 kcal/day). MOD-EX was prescribed unsupervised MVPA that progressed to 150 min/wk, whereas HIGH-EX was progressed to 250 min/wk. Body composition and VAT were measured by DXA (GE Lunar iDXA, Corescan) along with weight at 0, 6 and 12 months.

RESULTS: Weight significantly decreased in all groups at 6 months (DIET: -9.0±5.9 kg, MOD-EX: -10.2±6.4 kg, HIGH-EX: -9.4±5.3 kg; $p < 0.001$) and 12 months (DIET: -10.0±8.3 kg, MOD-EX: -11.1±8.1 kg, HIGH-EX: -9.7±6.9 kg; $p < 0.001$), with no significant difference between groups. A similar pattern was observed for percent body fat (Baseline: 43.3±5.5%, 6-month: 38.3±7.0%, 12-month: 37.7±7.6%; $p < 0.001$) with

no difference between groups. VAT decreased across time (Baseline: 1518±907cm³, 6-month: 1018±617cm³, 12-month: 971±648cm³; p<0.001) with no difference between groups.

CONCLUSIONS: The interventions were successful at reducing body weight and improving body composition in adults with obesity. The lack of additional weight loss, reductions in body composition and VAT with participation in MVPA at two different doses may suggest that there is a compensatory response in factors influencing energy balance that warrant further investigation. Supported by: NIH (R01 HL103646)

2893 May 31 4:30 PM - 4:45 PM

Impact of Intermittent Fasting on Energy Balance and Associated Health Outcomes in Lean Adults

Iain Templeman¹, Sue Reeves², Jean-Philippe Walhin¹, Harry Smith¹, Harriet Carroll¹, Peter J. Rogers³, Jeffrey M. Brunstrom³, Leonidas G. Karagounis⁴, Kostas Tsintzas⁵, Dylan Thompson¹, Javier Gonzalez¹, James A. Betts, FACSM¹. ¹University of Bath, Bath, United Kingdom. ²University of Roehampton, London, United Kingdom. ³University of Bristol, Bristol, United Kingdom. ⁴University of St Mark and St John, Plymouth, United Kingdom. ⁵University of Nottingham, Nottingham, United Kingdom. (Sponsor: Dr James A Betts, FACSM)

(No relevant relationships reported)

PURPOSE: To establish the effects of a diet combining intermittent fasting (IMF) with calorie restriction on energy expenditure and metabolic health, and to isolate the relative contributions of fasting and negative energy balance to any observed effects. **METHODS:** After a 4-week control phase, 36 lean adults (mean±SD; age = 42±11 y, BMI = 23.9±2.1 kg/m²) were randomised to one of three conditions for 20 days; 1) daily calorie restriction (75:75; 75% of habitual intake daily), 2) IMF with calorie restriction (0:150; alternating 24-h periods of fasting and feeding to 150% of habitual intake), 3) IMF without calorie restriction (0:200; alternating 24-h periods of fasting and feeding to 200% of habitual intake). In the IMF groups, transitions from feeding to fasting and vice versa occurred at 15:00 each day. In addition to free-living measures of energy intake (weighed record) and physical activity (combined heart rate/accelerometry), body composition (DEXA), metabolic rate and substrate oxidation (indirect calorimetry), fasted health markers and postprandial metabolic responses were measured at pre- and post-intervention.

RESULTS: Energy intake was reduced in the two energy-restricted groups (75:75 = -2602±904 kJ/d, 0:150 = -2105±1105 kJ/d; p=0.24) and maintained by 0:200 (+63±1439 kJ/d; p<0.01 v 75:75, p<0.01 v 0:150), a pattern mirrored by changes in body mass (75:75 = -1.9±1.0 kg, 0:150 = -1.6±1.1 kg, 0:200 = -0.5±1.1 kg; p=0.46 75:75 v 0:150, p=0.01 75:75 v 0:200, p=0.04 0:150 v 0:200). However, the decrease in fat mass with 75:75 (-1.8±0.8 kg) was greater than the decrease accompanying 0:150 (-0.8±0.9 kg, p=0.01 v 75:75), both of which differed from the stability seen following 0:200 (-0.1±0.7 kg, p<0.01 v 75:75, p=0.05 v 0:150). Furthermore, physical activity energy expenditure decreased following 0:150 when compared to 0:200 (0:150 = -410±707 kJ/d, 0:200 = +247±594 kJ/d; p=0.07) but was unaffected by 75:75 (+4±527 kJ/d; p=0.24 v 0:150, p=0.31 v 0:200). Despite these differences, metabolic rate, substrate oxidation, fasting biochemistry and postprandial metabolism were all unaffected.

CONCLUSIONS: In lean adults, restricting calories through a complete alternate-day approach to IMF attenuated reductions in fat mass and prompted declines in physical activity, whilst metabolic health was unaffected.

2894 May 31 4:45 PM - 5:00 PM

Changes In Health-related Quality Of Life In A 12-month Behavioral Weight Loss Intervention: The Heart Health Study

Katherine A. Collins, Renee J. Rogers, John M. Jakicic, FACSM. University of Pittsburgh, Pittsburgh, PA. (Sponsor: John Jakicic, FACSM)

(No relevant relationships reported)

Overweight and obesity have been shown to adversely affect health-related quality of life (HRQOL). HRQOL has been shown to improve with weight loss. However, it is important to examine whether physical activity in conjunction with weight loss has an added benefit for improvement in HRQOL. **PURPOSE:** To examine whether HRQOL improves with a lifestyle intervention for weight loss with varying doses of moderate-to-vigorous physical activity (MVPA) in adults who are overweight or obese. **METHODS:** Participants (N=270; age=45 ± 7.95 years; BMI=32.2 ± 3.7 kg/m²) engaged in a 12-month behavioral weight loss intervention. Participants were randomized to reduced calorie diet (DIET; N=), diet plus 150 min/week MVPA (DIET+PA150; N=), or diet plus 250 min/week MVPA (DIET+PA250; N=). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. Assessment of body weight and HRQOL (SF-36) were measured at baseline, 6 months, and 12 months. **RESULTS:** Weight significantly decrease in all groups at

12 months (DIET: -9.2±5.8 kg, DIET+PA150: -10.2±6.4 kg, DIET+PA250: -9.5±5.4 kg; p<0.001) with no significant difference between groups. There were significant improvements in HRQOL components of physical function, energy and fatigue, and change in health (Table); however, these did not differ by group. There were no significant changes in social function, mental health, pain, and general health. **CONCLUSION:** The addition of moderate or higher levels of physical activity to an energy restricted diet for weight loss did not improve quality of life compared to the diet alone. These results demonstrate the positive benefits that weight loss may have on HRQOL regardless of whether physical activity is included as a component of the intervention. (Supported by: NIH (R01 HL103646)

2895 May 31 5:00 PM - 5:15 PM

Reductions in Energy Expenditure After Aerobic and Resistance Exercise in Resistance-trained Males

George L. Grieve¹, J. Mark Davis, FACSM², J. Larry Durstine, FACSM², Marco Geraci², Xuewen Wang², Jackson S. Ritchey², Clemens Drenowatz³, Mark A. Sarzynski, FACSM². ¹Valdosta State University, Valdosta, GA. ²The University of South Carolina, Columbia, SC. ³University of Education Upper Austria, Linz, Austria. Email: glgrieve@valdosta.edu

(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the effects of exercise mode and intensity on energy expenditure (EE) during and after five time-matched aerobic and resistance exercise protocols in resistance-trained (RT) males. **METHODS:** Fourteen RT males (mean±SD; age:24.2±4.0 yrs; body mass:84.7±13.3 kg; height:181.2±8.8 cm; and body fat:15.9±4.6%) completed five separate protocols on separate days ≥48 hrs apart in random order, each lasting 40 min in duration: continuous aerobic (continuous), high intensity interval aerobic (HIIT), strength endurance (2x20), traditional resistance (3x10), and high intensity resistance (4x6). EE was measured before, during, immediately post- (0-30 min), and delayed post-exercise (60-90 min) using indirect calorimetry. **RESULTS:** No significant differences in exercise EE were seen between aerobic protocols. EE during both aerobic protocols was significantly greater (p<0.0001) than any of the three resistance protocols. EE during 4x6 was significantly greater than 3x10 and 2x20 by 38±10 kcal (p=0.04) and 67±8 kcal (p<0.001), respectively. From 0-30 min post-exercise, a mean increase in EE of 6.2% was seen only following the 2x20 protocol as compared to baseline pre-exercise (p<0.05). From 60-90 min post-exercise, the 3x10, 4x6, and HIIT protocols showed significant mean reductions in EE of 10.7%, 8.7%, 7.1% (p<0.05) as compared to baseline pre-exercise, respectively. The combined EE from during and after exercise resulted in the same rank order as during exercise (least to greatest: 2x20, 3x10, 4x6, continuous, and HIIT). **CONCLUSIONS:** Significant reductions in EE were found in the 3x10, 4x6, and HIIT protocols from 60-90 min post-exercise as compared to baseline pre-exercise. Continuous and HIIT protocols had the greatest EE during exercise when compared to the resistance protocols. These results have important implications on EE during and after exercise and should be considered when designing exercise training programs. Given the reductions found in EE 60-90 min post-exercise in the 3x10, 4x6, and HIIT protocols, special consideration should be given to post-exercise nutrition to avoid energy deficits which could negatively impact recovery. Supported by an ASPIRE I Grant from the University of South Carolina.

F-37 Free Communication/Slide - Immunology

Friday, May 31, 2019, 3:15 PM - 4:45 PM
Room: CC-105B

2896 Chair: Kyle Timmerman, FACSM. *Miami University, Oxford, OH.*

(No relevant relationships reported)

2897 May 31 3:15 PM - 3:30 PM**Cytokine Response to Traditional and Cluster Sets in Resistance-trained Women**

Sungwon Chae¹, Margaret T. Jones, FACSM², Jennifer B. Fields², Jonathan M. Oliver³, James C. Boyett¹, Felipe C. Vechin¹, Jonathan L. Nicholson¹, Spencer A. Moses¹, Jakob L. Vingren, FACSM¹. ¹University of North Texas, Denton, TX. ²George Mason University, Fairfax, VA. ³Texas Christian University, Fort Worth, TX. (Sponsor: Jakob L. Vingren, FACSM)
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(No relevant relationships reported)

Resistance exercise that incorporates intra-set rest between repetition blocks (i.e., cluster sets [CS]) can produce a smaller metabolic stress and endocrine response than traditional sets (TS). **PURPOSE:** To examine the effect of CS on the acute cytokine response in resistance trained women. **METHODS:** 12 resistance-trained women (mean \pm SE; 23.7 \pm 1.1 years; 160.1 \pm 1.5 cm; 62.5 \pm 1.7 kg; 5 \pm 1 years training) completed 3 sessions in the follicular phase. One-repetition maximum (1RM) back squat (BS) (98.7 \pm 4.1 kg), and BS:body mass (1.6 \pm 0.1) were determined in Session 1. For Session 2 (3 days post Session 1) and Session 3 (7 days post Session 2), subjects were randomly assigned to either 4 sets of 10 reps with 120 seconds (s) inter-set rest (TS) or 4 x (2 x 5 reps) with 30s intra-set rest and 90s inter-set rest (CS). All performed both protocols at 70% 1RM BS. Instructions were to perform every rep "as explosively as possible". Blood was collected pre-exercise (PRE), immediately after sets 1, 2, 3, 4 (IP), and at 5 (+5), 15 (+15), 30 (+30), and 60 (+60) min post-exercise and analyzed for interleukin (IL)-1 β , IL-2, IL-6, IL-8, IL-10, and IL-15. Data were analyzed using repeated measures ANOVAs (2 \times 9). **RESULTS:** A significant main effect of time ($p < 0.05$) was found for IL-1 β , IL-2, IL-8, IL-10, and IL-15. Concentration of IL-1 β was smaller at +5 (3.9 \pm 0.4 ng/mL), +15 (3.6 \pm 0.4) +30 (3.5 \pm 0.3), and +60 (3.7 \pm 0.4) compared to IP (4.1 \pm 0.4). IL-2 was greater after set 1 (10.8 \pm 1.0 ng/mL), and set 2 (11.0 \pm 1.2) compared to PRE (10.2 \pm 1.0), and smaller at +30 (9.9 \pm 1.0) compared to IP (11.0 \pm 1.0). IL-8 was greater after set 1 (8.4 \pm 0.6 ng/mL), set 2 (8.6 \pm 0.7), and set 3 (8.5 \pm 0.7) compared to PRE (8.0 \pm 0.6). IL-10 was smaller at +30 (31.3 \pm 7.4 ng/mL) compared to PRE (34.0 \pm 7.4), and also smaller at +15 (32.6 \pm 7.9) +30 (31.3 \pm 7.4), and +60 (33.4 \pm 8.6) compared to IP (38.0 \pm 8.6). IL-15 was greater at IP (15.5 \pm 4.0 ng/mL) compared to PRE (13.4 \pm 3.5), and smaller at PRE (13.4 \pm 3.5), +30 (11.9 \pm 3.3), and +60 (11.6 \pm 3.2) compared to IP (15.5 \pm 4.0). No condition \times time point effects were observed. **CONCLUSIONS:** Both TS and CS induced an acute cytokine response in resistance-trained women; incorporating intra-set rest (CS) did not appear to affect this cytokine response.

Supported in part by a grant from the National Strength and Conditioning Association Foundation.

2898 May 31 3:30 PM - 3:45 PM**The Relationship between Increased Cytokine Concentrations with Body Temperature Changes**

Brandon M. Gibson¹, Kylene Boka¹, Brittany N. Followay², Jeremiah A. Vaughan³, Elliot Arroyo¹, Joseph A. Laudato¹, Adam R. Jajtner¹, Ellen L. Glickman, FACSM¹. ¹Kent State University, Kent, OH. ²Ripon College, Ripon, WI. ³Bemidji State University, Bemidji, MN. (Sponsor: Ellen Glickman, FACSM)
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(No relevant relationships reported)

Purpose: To identify relationships between cytokines and time spent above critical body temperatures in response to aerobic exercise in various environments. **Methods:** 12 recreationally active men (24.4 \pm 3.1 yrs; 1.81 \pm 0.07m; 81.5 \pm 8.0kg; 47.2 \pm 4.8 ml/kg/min) completed five experimental visits: a $\dot{V}O_2$ max, and a cycling trial in 23°C/45%RH, 23°C/70%RH, 34°C/20%RH and 34°C/45%RH. After supine rest, exercise conditions consisted of 60mins of cycling at 60% $\dot{V}O_{2max}$, a 15min rest, and a time to exhaustion (TTE) trial at 90% $\dot{V}O_{2max}$. Blood was obtained before exercise (PRE), after 60min cycling (60), and after TTE (90). Serum concentrations of IL-1 β , IL-1ra, IL-6, IL-10 and TNF- α were analyzed via ELISA. Participant's rectal (T_{re}) and skin temperatures (T_{sk}) at five locations: Chest, Triceps, Forearm, Thigh and Calf

were monitored continuously. Whole body temperature (T_{wb}) and T_{sk} were calculated via weighted averages. Area Under the Curve with respect to increase (AUCi) was calculated for T_{re} , T_{wb} and T_{sk} . Data were analyzed as Pearson Product Moment Correlations between AUCi for T_{re} , T_{sk} and T_{wb} with changes in cytokine concentration. Time spent above specific critical temperatures for T_{re} , T_{wb} and T_{sk} were related to changes in cytokine concentrations from PRE-60 and PRE-90 using stepwise linear regression. **Results:** Correlations were observed between TNF α PRE-60, and PRE-90 with T_{sk} ($r=0.576$ $p < 0.001$; $r=0.515$ $p=0.001$, respectively) and T_{wb} ($r=0.611$ $p=0.001$; $r=0.516$ $p=0.001$, respectively) but not T_{re} . Time spent with T_{sk} above 33.5°C and 35°C were predictive of increases seen in TNF α PRE-60 ($r=0.695$, $p < 0.001$). TNF α PRE-90 was related to time spent above 33.5°C for T_{sk} ($r=0.593$, $p < 0.001$). Time spent with T_{wb} above 38°C was correlated to, but not predictive of increases seen in TNF α from PRE to 60 and PRE to 90 ($p=0.030$, $p=0.020$). Time spent above 38.5°C for T_{re} displayed significant correlations with increases seen in IL-6 PRE-60 ($r=0.470$, $p=0.002$). No other correlations or relationships were observed with changes in cytokine concentration and body temperature. **Conclusions:** Data indicate that changes in TNF α may be related to time spent above critical T_{sk} of 33.5°C and 35°C. Increases in IL-6 appear to be related to time spent above T_{re} of 38.5°C.

2899 May 31 3:45 PM - 4:00 PM**Exercise Suppresses Prostate Tumor Aggressiveness by Modulating Inflammatory Cytokines**

Darpan I. Patel, Kira Abuchowski, Roble Bedolla, Paul Rivas, Nicolas Musi, Robert Reddick, A. Pratap Kumar. *University of Texas Health Science Center at San Antonio, San Antonio, TX.*
Email: pateld7@uthscsa.edu

(No relevant relationships reported)

Inflammatory cytokines are thought to be at the root of prostate tumor progression. Exercise has been shown to be beneficial in men with prostate cancer (PCa), however, the impact of exercise on tumor physiology is not clearly understood. **PURPOSE:** Test the hypothesis that exercise inhibits tumor progression and modulates pro-tumorigenic cytokine concentrations in the transgenic adenocarcinoma of mouse prostate (TRAMP) model. **METHOD:** Thirty, 10-week old TRAMP mice were randomized to either voluntary wheel running (VWR) or control group. Palpable tumors and VWR activity were monitored weekly. Mice were sacrificed at 4, 8, 12 and 20-weeks to assess time point differences. Excised tumors were paraffin embedded, sectioned, and stained with hematoxylin and eosin. Sectioned tumor slides were scored by a pathologist blinded to the groups. Serum collected from mice sacrificed at the 4-week and 20-week time points were assayed in duplicate using a 32 panel Mouse Cytokine Magnetic Multiplex Assay. Analysis of variance was performed to determine significant differences between treatment groups. **RESULTS:** Control mice presented first with palpable tumors at 14 weeks of age. VWR significantly delayed the presence of palpable tumors by 5 weeks (19 weeks old; $p=0.05$). No significant pathological changes were observed as a function of time; therefore, data were pooled for analysis. A treatment effect was observed with VWR mice having significantly lower number of high-grade tumors compared to controls. Specifically, 71% of control mice had high grade tumors compared to only 17% in the VWR group ($p < 0.001$). Of the 32 cytokines measured, VWR significantly lowered concentrations of tumor modulating cytokines cotaxin (pre: 1291.2 \pm 310; post: 702.2 \pm 273; $p=0.03$), IL-1 α (pre: 457 \pm 97; post: 167 \pm 161; $p=0.03$), IL-5 (pre: 4.7 \pm 0.2; post: 1.9 \pm 0.4; $p=0.001$), IL-12(p40) (pre: 16.9 \pm 1.5; post: ND; $p=0.001$) and VEGF (pre: 1.37 \pm 0.3; post: 0.31 \pm 0.3; $p=0.004$). No changes were observed in the control group. After 20 weeks, VWR group had significantly lower IL-5 (Con: 3.75 \pm 0.7; VWR: 1.9 \pm 0.4; $p=0.01$) and VEGF (Con: 1.72 \pm 0.7; VWR: 0.31 \pm 0.3; $p=0.02$) compared to controls. **CONCLUSIONS:** These results suggest VWR suppresses tumor aggressiveness by altering the inflammatory cytokine profile. Further research on mechanisms of action is needed.

2900 May 31 4:00 PM - 4:15 PM**Circulating Mcp-1 Is Not Related To Self-reported Moderate To Vigorous Physical Activity.**

Bradley W. Macdonald, Chad Dolan, Avery N. Love, Melissa M. Markofski. *University of Houston, Houston, TX.*
(No relevant relationships reported)

PURPOSE: Monocyte chemoattractant protein-1 (MCP-1) is a key chemotactic signal which influences the recruitment and infiltration of circulating monocytes and macrophages. The purpose of this study was to examine the relationship between physical activity and circulating MCP-1 and monocytes in healthy, young adults. **METHODS:** Fourteen young (22.4 \pm 0.58 years), healthy adults were recruited for study. Subjects were asked to self-report their activity and were divided into two groups: high physical activity and moderate physical activity. Physical activity was confirmed with accelerometers (ActiGraph). A resting blood sample was collected from each subject. MCP-1 levels were analyzed via ELISA while classical (CD14+CD116-) and non-classical (CD14+CD116+) monocyte levels were analyzed via flow cytometry. **RESULTS:** Self-reported active subjects (N=9, $\dot{V}O_{2max}$: 50.3 \pm 2.7

mL·kg⁻¹·min⁻¹, Average Weekly MVPA: 712.7±69.5 min) had higher ($p<0.05$) VO_{2max} and weekly MVPA measures from the self-reported inactive group (N=5, VO_{2max} : 35.6±4.2 mL·kg⁻¹·min⁻¹, Average Weekly MVPA: 548.2±64.6 min). There were no significant differences observed between the self-reported active and inactive groups for MCP-1 serum concentration, classical monocyte percentage or non-classical monocyte percentage and no correlation was observed between MCP-1 and circulating monocytes subsets. Based on ActiGraph data recorded from subjects over the course of one week, the active and inactive groups were adjusted based on average weekly MVPA. The MVPA active group (N=8, VO_{2max} : 50.8±2.9 mL·kg⁻¹·min⁻¹, Average Weekly MVPA: 797.9±35.7 min) had higher ($p<0.05$) VO_{2max} and weekly MVPA measures from the MVPA inactive group (N=6, VO_{2max} : 37.5±4.2 mL·kg⁻¹·min⁻¹, Average Weekly MVPA: 462±44.6 min). No significant differences in MCP-1 serum concentration, classical monocyte percentage or non-classical monocyte percentage were observed between the groups divided by MVPA level. **CONCLUSION:** Differences in MCP-1 concentration based on amount of regular physical activity may not exist in a cohort of healthy young adults. All participants, even those who did not report regular physical activity, had at least 150 minutes of MVPA as confirmed by accelerometry and not having a true physically inactive group may have influenced the results.

2901 May 31 4:15 PM - 4:30 PM

Acute Heavy Resistance Exercise Protocol Induces Significant Physiological Stress Elevating Extracellular Heat Shock Protein

Jacob Bowie¹, Adam J. Sterczala¹, William J. Kraemer, FACSM², Carl M. Maresch, FACSM², Brett A. Comstock¹, Shawn D. Flanagan¹, Tunde K. Szivak¹, David R. Hooper¹, Elaine C. Lee¹.
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(No relevant relationships reported)

Cytoprotective protein HSP70 is important in recovery from stress and exercise, but has not been well-characterized in response to muscle damaging resistance exercise protocols.

PURPOSE: To characterize the physiological response to a high stress acute heavy resistance exercise protocol (AHREP) in blood biomarkers including extracellular HSP70 (eHSP70). **METHODS:** Healthy, resistance-trained men (n = 10, 24±4.5 years, 176.8±5.5 cm, 84.65±12.78 kg, 17.6±6.3% body fat, 145±18 kg 1RM) completed an AHREP (6x10RM). Blood samples were collected pre-exercise (PRE), immediately post (IP), and at 15, 30, 60, 120 minutes (min) and 24, 48, 72 hours (h) post-exercise. Samples were analyzed for stress biomarkers including lactate, creatine kinase (CK), complete blood count, cytokines, and eHSP70. The results were analyzed with a rANOVA and post hoc t tests. **RESULTS:** Plasma lactate was elevated 12 fold (vs. PRE 0.880 ± 0.296 mmol·L⁻¹) immediately after the AHREP (12.15±3.19) and remained elevated (vs. PRE, $p\leq0.0002$) at 120 min. Muscle damage was demonstrated by significantly ($p < 0.01$) elevated CK (vs. PRE 126±29 IU·L⁻¹) at 24h post-exercise (439±151). CBC indicated changes in leukocyte populations that were coincident with post-exercise increases ($p<0.05$) in chemoattract cytokine IL-8 (PRE 4.77±2.73%, IP 6.38±3.53). eHSP70 levels were increased ($p<0.05$, vs. PRE 0.391±0.244 ng·mL⁻¹) at IP (0.567±0.366) and 15 min post-exercise (0.515±0.345). **CONCLUSIONS:** The AHREP caused significant physiological stress that coincided with increases in circulating eHSP70 that returned to baseline levels within minutes post-exercise. eHSP70 likely responds with different kinetics during resistance exercise than as has been well-characterized during aerobic exercise. Supported by: New Faculty Start-up Funds.

2902 May 31 4:30 PM - 4:45 PM

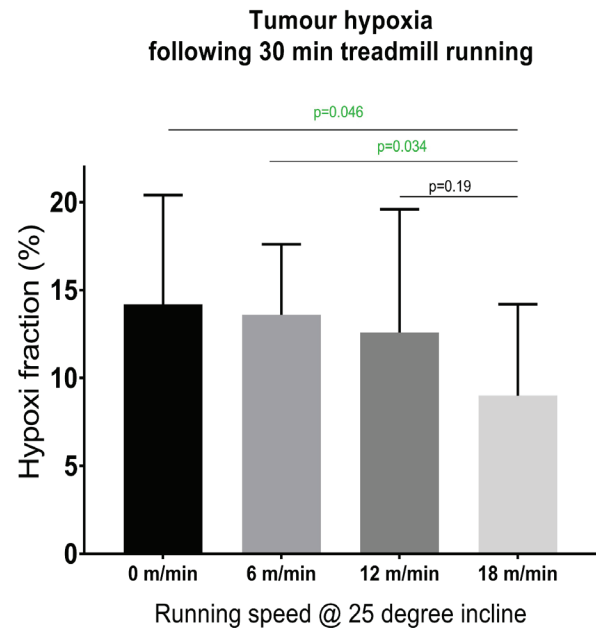
A Single High-Intensity Exercise Bout Reduces Tumour Hypoxia in Mice.

Simon Lønbro¹, Pernille Byrialsen Elming², Thomas Wittenborn², Michael R. Horsman². ¹Aarhus University, Aarhus C, Denmark. ²Aarhus University Hospital, Aarhus C, Denmark.
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(No relevant relationships reported)

INTRODUCTION: Low blood perfusion and hypoxia are characteristic features of tumors and are factors of resistance to radiation and chemotherapy. A few rodent studies show that aerobic exercise, that has no severe side effects, may improve perfusion and reduce hypoxia but the significance of exercise intensity is unknown. **METHODS:** Female CDF1 mice were injected with the C3H mammary carcinoma in the mammary fat pad and allocated to either a Control group (no exercise) or a group performing low (6 m/min), moderate (12 m/min) or high intensity (18 m/min) treadmill running for 30 minutes (n=11/group). Prior to running, all mice were injected with Pimonidazole and immediately after exercise injected with Hoechst 33342 before being sacrificed 1 minute later. Tumors were excised, and histological sections prepared. Hypoxia was determined from the degree of Pimonidazole binding, while

analysis of the Hoechst 33342 staining enabled analyses of perfused vessels in the tumor (latter analyses ongoing. Data not presented). **RESULTS:** The mean hypoxic fraction was 9.0±5.2% for mice exposed to the high intensity running schedule and was significantly lower compared with the hypoxic fraction in tumors from the control group (14.2±6.2%, Student's T-test $p=0.046$) and low intensity group (13.6±4.0%, $p=0.034$) but not the moderate intensity group (12.6±7.0%, $p=0.19$). **CONCLUSION:** High intensity for 30 minutes may reduce tumor hypoxic fraction in mice and our current studies investigate the duration of the reduction in hypoxia after exercise cessation and examine the effect of this exercise regime on tumor radiation response.



F-38 Clinical Case Slide - Rehabilitation Issues: Older Adults

Friday, May 31, 2019, 3:15 PM - 4:55 PM
Room: CC-306

2903 Chair: Kenneth Vitale. *University of California San Diego, San Diego, CA.*

(No relevant relationships reported)

2904 Discussant

Arthur Jason De Luigi. *MedStar NRH/Georgetown University Hospital, Olney, MD.*

(No relevant relationships reported)

2905 Discussant

Wayne Elton Derman. *Stellenbosch University, Cape Town, South Africa.*

(No relevant relationships reported)

2906 May 31 3:15 PM - 3:35 PM

The Effects of a Linearly Progressed Resistance Training Program on a Previously Sedentary 86 Year Old Woman

John Petrizzo¹, Jeremy Koppel², Erica Christen², Inna Koppel², Robert M. Otto, FACSM¹, John Wygand, FACSM¹. ¹*Adelphi University, Garden City, NY.* ²*Feinstein Institute for Medical Research, Manhasset, NY.* (Sponsor: Robert M. Otto, FACSM)
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(No relevant relationships reported)

History:

86 year old previously sedentary female agreed to participate in a linearly progressed resistance training program for six months. Prior to participation, the subject was evaluated by a physician and cleared to participate in the program. Medical history revealed a history of atrial fibrillation, hypothyroidism, hypertension, glaucoma, osteoarthritis, as well as peripheral edema. The subject reported the use of Norvasc, Losartan Potassium, Hydralazine Hcl, and Doxazosin Mesylate for her hypertension, Xarelto for her atrial fibrillation, Levothyroxine for her hypothyroidism, Latanoprost for her glaucoma as well as Lasix for her peripheral edema. Prior to initiation of the resistance training intervention, the subject's only self-reported physical activity was walking. She reported walking, on average, 1 - 3 hours per week. The subject also reported sleeping, on average, less than 5 hours per night.

Physical Examination:

The subject completed the Short Physical Performance Battery (SPPB) prior to initiating the resistance training intervention. Results of the subject's initial SPPB showed that she was unable to maintain a semi-tandem or tandem stand for 10 seconds, required the use of a walker to ambulate a distance of four meters, and was unable to transfer from sit-to-stand without the use of her upper extremities.

Test and Results:

Initial SPPB score of 2/12, consistent with poor balance, gait speed, and lower extremity functional strength

Initial Leg Press calculated 1RM = 23.1 kg

Initial Lat Pulldown calculated 1RM = 8.6 kg

Initial Bench Press calculated 1RM = 7.7 kg

Intervention:

A linearly progressed resistance training program comprised of the leg press, barbell bench press, and lat pulldown machine was implemented an average of twice per week for 6 months. The goal of the resistance training program was to make a small increase in the training load used on each of the three exercises as often as possible.

Outcomes:

Improvements of calculated 1RM of 209.8%, 268.4%, and 94.1% were noted for the leg press, lat pulldown, and bench press respectively. SPPB score double from 2/12 to 4/12. Additionally, the subject was also able to successfully transfer from sit-to-stand without the use of her upper extremities for assistance and no longer required the use of a walker during ambulation.

2907 May 31 3:35 PM - 3:55 PM

Complications Post Unicompartmental Knee Arthroplasty and Physical Therapy Manual Therapy

Julie B. Barnett. *UT Health San Antonio Texas, San Antonio, TX.*
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(No relevant relationships reported)

HISTORY: 65 year old male underwent an initial medial unicompartmental knee arthroplasty and physical therapy manual therapy and exercise. The patient had significant increase in pain after physical therapy manual techniques in extension and exercises interventions. Subsequently, the patient underwent a total knee arthroplasty after a lateral tibial plateau fracture was revealed.

PHYSICAL EXAMINATION: Patient had approximately minus 10 degrees of knee extension at eight weeks post unicompartmental medial arthroplasty.

DIFFERENTIAL DIAGNOSIS: Joint adhesions vs muscular restrictions vs fracture.

TEST AND RESULTS: Passive range of motion measurements taken during physical therapy with restrictions in knee extension passive range of motion. 2nd MRI revealing lateral tibial plateau fracture

FINAL WORKING DIAGNOSIS: Lateral tibial plateau fracture per MRI

TREATMENT AND OUTCOMES: Total knee arthroplasty performed and patient eventually gained full range of motion of the knee joint, normal gait, and reduction in pain.

2908 May 31 3:55 PM - 4:15 PM

Transplant Frailty Prehabilitation

Dimitri Constantinou, Keegan Willemse. *University of the Witwatersrand, Wits, South Africa.* (Sponsor: Yoganathan Coopoo, FACSM)

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(No relevant relationships reported)

HISTORY: 72 year old male, liver problem of non-cirrhotic portal hypertension and esophageal varices treated with ligation. Developed sudden onset Klebsiella pneumonia septicaemia, with atrial fibrillation whilst hospitalised and cardioverted pharmacologically. Whilst investigating, liver tumor identified on CT scan. Diagnosed as hepatoma. Treatment included 2 x chemoembolization. Lost 15 kg in the previous 8 months. Previous DVT following torn Achilles tendon repair. Insulin resistance. Ex-smoker. Activity - walking and golf. Minimal alcohol use. Medication - Prazolol, furosemide, spironolactone. Referred for prehabilitation whilst awaiting liver transplant.

PHYSICAL EXAMINATION: Colour - ashen/pallor. HR = 62 bpm, regular, good volume. BP = 96/74 mmHg. Cor - NAD Lungs - NAD. Abdomen - NAD. Clinically balance reduced, generalised muscle weakness.

DIFFERENTIAL DIAGNOSIS: Anemia, paraneoplastic syndrome, chemotherapy / oncology deconditioning, cardiac dysfunction

TEST AND RESULTS: Lab results - marginally raised liver enzymes. No current anemia. Staged treadmill test using modified Bruce Protocol with ECG monitoring and mobile metabolic measurements. The results showed pre-exercise HR = 60 bpm, regular, pre exercise BP = 94/76 mmHg; maximum BP post exercise expected increases with peak RPE of 15/20 although physically could not continue. ECG normal at rest and with effort. Peak heart rate = 184 (112% of predicted). Exercise time = 9.58 minutes. Maximum load to stage 5 = 17 mets. Peak Vo2 = 18.8 ml/min/kg at 08.30 minutes. RER reached 1 at 3.15 mins. Ventilatory equivalent was high, and occurred early - implying early anaerobic dependent metabolism, likely from compromised aerobic energy system. Liver dysfunction with effects on glycogenolysis and gluconeogenesis unknown.

FINAL WORKING DIAGNOSIS: General deconditioning of multiple etiologies related to liver tumor

TREATMENT AND OUTCOMES: Exercise prehabilitation for transplant to improve aerobic function, muscle strength and balance. Exercise sessions three times per week, with significant improvements in objective outcome measures and subjective energy levels, function and quality of life.

2909 May 31 4:35 PM - 4:55 PM

Age and Gender Specific Issues - Power Based Exercise Program in a Postmenopausal Female

Michele Aquino, John Wygand, FACSM, Robert M. Otto, FACSM, John Petrizzo. *Adelphi University, Garden City, NY.* (Sponsor: John Wygand, FACSM)

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(No relevant relationships reported)

History:

70 year old female with Osteoporosis was referred to Physical Therapy for gait and balance training. The patient denies any prior history of cancer, diabetes, neurological history, prior orthopedic injuries/surgeries, or major cardiac events/surgeries. Her

current prescribed medications include Lipitor, Norvasc, Hyzaar and Lexapro. The patient further mentions a history of osteopenia, but a recent DEXA scan classified the patient as Osteoporotic at femoral neck with a T-score of -2.5. The patient was prescribed 70 mg of Fosamax QD and continued with supplemental Calcium with Vitamin D. The patient reported reduction of balance with day to day activities and reported a fear of falling, but denied any falls.

Physical Examination:

Postural assessments demonstrated excessive forward head posture, with increased thoracic kyphosis along with excessive lumbar lordosis. Neurological assessment and ROM at the lumbar spine and hips were all within normal limits. Limited muscular strength was noted in bilateral lower extremities. Deficits in static balance were also noted with tandem stance.

Test and Results:

Dynamic Gait Index Score of 15/24, consistent with an increased fall risk.

DEXA results at femoral neck: T-Score: -2.5; BMD: .572 gr/cm²

DEXA results at lumbar spine: T-Score: -2.2; BMD: .807 gr/cm²

Intervention:

A Progressive Resistive Functional Power based exercise program was conducted an average two times per week for one year. A treadmill warm-up followed by progressive functional activities such as sit to stands for speed, forward step ups for speed, hip abduction and hip extension for speed were included. Progressions consisted of increased resistance and increased speed of movement.

Outcomes:

DEXA scan demonstrated BMD improvements of 29% (742 gr/cm²) and 24% (1.003 gr/cm²), as well as improvements in T-score to -2.1 to -1.5 at her femoral neck and lumbar spine, respectively. The changes attenuate fracture and mortality risk. Furthermore, a 7 point change in her Dynamic Gait Index score was noted post intervention, resulting in a decreased risk of falling. The patient has continued to be independent with a home exercise program along with continued use of her prescribed medications.

2910 May 31 4:15 PM - 4:35 PM

Mitochondrial Myopathy, The Use Of Resistance, Mobility And Neuromuscular Exercise Training In A Community Clinic.

Catherine R. Moss. *Optimize Health Ltd; The University of Auckland, Auckland, New Zealand.*

(No relevant relationships reported)

History:

A Female 68 yrs old was presented to the exercise rehabilitation clinic with:

³ Mitochondrial Disease (ragged red muscle fibers, excessive mitochondria)

³ POLG-associated CPEO

³ Osteoporosis

Physical examination:

³ Extreme muscle weakness

³ Low BMI

³ No eye movement tracking, eyelids paralyzed

³ Fatigue

Differential Diagnosis:

Severe cervical kyphosis and mild thoracic kyphosis and anterior pelvic tilt, low muscle strength.

Testing and Results:

A continuous recumbent cycle protocol with peak power of 28 Watts, peak blood pressure 168/74 mmHg, 110 bpm.

Functional testing findings: 30-second Sit to stand test: 3 reps in 30 seconds; Dumbbell bicep curl test (60 seconds): Left arm was 30 reps, Right arm was 20 reps; Romberg (eyes open): <3 seconds for each leg, Tandem stance balance test: not possible without modification.

Results

- Post 8 week test results

30-second Sit to stand test: 6 reps in 30 seconds (100% increase); Dumbbell bicep curl test (60 seconds): Left arm was 47 reps (17 rep increase), Right arm was 41 reps (21 rep increase); Romberg (eyes open): Left leg was 4.50 seconds (~2 second improvement) and right leg was 5.46 seconds (~3.5 second improvement), Tandem stance balance test: Left leg was 6.12 seconds and right leg was 5.59 seconds (and increase on both sides from 0 seconds). Working Diagnosis:

Mitochondrial myopathy with POLG-associated CPEO and osteoporosis with associated poor muscular strength, poor balance and posture.

Treatment and Outcomes:

The client attended a community clinical exercise rehabilitation program for 8 weeks, 2 x week 30 minutes. After a 5-minute warm up on a recumbent cycle (28-30 Watts), the client went through a one-on-one resistance & mobility training session focusing on variations of: Strength training, proprioception training, upper body & neck mobility & posture, co-ordination and muscle activation, functional balance training

Outcomes: A low intensity progressive resistance program that incorporates a variation of balance, proprioception, flexibility and muscle activation as well as upper back

mobility training is recommended for the mitochondrial myopathy conditions. Program should be continued for a further 10-12 weeks, 2 x per week of ~30 minutes with slow to moderate intensity progression.

F-39 Clinical Case Slide - Spine II

Friday, May 31, 2019, 3:15 PM - 4:55 PM

Room: CC-202C

2911 **Chair:** Sherrie L. Ballantine-Talmadge, FACSM. *CU Sports Medicine and Performance Center, Boulder, CO.*

(No relevant relationships reported)

2912 **Discussant**

Dina C. Janse van Rensburg, FACSM. *University of Pretoria, Pretoria, South Africa.*

(No relevant relationships reported)

2913 **Discussant**

Lindsay Ramey. *University of Texas Southwestern Medical Center, Dallas, TX.*

(No relevant relationships reported)

2914 May 31 3:15 PM - 3:35 PM

Progressive Asymmetric Low Back Pain in a Young Basketball Player

Marianne Luetmer, Edward Laskowski, FACSM. *Mayo Clinic, Rochester, MN.*

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(No relevant relationships reported)

History: A 23 year old otherwise healthy male basketball player developed acute onset of sharp right-sided low back pain upon landing after performing a slam dunk. He had no lower extremity radicular pain, focal weakness, or sensory loss; no constitutional symptoms. At first presentation he was diagnosed with mechanical low back pain. The prescribed physical therapy intervention was beneficial however his pain progressed. He returned to Sports Clinic one year later; the pain had spread to his right gluteal region and was exacerbated by impact exercise. He could no longer play basketball and pain interfered with daily activities.

Physical Examination:

On initial examination: tight hip internal and external rotators bilaterally, negative Stinchfield and FABER tests bilaterally, and tenderness to palpation over right lumbar paraspinals with an otherwise normal exam. One year later: strength, sensation, and reflexes remained intact. Focal tenderness over right SIJ. Normal lumbar ROM.

FABER and Stinchfield tests reproduced right-sided SI region pain. FADIR and labral scour maneuvers negative.

Differential Diagnosis:

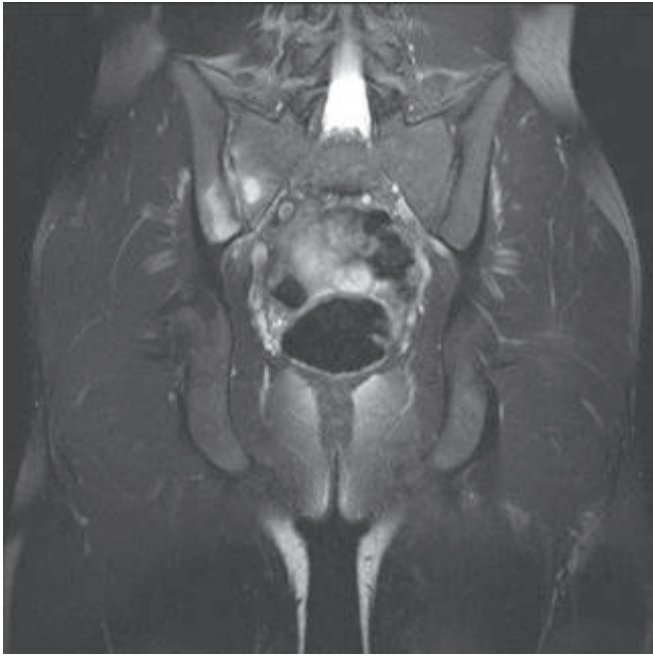
1. Mechanical low back pain
2. Spondylolysis
3. Sacroiliitis
4. Femoral acetabular impingement
5. Labral pathology
6. Avascular necrosis

Tests and Results:

-Lumbar radiographs, year 2017: Normal.

-Pelvic radiographs, 2018: Mild iliac-sided sclerosis and irregularity bilateral SIJs, more prominent on right. No fracture or dislocation.

-Lumbar and pelvic MRI, 2018: Extensive subchondral marrow edema right SIJ; right SIJ effusion with changes suggesting enthesitis. Compatible with marked asymmetric sacroiliitis. Normal lumbar spine.



-HLA-B27 positive. ESR and CRP normal.

Final Working Diagnosis: Axial spondyloarthritis

Treatment and Outcomes:

1. Trial of naproxen 500 mg BID
2. Fluoro-guided right SIJ corticosteroid injection
3. Low-impact aerobic conditioning; core and back strengthening exercises with emphasis on optimal technique

2915 May 31 3:35 PM - 3:55 PM

Back Pain in a Multi-Sport High School Athlete

John Diefenderfer, Rob Stevens. *Maine General Sports Medicine, Augusta, ME.* (Sponsor: James Dunlap, FACSM)
(No relevant relationships reported)

HISTORY: A 15 year old male football player presented with low back pain that was worse on the left side. His injury occurred about 3 weeks ago during practice where he dove to tackle another teammate and had sharp pain in his lower back. He stated running/sprinting, jumping, twisting to throw the football, and sometimes bending forward all worsened the pain. Rest seemed to help, but he continued to have a dull ache in his low back that was fairly constant. He has tried heat and stretching before practice. He denies numbness, tingling, or weakness. He denies any bowel/bladder incontinence. He denies previous back injury or trauma. He is a year round athlete and also participates in basketball and hockey.

ROS: pertinent negatives include no fevers, rash, recent weight loss/gain, or joint pains. **PHYSICAL EXAMINATION:** Height: 5'7" Weight 133 lbs. Gen: no acute distress. Gait: normal, able to effectively toe and heel walk, tandem gait intact. Lumbar Spine Exam: Skin / Lymph: normal, no scars, mild stretch marks superficially midline around T10-12. Tenderness: midline L5-S1 as well as adjacent on the left, no step-offs noted, TTP SI joints bilaterally. Flexion: 60 degrees with pain. Extension: 20 degrees. Moderate to severe bilateral hamstring tightness.

Strength/reflexes/sensation/distal pulses of both LE intact. Special testing: Seated/Supine SLR, FABER, FADIR negative bilaterally. Stork testing positive bilaterally.

DIFFERENTIAL DIAGNOSIS: Lumbar muscle strain, Iliolumbar ligament sprain, SI joint dysfunction, Spondylolysis with or without spondylolisthesis, Ankylosing Spondylitis.

TEST AND RESULTS: X-rays lumbar spine: Bilateral pars defect L5 with mild Grade 1 spondylolisthesis of L5/S1. MRI lumbar spine without contrast - Acute bilateral pars defects at L4. At L5/S1 there are bilateral L5 pars defects which appear chronic and have no associated edema. There is resultant uncovering of the disc and some mild bilateral foraminal narrowing at L5/S1. No spondylolisthesis at L4/5.

FINAL WORKING DIAGNOSIS: Multilevel Bilateral Spondylolysis, acute at L4, with grade 1 spondylolisthesis L5/S1

TREATMENT AND OUTCOMES:

Physical therapy without bracing due to patient choice. Relative rest and discontinuation of contact sports while in PT. Discussion about further return to play will take place upon completion of PT.

2916 May 31 3:55 PM - 4:15 PM

Fragile Bones in a Horseback Rider

Jacob Wessels. *University of Minnesota, Minneapolis, MN.*
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(No relevant relationships reported)

HISTORY: A 55-year-old postmenopausal female presents with back pain that started when landing a jump while horseback riding. The jump was a routine jump and she felt sharp immediate pain in her mid-back. She has been riding more infrequently but no other change to her landing. This felt similar to a compression fracture five years ago she sustained sitting while on a boat ride. She has reported general fatigue and sleeping more than usual. Some heat and cold intolerance. No kidney stones. She has history of vitamin d deficiency, heartburn on omeprazole and moderate alcohol use, never smoker.

PHYSICAL EXAMINATION: P: 90 BP: 128/76 Height: 66.5in Weight: 156lb

Gen: pleasant well appearing female in no distress

Neck: no thyromegaly or palpable mass

Heart: rrr, no murmur

Back: no deformity, normal posture, tender to palpation over T6-T9 spinous processes, tender over adjacent paraspinal muscles. Forward flexion and back extension reproduces pain, no radiation down legs or to abdomen.

Neuro: reflexes 2+, strength 5/5 in upper and lower extremity.

DIFFERENTIAL DIAGNOSIS:

1. Primary osteoporosis
2. Hyperparathyroidism
3. Hypothyroidism
4. Pituitary dysfunction
5. Multiple myeloma

TEST AND RESULTS:

DXA: L1-L3 t-score -2.2BMP: Na 140, K 4.4, Cl: 105, CO2: 28, Creatinine 0.59, GFR >90, Glucose: 97, Calcium 9.8

TSH: 0.04 (0.40 - 4.00 mU/L) T4: 0.30 (0.76 - 1.46 ng/dL)

PTH: 19 (18 - 80 pg/mL)

Vita D 37 (20 - 75 ug/L)

Further Labs:

Free T3: 2.0 (2.3-4.2 pg/mL)

FSH: 100.1 LH: 23.8 Prolactin 5 (3-27ug/L)

Insulin Growth Factor 1: 89 (49 - 234 ng/ml)

Cortisol stimulation test: (850AM) 16.3, 30 min: 22.5, 1 hour: 26.0 (8 AM Reference Range 4-22 ug/dL, 30-60 minutes post stim: >20 ug/dL)

Tissue Transglutaminase IgG: <1

Lumbar X-ray: Anterior vertebral compression deformity involving T7, T8, and T9 vertebral bodies. There is also anterior wedging of T10 vertebral body which may be physiologic.

MRI Head/Brain: No focal abnormality of the pituitary gland.

FINAL WORKING DIAGNOSIS: Osteoporosis with insufficiency fracture and isolated central hypothyroidism

TREATMENT AND OUTCOMES:

1. Calcitonin nasal spray for acute pain control
2. Levothyroxine replacement to T4 in normal range
3. Yearly pituitary laboratory evaluation
4. Follow up when euthyroid for osteoporosis treatment
5. Repeat DXA in 1-2 years

2917 May 31 4:15 PM - 4:35 PM

Back Pain - Swimming and Lacrosse

McKayla Schmitt. *University of Minnesota, Minneapolis, MN.*
(Sponsor: Suzanne Hecht, FACSM)
(No relevant relationships reported)

HISTORY: A 17-year-old senior swimmer and lacrosse player has had 6 months of low back pain. She had no acute injury but reports gradual onset of pain that has progressed causing her to be unable to participate in her sports. She has almost nightly awakening secondary to back pain. She denies numbness, tingling, weakness, or radiation of pain into her lower extremities.

She has a history of celiac disease. There is a family history of hypothyroidism, celiac disease, and rheumatoid arthritis.

PHYSICAL EXAMINATION: Exam revealed bilateral, left greater than right, paraspinal muscle tightness from T10-L5. She had full forward flexion, extension, rotation, and lateral flexion. She had a negative straight leg raise, slump test, and stork test, bilaterally. No neurological signs or symptoms.

DIFFERENTIAL DIAGNOSIS:

1. Strain of lumbar paraspinal muscles
2. Spondylolysis
3. Spondyloarthritis

TESTS AND RESULTS:

Thoracic and lumbar spine anterior-posterior and lateral radiographs:

--Spondylolysis with spondylolisthesis at L5-S1
 Lumbar spine MRI:
 --Anterolisthesis with spondylolysis of L5 on S1.
 --Desiccation at the level of L5-S1 with mild loss of disc height
 HLA-B27: negative
 TSH: 0.86 (normal)
 Vitamin D: 37
 CBC: within normal limits
 CRP: 6.8 (normal)
 ESR: 16 (normal)

FINAL/WORKING DIAGNOSIS:

Spondyloarthritis

TREATMENT AND OUTCOMES:

1. Referral to rheumatology
2. Initiation of Methotrexate and Humira
3. Returned to swimming within 4 weeks of initiation Methotrexate, and 2 weeks of initiation of Humira, with significant reduction in low back pain

2918 May 31 4:35 PM - 4:55 PM**Elite Weightlifter With Acute Back Pain**

Taoufik Bel Fekih, Nidal Hammad, Louis Holtzhausen, FACSM, Yasin Al Makhadma. *Aspetar, Doha, Qatar*. (Sponsor: Louis Holtzhausen, FACSM)
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 (No relevant relationships reported)

HISTORY: An 18 years old male, elite weightlifter sustained a sudden onset of sharp pain in the low back during back squat training (150 kg), with an episode of numbness of posterior right thigh which quickly resolved.

The pain was localized in the right lateral L4/L5 area, with intensity rated 8/10 on a Numerical Pain Scale.

Training history: Weightlifting and resistance training 6 days (30 hours)/week.

PHYSICAL EXAMINATION: No gait abnormality

No neurological deficit, Straight leg raise test negative

Para-spinal muscular spasm and a mildly limited ROM in right rotation, lumbar spine extension, lateral flexion to the right.

Pain-free sacroiliac joint.

Tenderness on palpation of spinous process and L4-L5 facet area on the right side.

Neurological examination normal, including motor function, sensory and reflexes.

DIFFERENTIAL DIAGNOSIS: A simple "lumbago"

Intervertebral disc prolapse

Burst fracture

Spondylolysis

Acute deterioration of spondylolisthesis

TEST AND RESULTS: Standard X-rays showed probable L5 pars lesion, Loss of disc height at L4-L5. An osseous fragment overlying the L4-L5 neural foramina.

The MRI images showed an apophyseal ring fracture involving the postero-inferior L4 vertebral body, with mild bone edema. There was no clear root impingement. There was an L5-S1 disc hernia.

CT scan with 3D rendering confirmed the presence of L4-L5 (acute) ring fracture; and an older fracture at L5-S1.

Laboratory tests showed: Vitamin D deficiency (<10 ng/ml for range 30-80 ng/ml)

Bone densitometry (L4 and 5): Minus 2 (Osteopenia)

FINAL WORKING DIAGNOSIS: Posterior apophyseal ring fracture.

Psycho-social status:

High anxiety levels because of fear of missing an upcoming international competition.

TREATMENT AND OUTCOMES: A "conservative" approach was followed.

Including:

NSAID's

Use a lumbar brace for 4 weeks.

Abstain from weight-lifting for 8 weeks (reviewed regularly)

Vitamin D supplementation: 50,000 IU, 1tab/week

Calcitonin IM injections 100 UI/dayx10 days

Graded exercise rehabilitation, including incident-free progressive weight loading.

The athlete returned to previous level of activity after 8 weeks.

He could back squat 260 kg at 3 months' post injury, and won the Junior World Championships in his weight class.

F-41 Rapid Fire Platform - Vascular Function

Friday, May 31, 2019, 3:15 PM - 4:35 PM

Room: CC-Hall WA2

2920 **Chair:** J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*

(No relevant relationships reported)

2921 May 31 3:15 PM - 3:25 PM**Alterations in Vagal Tone After Acute Resistance Exercise in Resistance-Trained and Untrained Individuals**

Stacie M. Humm, Erica M. Marshall, Jason C. Parks, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.* (Sponsor: J. Derek Kingsley, FACSM)

(No relevant relationships reported)

Data have demonstrated that an acute bout of resistance exercise (ARE) reduces vagal modulation. However, only a handful of studies have evaluated differences between resistance-trained (RT) and untrained (UT) individuals in response to an ARE.

PURPOSE: To compare alterations in vagal modulation during recovery from ARE in RT and UT individuals. **METHODS:** Eighteen RT individuals (Mean±SD; Age: 23±3yrs; Ht: 1.7±0.1m; Wt: 75.2±15.6kg) and eight UT individuals (Age: 24±3yrs; Ht: 1.6±0.09m; Wt: 61.9±10.8kg) volunteered to participate. Vagal modulation was assessed using heart rate variability (HRV) in the frequency domain [High-frequency power (lnHF)], as well as heart rate complexity [sample Entropy (SampEn) and Lempel-Ziv entropy (LZEn)]. Data were collected at rest, 15 minutes (Rec1) and 30 minutes (Rec2) during recovery from ARE and a control (CON). The ARE utilized 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) and 2 minutes of rest between sets and exercises on the chest press, leg press, latissimus dorsi pulldown, leg curl and leg extension. A 2x2x3 repeated measures ANOVA was used to examine groups (RT, UT) across conditions (CON, ARE) on the repeated factor of time (rest, Rec1, Rec2). **RESULTS:** The groups were similar (p≥0.05) for age, and height, but not weight. The 1RMs on all the exercises were different (p≤0.05) between groups. At rest, all measures of vagal modulation were similar between groups. In addition, there were no 3-way interactions for any measures of vagal modulation. There were significant time x condition interactions for lnHF (ARE: rest: 7.5±1.2ms2; Rec1: 5.8±2.2ms2; Rec2: 4.5±1.2ms2; p=0.0001), SampEn (ARE: rest: 1.5±0.4; Rec1: 1.3±0.4; Rec2: 1.4±0.4; p=0.022), and LZEn (ARE: rest: 0.8±0.08; Rec1: 0.7±0.1; Rec2: 0.7±0.2; p=0.001). LnHF and LZEn were reduced at Rec1 and Rec2 compared to rest, with similar responses between the resistance-trained and untrained groups. SampEn was reduced only at Rec1 compared to baseline, with no difference between groups. **CONCLUSIONS:** These data demonstrate that both resistance-trained and untrained individuals have similar reductions in vagal modulation in response to an acute bout of resistance exercise using weight machines.

2922 May 31 3:25 PM - 3:35 PM**Influence of Cardiorespiratory Fitness on Central and Local Arterial Stiffness During Acute Inflammation**

Elizabeth C. Schroeder¹, Thessa IM Hilgenkamp¹, Wesley K. Lefferts¹, Amanda V. Sardeli², Stacy Arriola¹, Tracy Baynard, FACSM¹, Bo Fernhall, FACSM¹. ¹University of Illinois at Chicago, Chicago, IL. ²Campinas University, Campinas-SP, Brazil. (Sponsor: Bo Fernhall, FACSM)
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(No relevant relationships reported)

Acute inflammation is associated with increased cardiovascular (CV) risk. Aortic stiffness, a risk factor for CV disease, increases during acute inflammation. However, whether inflammation affects the aorta and carotid similar has not been determined. High cardiorespiratory fitness is cardio-protective and associated with lower central artery stiffness and inflammation. Thus, cardiorespiratory fitness may be protective and attenuate increases in arterial stiffness during acute inflammation. **PURPOSE:** Determine the effect of acute inflammation and fitness on arterial stiffness. **METHODS:** Arterial stiffness was assessed in 11 low fit (6 male, 24 ± 5 yrs, 22.8 ± 4.3 kg/m², 34.5 ± 2.9 ml/kg/min) and 12 high fit (VO₂peak >75th age- and sex-specific percentile; 5 male, 27 ± 4 yrs, 22.6 ± 1.9 kg/m², 56.4 ± 9.7 ml/kg/min) participants at baseline and 24h-post typhoid vaccination. Aortic pulse wave velocity (PWV) and brachial blood pressure were assessed with the Mobilograph device. Carotid β-stiffness was assessed via ultrasound with echo-tracking. Carotid pressure and wave reflections were obtained via tonometry (SphygmoCor) and calibrated to brachial mean and diastolic pressure. C-reactive protein (CRP) and interleukin-6 (IL-6) were assessed via ELISA. **RESULTS:** Acute inflammation was induced as evident by increases in CRP

and IL-6 ($p < 0.01$; Table). Mean arterial pressure and PWV were unaltered ($p > 0.05$), and heart rate increased at 24h ($p < 0.05$). β -stiffness and pulse pressure increased in high fit participants, with no change in low fit (interaction, $p = 0.02$). Carotid wave reflections were reduced at 24h in both groups ($p < 0.05$). **CONCLUSION:** While neither fitness nor acute inflammation altered aortic stiffness, fitness may alter the sensitivity of the carotid artery to acute inflammation. Future research is necessary to examine the mechanism of these differential stiffness responses during acute inflammation and their implications for the cerebrovasculature.

	Low Fit		High Fit		p-value	Time	Group	Interaction
	Baseline	24h	Baseline	24h				
Inflammatory Markers	n=8		n=11					
CRP, mg/L*	1.51 ± 1.97	3.50 ± 3.69	0.70 ± 2.01	2.31 ± 3.95	<0.01	0.17	0.16	
IL-6, pg/mL	1.35 ± 0.46	2.60 ± 1.36	0.90 ± 0.49	2.22 ± 1.35	<0.01	0.27	0.80	
Arterial Stiffness	n=11		n=12					
PWV, m/s	5.0 ± 0.5	5.1 ± 0.3	5.1 ± 0.6	5.2 ± 0.3	0.30	0.54	1.00	
Beta-stiffness Index	4.5 ± 1.1	4.2 ± 1.0	4.0 ± 1.2	4.4 ± 1.4 ¹	0.74	0.63	0.02	
Hemo-dynamics	n=11		n=12					
Heart rate, bpm	60 ± 9	63 ± 7	50 ± 9	52 ± 8	0.02	0.01	0.58	
MAP, mmHg	92 ± 9	91 ± 8	92 ± 10	91 ± 7	0.22	0.96	0.59	
Carotid SBP, mmHg	107 ± 10	107 ± 9	107 ± 12	108 ± 11	0.99	0.94	0.89	
Carotid DBP, mmHg	71 ± 9	71 ± 8	71 ± 7	69 ± 6	0.31	0.59	0.27	
Carotid PP, mmHg	35 ± 7	33 ± 8	37 ± 8	39 ± 8	0.95	0.28	0.02	
Carotid Wave Reflection	n=11		n=11					
Forward wave, mmHg	33 ± 7	36 ± 13	34 ± 8	37 ± 11	0.09	0.69	0.58	
Reflected wave, mmHg	15 ± 3	13 ± 3	17 ± 4	17 ± 5	0.03	0.06	0.17	
Reflection index, a.u.	45 ± 8	39 ± 9	52 ± 12	47 ± 15	0.01	0.16	0.46	

Data mean ± standard deviation. ¹different from baseline, $p < 0.05$; CRP: C-reactive protein; DBP: diastolic blood pressure; IL-6: interleukin-6; MAP: mean arterial pressure; PWV: pulse wave velocity; SBP: systolic blood pressure; *analyzed using log-transformed values

2923 May 31 3:35 PM - 3:45 PM

The Influence Of Habitual Moderate-Vigorous Physical Activity Levels Versus Aerobic Fitness On Age-Related Endothelial Function

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(No relevant relationships reported)

Older adults (OA) have reduced vascular function, as assessed via flow-mediated dilation (FMD). However, it is unknown whether OA also have reduced low flow-mediated constrictor (L-FMC) responses than younger adults (YA). Further, we have previously demonstrated in OA that FMD responses are influenced more by habitual moderate-vigorous physical activity (MVPA) levels than aerobic fitness. It is unclear whether differences in habitual MVPA levels between YA and OA contribute to age-related declines in vascular function. **PURPOSE:** To test the hypotheses that: 1) YA would have superior brachial (BA) and popliteal (POP) FMD and L-FMC versus OA, and 2) that habitual MVPA levels would have a greater influence on endothelial function than age- and sex- aerobic fitness levels. **METHODS:** FMD and L-FMC were measured via duplex ultrasonography in 9 YA (5♀, 24±3 yr) and 9 OA (5♀, 68±4 yr) matched for body mass index, as well as age- and sex-related aerobic fitness categories (Poor-Excellent). L-FMC and FMD were quantified as the percent decrease in diameter (from baseline) during the last 30-s of a 5-min distal cuff occlusion and the percent increase in diameter during a 5-min post-cuff deflation period, respectively. Peak oxygen consumption was measured via indirect calorimetry using an incremental cycle ergometer test. MVPA was quantified over at least 7-d using a PiezoRx® physical activity monitor. **RESULTS:** Compared to OA, YA spent more time engaged in MVPA (426±178 vs. 260±91 min/week, $p = 0.03$), had higher BA-FMD (8.0±2.8 vs.

5.6±1.7%, $p = 0.04$) and POP-FMD (5.8±0.8 vs. 3.2±1.2%, $p < 0.01$). However, both groups had similar BA L-FMC (YA, -1.5±1.7 vs. OA, -0.8±1.1%, $p = 0.35$) and POP L-FMC responses (YA, -1.7±1.7 vs. OA, -0.6±1.9%, $p = 0.19$). MVPA was moderately correlated to BA-FMD ($r = 0.64$, $p < 0.01$) and POP-FMD ($r = 0.53$, $p = 0.03$). However, age-/sex-specific aerobic fitness categories were not correlated to BA-FMD ($p = 0.28$) or POP-FMD ($p = 0.30$). **CONCLUSION:** Based on age- and sex-related aerobic fitness categories, our results suggest that lower weekly MVPA time may have a greater influence on age-related declines in endothelial-dependent vasodilation than aerobic fitness status *per se*. However, neither BA nor POP endothelial-dependent vasoconstrictor responses were altered with aging.

2924 May 31 3:45 PM - 3:55 PM

Vascular Responses To Acute Exercise Following Catheterization-induced Damage In Humans.

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(No relevant relationships reported)

Diagnosis and treatment for coronary artery disease (CAD) includes angiography and/or percutaneous coronary intervention. However, catheterization may result in acute artery dysfunction and damage. Whilst exercise training is recommended for CAD patients following catheterization, it is not known if there is an acute period when exercise may be detrimental due to the prior catheterization. In support of this, animal models have demonstrated exercise-induced paradoxical vasoconstriction post catheterization. **PURPOSE:** This study, for first time in humans, aims to examine the vascular responses to acute exercise following catheterization. **METHODS:** 24 CAD patients (age: 66.1±7.1 years 31.9±7 kg/m², 83.3% males) undergoing transradial catheterization were assessed pre and 1 week post intervention. Endothelial function was assessed by radial artery (RA) flow mediated dilation (FMD) in both catheterized and control arm. Bilateral RA diameter and blood flow were assessed during handgrip exercise (HE), 3min stages at 5%, 10%, 15% of maximum voluntary contraction. Differences pre-post catheterization, between the catheterized and control arm, and between HE intensities were determined using mixed-linear model (SPSS 25). **RESULTS:** FMD was impaired in the catheterized arm [6.4% (5.0, 7.7) to 4.3% (2.9, 5.6)] but not in the control arm [6.5% (5.2, 7.8) to 6.5% (5.2, 7.9)], post catheterization (time*arm $p < 0.05$). There was a significant dose-dependent increase in blood flow with incremental exercise ($p < 0.001$). However, there was no difference in the exercise responses between arms or pre-post catheterization. Baseline RA diameter was higher in the catheterized arm post catheterization [0.28cm (0.26, 0.30) to 0.29 (0.28, 0.31) $p < 0.001$]. There was no dilation in the RA, in any condition, with increasing exercise intensity ($p > 0.05$). **CONCLUSION:** Endothelial function, assessed by FMD, was impaired 1 week post catheterization. Interestingly, the RA's ability to dilate with increased blood flow was not apparent pre or post catheterization. This suggests either that the artery does not dilate at these exercise intensities, or that these patients have an inherent impaired vasodilation. Further work is needed to examine this with different exercise intensities/modes and in different groups following catheterization.

2925 May 31 3:55 PM - 4:05 PM

Effect of Acute Hyperglycemia on Microvascular Hemodynamics and Tissue Oxygenation during Handgrip Exercise

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(No relevant relationships reported)

Acute hyperglycemia elicits endothelial dysfunction at rest through reactive oxygen species-mediated damage to the endothelial surface layer (ESL). The ESL is associated with many of the mechanisms responsible for appropriate microvascular adjustments to exercise. **PURPOSE:** We tested the hypotheses that acute hyperglycemia would lead to 1) an 'overshoot' in deoxygenated heme concentration (deoxy-[heme]) at exercise onset reflecting greater fractional oxygen extraction and 2) less increase in total heme concentration (total-[heme]) during exercise reflecting less increase in microvascular hematocrit. **METHODS:** Three healthy young men (26 ± 4 yr) completed a 10-minute constant-load handgrip exercise test at 40% of peak power (9.6 ± 0.7 W) under control conditions (CON) and during acute hyperglycemia (HGL), i.e., 90-minutes after oral consumption of a 10 ounce solution containing 75g of dextrose. Near-infrared spectroscopy was used to measure deoxy-[heme] and total-[heme] of the flexor digitorum superficialis (FDS) continuously at rest and during exercise. **RESULTS:** Deoxy-[heme]_{CON} and total-[heme]_{CON} were significantly greater during exercise (189 ± 28 μM and 341 ± 34 μM, respectively) compared to rest (164 ± 13 μM and 302 ± 17 μM, respectively) ($p < 0.01$). Deoxy-[heme]_{HGL} and total-[heme]_{HGL} were significantly greater during exercise (181 ± 14 μM and 322 ± 27 μM, respectively)

compared to rest ($168 \pm 26 \mu\text{M}$ and $313 \pm 16 \mu\text{M}$, respectively) ($p < 0.01$). As a percent of steady-state (SS) values, deoxy-[heme]_{CON} was greater than deoxy-[heme]_{HGL} from 35s until 75s of exercise ($p < 0.05$). Deoxy-[heme]_{CON} and deoxy-[heme]_{HGL} were not different at SS. Total-[heme]_{HGL} was significantly lower than total-[heme]_{CON} at SS ($p < 0.01$). **CONCLUSION:** These data suggest that acute hyperglycemia leads to 1) increased fractional oxygen extraction at the onset of moderate-intensity handgrip exercise reflecting impaired perfusive oxygen delivery and 2) less of an increase in microvascular hematocrit reflecting impaired diffusive oxygen conductance during exercise steady state.

2926 May 31 4:05 PM - 4:15 PM

A Longitudinal Investigation On The Effect Of Age And Sex On Flow-mediated Dilatation In Children

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Flow-mediated dilation (FMD) is a non-invasive assessment of arterial endothelial function. Previous cross-sectional analysis suggests resting arterial diameter and FMD increase throughout childhood, with no sex-based differences in FMD until girls exceed that of boys at 17-18 years old. No previous investigations included longitudinal examinations of the change in FMD over time, between boys and girls. **PURPOSE:** To assess the effects of age and sex on arterial diameters and FMD in school-aged children annually over a 3-year period. We hypothesized that resting arterial diameters will be larger in boys compared to girls at every time point and will increase each year, in both sexes. We also hypothesized that there would be no difference in FMD in girls versus boys over all 3 years as all of the children were tested younger than 17-18 years. **METHODS:** This observational study assessed 100 participants initially aged 8.5 ± 1.1 years, (range 6-10 years, 53 boys) annually for 3 years from the School-age Kids' health from early Investment in Physical activity (SKIP) study. The primary outcome was brachial artery FMD, which was measured using ultrasound technology. **RESULTS:** One-way repeated measures ANOVA was followed up with paired-sample t-test to compare mean differences between years. Two-way repeated measures ANOVA with sex as the between subjects' factor was used to determine interaction effects. Resting arterial diameter was largest across the cohort at year 3 ($2.8 \pm 0.28\text{mm}$) compared to year 1 ($2.7 \pm 0.30\text{mm}$, $p < 0.001$) and year 2 ($2.7 \pm 0.30\text{mm}$, $p < 0.001$). Contrary to our hypothesis, allometrically scaled FMD for boys was larger than girls (boys: 6.4 ± 3.09 , girls: $6.2 \pm 3.17\text{mm}$, $p = 0.002$) and no time differences were observed between years 1, 2 and 3 (year 1: 6.2 ± 3.11 , year 2: 6.2 ± 3.14 , year 3: $6.35 \pm 3.15\%$, $p = 0.67$). On average, boys had a larger resting arterial diameter compared to girls (2.8 ± 0.3 , girls: 2.6 ± 0.24 , $p = 0.001$). **CONCLUSION:** Differences observed in resting arterial diameter are driven by year 3 data and allometrically scaled FMD was larger in boys compared to girls, which may be explained by boys having larger resting arterial diameters compared to girls, and may also be accounted for by rapidly changing growth patterns in children. Funded by CIHR.

2927 May 31 4:15 PM - 4:25 PM

HIITing The Brain Enhances Cerebrovascular Shear Stress; The Link To Neuroprotection?

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High-intensity interval exercise training (HIIT) is considered a more time-efficient alternative to moderate-intensity continuous training (MICT) that can optimize metabolic and cardiovascular health though its impact on the cerebrovasculature is unknown.

PURPOSE: Pilot examination to characterise local cerebrovascular shear stress responses during an acute bout of HIIT and MICT.

METHODS: Following ethics approval, 2 physically-active males (21-23 yrs) were randomly assigned to HIIT or MICT (semi-recumbent cycling) preceded by a standardized warm-up and separated by sufficient time to allow for full haemodynamic recovery. During HIIT, subjects performed 3 intervals (each consisting of 2 mins at 60W and 2 mins at 100W) and for MICT, isovolume work performed continuously at 80W for 12 mins. Diameter, blood flow and shear rate in the internal carotid artery (ICA) were measured using Doppler ultrasound at rest and averaged over the final 4 min of HIIT and MICT. The end tidal partial pressure of carbon dioxide (PET_{CO2}), heart rate (HR), mean arterial pressure (MAP) and oxygen uptake (V_{O2}) were recorded continuously photoplethysmography and respiratory gas analysis.

RESULTS: Exercise-induced increases in HR, MAP and V_{O2} were comparable between HIIT and MICT and were accompanied by an equivalent, progressive

reduction in PET_{CO2}. In contrast, ICA diameter decreased more markedly during HIIT [Δ (exercise minus rest) HIIT: -0.15 mm vs. Δ MICT: -0.01 mm] with increased velocity (Δ HIIT: $7.75 \text{ vs. } \Delta$ MICT: $3.39 \text{ cm}\cdot\text{s}^{-1}$) and corresponding elevation in shear rate (Δ HIIT: $38 \text{ vs. } \Delta$ MICT: 9 s^{-1}).

CONCLUSIONS: These findings, albeit proof-of-concept, provide preliminary evidence highlighting a fourfold greater elevation in local cerebrovascular shear stress during HIIT compared to an equivalent volume of MICT. This is primarily attributable to local vasoconstriction that cannot be explained by hyperventilation-induced hypocapnia though likely represents a functional response coupling cerebral O₂ delivery to demand. To what extent repeated exposure to the intermittency of HIIT-induced cerebrovascular shear stress confers enhanced neuroprotection in the long-term is currently under investigation.

Supported by a Royal Society Research Fellowship (#WM 1000707)

2928 May 31 4:25 PM - 4:35 PM

Impairments In Lower Limb Microvascular Function Associated With Cycle Phases In Young Healthy Women.

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Impairments in lower limb microvascular function associated with cycle phases in young healthy women.

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University of Calgary, Faculty of Kinesiology.

Purpose: Differences in women's hormone concentrations throughout the menstrual cycle affects vascular responsiveness. Previous investigations have shown that these changes can be modulated by regular use of oral contraceptives. However, most of these studies only assessed changes in vascular function at the upper limb conduit artery level. This study investigated whether vascular function at the lower limb microvasculature of healthy young women might be affected by the phase of the menstrual cycle. **Methods:** 14 young (25 ± 5 years of age) physically active women participated in the study. The participants were assigned to two groups of seven participants each according to oral contraceptive use: non-contraceptive group (women who did not use any contraceptive within the last two years prior to the intervention - NCP) and oral contraceptive group (seven women who used oral contraceptive regularly for at least two years prior to the intervention - OCP). The participants underwent two lower limb vascular occlusion tests (5 min of baseline, 5 min of occlusion, and 8 min following cuff release) in two different phases of the menstrual cycle (follicular and luteal phase). Microvascular responsiveness was assessed by the percent of change of the NIRS-derived muscle oxygen saturation (StO₂) reperfusion slope (%/sec) of the tibialis anterior muscle. **Results:** There was no difference in the reperfusion slope of the NCP group between the follicular ($1.18 \pm 0.5 \%$ /sec) and luteal ($1.01 \pm 0.3 \%$ /sec) phases. The reperfusion slope of the OCP group was significantly steeper in the follicular ($0.85 \pm 0.2 \%$ /sec) compared to the luteal phase ($0.63 \pm 0.2 \%$ /sec). **Conclusion:** Use of oral contraceptive is associated with reduced microvascular function in the luteal phase in young physically active women.

F-54 Free Communication/Poster - Youth

Friday, May 31, 2019, 1:00 PM - 6:00 PM

Room: CC-Hall WA2

2955 Board #1 May 31 2:00 PM - 3:30 PM

Vertical Jump and Agility Performance Improves After 8-week Conditioning Program in Youth Female Volleyball Athletes

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Volleyball athletes must employ specific conditioning exercises with high levels of force, high rates of speed, and quick changes-of-direction. Volleyball sport specific vertical jumping ability can be assessed through various types of vertical jumping protocols such as the block vertical jump (BVJ), the countermovement vertical jump (CMJ), and the two-step approach vertical jump (AVJ). Sport specific agility testing for volleyball can be assessed with a 9-cone (9C) test to determine the athletes' ability to generate quick and accurate movement with change-of-direction and/or acceleration and deceleration.

PURPOSE: The purpose of this study was to determine if an 8-week combined high intensity interval training and plyometric (HIIT-PT) conditioning program improves

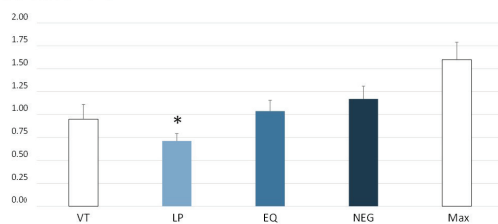
performance on three vertical jump protocols and agility time in youth female volleyball athletes. **METHODS:** Eleven female youth volleyball players (ages: 15±2.7 yrs.; height: 68.2±1.3 in; mass: 143.5±14.8 lbs) completed an 8-week summer HIIT-PT conditioning program. The 8-week summer conditioning program consisted of combined 2 x week (60 min each) high intensity interval exercises and 2 x week (60 min each) plyometric exercises. Three vertical jump protocols (BVJ, CMJ, AVJ) and an agility test (9C) were administered at the beginning of the first week and at the end of week 8 of the summer HIIT-PT conditioning program.

RESULTS: Prior to data comparisons, a Kolmogorov-Smirnov test of normality was performed for each of the four variables and determined to be from a normal distribution (BVJ: $p = .096$, CMJ: $p = .200$, AVJ: $p = .187$, 9C: $p = .127$). A series of paired sample t-tests were performed to compare pretest and posttest vertical jump heights (inches) and agility times (seconds). All three vertical jump protocols significantly increased (BVJ: 14.6 vs 16.1, $p.000$; CMJ: 17.3 vs 18.4, $p.000$; AVJ: 21.0 vs 23.1, $p.001$) and agility times decreased (9C: 25.3 vs 23.6, $p.000$) following the 8-week HIIT-PT summer conditioning program. **CONCLUSION:** Results from this study indicate that employing an 8-week combined HIIT-PT conditioning program may improve jumping and change-of-direction outcomes in youth female volleyball athletes.

2956 Board #2 May 31 2:00 PM - 3:30 PM
The Talk as a Measure of Exercise Intensity in Children
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Purpose: The purpose of this study was to determine if the Talk Test (TT) is a valid measure of ventilatory threshold (VT) in children. **Methods:** Thirteen healthy children (age 8-12 y) performed maximal incremental exercise with respiratory gas exchange and with the TT. During the last 30 seconds of each stage they read a passage containing 100-106 words and were asked if they could "speak comfortably". Gas exchange was measured and was used to identify VT. Comparison measurements occurred at the last positive (LP), equivocal (EQ), and negative (NEG) stages of the TT. **Results:** There were significant ($p<0.05$) differences in VO_2 (VT vs LP and NEG stages; 0.95 ± 0.580 vs $0.71\pm0.284^*$ and $1.17\pm0.504^*$), HR (VT vs LP, EQ, and NEG stages; $136.0\pm19.0^*$ vs $126.3\pm12.91^*$ and $152.5\pm15.40^*$ and $160.5\pm16.28^*$), and RPE (VT vs LP and NEG stages; 5.2 ± 2.70 vs $3.6\pm1.32^*$ and $7.2\pm1.09^*$). **Conclusion:** It was concluded that the EQ stage of the TT is a valid measure of the exercise intensity at VT in children, as it is already known to be in adults.

Results- VO_2



2957 Board #3 May 31 2:00 PM - 3:30 PM
Predicting Changes in Adolescent Muscle Mass with Field Testing
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With physical training and normal adolescent growth, gains in lean muscle mass can be seen among the healthy adolescent population. Assessing these gains is crucial to monitoring and adjusting training protocols and helping with client motivation and investment. However, the ability of common field tests to accurately predict changes in muscle mass among this population has yet to be proven.

PURPOSE: The purpose of this study was to assess the ability of the standing long jump (SLJ) and 90° push-up (PU) test to accurately predict changes in lean mass (ΔLM) among healthy adolescents aged 12-18 years.

METHODS: Forty-five healthy adolescents completed the standing long jump, 90° push-up test, and a full-body dual energy x-ray absorptiometry (DEXA) scan twice

with 7-10 months between test sessions. The difference in each outcome was calculated and used to indicate change. Field test predictive ability was evaluated using multiple regression and accounted for age (yrs), sex (female = 0, male = 1), height (cm), body mass, and pubertal stage using the Pubertal Development Scale (PDS).

RESULTS: A mean change of 2198.82 g of lean mass (range = -1193.60, 7307.70; SD = 1816.67) was shown using DEXA. The SLJ and PU had a mean change of 5.11 cm (range = -36.00, 35.70; SD = 16.40) and 0 repetitions (range = -13, 11; SD = 5.30) respectively. Both ΔSLJ ($r = .340, p = .011$) and ΔPU ($r = .315, p = .018$) had significant moderate relationships to ΔLM . The inclusion of ΔSLJ and ΔPU in the model accounted for an additional 8.8% of the variability ($R^2 = .551$ from .463) and 4.2% ($R^2 = .593$) respectively. The overall model explained 59.3% of the variability in lean mass change and resulted in the following predictive equation: $\Delta LM = 1237.59 + (-630.44 \times \text{age}) + (-169.34 \times \text{PDS}) + (847.31 \times \text{gender}) + (33.89 \times \text{height}) + (199.04 \times \text{BMI}) + (29.07 \times \Delta SLJ) + (73.13 \times \Delta PU)$

CONCLUSIONS: Along with anthropometric developmental factors, the SLJ and PU tests can be used to estimate changes in lean muscle mass. However, these factors only account for approximately 60% of the change in lean muscle mass leaving the remaining 40% attributable to other (neural, mechanical, motivational) factors. Nevertheless, this prediction equation can assist in monitoring changes in lean muscle mass during adolescence.

2958 Board #4 May 31 2:00 PM - 3:30 PM
Relationship Between Physical Activity and Motor Skills in 3-5 year olds: National Youth Fitness Survey
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PURPOSE: The purpose of this study was to examine what kind of physical activity would have a positive relationship with motor skills in children through secondary data analysis.

METHODS: Data from children 3-5 years old (N=352, 179 males) who participated in the National Youth Fitness Survey (2012) were used. Included in this study were demographics, anthropometrics, physical activity questionnaire by parent report, and motor skill score determined by Test of Gross Motor Development-2nd Edition. Multiple regression was conducted to examine the relationship between physical activity and motor skills controlling for sex, race, and parent's socioeconomic status.

RESULTS: The most commonly reported activities were running (43%), playing outdoor games (35%), and riding a bike (34%). Motor skills standard scores were locomotor (Mean (SE)=(9.99 (.16)), object control (Mean (SE)=8.52 (0.14)), and gross motor skill (Mean (SE)=95.57 (.68)). Participation in the following activities were positively related to gross motor skill score: riding a bike (β (SE)=5.27 (2.02), $p=0.02$), scooter riding (β (SE)=9.83 (2.59), $p=0.002$), swimming (β (SE)=4.01 (1.17), $p=0.004$), and jumping on a trampoline (β (SE) = 7.45 (3.09), $p=0.03$). With the exception of riding a bike the activities positively related to gross motor skill score had a reported range of participation between 7-12%.

CONCLUSIONS: The key findings of this study indicated that participation in specific physical activities were related to gross motor skill score in preschool aged children. Further, it showed that with the exception of riding a bike the activities that the children participated in the most were not the same as those activities that were positively related to their gross motor skill score.

2959 Board #5 May 31 2:00 PM - 3:30 PM
Tri-Ponderal Mass Index and Fitnessgram BMI Classification In Sixth-grade Children
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To classify the health status of children, criterion standards for body composition and body mass index (BMI) have been established by FITNESSGRAM according to gender and age. Standards for aerobic capacity (AC) have also been established to assess cardiorespiratory function. Tri-Ponderal Mass Index (TMI) has been shown to better classify overweight and obesity than BMI in youth. **PURPOSE:** The purpose of this study was to determine the association between TMI and FITNESSGRAM BMI classification in sixth-grade children. **METHODS:** Subjects were 439 sixth-grade boys and girls, ages 11-13, who completed each of the FITNESSGRAM components as a part of their yearly assessment. In addition to height and weight, subjects' AC was determined from one-mile run/walk times, age, gender and BMI. 43% percent of these students were classified within the Healthy Fitness Zone (HFZ) for BMI. 42% percent of these students were classified as High Risk for BMI. **RESULTS:** The correlation

between TMI and BMI was .98, and the correlation between BMI and AC was -.82. The correlation between TMI and AC was -.80. Receiver Operating Characteristic (ROC) analysis indicated that a TMI of 13.97 represents the best cut-off score for classifying girls within the HFZ for BMI, with 94% classified correctly, and AUC = .98. Also, a TMI of 13.41 represents the best cut-off score for classifying boys within the HFZ for BMI, with 94% classified correctly, and AUC = .98. For determining High Risk classification for BMI, a TMI of 14.90 represents the best cut-off score for classifying girls as High Risk for BMI, with 96% classified correctly, and AUC = .99. Also, a TMI of 15.24 represents the best cut-off score for classifying boys as High Risk for BMI, with 94% classified correctly, and AUC = .98. **CONCLUSIONS:** TMI is strongly associated with classification according to FITNESSGRAM BMI standards in sixth-grade children. These data suggest that a TMI of 13.97 for girls and 13.41 for boys are the best criteria for HFZ classification for FITNESSGRAM BMI. Also, a TMI of 14.90 for girls and 15.24 for boys are the best criteria for High Risk classification for FITNESSGRAM BMI. TMI is a substantial factor in determining overweight and obesity, and body size has been shown to be an important health-related outcome, especially in youth.

2960 Board #6 May 31 2:00 PM - 3:30 PM

A Comparison Of Health-related Fitness Variables Between Youths In Singapore And Taipei

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Health-related fitness (HRF) variables may reduce cardiovascular risk factors if detected early in youths. A comparison between two similar high-density cities may reveal more information on their health status. **PURPOSE:** To compare HRF variables between youths in Singapore (SGP) and Taipei (TP).

METHODS: A total of 1559 youths from SGP (age: 13.49 ± 1.21 years, height: 159.76 ± 8.94 cm, weight: 51.91 ± 13.38 kg, Body Fat (BF) %: 21.51 ± 10.25 %) and 1620 youths from TP (age: 13.84 ± 0.91 years, height: 160.89 ± 7.86 cm, weight: 55.57 ± 13.35 kg, BF%: 23.29 ± 10.30 %) participated in this study. Body Mass Index (BMI) was calculated and BF% was measured by bio-electric impedance analysis. Aerobic fitness, lower limb flexibility, arm strength, and abdominal endurance were tested using the 15m youth Progressive Aerobic Cardiovascular Endurance Run (PACER) test, one-legged sit-and-reach (SRT), handgrip strength (HS) test, and 1-minute sit-up test (SUT) respectively.

RESULTS: Higher percentage of youths from TP were in the normal (TP: 54.88%, SGP: 46.89%) and overweight (TP: 18.15%, SGP: 12.70%) BMI range, while there was a higher percentage of underweight youths in SGP (40.41%) compared to TP (26.98%). Significant differences were found between SGP and TP for height (SGP: 159.76 ± 8.94 cm, TP: 160.89 ± 7.86 cm, $p < 0.0005$), weight (SGP: 51.91 ± 13.38 kg, TP: 55.57 ± 13.35 kg), BMI (SGP: 20.19 ± 4.21 kg·m⁻², TP: 21.35 ± 4.28 kg·m⁻², $p < 0.0005$), BF% (SGP: 21.51 ± 10.25 %, TP: 23.29 ± 10.30 %, $p < 0.0005$), SRT (SGP: 54.14 ± 10.15 cm, TP: 51.78 ± 11.29 cm, $p < 0.0005$), SUT (SGP: 38.94 ± 11.92, TP: 33.03 ± 9.71, $p < 0.0005$) and PACER (SGP: 40.93 ± 23.90 laps, TP: 37.75 ± 18.86 laps, $p < 0.0005$). No significant difference was found in HS between youths in both countries (SGP: 25.18 ± 7.77 kg, TP: 25.45 ± 7.33 kg, $p = 0.32$), with SGP having a lower obesity rate (SGP: 12.7%, TP: 18.15%).

CONCLUSIONS: Higher BMI and BF% values were found in TP as compared to SGP. While youths in both countries had similar arm strength, SGP youths had higher abdominal endurance, better flexibility and higher aerobically fitness as compared to TP youths. Youths from both countries have differences even with similar population density and should maintain their fitness health status through physical activities as this will help to reduce the risk of cardiovascular diseases in the future.

2961 Board #7 May 31 2:00 PM - 3:30 PM

High Intensity Interval or Moderate Continuous Training in Health Indicators of Adolescents with Central Obesity

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PURPOSE: To evaluate the effects of HIIT and moderate intensity continuous training (MICT) on health indicators from adolescents with central obese.

METHODS: This is a randomized clinical trial, with three evaluations: baseline, after 8 and after 16 weeks. The sample was composed by 42 participants, randomized in two groups: HIIT (n = 22) and a MICT (n = 20). After 16 weeks of training (3 sessions/

week), 34 adolescents finished the program (HIIT, n = 21; MICT, n = 13). The HIIT group performed different models of interval training, progressively organized, and the MICT trained in a fixed intensity from 60 to 80% of HRmax. Anthropometrical data ([BMI, Waist Circumference [WC], Height Waist Ratio [HWR], Body Fat Percentage [%BF]), cardiorespiratory fitness (CRF), blood pressure (systolic and diastolic) and metabolic profile (fasting blood glucose [FBG], high density lipoproteins [HDL-C], low density lipoproteins [LDL-C], total cholesterol, non-HDL cholesterol and triglycerides [TG]) were analyzed.

RESULTS: Sixteen weeks of aerobic training resulted in significant reductions in BMI (HIIT = -4.5% [ES = -0.26] vs MICT = -3.9% [ES = -0.24]), WC (HIIT = -6.9% [ES = -0.64] vs MICT = -6.6% [ES = -0.61]), HWR (HIIT = -10.5% [ES = -1.00] vs MICT = -5.2% [ES = -0.50]), %BF (HIIT = -14.3% [ES = -0.59] vs MICT = -9.8% [ES = -0.40]), FBG (HIIT = -6.1% [ES = -0.65] vs MICT = -11.1% [ES = -0.89]) and non HDL cholesterol (HIIT = -14.5% [ES = -0.44] vs MICT = -11.0% [ES = -0.37]), and increased CRF (HIIT = 13.0% [ES = 1.77] vs MICT = 10.3% [ES = 0.76]). Only HIIT improved diastolic blood pressure (-17.0%, ES=-0.87), LDL-C (-13.3%, ES=-0.34) and total cholesterol (-11.9%, ES = -0.47), but only MICT changed positively TG (-23.4%, ES = -0.44). No changes were observed for systolic blood pressure and HDL-C. No differences were found in all variables between groups. Relating to inadequacy cases, both groups changed TG (HIIT = 20 to 11, MICT 13 to 6), but only HIIT decreased the number of adolescents in inadequacy from CRF and blood pressure (from 14 to 3). **CONCLUSIONS:** 16 weeks of HIIT or MICT positively impact anthropometrical variables, metabolic profile and CRF in obese adolescents.

2962 Board #8 May 31 2:00 PM - 3:30 PM

Physiological And Anthropometric Profiles Of Elite Teenage Cyclists In The United States

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(No relevant relationships reported)

PURPOSE: Maximal oxygen consumption (VO_{2max}), power output at VO_{2max} (W_{max}), lactate threshold (LT), and several anthropometric characteristics are related to elite cycling performance in adults. These factors may change during adolescent development, yet little is known about how values among teenage cyclists compare to their adult counterparts. Low bone mineral density (BMD) has also been reported in competitive adult road cyclists versus recreationally active controls, but BMD in younger cyclists has not been thoroughly investigated.

METHODS: We examined variables from a graded exercise test (LT, VO_{2max} , W_{max}) and anthropometric characteristics (height, weight, % fat) in 8 elite male teenage cyclists (16.8 ± 1.4 y) and compared them to junior Italian cyclists and professional cyclists in the literature. BMD was also measured via DXA, and compared to age-specific norms.

RESULTS: Our cohort possessed comparable absolute/relative VO_{2max} (4.6 ± 0.7 L/min; 74.9 ± 6.6 mL/kg/min) and W_{max} (375 ± 67 W; 6.1 ± 0.7 W/kg) values to previously studied junior Italian cyclists, with inter-study differences potentially explained by different rider specializations and competitive-levels, and methodological differences between studies. Our teenaged cyclists were smaller (176 ± 6 cm), lighter (61.5 ± 5.0 kg), and had lower absolute VO_{2max} and W_{max} than professional adult cyclists in prior studies. Total BMD values (1.142 ± 0.088 g/cm²), and values for the spine, femur, and femoral neck were all > 50th percentile for age/sex.

CONCLUSIONS: The largest differences in exercise responses between competitive teenage and adult cyclists were in absolute aerobic power (rather than per kgBW), which would presumably diminish with any further increases in size/mass with maturation in young cyclists. The healthy BMD levels in this group could be related to age, or to mountain biking and other cross-training completed by this group of athletes.

2963 Board #9 May 31 2:00 PM - 3:30 PM

The Chinese Assessment Of Motor Quotient: Methods For Children In 7 To 9 Years Old

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PURPOSE: Motor quotient is described as an index of the present rate of development and, possibly, predicts future development. As such, it is expected that those who have greater motor quotient would be more likely to obtain the health benefits offered by habitual physical activity. A theoretical model and assessment frame, the Chinese

Assessment of Motor Quotient (CAMQ), for the assessment of childhood motor quotient had been proposed in theory, but validity data were lacking. The purpose of this study was to explore validity evidence for the CAMQ among children 7 to 9 years.

METHODS: The CAMQ validity was evaluated through two analyses that utilized cross-sectional data obtained through local schools in Chongqing, China. A confirmatory factor analysis (CFA) compared the data to the theoretical model. Patterns of association between age and gender and the CAMQ total and domain scores were examined using regression models. The CAMQ was completed by 572 children (53 % male) in 7 to 9 years (mean 8.2 years), with all guardian of children approached agreeing to participate.

RESULTS: The CAMQ model included three domains: physical competence (fitness), athletic performance (motor skill) and motor behavior (motivation). Using CFA analyzed the validity data 557 children with complete raw scores. The results showed the $\chi^2/df=2.79$, GFI = 0.96, CFI=0.95, NFI=0.93, TLI= 0.95, RMSEA=0.05. Regression models showed that interpretive categories, developed from age and gender-adjusted normative data, were not associated with age indicating that the CAMQ is suitable for use across this age range. Children's gender was associated with physical competence and athletic performance domain scores, indicating that further research is required regarding the gender adjustment of the raw CAMQ scores.

CONCLUSIONS: The CAMQ offers a comprehensive assessment of physical competence, athletic performance, and motor behavior as components of children motor quotient (7 to 9 years). Monitoring of these measures enhances our understanding of children's motor quotient and assists with the identification of areas where additional supports are required.

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2964 Board #10 May 31 2:00 PM - 3:30 PM
Comparison Of Adolescents' Fitness Between Hong Kong, Taipei And Shanghai

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Poor health status in childhood has been documented to persist into adulthood, reducing quality of life. **PURPOSE:** To understand the fitness levels in adolescents between three countries that share similarities in race and culture.

METHODS: A total of 4736 healthy adolescents (age: 13.79 ± 0.93yrs, height: 162 ± 8.21cm, weight: 54.79 ± 12.82kg, BF%: 22.25 ± 10.00%) were recruited for the intervention from Shanghai (SH) (n=1586), Hong Kong (HK) (n=1530) and Taipei (TP) (n=1620). Anthropometric measurements were taken on the same day. Participants took their percent body fat (BF%) with a bio-impedance analysis, and handgrip strength test (HGS) with a hand dynamometer. Flexibility, abdominal muscular strength, and cardiovascular fitness (CF) were measured with one-legged sit and reach test (SRT), one-minute sit-up test, and 15m PACER test respectively.

RESULTS: One-way ANOVA showed significant differences between the three countries for height (SH: 164.4 ± 7.83cm, HK: 160.7 ± 8.40cm, TP: 160.89 ± 7.86cm; p < 0.0005), weight (SH: 56.48 ± 12.24kg, HK: 52.2 ± 12.44kg, TP: 55.58 ± 13.35kg; p < 0.0005), BF% (SH: 22.23 ± 9.64%, HK: 21.16 ± 10.00%, TP: 23.3 ± 10.30%; p < 0.0005), HGS (SH: 55.53 ± 14.09kg, HK: 51.94 ± 13.90kg, TP: 50.86 ± 14.67kg; p < 0.0005), abdominal muscular strength (SH: 36.20 ± 9.24 reps, HK: 30.56 ± 10.14 reps, TP: 33.03 ± 9.71 reps; p < 0.0005) and CF (SH: 40.11 ± 16.05 laps, HK: 35.48 ± 18.44 laps, TP: 37.77 ± 18.86 laps; p < 0.0005). Kruskal-Wallis Test analyzed results of SRT showed significant difference between the three countries (SH: 54.96 ± 9.70cm, HK: 49.61 ± 12.03cm, TP: 51.79 ± 11.29cm; p < 0.0005). Significant differences were observed in the inverse relationship between BF% and CF (r = -0.46; p < 0.0005), BF% and abdominal strength (r = -0.30; p < 0.0005) and a positive linear relationship between abdominal strength and CF (r = 0.54; p < 0.0005).

CONCLUSIONS: Adolescents from Shanghai, Hong Kong and Taipei are vastly different in all health-related fitness variables which could be attributed to environmental and social factors. However, they are generally healthy and fit with good BF% level and CF. Adolescents should continue to be exposed to regular physical activities to maintain and improve fitness status. This would prevent unwanted cardiovascular diseases in future which would lead to higher quality of life.

2965 Board #11 May 31 2:00 PM - 3:30 PM

The Effects of Plyometric or Combined Training on Kicking Time in Teenager Taekwondo Athletes

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Purpose: To compare the effectiveness of a general plyometric training (GP) and a GP plus transfer exercises (GP + TE) on kicking time (KT) in cadet and junior taekwondo athletes. **Methodology:** Volunteers were 33 athletes between 12 and 17 years old and taekwondo practice experience of 3.0 ± 1.2 yr. Participants were randomly assigned to GP, GP+TE, or a control (CON) group, and underwent a 3-week intervention, training 3 times per week. The training session was divided into a stretch, a general warm-up and the treatment phase, according to the specifications for each group, each lasting approximately 10-min. Following the intervention, the athletes completed their regular training. The exercises performed by the participants only differed in the 10-min lasting the intervention. The GP group completed 8 sets of 6 repetitions of countermovement jumps (CMJ), the GP+TE completed the same exercise exercises as the GP group immediately followed by a taekwondo kicking technique on a kicking pad. The CON group only performed static stretching. A Fitlight Trainer System was used to measure before and after KT performance. For the KT drill, the athlete was instructed to use the dominant leg in a circular kick ("Bandal Chagui") and in a frontal kick ("Miroto Chagui"). The front leg was used for both kicks, and the first sensor of the measurement system was located at ankle height to start the time and a second sensor was located at the height of the performer's navel to stop the time and register the KT. A 3 x 2 (groups x measurements) general linear model ANOVA was used to analyze KT. **Results:** No significant interaction or main effects were shown on circular kick KT scores (p > 0.05). A significant measurement main effect was found on frontal kick KT (F = 4.743, Pre = 0.354 ± 0.004s vs. Post = 0.344 ± 0.004s; p < 0.037) regardless of the experimental group. **Conclusion:** The GP and the GP+TE training elicited similar improvements in frontal kick KT in cadet and junior taekwondo athletes. Circular kick KT was unaffected by training.

2966 Board #12 May 31 2:00 PM - 3:30 PM

Which Is Better In Physical fitness Between Obese And Lean Young Children?

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[Introduction] The number of children being diagnosed with infant metabolic syndrome is also on the rise. Moreover, an increase in the prevalence of lean children is also beginning to be seen in recent years.

[Purpose] This study aims to examine the characteristic of physical fitness according to level of obesity index among young children from the age of three to six by using a large-scale dataset.

[Methods] The subjects included 5640 young children (2840 boys and 2800 girls). We administered physical fitness tests comprising seven types of exercises (grip strength, standing long jump, softball throw, 25-m run, side-step, upright hand standing time, and sitting trunk flexion) to gauge the children's state of physical fitness. A T-score was calculated on the basis of the mean and standard deviation according to sex and age, and this score was used as an individual score of physical fitness. Children were divided into seven groups on the basis of the obesity index (~15%, -15%~-5%, -5%~0%, 0%~+5%, +5%~+15%, +15%~+20%, +20%~). Further, the extent of differences among children with different obesity index was examined for each type of exercise. To conduct a statistical analysis of the data, one-way ANOVA and multiple comparisons (Tukey's HSD test) were employed.

[Results]The analysis revealed a significant difference among the groups for all the exercises. In the 25-m run, standing long jump, and upright hand standing time, "+20% or more" group had the lowest scores. In the softball throw, sitting trunk flexion, side-step, grip strength, and overall physical fitness, "-15% or less" group scored the lowest.

[Discussion]The physical fitness of obese (+20%~) and lean (~15%) children was found to be poor. In the lean children, the reason is thought to be low muscle mass and underdevelopment due to a lack of physical activity. Moreover, their low expenditure of energy is suspected to result in a low appetite, which can lead to poor nutrition. On the other hand, the severely obese children (+20 or more) may be undeveloped due to their lack of physical activity and excessive and imbalanced diet. However, the mildly obese (up to +15%) are not physically underdeveloped at infancy. They do not need extreme obesity prevention measures, and it is important for them to acquire a "play a lot, eat a lot" lifestyle.

- 2967** Board #13 May 31 2:00 PM - 3:30 PM
Unit Characteristics Of Physical Activity Intensity In Physical Education Lesson Among Elementary School
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 (No relevant relationships reported)

[PURPOSE] This study aimed to measure the intensity of a given physical exercise during an elementary school level physical education class.
 [METHODS] The subjects of this study were 28 elementary school children (16 boys and 12 girls) in the 5th grade. To measure exercise intensity, a Lifecorder GS (manufactured by SUZUKEN Co., Ltd) was used. There were five target units of exercise including long jump, expression, tag rugby, hurdle run, and Tee-ball. The length of each class as well as the proportion of each exercise were measured according to the period recording method (Instruction, Management, Motor learning, Cognitive learning). To assess the difference in intensity across each of the five units of exercise, the coefficient of variation (CV) was calculated. A corresponding one-way analysis of variance and a multiple comparison test were used for clarification. In addition, when Bartlett's test was applied and a significant main effect was observed, a test of equal variances between the two groups was used.
 [RESULTS] Regarding individual differences in exercise intensity, significant differences were found between tag rugby and both tee balls and long jump, as well as between expression and long jump. The coefficient of variation was calculated as follows: expression (29%), tag rugby (27%), Tee-ball (25%), hurdle run (18%), long jump (17%). In addition, differences in units were significantly higher in exercise intensity between hurdle run and tag rugby, expression and tee ball, as well as between long jump and Tee-ball.
 [CONCLUSIONS] In physical education classes, there is a difference in physical activity among the five exercises measured, and it is presumed that the magnitude of these differences varies depending on the individual exercise. That such individual differences exist in physical education classes is, in itself, not a problem. However, this would become undesirable in any situation in which the difference becomes large, thus failing to ensure consistency in the amount of physical activity and potentially resulting in children performing less physical activity. In order to secure a consistent level of activity intensity in physical education lessons, it is necessary to take measures for children with less physical activity.

- 2968** Board #14 May 31 2:00 PM - 3:30 PM
Physical Fitness Level And Personality Traits At Age Six: Longitudinal Relationship With The Big Five
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 (No relevant relationships reported)

[PURPOSE] To examine the longitudinal change of the Big Five factors of personality in children aged six years with high and low physical fitness (PF) levels.
 [METHODS] The participants were 186 six-year-old children (87 boys, 99 girls). To measure PF level, PF tests for young children were conducted. Principal component analysis was performed for the seven PF test parameters, and the first principal component scores were converted into T scores classified by sex and age (categories spanning 0.5 years), which were treated as overall PF scores. To investigate children's personalities with regard to the Big Five factors of personality, a questionnaire survey was administered to the children's teachers. The five main factors of personality traits were "openness(O)," "conscientiousness(C)," "neuroticism(N)," "extraversion(E)," and "agreeableness(A)." Based on the overall PF score at age six we divided the participants into a higher PF level group (upper 25%, 47 participants) and lower PF level group (lower 25%, 47 participants). We conducted a two-factor analysis of variance (PF level × age) that corresponded to only one factor concerning the evaluation. When a significant main effect was observed, multiple comparison test (Tukey's HSD) was conducted. The statistical significance level of this study was less than 5%.
 [RESULTS] "O" was significantly higher in the higher PF level group at ages five and six. "C" and "E" were significantly higher in the higher PF level group at ages four and six. "A" was significantly higher at ages four, five, and six in the higher PF level group. For "A," a significant difference was found between the age of four and six and five and six in both groups, and for "E," a significant difference was observed only in the higher PF level group, between the ages of four and five, four and six, and five and six.
 [CONCLUSION] It was suggested that "A" and "E" are particularly fostered from the ages of five to six. It was inferred that personality characteristics were nurtured through physical activities such as athletic play, which involve communicating with multiple persons and obeying rules.

- 2969** Board #15 May 31 2:00 PM - 3:30 PM
Relationship Between Physical Fitness Characteristics Of Girls And Attitudes And Preference For Exercise
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 (No relevant relationships reported)

PURPOSE: The purpose of this study is to investigate the relationship between physical fitness characteristics of girls and their attitudes toward and preference for exercise and physical education.
 METHODS: The participants of this study were 181 public elementary school girls, ranging from third grade to sixth grade. Eight items of a physical fitness test were divided by grade, and we calculated T-scores; the average T-scores of the eight items was taken as the total physical fitness score. An upper group of physical fitness was established for those that scored in the upper 25% (45 people); the lowest 25% (45 people) made up the lower group of fitness. These two groups were analyzed. A questionnaire survey was conducted using a five-point scale for the investigation of attitude and preference of exercise and physical education.
 In order to investigate the difference between the attitudes toward and preference for exercise and physical education between the two groups, an independent t-test was used.
 RESULTS: Statistical analysis of survey results demonstrated that 31 out of 40 items showed a significant difference. Among them, for items such as "I don't want to get tired," "I am not interested in exercise," "I dislike feeling inferior," "I don't want people to know about my abilities," and "I don't want my friends to get angry when I can't do something well," the lower group reported higher scores than the upper group.
 CONCLUSIONS: Based on physical fitness level, the upper group and the lower group displayed very different thinking processes about exercise and physical education. It is particularly conceivable that girls with inferior physical fitness have negative thoughts about exercise. In addition to this, girls with inferior physical fitness was suggested that tends to extremely dislike to be seen movement and to be evaluated by someone.

- 2970** Board #16 May 31 2:00 PM - 3:30 PM
Physical Activity And Physical Fitness Characteristics Of Young Children With Extended-hours Childcare
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 (No relevant relationships reported)

[Purpose] This study aimed to clarify the difference between the amount of physical activity obtained and the physical fitness characteristics of infants in extended child care and those not in extended childcare.
 [Method] Forty-two aged 6years-old children enrolled in a private kindergarten participated with 21 of those having used extended childcare for two years or three years (the use group), and 21 who had not used it (the non-use group). The amount of physical activity the infants engaged in was measured using Panasonic's Day calorie. For physical fitness and exercise ability, we conducted an infant physical fitness test and calculated the T score by gender and age (0.5 year categorizations) from the results of the seven items measured; the average T score of seven items was taken as the total physical fitness score. A t-test that did not correspond to the comparison between the number of steps and the total physical fitness score within the normal amount of childcare time of the use group and the non-use group was applied. In addition, Pearson's correlation coefficient was used to examine the relationship between the use group and the non-use group's physical activity levels and overall physical fitness scores.
 [Results and Discussion] The results of the analysis found that there was no significant difference in amount of physical activity and physical strength/exercise ability between the use group and the non-use group. Regardless of whether extended-hours childcare use is used or not, it appears that the same tendency was shown because all of the children are doing the same activities during regular childcare hours. On the other hand, the extended-hours childcare children showed 2,335.84 steps per hour, so it is possible that extended-hours childcare is playing an important role in securing the amount of physical activity.

- 2971** Board #17 May 31 2:00 PM - 3:30 PM
Seasonal Variation In Physical Activity Levels Among Elementary School Children In The Arctic Areas.
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PURPOSE

To compare elementary school children's physical activity levels during two different seasons in Northern Norway.

METHODS:

Elementary school children from 1st, 3rd, 5th and 7th grade were recruited to wear an accelerometer (GT3X-BT, ActiGraph, LLC, Pensacola, United States) for seven consecutive days during two different seasons: The winter season in November ($n=235$), and the summer season in June ($n=214$). The primary physical activity outcome was measured as total counts per minute and time spent at different activity intensities. We defined moderate-to-vigorous physical activity (MVPA) as >2000 counts per min, as previously used (Ekelund et al., 2004).

RESULTS

Girls had more counts per min during the measured week in the summer season (616 ± 380.5) compared to the winter season (589 ± 124.8) ($p<0.001$), while there was no significant differences among boys. Boys spent more time in MVPA during the winter season (71.5 minutes \pm 26.7) compared to the summer season (61.5 minutes \pm 12.9) ($p<0.05$). Children in 7th grade spent more time in MVPA during the winter season (64.6 minutes \pm 26.1) compared to the summer season (44.9 minutes \pm 23.6) ($p<0.001$). There were no differences between sexes for time spent in MVPA or counts per min ($p<0.05$) during the winter season, except for counts per min in 1st grade ($p<0.05$). During weekdays in the winter season, 53.1% of the children reached MVPA of ≥ 60 minutes physical activity daily. In weekdays during the summer season, 62.5% of the children reached MVPA ≥ 60 minutes.

CONCLUSION Girls had more counts per minute during the summer season compared to the winter season, but there were no differences in time spent in MVPA. Boys spend more time in MVPA during the winter season compared to the summer season. 62.5% met the recommended 60 min per day of MVPA during the summer compared to the winter where 53.1% met the recommendations.

2972 Board #18 May 31 2:00 PM - 3:30 PM Associated Factors To Health Risk Behaviors in Adolescent's Athletes

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PURPOSE: To verify associated factors with health risk behaviors (HRB) in Brazilian adolescents' athletes. **METHODS:** Cross-sectional study, with 367 athletes (15.68 \pm 0.78 years) from Curitiba/PR/Brazil. The HRB evaluated were: insufficient levels of physical activity, high TV and videogame time, low consumption of fruits and vegetables, consumption of alcohol, tobacco and illicit drugs, sexual and violent behavior. Investigated associated factors were: sex, age, socioeconomic status, type of sport, years of training and weekly training volume, evaluated through questionnaires. Poisson regressions analyzed the factors associated with HRB, adopting $p<0.05$.

RESULTS: The collective sport (PR: 3.11, 95% CI: 1.13-8.58) and years of practice (PR: 1.14, 95% CI: 1.01-1.29) were positively associated to high TV time. For the high videogame time, inverse associations were seen for age (PR: 0.59, 95% CI: 0.39-0.89) and for the weekly training volume (PR: 0.92, 95% CI: 0.86-0.99), but not for years of practice (PR: 1.12, 95% CI: 1.01-1.25). For vegetable consumption, inverse associations were seen for the weekly training volume (PR: 0.98, 95% CI: 0.96 - 0.99). Age was positively associated with mild (PR: 1.64, 95% CI: 1.32-2.03) and excessive (PR: 1.82, 95% CI: 1.34-2.48) alcohol consumption. On the other hand, inverse associations were seen for the weekly training volume and mild (PR: 0.95, 95% CI: 0.92-0.99) and excessive (PR: 0.94, 95% CI: 0.89 - 0.99) alcohol consumption. Positive associations were seen for age (PR: 9.59; 95% CI: 3.36-27.38) and weekly training volume (PR: 1.20; 95% CI: 1.01-1.45) for tobacco consumption, and age for illicit drug use (PR: 18.08; 95% CI: 3.38-56.65). Girls were less likely to have sexual (PR: 0.28, 95% CI: 0.08-0.94) and violent (PR: 0.23, 95% CI: 0.08-0.62) risk behaviors. **CONCLUSIONS:** It was observed that characteristics of sports practice, such as years of practice and weekly training volume may favor healthy behaviors such as a lower videogame time, alcohol consumption and increased consumption of vegetables in adolescent's athletes.

2973 Board #19 May 31 2:00 PM - 3:30 PM Comparison Of Physical Activity, Cardiovascular Endurance And Perception Of Quality Of Life Between Adolescents Engaged And Non-engaged In After School Sports Program

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Objective: To compare the level of physical activity, cardiovascular endurance and perception of quality of life of male and female adolescents, of three different groups: 1) engaged in after school sports programs; 2) engaged in any other type of regular physical exercise; 3) not engaged in any type of formal physical exercise. **Methods:** The sample consisted of 374 adolescents, 198 boys (16.35 \pm 0.65) and 176 girls (16.19 \pm 0.67). The QAFA questionnaire was used to evaluate the level of physical activity (min/week) and the Pacer test for cardiovascular endurance (VO_{2max}). The KIDSCREEN-52 was used to evaluate perception of quality of life. Anova's One-way and post hoc Scheffé were used for the comparisons, with $p<0.05$. **Results:** non-exercising adolescents presented lower levels of physical activity (Boys: 471.72 \pm 570.07 min/week; Girls: 332.09 \pm 359.22 min/week) and cardiovascular endurance (Boys: 36.41 \pm 4.70 ml/kg/min; Girls: 31.16 \pm 3.23 ml/kg/min) when compared to those engaged in after school sports programs (Boys: 1074.17 \pm 733.98 min/week; 40.15 \pm 6.50 ml/kg/min; Girls: 985.00 \pm 634.95 min/week; 33.46 \pm 4.70, respectively) and other type of regular physical exercise (Boys: 866.89 \pm 572.45 min/week; 38.49 \pm 5.45 ml/kg/min; Girls: 635.43 \pm 467.78 min/week; 32.96 \pm 4.5 ml/kg/min, respectively), $p<0.01$. Boys (77.51 \pm 8.45 points) and girls (74.84 \pm 8.90 points) engaged in after school sports program had higher scores for perception of quality of life when compared to boys (72.74 \pm 9.15 points) and girls (74.18 \pm 6.95 points) engaged in other type of physical exercise and non-exercise boys (72.18 \pm 10.31 points) and girls (69.98 \pm 9.35 points), $p<0.05$. **Conclusion:** adolescents engaged in after school sports programs presented higher levels of physical activity, cardiovascular endurance and better perception of quality of life. Support: Fundação Araucária

2974 Board #20 May 31 2:00 PM - 3:30 PM Relationship Between Physical Fitness Level At Age 6 And Motivation And Perseverance

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(No relevant relationships reported)

[Purpose]

The purpose of this study was to investigate the relationship between physical fitness (PF) level at the age of 6 and longitudinal change of motivation (M) and perseverance (P).

[Methods]

The participants were 186 young children (87 boys and 99 girls). For measuring PF, PF tests for young children were conducted. Principal component analysis was performed for the seven PF test parameters, and first principal component scores were converted into T-scores classified by sex and age (categories spanning 0.5 years), which were treated as overall PF scores. The upper 25% of the overall PF scores was classified as a higher PF level group (47 participants), and the lower 25% of the overall PF scores was classified as a lower PF level group (47 participants). In addition, in order to objectively investigate young children's personalities with regard to "M" and "P", a questionnaire survey was administered to the young children's schoolteachers.

A two-factor analysis of variance (PF level group \times grade) that corresponded to only one factor concerning the evaluation was conducted. Multiple comparison tests (Tukey's HSD) were performed for all observed significant main effects. The statistical significance level of this study was less than 5%.

[Results]

With respect to "M" and "P", the results showed no significant interaction between PF level and grade; however, a significant main effect was observed between the PF level groups and grade.

The multiple comparison test between the PF level groups showed that "M" and "P" were significantly higher in the higher PF level group, and it is motivated at the ages of 4 (0.477), 5 (0.631), and 6 (0.870), the patience. In terms of strength, the effects increased at the ages of 4 (0.655), 5 (0.904), and 6 (1.232).

The multiple comparison test between the grade levels showed that both "M" and "P" were significantly higher in the higher PF level group at age 6 than at age 4 and at age 5.

[Discussion]

Infants with high PF at the age of 6 show high "M" and "P" at the age of 4. Further, the difference widens with successive grade levels, thereby suggesting that the bipolarization of "M" and "P" originates in early childhood.

and are negatively influenced by BF. Further studies addressing the variation in growth characteristics and health behaviors that potentially influence muscle power during childhood are needed. Supported in part by FIPI/DEGI/UPRRP.

2975 Board #21 May 31 2:00 PM - 3:30 PM

Acute Cardiometabolic Responses to Integrative Neuromuscular Training in Children

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Integrative neuromuscular training (INT) is a method of conditioning that includes strength and conditioning exercises which are designed to enhance both health- and skill-related components of physical fitness. While previous investigations have examined the effects of INT on performance, the acute cardiometabolic responses to INT have not been examined. **PURPOSE:** To examine the acute cardiometabolic responses to a specific INT protocol and to compare these responses to a bout of moderate intensity treadmill (TM) walking in children. **METHODS:** 14 children (10.7±1.1 yr) were tested for peak oxygen uptake ($\dot{V}O_2$) and peak heart rate (HR) on a maximal TM test and subsequently participated in 2 experimental conditions on nonconsecutive days: a 12-min INT protocol of 6 exercises and a 12-min TM walking protocol at 50% $\dot{V}O_{2peak}$. The INT protocol included balance board squats (EX1), medicine ball squats with toss (EX2), planks with side step (EX3), medicine ball forward lunges (EX4), battling rope double arm waves (EX5) and medicine ball slams (EX6). Each INT exercise was performed twice for 30 sec with a 30-sec rest interval between sets and exercises. Participants performed the INT and TM protocols while connected to a metabolic system and HR monitor. **RESULTS:** Throughout INT mean HR significantly increased from 121.1±9.0 b·min⁻¹ during EX1 to 183.5±7.9 b·min⁻¹ during EX6 and mean $\dot{V}O_2$ significantly increased from 14.9±3.6 ml·kg⁻¹·min⁻¹ during EX1 to 33.3±6.0 ml·kg⁻¹·min⁻¹ during EX6 ($p<0.05$). Mean HR and $\dot{V}O_2$ values during INT ranged from 60.9% to 92.4% of HRpeak and from 28.1% to 63.0% of $\dot{V}O_{2peak}$, respectively. During the TM condition, mean HR and $\dot{V}O_2$ values ranged from 121.1±11.7 b·min⁻¹ to 150.4±17.3 b·min⁻¹ and from 19.2±2.5 ml·kg⁻¹·min⁻¹ to 26.8±6.2 ml·kg⁻¹·min⁻¹, respectively. Mean HR and $\dot{V}O_2$ values were significantly higher during EX5 and EX6 of INT than during the same time intervals of TM walking ($p<0.05$). **CONCLUSION:** These data indicate that INT can pose a moderate to vigorous cardiometabolic stimulus in children, and selected INT exercises are more intense than moderate intensity walking.

2976 Board #22 May 31 2:00 PM - 3:30 PM

Longitudinal Assessment of Peak Power During Childhood

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Factors influencing peak power (PP) during childhood are still unclear. Even though physical activity in children consist mostly of high intensity short burst movement, there are limited longitudinal studies assessing PP during childhood. **PURPOSE:** To evaluate PP in children and identify the possible influence of sex and body fat (BF). **METHODS:** Forty-four children (24 girls and 20 boys), were evaluated in 1st grade and for the next four consecutive years (mean group age on the first and last evaluation: 6.4±0.5, and 10.5±0.5 years respectively). Counter-movement vertical jump height (JH) was determined using an electronic platform and converted to PP(W) using Canavan & Vescovi's equation. Height and weight were measured, and triceps and calf skinfolds were also measured for BF estimate. Repeated measures ANOVA were performed to determine differences in all variables by grade and Pearson correlations to evaluate relationships between BF, JH, PP and relative peak power (RPP). Independent sample t-test was used to detect differences between sex. **RESULTS:** JH increased between grades, being significant between 2nd, 3rd and 4th grade (27.1±4.3, 28.4±4.2, 29.9±4.9, 31.7±6.0, 32.7±7.0 cms, for 1st, 2nd, 3rd, 4th and 5th grade respectively, $p<0.05$). PP (W) also increased significantly, except from 3rd to 4th grade (1009.7±41.9, 1177.8±35.5, 1537.7±86.3, 1587.9±46.3, 1812.3±47.3 W for 1st, 2nd, 3rd, 4th, and 5th grade respectively, $p<0.01$). No differences were found in JH or PP between boys and girls in any grade. Negative correlations were found between BF and JH ($r = -.48, -.59, -.71, -.63, -.46$ for the 1st, 2nd, 3rd, 4th and 5th grade respectively, $p<0.01$), also between BF and RPP (W/Kg) ($r = -.61, -.67, -.69, -.77$, for the 1st, 2nd, 4th and 5th grade respectively, $p<0.001$). **CONCLUSION:** These results suggest that JH and PP increase similarly between boys and girls as they move from 1st to 5th grade

2977 Board #23 May 31 2:00 PM - 3:30 PM

Criterion-related Validity Of A Cadence Rope Skipping Test For Estimating $\dot{V}O_{2peak}$ In Adolescents

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Rope skipping is a fun and excellent moderate to vigorous physical activity (MVPA) for school students especially for elementary and junior high schools. Studies demonstrate that prolonged rope skipping exercise could effectively improve aerobic fitness. Considering the specificity principle in fitness evaluation, it is desirable to develop a rope-skipping specific exercise testing for evaluating aerobic fitness. **Purpose** The purpose of this study was to develop a prediction model to estimate peak oxygen uptake ($\dot{V}O_{2peak}$) from a sub-maximal cadence rope skipping test among secondary school students. **Methods** A total of 58 secondary school students (38 boys, 20 girls, age=13.8±/1.1 yrs) completed two different forms of rope-skipping exercises (free-style skipping & Gallop-style skipping, in randomized order) with a steady cadence of 60 skips per min, for 3 min each and at least 20 min apart. Exercise heart rates (EHR) throughout the 3-min skipping and additional 1-min post-exercise HR (PHR) were monitored continuously using Polar HR monitor. Students also completed a treadmill $\dot{V}O_{2peak}$ test using calibrated direct $\dot{V}O_2$ metabolic measuring system (COSMED K4b2). Moderate to vigorous physical activity habits (MVPA), in term of average min per day were assessed by questionnaire. $\dot{V}O_{2peak}$ was then correlated with HER and PHR at various time points, as well as MVPA, BMI, age, and gender, using stepwise regression, to determine criterion-related validity. **Results** Regardless of skipping style, $\dot{V}O_{2peak}$ was best correlated with PHR at 20s after the exercise, followed by MVPA, gender, and BMI. The best equation was: $\dot{V}O_{2peak} = 70.422 + (7.542 * \text{gender}) + (.126 * \text{MVPA}) - (.470 * \text{BMI}) - (.167 * \text{PHR@20s})$; $R = .870$, $SEE = 4.54 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$, using the free-style rope skipping test. Both free-style and Gallop-style rope skipping gave similar level of criterion-related validity. **Conclusion** A 3-min free-style cadence rope skipping submaximal test was effective to estimate $\dot{V}O_{2peak}$ of secondary school students using post-exercise heart rate at 20 seconds after the exercise, and gender, MVPA, and BMI. This test is particularly suitable for athletes of rope skipping to evaluate aerobic fitness due to its' good validity and specificity.

2978 Board #24 May 31 2:00 PM - 3:30 PM

Acute Physiological And Perceptual Responses To Body-weight Circuit And Treadmill-based High-intensity Interval Exercise In Children

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(No relevant relationships reported)

Research examining acute responses to non-laboratory-based high-intensity interval exercise (HIIE), such as body-weight exercise, in children is lacking. **PURPOSE:** To compare the acute physiological and perceptual responses between body-weight circuit (CIRC) and treadmill high-intensity interval running (TM) in children. **METHODS:** Physically active boys (n=17; age = 9.7 ± 1.3 years) completed a graded exercise test to determine maximal heart rate (HR_{max}), peak oxygen uptake ($\dot{V}O_{2peak}$) and maximal aerobic speed (MAS). Time-matched (8-min) CIRC and TM were completed in a randomized order on separate days within a 1 to 2-week period. CIRC consisted of two sets of 4 bouts of 30 s of maximal repetitions of mountain climbers, jump squats, jumping jacks, and burpees, whereas TM included 30 s bouts at 100% MAS. Both had a 30 s recovery between bouts. HR and gas exchange data were continuously assessed using a portable metabolic analyzer and HR monitor, and blood lactate concentration (BLA) was measured pre- and post-exercise. Global affect (PANAS) and exercise enjoyment (PACES) were assessed at baseline and post-exercise. Rating of perceived exertion (RPE), affect (Feeling Scale) and enjoyment (Exercise Enjoyment Scale) were recorded pre- and post-exercise and at 38% and 75% of session completion. **RESULTS:** Mean peak HR and $\dot{V}O_2$ were 87% HR_{max} and 74% $\dot{V}O_{2peak}$ for CIRC and 89% HR_{max} and 80% $\dot{V}O_{2peak}$ for TM, with a significant difference in peak $\dot{V}O_2$ between regimens ($p<0.05$). Yet, there were no differences in session HR, $\dot{V}O_2$ or V_E ($p>0.05$). Post-exercise BLA was significantly higher following CIRC vs. TM (mean difference = 3.0 ± 2.2 mM, $p<0.05$). RPE, affect and enjoyment responses did not differ between regimens during exercise, and affect did not differ from pre- to post-exercise within or between regimens ($p>0.05$). Post-exercise enjoyment was significantly lower after CIRC vs. pre-exercise (mean difference = 3.9 ± 1.1, $p<0.05$). **CONCLUSION:** Although HR was similar, there was a higher peak $\dot{V}O_2$ in response to TM, paralleling previous work in adults. The greater BLA accumulation in CIRC may be explained by

greater muscle recruitment required for multi-joint, dynamic movements and could explain the reduced post-exercise enjoyment. Future research should investigate higher volume protocols utilizing different body-weight exercises.

2979 Board #25 May 31 2:00 PM - 3:30 PM
The Effect Of Comprehensive Coordination Training On Children's Cognitive Function

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PURPOSE: The aim of this study was to investigate the impact of comprehensive coordination training on children's cognitive function by adding two extracurricular exercises per week.

METHODS: A sample of 120 children aged 7-9 years old who participated in the "MQ101" program were randomly divided into two groups. The experimental group consisted of 58 people and the control group of 62 people. The experimental group participated in extracurricular comprehensive coordination training for 12 weeks, 2 times a week, and 1 hour each time. The control group did not participate in specialized training courses (not limiting students' self-exercise). The height, weight, 50-meter run, Body Comprehensive Coordination Test (BCCT) and the Eriksen Flanker test were tested in the pre-post experiment. The independent sample T-test and factor analysis were used to analyze the change values between the experimental group and the control group.

RESULTS: The two groups had no significant demographic differences in age, gender, height, weight, physical fitness tests or BCCT before the experiment. After the experiment, height, weight, and 50-meters-run had significantly changed in two groups ($p < 0.05$). However, regarding a body comprehensive coordination test, only the experimental group has significant differences before (29.75 ± 6.75) and after (32.80 ± 5.21) the experiment ($p < 0.05$). The results of Flanker test indicated that the post-test period had a higher accuracy rate in both congruent (95.27 % ± 9.76) and incongruent (91.03 % ± 6.97) trials compared with those in the pre-test period (84.7% ± 10.29 and 73.69 % ± 7.79, respectively) in the experimental group. Additionally, no significant differences were found in the reaction time between the experimental group and the control group.

CONCLUSIONS: Comprehensive coordination training has a great impact on the development of children's coordination skills. In addition, behavioral testing results also suggest that coordinative training may specifically benefit prefrontal-dependent tasks in the immature brain state of children aged 7-9 years old by increasing the allocation of attention resources and enhancing the efficiency of neurocognitive processing. (This study was supported by NPOSS Grant 15CTY011.)

2980 Board #26 May 31 2:00 PM - 3:30 PM
Clarify The Influence Of Changing Parental Consciousness On Opportunities Of Children's Exercise

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 (No relevant relationships reported)

PURPOSE: This study was to clarify the influence of changing parental consciousness on children's exercise opportunities.

METHODS: We urged a change in parental consciousness by showing them how pleasantly children exercised in various exercise programs. The participants included 32 children and their parents. The selection method firstly extracted the lowest 50% ranked by three test (50 m run, standing long jump, and soft ball throw) total scores out of the 103 elementary school 1st and 2nd graders who intending to participate in the program. We then used based on the results of a questionnaire on extracted person, "children who do not like exercising and have few opportunities to exercise" were selected. Various exercise programs were conducted seven times in total. The program also consisted of playful activities in addition to basic physical activities such as running, jumping, and throwing. We tried a questionnaire on the first and last day of the program. We examined the following three issues using the collected data: whether parents intending to increase opportunities for children to get exercise actually did it, whether the presence of a playground is related to intention of parents to increase those opportunities, and whether the presence or absence of a place is relevant to the increase in children's exercise opportunities.

RESULTS: The findings revealed that although 96% of the parents intended to increase opportunities for children to get exercise, only 25% were actually able to increase it. Further, 56% of those who intended to increase such opportunities had an appropriate playground near their houses, although 69% of them could not actually increase it.

CONCLUSION: The number of parents intending to create more opportunities for children to exercise increased. However, this change in consciousness did not necessarily lead to an actual increase. The result suggests that other factors are involved in increasing opportunities for children to exercise, such as time and environment. This study was limited by time constraints. Therefore, it is necessary to continue the program over a longer period of time and analyze further changes in parental consciousness to determine the influence on opportunities for children's exercise activities.

2981 Board #27 May 31 2:00 PM - 3:30 PM
Body Mass Index and Physical Fitness Measures of 6th, 7th, and 8th Grade Boys and Girls

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PURPOSE: To describe the anthropometric and fitness profiles of 6-8 grade students who participated in 2-3 days/week of PE classes during the academic year.

METHODS: Data was collected on all willing 6-8 graders from the years 1992 to 2002, for a total of 10 years. Subjects included 1374 6th graders (height 59.33 ± 3.3 in, weight 102.6 ± 28.2 lbs), 1267 7th graders (height 62.4 ± 3.0 in, weight 117.7 ± 31.4 lbs), and 634 8th graders (height 63.1 ± 3.2 in, weight 125.7 ± 29.7 lbs) at a Chambersburg, PA junior high school. Participants completed fitness markers (height, weight, one-mile run, and curl ups) once in a year. Descriptive/frequency statistics were used to examine dependent variables for each participant, analyzing by grade and gender. Values were compared to the normative healthy fitness zones (HFZ) by FITNESSGRAM. **RESULTS:** 6th grade boys had a mean body mass index (BMI) of 19.7 ± 3.7 kg/m², one-mile run of 9.4 ± 2.3 minutes, and curl ups of 45.8 ± 10.1; 63.9% met the HFZ for BMI, 77.5% met the HFZ for one-mile run, and 96.5% met the HFZ for curl ups. 6th grade girls had a mean BMI of 20.6 ± 4.8 kg/m², one-mile run of 10.7 ± 2.3 minutes, and curl ups of 39.9 ± 10.7; 57.5% met the HFZ for BMI, 70.0% met the HFZ for one-mile run, and 94.7% met the HFZ for curl ups. 7th grade boys had a mean BMI of 20.2 ± 3.8 kg/m², one-mile run of 9.0 ± 2.6 minutes, and curl ups of 49.7 ± 11.6; 71.9% met the HFZ for BMI, 72.2% met the HFZ for one-mile run, and 97.1% met the HFZ for curl ups. 7th grade girls had a mean BMI of 21.5 ± 5.0 kg/m², one-mile run of 10.7 ± 2.6 minutes, and curl ups of 41.3 ± 10.7; 63.8% met the HFZ for BMI, 69.2% met the HFZ for one-mile run, and 98% met the HFZ for curl ups. 8th grade boys had a mean BMI of 21.1 ± 3.7 kg/m², one-mile run of 9.2 ± 3.3 minutes, and curl ups of 50.9 ± 11.6; 67.2% met the HFZ for BMI, 53.1% met the HFZ for one-mile run, and 85.3% met the HFZ for curl ups. 8th grade girls had a mean BMI of 22.6 ± 4.9 kg/m², one-mile run of 10.5 ± 1.8 minutes, and curl ups of 38.0 ± 9.6; 54.0% met the HFZ for BMI, 59.7% met the HFZ for one-mile run, and 80.1% met the HFZ for curl ups. **CONCLUSIONS:** Many junior high aged children are not meeting standards that are accepted regarding BMI, one-mile run, and curl ups. More work is needed to decrease BMI and obesity in children. More physical activity/sports involvement outside of PE programs may be needed for children not meeting these HFZ standards.

2982 Board #28 May 31 2:00 PM - 3:30 PM
The Role of Growth and Maturation During Adolescence on Team Selection and Short-Term Sports Participation

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 (No relevant relationships reported)

Older (born in a month at the start of the team selection year; termed relative age (RA)), more mature adolescent athletes are more likely to be selected onto youth teams. However, little is known as to whether selection onto a team influences an individual's short-term sports participation. **Purpose:** (i) to investigate the relationship of RA, anthropometrics, and maturity on team selection and (ii) the short-term (3 years) consequence of selection on sports participation. **Methods:** 851 participants were recruited from six bantam team sport try-outs: soccer, football, basketball, volleyball, baseball and hockey. Parental heights, date of birth, date of test, height, sitting height and weight were recorded and age at peak height velocity (APHV) and final adult height predicted. Athletes were placed in month quartiles for month of birth. Reference standards were used to create z-scores. Sports participation was recorded at try outs and at 3 year follow-up. Analysis included chi-squared and ANOVA. **Results:** The sample showed an over representation of the first and second birth month quartiles ($p < 0.05$). Z-scores for height ranged from 0.1 (1.1) to 1.8 (1.2) and were significantly different between sports ($p < 0.05$). Some height and APHV differences

were found between selected and non-selected athletes ($p < 0.05$). 4% of non-selected athletes dropped out of all sport participation. 84% of selected athletes were still in the same sport compared to 68% of athletes still in the same sport but who were not selected. **Discussion:** In general athletes at try-out were already taller than the general population, in some sports were maturing earlier, and were born early in the selection year. If not selected a large percentage changed sports. Coaches should be aware of the consequences of selecting the oldest, tallest and more mature athletes on continued sports participation.

2983 Board #29 May 31 2:00 PM - 3:30 PM

An Evaluation of the Irish Life Schools Fitness Challenge

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BACKGROUND: Children and adolescents with high levels of cardiorespiratory fitness (CRF) have a favourable cardiovascular risk profile and a reduced risk of myocardial infarction, stroke, and mortality in adulthood. Furthermore, levels of CRF tend to track from adolescence to adulthood. The 20m shuttle run test (20mSRT) is the most widely-used test to estimate CRF in adolescents. The Irish Life Health Schools Fitness Challenge is a national initiative designed to improve CRF levels among first year students attending Irish secondary-level schools.

PURPOSE: To assess the effect of the annual Irish Life Health Schools Fitness Challenge on CRF in 12-year old boys and girls between 2012 and 2017.

METHODS: Participating schools used a 20mSRT to assess CRF levels before and after a 6-week exercise intervention. The exercise intervention was designed and implemented by teachers in each school. The 20mSRT involved running back and forth between two lines 20m apart, keeping in time with a series of audio signals. The starting speed was 8.5 km.hr⁻¹ and increased by 0.14 m.sec⁻¹ every min. The test was terminated if a participant stopped voluntarily, or was unable to maintain the set pace. **RESULTS:** Mean 20mSRT score was significantly higher in boys than girls at baseline ($p < 0.001$) and 6 weeks ($p < 0.001$). Mean 20mSRT score (total number of shuttles) increased ($p < 0.001$) by 16% (53.5 ± 14.7 vs. 62.0 ± 15.4) in boys ($n=14,378$) and 19% (37.2 ± 11.8 vs. 44.1 ± 12.6) in girls ($n=14,698$) ($p < 0.001$).

CONCLUSIONS: A 6-week school-based exercise intervention designed and implemented by teachers resulted in a significant improvement in 20mSRT performance in 12-year old boys and girls.

2984 Board #30 May 31 2:00 PM - 3:30 PM

Presence Of The Pediatric Inactivity Triad (PIT) In 4th And 5th Graders.

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(No relevant relationships reported)

The Pediatric Inactivity Triad (PIT) has recently been proposed as new way to examine the relationships between physical inactivity and impaired health in youth. Physical inactivity, dynapenia, and physical illiteracy are believed to be the primary determinants of PIT. **PURPOSE:** The purpose of this investigation is to determine if important relationships exist between the proposed determinants of PIT with anthropometric and psychometric measures. **METHODS:** Thirty children (10 females, 20 males) completed a series of tests and questionnaires to assess physical activity (Evaluation of Physical Activities in Youth: EASY), muscular strength and power (hand grip, vertical leap), physical literacy (Physical Literacy Assessment for Youth: PLAY Basic), body image (Social Physique Anxiety Scale for Children: SPAS) and anthropometrics (BMI, waist circumference). **RESULTS:** One third of participants (10 out of 30) were identified as not being competent by the PLAY Basic. 40% of participants did not achieve the federal guideline for physical activity in youth. 37% of participants were in the lowest 25th percentile for hand grip and vertical leap. 5 (17%) participants displayed physical inactivity, dynapenia, and physical illiteracy. SPAS was correlated with BMI ($r=0.38$, $p=0.04$) and PLAY Basic ($r=-0.42$, $p=0.02$). PLAY Basic was also correlated with EASY ($r=0.44$, $p=0.01$) and vertical leap ($r=0.39$, $p=0.04$). **CONCLUSIONS:** The results of this investigation suggest that it may be possible to identify individuals impacted by PIT. Several of these determinants are interrelated, so it may be possible to positively impact PIT by designing interventions to address specific outcomes.

2985 Board #31 May 31 2:00 PM - 3:30 PM

Sex-Based Differences in the Upper Body Musculature May Influence Rate of Force Development in High School Students

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Changes in skeletal muscle occur during the process of maturation that influence the expression of muscular strength. The isometric mid-thigh pull (IMTP) is used to measure force-time characteristics [peak force (PF) and rate of force development (RFD)], while the bioelectric properties of body tissues can be used to estimate lean body mass (LBM) and cellular health via phase angle. **PURPOSE:** To evaluate the contributions of segmental LBM, phase angle, and potentially relevant developmental indicators on IMTP performance in adolescents. **METHODS:** Twenty-three high school students (14 girls and 9 boys; age=15.4±0.8y; height=1.7±0.07m, body mass=68.9±14.9kg) underwent anthropometric measurements to determine somatic maturity and multi-frequency bioelectrical impedance analysis to determine whole body phase angle (50 kHz), overall LBM, and segmental LBM of the arms, legs, and trunk. Participants performed an IMTP with a custom-built rack and force plates to determine peak RFD, absolute PF, and PF relative to body mass. Stepwise linear regression was used to determine the relationships between IMTP performance and segmental LBM as well as specific developmental indicators (chronological age and somatic maturity). Independent sample t-tests were used to evaluate sex-based differences. Pearson correlations were also used to compare IMTP performance with overall LBM and whole body phase angle. **RESULTS:** Sex-based differences ($p < 0.05$) were shown for maturity offset (female: 2.5±0.6y; male: 0.9±0.8y), whole body LBM (female: 101.3±15.9kg; male: 117.8±18.3kg), arm LBM (female: 10.2±2.6kg; male: 12.7±2.7kg), RFD (female: 1596.17N*s⁻¹; male: 2742.41N*s⁻¹). RFD was significantly associated with arm LBM ($r^2=0.239$; $p < 0.05$) while the addition of trunk LBM improved the model ($r^2=0.454$; $p < 0.05$). Neither chronological age nor somatic maturity were associated with any of the IMTP variables, while RFD was significantly correlated with both whole body phase angle ($r=0.495$) and overall LBM ($r=0.476$). **CONCLUSION:** Significant sex-based differences in the upper body musculature likely influence RFD in high school students despite girls displaying greater somatic maturity than boys. Phase angle may also play a role in the rate of muscular strength expression in adolescents.

2986 Board #32 May 31 2:00 PM - 3:30 PM

Physiological and Perceptual Responses to Step-Wise and Ramp Graded Exercise Tests in Children

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(No relevant relationships reported)

Step-wise graded exercise tests are common protocols to measure aerobic fitness in children but have limitations due to the nature of the increments. Modifying these tests to a ramp protocol could overcome some of these limitations. **PURPOSE:** To examine physiological and perceptual responses to step-wise and ramped graded exercise tests in children ($n = 8$; age = 13.3 ± 2.2 yrs.). **METHODS:** The standardized James protocol (STEP) and a modified-ramp James protocol (RAMP) were performed on a cycle ergometer on separate days. Protocol order was counterbalanced. STEP commenced with three 3-min stages, followed by 1-min stages. Work rate increases were based on body surface area. For RAMP, work rate was ramped to match the 3-min and 1-min stages of STEP. Work rate was increased until volitional exhaustion for both tests. Oxygen consumption ($\dot{V}O_2$), heart rate (HR), respiratory exchange ratio (RER) and OMNI ratings of perceived exertion for chest (RPE-chest), legs (RPE-legs) and overall (RPE-overall) were recorded at the end of each 3-minute stage and peak exercise. Physiological and perceptual responses between tests were compared using two-way repeated-measure ANOVAs and test time (TT) and peak power (PP) were compared using repeated measure t-tests. Significance was established at $p < 0.05$. **RESULTS:** The physiological and RPE responses were similar between tests at the end of each 3-min submaximal stage ($p > 0.05$). At peak exercise, absolute and relative $\dot{V}O_2$ for STEP were 2.17 ± 0.67 L·min⁻¹ and 42.5 ± 5.9 ml·kg⁻¹·min⁻¹. For RAMP, absolute and relative $\dot{V}O_{2peak}$ were 2.33 ± 0.89 L·min⁻¹ and 45.3 ± 8.9 ml·kg⁻¹·min⁻¹. The differences were not significant. There were no differences between STEP and RAMP for peak HR (196.3 ± 9.8 bpm vs. 196.1 ± 9.7 bpm) and peak RER (1.24 ± 0.11 vs. 1.21 ± 0.06). At peak exercise, RPE-chest, RPE-leg and RPE-overall were similar between STEP (4.8 ± 4.0 , 8.4 ± 2.1 and 7.6 ± 3.0 , respectively) and RAMP (5.6 ± 3.4 , 8.5 ± 2.3 and 8.0 ± 1.8 , respectively) ($p > 0.05$). TT and PP for STEP were 11.3 ± 2.5 min and 196.8 ± 70.7 W and 12.4 ± 2.4 min and 210.3 ± 65.5 W for RAMP ($p = 0.11$ and $p = 0.12$, respectively) **CONCLUSION:** Although limitations in step-wise protocols

exist, submaximal and peak physiological and perceptual responses were similar to a ramp protocol. Both protocols may be appropriate in children to measure aerobic fitness.

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2987 Board #33 May 31 2:00 PM - 3:30 PM

Determinant Factors of Cellular Health Among Adolescent Girls and Boys

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Several studies have demonstrated that cardiorespiratory fitness (CRF) and body adiposity are strong indicators of health during childhood and adolescence. However, it is not known if these parameters are associated with cellular health. For example, phase angle (PhA) is used to evaluate nutritional status and is an indicator of cellular health. PURPOSE: In this study, we test if body composition and CRF have an influence on cellular health among adolescents of both genders. METHODS: 203 girls (12.7 ± 1.3 years) and 221 boys (12.8 ± 1.3 years) were evaluated. The peak of height velocity (PHV) was used as an indicator of somatic maturation. The percentage of fat mass (%FM) was calculated based on skinfold thickness (triceps and calf). CRF was assessed with the Leger test. Bioelectrical impedance analysis provided parameters to calculate the values of PhA and fat-free mass (FFM). Bivariate correlation was used to verify the association between PHV with PhA, %FM, FFM and CRF. We used partial correlation to evaluate if PHV was a mediator of the relationship between PhA, %FM and CRF. A linear regression analysis adjusted by PHV was used to verify if variables (%FM, FFM and CRF) influenced cellular health among adolescents of both genders. RESULTS: The PHV showed a significant positive correlation with FFM in girls (r = 0.83, p<0.001) and boys (r = 0.83, p<0.001); with PhA in girls (r = 0.24, p<0.01) and boys (r = 0.38, p<0.001); and with %FM but only in girls (r = 0.15, p<0.05). PHV was negatively correlated with CRF in girls (r = -0.54, p<0.001) and boys (r = -0.20, p<0.01). Linear regression of the PhA adjusted by the PHV had an effect on %FM in girls (β = 0.233, p<0.05) but not in boys (β = 0.013, p=0.834), on CRF in boys (β = 0.166, p<0.05) but not in girls (β = 0.007, p=0.931), and on FFM in girls (β = 0.697, p<0.001) and in boys (β = 0.614, p<0.001). CONCLUSION: We discovered that PhA when controlled by somatic maturation seems to be more influenced by %FM in girls, CRF in boys, and FFM in both genders of adolescents. Interestingly, cellular health and CRF (for girls) and %FM (for boys) were not associated with PhA. This has implications for physical activity behavioral for improved health in adolescents of both genders. Supported by CAPES (No. 23001.000422/98-30)

2988 Board #34 May 31 2:00 PM - 3:30 PM

Resting Energy Expenditure and Metabolic Equivalents in Youth: Impact of Inconsistent Operational Definitions

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Youth metabolic equivalents (MET_y) are multiples of resting energy expenditure (REE), but there are different operational definitions for REE, including basal metabolic rate (BMR) and resting metabolic rate (RMR). PURPOSE: To compare MET_y defined as multiples of BMR (MET_{yBMR}) versus RMR (MET_{yRMR}). METHODS: Data from two studies (N = 255, 47.4% male, mean ± SD age 10.2 ± 1.5 years) were analyzed. For all participants, BMR was predicted using Schofield's equations. RMR was assessed during 30-min supine rest while wearing a portable metabolic unit (Cosmed K4b²). Participants also performed structured physical activities (PA) ranging from sedentary behaviors (SB) to vigorous PA. MET_{yBMR} and MET_{yRMR} were calculated by dividing steady state oxygen consumption by BMR and RMR, respectively. Values were compared using two-way (Activity X MET_y calculation) analysis of variance on a mixed-effects model. Post-hoc tests were performed with Bonferroni correction (α = 0.05). MET_{yBMR} and MET_{yRMR} values were also classified as SB (≤1.50 MET_y), light PA (1.51-2.99 MET_y), moderate PA (3.00-5.99 MET_y), or vigorous PA (≥6.00 MET_y). Classifications were compared with a confusion matrix. RESULTS: There was a significant interaction (F(30) = 19.1, p < 0.001) between activity and MET_y calculation. MET_{yBMR} and MET_{yRMR} differed significantly for 20 of 31 activities (64.5%), with differences ranging from 0.2 MET_y for supine rest to 4.8 MET_y for the running course (p < 0.001). For intensity classification, MET_{yBMR} and MET_{yRMR} gave the same classification in 61.4% of cases (see table). CONCLUSION: MET_{yBMR} and MET_{yRMR} are comparable (within 0.5 MET_y) for SB, but MET_{yBMR} becomes progressively higher than MET_{yRMR} as intensity increases, reaching differences >40%. MET_{yBMR} and MET_{yRMR} are not interchangeable units, and care is necessary when interpreting and comparing the findings of studies that use MET_y.

MET _{yBMR}	MET _{yRMR}			
	SB	Light PA	Moderate PA	Vigorous PA
SB	342	6	0	0
Light PA	180	220	10	0
Moderate PA	14	265	561	23
Vigorous PA	0	34	301	204

2989 Board #35 May 31 2:00 PM - 3:30 PM

Comparative Study On Body Composition Distribution Between Obese And Normal Children In China

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The prevalence of obesity among Chinese children is on the rise, and Asian are more likely to have centripetal obesity. PURPOSE: To compare the body composition and distribution of obese children and normal children, and to find out the changing rules among different ages. METHODS: We recruited 219 Chinese children (12.18±3.05 yr.; height: 155.24±15.66 cm; mass: 48.60±14.41 kg; boys: 48.4%). The age ranges from 7 to 17, and is divided into three age groups, including 7-9, 10-13 and 14-17. According to national standards, <Screening for overweight and obesity among school-age children and adolescents >, they are divided into normal group(n=161) and obesity group(n=58). Their body composition was measured using dual-energy X-ray absorptiometry (DEXA), the main indicators were bone mineral content (BMC), fat mass(FM) and lean mass(LM) of trunk and limbs, and body fat percentage(BFP), trunk fat Percentage(TFP), trunk LM Percentage(TLP),trunk BMC Percentage(TBP). Paired samples t test and correlation analysis with age control was used for statistics. RESULTS: BFP and FM in obesity group were higher than those in normal group with significant difference (p<0.01). BMC and FM were higher in obesity groups, but there was no significant difference. The TFP of normal group was significantly lower than that of obesity group in each sex. (p < 0.01), Boys TBP normal group was significantly lower than obesity group(p<0.05), and TLP had no significant difference. Girls have completely opposite results. In 7-9 years old group, there was no significant difference in all indexes between obesity group and normal group. In 10-13 years old group, TFP in obesity group was higher than that in normal group(boys p<0.01, girls p=0.51), and in 14-17 years old group, there was no significant difference in TFP ratio between obesity group and normal group. There was a moderate negative correlation between FM and BMC in the trunk of overweight women (r=-0.515, p<0.05). TFP was negatively correlated with LM in obesity group(boys r=-0.460,p<0.01, girls r=-0.545,p<0.01),but there was no correlation in normal group. CONCLUSIONS : TFP was higher in obese children, and the trend of fat centripetal distribution increases first and then decreases with age. Children with centripetal obesity tend to have lower LM, and girls also have lower BMC.

2990 Board #36 May 31 2:00 PM - 3:30 PM

Systolic Blood Pressure Mediates the Relationship Between Body Mass Index and Inhibitory Control in Children

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(No relevant relationships reported)

Increased body mass index (BMI) and systolic blood pressure (SBP) have been shown to be associated with poorer inhibitory cognitive control throughout childhood and impact children's health. Further statistical procedures may help to understand the nature of relationship between these variables in children. PURPOSE: Here, we verify the mediation role of the SBP in the relationship between BMI and inhibitory control. METHODS: Twenty non-normotensive (NNT) children (age: 10.86 (10.18-10.98) years; 8 hypertensive stage I; 1 hypertensive stage II and 11 pre-hypertensive) were paired with 20 normotensive (NT) children (age: 10.40 (9.86 – 10.69) years) by cardiorespiratory fitness, BMI, somatic maturation, scholar performance and age. They differed on SBP (NNT: 120.53±6.73 mmHg vs NT: 106.64±7.04 mmHg; p<0.01) and diastolic blood pressure (DBP) (NNT: 75.83±8.81 mmHg vs NT: 64.80±4.94 mmHg; p<0.01). BP was calculated by the average of three measures with a two-minute interval between them. Inhibitory control was measured by a food specific inhibitory Go/ No-go task. The Go stimuli were presented as office and bathroom pictures, whereas the No-go (inhibition) stimuli were food and toys images. Performance

was evaluated based on number of errors during No-go stimuli. T-tests were applied to verify differences between independent variables and cognitive performance. Thereafter, a four step mediation was applied using SBP as a mediator of the relation between BMI and number of errors. **RESULTS:** NNT group had higher number of errors compared to NT one (4.14 ± 0.92 vs. 2.43 ± 0.54 ; $p = 0.002$). In addition, a relationship between BMI and number of errors ($\beta = 0.38$, $SE = 0.16$, $p = 0.02$) was found. However, when considering SBP, this relationship was no longer statistically significant ($\beta = 0.24$, $SE = 0.16$, $p = 0.13$). The bootstrapped unstandardized indirect effect was 0.13 and the 95% confidence interval ranged from 0.02 to 0.35. This indicates SBP as a full mediation of the relation between BMI and inhibitory control. **CONCLUSION:** We confirm the relationship between body mass index and cognitive inhibitory control in children and for the first time present systolic blood pressure as a mediating mechanism.

2991 Board #37 May 31 2:00 PM - 3:30 PM
Examining the Relationship Between Physical Activity and Cardiometabolic Biomarkers in Youth with Overweight or Obesity

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While physical activity is known to have beneficial effects in youth, including short-term improvements in adiposity, little is known regarding the association of physical activity with cardiometabolic biomarkers among youth. This is especially true in youth with overweight or obesity. **PURPOSE:** To determine the relationship between achieving 30 minutes of moderate-to-vigorous physical activity (MVPA) per day and markers of cardiometabolic health in youth with overweight or obesity. **METHODS:** Eighty-one children (mean age $6.7\text{yrs} \pm 1.2$, 54% male, 47% with overweight, 53% with obesity), who are participating in a longitudinal intervention to increase physical activity and cardiometabolic health provided data on physical activity (via accelerometer), body composition (via DXA), blood pressure, and fasting biomarkers (insulin, glucose, triglycerides, & cholesterol). A series of ordinary least squares regressions were conducted examining the relationship between the various markers and achieving 30 minutes of MVPA, while controlling for age and sex (model one) and age, sex, and percent body fat (model two). **RESULTS:** Our results indicated that percent body fat was negatively associated with achieving 30 minutes of MVPA ($b = -2.98$, $P < .01$) after controlling for age and sex. Of the remaining biomarkers, only fasting insulin was associated with achieving 30 minutes of MVPA ($b = -3.81$, $P < .05$), but this relationship became non-significant ($b = -2.36$, $P = .16$) when adding percent body fat to the model ($b = 0.50$, $P < .01$). **CONCLUSIONS:** Achieving 30 minutes of MVPA was negatively associated with adiposity, but other cardiometabolic biomarkers were not associated with achieving 30 minutes of MVPA among youth with overweight and obesity.

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F-55 Free Communication/Poster - Injury, Injury Prevention, Recovery and Rehabilitation

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

2992 Board #38 May 31 2:00 PM - 3:30 PM
Negative Impact of Icing Treatment on Qualitative Recovery of Injured Soleus Muscle in Rats

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 (No relevant relationships reported)

PURPOSE: Although the RICE (Rest, Ice, Compression, and Elevation) treatment has been recognized as the gold standard of first aid treatment for sports injuries, we and the others previously demonstrated that a transient icing treatment immediately after skeletal muscle injury impaired muscle regeneration. However, the information

about the influence of icing treatment following skeletal muscle injury remains limited. This study was, therefore, to investigate the impact of icing as a first-aid treatment on qualitative recovery of damaged muscle in terms of fibrosis and myosin heavy chain (MyHC) profile.

METHODS: Male Wistar rats (9-10 weeks of age) were randomly assigned to control (Con), injured, and injured with icing groups (Ice). Bupivacaine (BPVC) was injected into slow soleus muscles bilaterally in order to induce muscle injury in the two injury groups. Application of icing treatment (ice pack, 0°C for 20 min) to the icing group was carried out immediately after the BPVC injection. At 3 days-4 weeks after BPVC injection, soleus muscles were removed and analyzed.

RESULTS: Compared with the Con group, a significant increase in fibrotic area was observed after 2 weeks following injury in the injured groups, but after 1 week following injury in the Ice group ($P < 0.05$). This area was also tended to be higher in Ice than in injured animals during 1-4 weeks of recovery period. In addition, the number of Tcf4-positive nuclei, a fibroblast marker, located in interstitial spaces in both injured groups markedly increased 1 week after BPVC injection. The numbers were tended to be more magnified in the Ice group than in the injured group, then their number in both injured groups gradually decreased thereafter. Injury-related de novo appearance of embryonic, neonatal, IId/x, and IIB MyHC isoforms was noted in both injured groups 1 week after BPVC injection. These MyHC isoforms were significantly decreased toward the undetectable level thereafter. However, the embryonic MyHC isoform was still detectable in icing, but not in injured, animals 4 weeks after BPVC injection.

CONCLUSIONS: Our results suggested that icing treatment following skeletal muscle injury will have a negative impact on recovery process (fibrosis and normalization of MyHC profile) of regenerating muscle.

2993 Board #39 May 31 2:00 PM - 3:30 PM
Stressed Outover Stress Fractures? Potential Predictive Model To Determinethose At Risk

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PURPOSE: Stress fractures are injuries caused by cumulative, repetitive stress that leads to abnormal bone remodeling. There are two causes of stress fractures, excessive stresses causing weakening of bone material and typical stresses acting on abnormal bone. Stress fractures are more common in certain populations including women, military personnel, high-level athletes, and the middle aged/elderly. Stress fractures have a large socioeconomic impact as they cause prolonged periods away from competition and a significant amount of healthcare spending. A reliable, reproducible method to determine which individuals are most susceptible within the predisposed populations would provide cost-effective prevention strategies. Advanced numerical simulation tools may be key to modeling the mechanical behavior of bones under different loading conditions.

METHODS: Method: The hybrid finite-discrete element method (FDEM) combines aspects of the finite element method to model the elastic behavior of materials and the discrete element method to model the initiation and propagation of fractures. The FDEM is used to simulate the deformation and fracturing in materials such as bone and rock. This can capture the transition of a solid from a continuous to a discontinuous state by directly simulating fracturing processes. See the Image 1 for further explanation of methods.

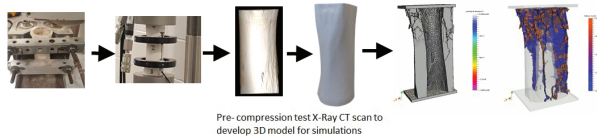
RESULTS: Refer to Image 2 for graphs and model results.

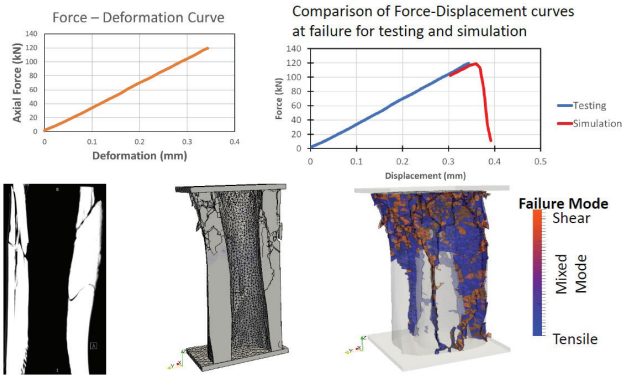
CONCLUSION: The FDEM model shows promise to help predict stress fractures. Further studies are needed; including realistic bone loadings to real life situations.

An initial simulation study was done in which prepared bovine tibiae without surrounding soft tissue was first imaged using computed tomography (CT). Following CT imaging, the bones were loaded in compression to the point of failure.

The tibiae were then re-imaged with CT. The initial CT data provided a three-dimensional model that could be used in the simulation software.

The 3D model, along with the compression test, were used to calibrate a FDEM numerical model. Once calibrated, a numerical simulation of the compression test was conducted. The strength, stiffness, and fracture patterns from the physical testing and numerical simulation were then compared.





Comparison of testing and simulated fracture patterns. Both methods showed the predominant failure mechanism was axial splitting with fractures forming parallel to the applied forces. There was an encouraging agreement between physical tests and numerical simulations.

made software was used to align the talus and calcaneus of the uninjured and injured side based on principal axis of inertia and moments of inertia. Thereafter, the curvature radius and arch length of each talus and calcaneus were measured in coronal and sagittal plane. Paired sample t test was used to compare the results in uninjured and injured side.

RESULTS: The analysis of the calcaneus have showed that there was no difference between uninjured and injured cases for curvature radius neither in coronal plane (60 ± 10 mm vs. 61 ± 11 mm, respectively) nor in sagittal plane (58 ± 16 mm vs. 60 ± 12 mm) ($p > 0.05$). In addition, there was not statistical difference between uninjured and injured cases for the arch length neither in coronal (23 ± 3 mm vs. 21 ± 3 mm) nor in sagittal plane (19 ± 5 mm vs. 17 ± 5 mm) ($p > 0.05$). The analysis of talus has shown that there was not significance between uninjured and injured side for the curvature radius measured in coronal plane (55 ± 7 mm vs. 56 ± 8 mm) and in sagittal plane (34 ± 4 mm vs. 34 ± 7 mm) ($p > 0.05$). Additionally, there was not significance between uninjured and injured side for the arch length measured in sagittal plane (29 ± 4 mm vs. 28 ± 4 mm) ($p > 0.05$). Importantly, there was statistical significance between uninjured and injured side for the arch length measured in coronal plane (29 ± 4 mm vs. 21 ± 4 mm) ($p < 0.05$).

CONCLUSIONS: Microfractures of the talus and consequent decrease in its arch length measured in the coronal plane may be a predictor of the foot injuries.

2994 Board #40 May 31 2:00 PM - 3:30 PM Association Between Femoral Cartilage Deformation and Pain Following Running

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Patellofemoral pain (PFP) is a multifactorial knee pathology and prevalent in physically active individuals. Running is one of the most popular forms of exercise accounting with nearly 17 million runners in the US. Despite the health benefits, running may lead to injury with more than 20% of runners injured annually. Of those, 10% develop PFP. Emerging evidence suggests chronic PFP may lead to patellofemoral osteoarthritis, a condition characterized by cartilage breakdown. However, little is known about how activities that cause the symptoms of PFP influence cartilage health. Diagnostic ultrasound imaging is an emerging technique to measure cartilage thickness immediately after physical activity. No research has analyzed femoral cartilage deformation followed by running in patients with PFP. **PURPOSE:** To determine if 30 minute running changes cartilage thickness and joint pain in patients with PFP compared to healthy adults. **METHODS:** As part of an ongoing investigation, 6 adults (n=3 PFP, age: 21.3 ± 0.6 yrs, body mass index [BMI]: 20.5 ± 3.2 kg/m²; n=3 healthy, age: 21.0 ± 1.0 yrs, BMI: 21.9 ± 1.4 kg/m²) participated. A GE LOGIQe diagnostic ultrasound machine with a 12MHz linear probe was used to obtain the knee cartilage images before and after 30 minutes running. Perceived pain level was measured using a 10cm Visual Analog Scale (VAS). Correlation between percent cartilage thickness change and VAS was performed to measure the association between two variables and a simple regression analysis was performed to determine the predictability of cartilage thickness measure according to the pain level change. **RESULTS:** Pain level change and cartilage deformation showed a strong correlation ($r = -0.85$, $p = 0.033$), and pain level change explained 72% of the variance in cartilage thickness ($R^2 = 0.72$, $p = 0.03$). **CONCLUSIONS:** Though continuation of this investigation is needed to confirm our findings, the strong positive association between pain level and cartilage deformation implies that measuring pain by VAS before and after physical activities may be an easy and effective means for clinicians to evaluate cartilage deformation.

2995 Board #41 May 31 2:00 PM - 3:30 PM Early Microfractures Of Talus And Calcaneus As A Predictor Of The Foot Injuries

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PURPOSE: The aim of this study was to investigate whether the early detected microfractures of talus and calcaneus may be a predictor for foot injuries. **METHODS:** Five sportsman with microfractures of talus and five with microfractures of calcaneus that undergo foot injuries were included in the evaluation. Uninjured side served as a control. The reconstructions of the bones were performed and custom

2996 Board #42 May 31 2:00 PM - 3:30 PM Intratendinous Distribution Of Achilles tendinosis, A retrospective Study.

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Background. Achilles tendinopathy is a very common condition. The pathology of overuse tendinopathy has been described as a continuum that comprises 3 stages: reactive tendinopathy, tendon disrepair and degenerative tendinopathy with tendinosis. The precise location of tendinosis in the Achilles tendon tends to vary from patient to patient: musculotendinous, insertional, anteriorly or posteriorly in the tendon. **Aim.** This study describes the variation in the location of the intratendinous zone of tendinosis in the Achilles tendon. **Patients and methods.** All ultrasound scans of all patients who presented with pain in the Achilles region were retrospectively analyzed and classified. In this respect, classification occurred into the following three categories: tendinosis, reactive tendinopathy or other (e.g. normal scan, peritendinopathy, bursitis,...). The tendinosis group was subdivided according to the location of the tendinosis zone into proximal or insertional, which were further subdivided into anterior, posterior or both. **Results.** In total we recorded and examined the ultrasound scans from 395 tendons from 325 patients, meaning 70 patients had bilateral complaints. 209 of them were men and the mean age of this population was 43 years. In 41 patients we found two zones of tendinosis. In 55,5% of the patients with pain in the Achilles region tendinosis was seen, in 18,8% reactive tendinopathy and in 25,7% something else. The results showed that in 68,2% of the sample the tendinosis zone was proximal, whereas in 31,8 % it was insertional. The proximal tendinosis zone was mostly found right across the width of the tendon (57%), but also anteriorly (15,2%) and posteriorly (27,8%). The insertional tendinosis zone, however, was mostly found posteriorly (49,3%), followed by anteriorly (27,3%) and across the width of the tendon (23,4%). **Conclusions.** Although we already know that the tendinosis zone in Achilles tendinopathy occurs at different locations, the relative distribution of these zones remained relatively unclear. The distribution described raises concern about the fact that all these patients are often treated with the same protocol. Further research is needed to determine whether a difference in approach according to the location of the tendinosis zone is appropriate.

2997 Board #43 May 31 2:00 PM - 3:30 PM Side Differences in the Y-Balance Test Performance in Patients with Unilateral Low Back Pain

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PURPOSE: Diminished balance is a well-recognized impairment in individuals with low back pain (LBP). Clinically, the Y-balance test (YBT) has been recommended as an outcome measure to assess dynamic balance deficits in the LBP population. Specifically, the reach distances of the 3 testing directions collected from both limbs often are averaged to represent a patient's balance performance. However, it is unclear if these patients perform the YBT differently when they stand on their painful limb versus on their non-painful limb. The purpose of the study was to compare the differences in the YBT between the painful versus non-painful limbs of patients with LBP under two separate conditions: performing the YBT on the dominant leg and on the non-dominant leg. **METHODS:** Thirty-one right-leg-dominant adults (37.1 ± 12.5 years) with unilateral LBP completed the study, including 14 participants with LBP on the right side (9 men, 5 women) and 17 participants with LBP on the left side (8

men, 9 women). Each participant stood on one leg unsupported, with the opposite foot reaching as far as they could without losing balance in 3 directions: anterior (ANT), posteromedial (PM), and posterolateral (PL). Each participant performed a total of 9 trials for each direction and for each limb, but only the last 3 trials were measured and normalized to the corresponding leg length for later statistical analysis. Two separate 2 (group) x 3 (direction) ANOVAs with repeated measures were used to determine differences between groups, one for the dominant (right) leg, and the other for the non-dominant (left) leg. **RESULTS:** There were no significant differences in age and body mass index ($p > .05$) between groups. When standing on the dominant (right) leg, there was a significance difference ($p = 0.037$) in the PM reach distance between groups, with the left LBP group (86.1 ± 4.7 cm) reaching a shorter distance than the right LBP group (101.6 ± 5.2 cm). There were no significant differences in the ANT and PL directions. In addition, there were no differences in all directions between groups when standing on the non-dominant (left) leg. **CONCLUSIONS:** The results of the study suggest that using a composite score may fail to show dynamic balance deficits. The PM reach direction appears to be the most challenging testing component for patients with LBP.

2998 Board #44 May 31 2:00 PM - 3:30 PM
Skeletal Muscle Size, Quality And Function In Patients With Several Years After Total Hip Arthroplasty

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Total hip arthroplasty (THA) leads decrease of physical activity and muscle function, and it would induce asymmetric motor performance in daily life since most cases of THA are applied to one side. For prevention of muscle dysfunction, some sports activities such as golf, walking, swimming and so on are recommended after THA. Recently, muscle quality, i.e. fat and/or connective tissue within skeletal muscle, has been used as one of important factors to determine muscle function. **PURPOSE:** The purpose of this study was to compare muscle size, quality and function between the operated and non-operated legs in patients with one side THA with several year's exercise habits after THA. **METHODS:** Fourteen men and women (67.1 ± 5.3 years; height, 161.3 ± 6.8 cm; body mass, 65.5 ± 18.5 kg) with exercise habits, such as golf, participated in this study. They had THA surgery in either side several years ago (4.9 ± 2.5 years). B-mode transverse images of rectus femoris were taken using ultrasound system (Logiq e Premium, GE Healthcare, USA), and isometric knee extension strength (KE) was measured in both operated and non-operated legs. Muscle thickness as an index of muscle size, echo intensity as an index of muscle quality and KE were compared between operated leg and non-operated leg. **RESULTS:** There were no differences between operated leg and non-operated leg in muscle thickness (1.4 ± 0.5 cm vs. 1.4 ± 0.4 cm, $P > 0.05$), echo intensity (88.7 ± 17.8 a.u. vs. 88.9 ± 17.3 a.u., $P > 0.05$) and KE (38.3 ± 13.8 kg vs. 41.3 ± 12.3 kg, $P > 0.05$). **CONCLUSION:** As the result of several years passing after THA, the difference of high muscle size, quality and function was not shown between operated and non-operated leg. Several year's exercise habits can improve not only muscle size and function but also muscle quality.

2999 Board #45 May 31 2:00 PM - 3:30 PM
Effects of Deep Oscillation Therapy on Symptoms Associated with Eccentric Exercise-Induced Delayed Onset Muscle Soreness

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 (No relevant relationships reported)

Delayed onset of muscle soreness (DOMS) has debilitating symptoms that produces muscle damage and performance deficits among athletes. Deep oscillation therapy (DOT) is a therapeutic intervention that utilizes an electrostatic wave to create a deep oscillation massage at the cellular level with proposed physiological benefits. There is little evidence to support the use of DOT on exercise-induced DOMS. **Purpose:** Examine the effects of DOT on girth, pain pressure threshold (PPT), perceived pain, strength, and range of motion (ROM) following a bout of eccentric exercise-induced DOMS when compared to control. **Methods:** Moderately active participants (age: 22 ± 2.5 years; male: $n=5$, female: $n=5$) completed an eccentric exercise protocol for the elbow flexors to induce DOMS as part of a randomized counter-balance design study [Control group (C: no treatment) and a treatment group (T: DOT)]. T group received a 20-minute DOT treatment for 6 days. Visual analog scale assessed pain and

a manual algometer assessed PPT and girth was measured at 3 sites on the bicep (5, 9, 13 cm proximal from the antecubital line). A goniometer assessed ROM for extension and flexion. Isokinetic dynamometer measured strength for 2 maximum voluntary isometric contractions at 3 angles (30° , 90° , 130°). A 2 x 6 repeated measures ANOVA to examine differences for girth, PPT, perceived pain, ROM, maximum voluntary isometric contraction (MVC) and maximum isokinetic contraction (MIC). **Results:** A significant main effect was found for perceived pain and PPT between groups ($P \leq 0.01$; $P = 0.002$); with significant interactions between days ($P \leq 0.01$; $P \leq 0.01$). Both displaying improvements for the T group. Girth was significantly different over time for both C and T (2.55 vs. 1.42 , $P = 0.03$) and T resulted in a reduction for days 2-6 ($P = 0.04$). Mean ROM significantly changed over time, with Days 2-6 significantly less than Day 1 ($P < 0.05$), but no significant differences occurred between groups. No differences were found in MVC and MIC at any angles over time or between groups. However, MIC at 30° was decreased over time (5.68 and $.41$, $P = 0.001$), with Day 2 significantly lower than Day 1 (mean difference 14.5 ± 4.8 , $P = 0.008$), with a resulting increase for T when compared to C. **Conclusion:** There are positive effects from DOT on symptoms of exercise-induced DOMS.

3000 Board #46 May 31 2:00 PM - 3:30 PM
Effects of Testosterone and Resistance Training on Anabolic and Inflammatory Biomarkers Following Spinal Cord Injury

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Resistance training (RT) evokes skeletal muscle hypertrophy via increasing insulin growth factors-1 (IGF-1) after spinal cord injury (SCI). Muscle hypertrophy increases basal metabolic rate (BMR) following 16 weeks of RT; increase in BMR is also linked positively to adiponectin after SCI. The effects of combining testosterone replacement therapy (TRT) and RT on circulating growth factors, adiponectin and inflammatory biomarkers are still unclear. **PURPOSE:** To examine the effects of TRT+RT on IGF-1, insulin growth factors binding protein-3 (IGFBP-3), adiponectin and interleukin-6 (IL-6) compared to TRT only in men with SCI. **METHODS:** Twenty-two men with motor complete SCI were randomized into either 16 weeks of TRT+RT ($n = 11$) or TRT ($n = 11$). After overnight fast, IGF-1, IGFBP-3, adiponectin and IL-6 were measured. Evoked progressive RT using neuromuscular electrical stimulation (2 lbs. increments) was administered twice weekly. Daily TRT patches (2-6 mg/day) were applied on both shoulders at bedtime for 16 weeks. **RESULTS:** IGF-1 showed a decrease ($P = 0.008$) in both TRT+RT ($n=11$; B2: 169.5 ± 96.5 to P1: 101.5 ± 28 ng/ml) and TRT only ($n=11$; B2: 136 ± 74 to P1: 99 ± 36 ng/ml) groups. IGFBP-3 increased significantly ($P = 0.0001$) in both TRT+RT ($n=11$; B2: 1764 ± 665 to P1: 2548.5 ± 853 ng/ml) and TRT ($n=11$; B2: 1918.5 ± 587 to P1: 2778 ± 967 ng/ml). A significant interaction was noted between TRT+RT and TRT groups in the circulating adiponectin ($P = 0.024$). IL-6 decreased ($P = 0.039$) in TRT+RT ($n=8$; B2: 5.5 ± 5.6 to P1: 2.9 ± 5.4 pg/ml) and TRT ($n=10$; B2: 5.9 ± 6.0 to P1: 3.9 ± 4.4 pg/ml) groups. **CONCLUSION:** Greater adipose tissue in men with SCI may have resulted in aromatization of testosterone to estradiol that has been previously shown to decrease IGF-1 and increase IGFBP-3. Increased circulating testosterone following TRT+RT may be responsible for suppressing adiponectin but not in the TRT group. Finally, administering TRT with or without RT may elicit anti-inflammatory effects after SCI.

F-56 Free Communication/Poster - Interventions and Health Promotion

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

3001 Board #47 May 31 3:30 PM - 5:00 PM
Effectiveness of One-Year FMS Based Training on Physica Function and Fitness of College Pilot Trainees

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 (No relevant relationships reported)

PURPOSE: The fitness and health of airline pilots are essential for the safety of billions of the people traveling on commercial airlines around the world every year. Yet, no effective intervention has been developed to improve pilots' fitness using a

simple and easy approach. Using a randomized controlled trial design, we examined the effectiveness of 1-yr. supervised FMS (functional movement system) based training.

METHODS: 122 male, healthy college pilot trainees (20.1 ± 0.3 yr.) were randomly assigned to FMS training (n = 62) and regular physical education control (n = 60), 178.99 times, about 192 hours in total, during one year, and their height, weight and a set of fitness were measured before and after the study.

RESULTS: Overall adherence to prescribed exercise sessions was 178.99±12.95 times or a 93±6% adherence rate, and there is no difference between groups. FMS scores in the training group increased by 29.7% (from pretest of 13.8 ± 1.44 to posttest of 17.9 ± 1.03), but only 5.1% improvement in the control group (from 13.7 ± 1.28 to 14.4 ± 1.06). Similar changes were observed in weight, BMI, hand-grip (HG), stand-long-jump (SLJ) and Sit-&-Reach (S&R), which are summarized in the table below (M±SD):

Differences between Posttest and Pretest in Selected Fitness Variables							
Group	Weight (kg)	Height (cm)	BMI	FMS	HG (kg)	SLJ (m)	S&R (cm)
Control	0.05±1.50	0.02±.1	0.13±.49	0.70±.81	1.83±1.69	0.10±.07	2.42±1.05
Training	-0.92±2.04	0.06±.3	-0.31±.66	4.10±1.36	4.11±2.17	0.18±.06	4.42±1.19
<i>Effect size</i>	-.26	.089	-.66	.84	.51	.49	.67
<i>F</i>	7.386*	5.177	6.886*	18.649***	41.83***	1.045	2.153***

*p<0.05, **p<0.01, ***p<0.001.

CONCLUSIONS: The FMS based training can effectively improve FMS and other physical fitness of college pilot trainees.

KEY WORDS: exercise intervention, randomized controlled trial, college students

3002 Board #48 May 31 3:30 PM - 5:00 PM
Low-volume High-intensity Interval Training On Cardio-metabolic Health And Adherence-related Psycho-perceptual Responses In Overweight/obese Middle-aged Adults

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High-intensity interval training (HIIT) has been proposed as a time-efficient protocol to improve metabolic health. However, its practical efficacy in terms of cardio-metabolic and adherence compared with higher-volume moderate-intensity continuous exercise (MICE) remains unclear.

PURPOSE: To compare the training effects between low-volume HIIT and higher-volume MICE on cardio-metabolic and psycho-perceptual responses in overweight/obese middle-aged men.

METHODS: Twenty overweight/obese men (mean age: 48.0 ± 5.7 years) were randomly assigned to undertake either HIIT (n=10) or MICE (n=10) training for 8 weeks (3 sessions/week). HIIT sessions consisted of ten 1-minute intervals of exercise at 80-90% HR_{max} separated by 1-minute active recovery. MICE sessions involved 50-minute continuous exercise at 65-70% HR_{max}. Health-related variables including cardiovascular fitness (VO_{2max}), body composition and cardio-metabolic blood markers were assessed before and after the intervention. Adherence-related psycho-perceptual variables including enjoyment and self-efficacy were also assessed after the intervention. Paired-sample t-tests were used to compare changes within a group before and after the intervention. Analyses of Covariance were used to compare the group difference in outcome variables after controlling for baseline values.

RESULTS: Both groups showed similar VO_{2max} increase over the 8-week intervention (HIIT: 32.5 ± 5.6 to 36.0 ± 6.2 ; MICE: 36.3 ± 6.0 to 21.5 ± 40.2 ± 5.1 mL kg⁻¹min⁻¹, both p < 0.05). Both groups had significant fat% loss (HIIT: 24.5 ± 3.4 to 23.2 ± 3.5; MICE: 23.0 ± 4.3 to 21.5 ± 4.1, both ps < 0.05) and there was a trend favoring MICE (p = 0.054). Compared to the baseline, MICE group significantly decreased weight, body mass index (BMI), waist circumference and glycated hemoglobin whereas HIIT increased high-density lipoprotein after the intervention. However, these variables did not differ significantly upon group comparison. The self-efficacy and enjoyment responses were found similar between HIIT and MICE (both ps > 0.05).

CONCLUSIONS: Our findings suggest that low-volume HIIT elicits a similar improvement of cardiovascular fitness and adherence-related psycho-perceptual responses as traditional higher-volume MICE in overweight/obese middle-aged men.

3003 Board #49 May 31 3:30 PM - 5:00 PM
Features of Gaseous Metabolism during Exercise Tolerance Testing in Overweight Women

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 (No relevant relationships reported)

PURPOSE: To reveal differences of gas metabolism indexes between overweight and normal weight women when they did exercise under different load, instruct overweight women to do exercise scientifically.

METHODS: Women between 20 and 30 years were divided into normal weight(NW) group(N=15, BMI=18-23.9kg/m²) and overweight(OW) group(N=15, BMI>24kg/m²). After the baseline test, using modified Bruce treadmill protocol, the air metabolism indexes of two groups were determined by Cortex MetaMax 3B portable gas metabolic analyzer, including VO₂, minute ventilation(MV), breathing frequency(BF), expiratory end-tidal CO₂ concentration(ETCO₂), expiratory end-tidal O₂ concentration(ETO₂), arterial blood carbon dioxide partial pressure(PaCO₂), VCO₂, oxygen pulse and maximal voluntary ventilation(MMV), etc.

RESULTS: Most of indexes such as VO₂, VCO₂, and MV rose gradually with the load increase during exercise tolerance testing except for ETO₂ and PaCO₂. PaCO₂ and VCO₂ of OW group at grade 4 and grade 5 was significant lower than NW group by 5.6 mmHg and 0.6L/min separately. ETCO₂ of OW group at grade 3 and 4 were significant lower than NW group about 0.5% and 0.6% respectively. During recovery stage, most of indexes decreased gradually, while ETO₂ presented a rising trend. During the recovery stage, ETCO₂ of OW group was significantly lower than NW group(5.3% vs 5.8%), while MMV, MV and oxygen pulse were significantly higher than NW group. MMV of OW group at 2, 3 and 4 minutes were significant lower than NW group by 1L/min, 1L/min and 0.9L/min; MV of OW group were significant lower than normal weight group by 17.8L/min, 20.1L/min and 16.9L/min. The oxygen pulse of OW group during whole 5 minutes recovery period were significantly higher than NW group by 2.7L/min, 3.9L/min, 3.9L/min, 2.9L/min and 2.0L/min. The gaseous metabolism between two groups was significantly different when they did 7.1 and 10.2 METs exercise.

CONCLUSIONS: Although there was no difference in gas metabolism between overweight and normal weight women in resting state, the respiratory function of overweight women was weaker than normal weight women during exercise, especially at the intensities of 7.1 and 10.2 METs. After exercise tolerance testing, the recovery rate of gas metabolism in overweight adult women was slower than that of normal weight women.

3004 Board #50 May 31 3:30 PM - 5:00 PM
Effects of two Different Stretching Methods Program on Range of Motion in Militaries

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 (No relevant relationships reported)

The proprioceptive neuromuscular facilitation and stretching methods are commonly applied in warm-up routines, often with the aim of injury prevention. **PURPOSE:** to investigate the effect of a 12-week program of flexibility training on range of motion (ROM) of shoulder and lumbar spine joints in male militaries. **METHODS:** 90 young male militaries (17.02 ± 1.24 years old), of a universe of 500 students from Air Cadets Preparatory School, were randomly assigned in 3 groups with 30 subjects each one: stretching (SG), proprioceptive neuromuscular facilitation (FNPG) and control (CG). The ROM was measured by goniometry based on LABIFIE protocol in three moments: before, during (6-week) and after training (12-week). The experimental groups performed 3 sets with 5 seconds rest intervals, 5 times a week, for shoulder horizontal flexion (SHF), shoulder horizontal extension (SHE) and lumbar spine flexion (LSF). The scale of perceived exertion in the Flexibility (PERFLEX) (0 - 110) was used to control the intensity in both groups, SG (31 - 60) and FNPG (61 - 80). The exercise duration was 5 seconds for the SG and 8 seconds for each phase (contraction-relaxation) for the FNPG. **RESULTS:** There were no significant differences among 3 groups in the ROM baseline values. The comparative analysis of ROM rates, defined through one-way ANOVA combined with Tukey post-hoc test, showed significant differences in the following movements to the FNPG: SHF (Δ% = 4.6, p < 0.001); SHE (Δ% = 8.6, p < 0.002); LSF (Δ% = 56.1, p < 0.001). **CONCLUSION:** It was concluded that the program of flexibility training by FNP resulted in higher rates of development of ROM when compared to the stretching.

- 3005** Board #51 May 31 3:30 PM - 5:00 PM
Step Count Targets Corresponding to China Physical Activity Guidelines for the Preschool Children
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Chinese Preschool Children (3-6 years old) Physical Activity Guidelines (2018 ed) recommends that preschool children should accumulate at least 180 minutes of physical activity (PA) at any intensity throughout the day, including no less than 60 minutes of Moderate-to-Vigorous PA (MVPA).

PURPOSE:

Step count(SC) targets corresponding to these recommendations to assist parents and childcare workers, who will guide children to achieve the PA goal.

METHODS:

903 preschool children were instructed to wear the ActiGraph GT3x accelerometers sensor for more than 4 days, including at least 3 workdays and 1 weekend, for at least 8 hours per day. Sedentary Behavior (SB), Light PA (LPA), Moderate PA (MPA), Vigorous PA (VPA), MVPA, Total PA (TPA) and SC were obtained by GT3x. Receiver operating characteristic curve (ROC) was applied to analyze the thresholds for SC associated with MVPA and TPA, as well as sensitivity and specificity. The statistical analysis was performed by SAS JMP 13.

RESULTS:

The survey obtained valid data from 795 participants. The total wearing days were 4520, with the wearing time of 765.16±122.96min. The time of SB, LPA, MPA, VPA, MVPA, TPA and SC was 470.27±150.24min, 245.66±74.52min, 42.99±20.53min, 16.27±12.50min, 59.26±30.91min, 304.93±94.65min and 8005±3160 steps, respectively. In 4520 days, 43.94% of MVPA reached to 60min and 90.44% of TPA reached to 180min. Only 3 days which contained 60min or more MVPA did not reach to 180min of TPA. The consistency test result was $Kappa = 0.9987$ ($P < 0.0001$). Thus, the evaluation of MVPA was more valuable.

The study also carried out ROC analysis of SC and MVPA which reached to 60min or not. The result showed the Area Under Curve was 0.8671. The maximum Youden index was 0.5900, corresponding to the SC of 7686 steps. The specificity was 0.8505 and sensitivity was 0.7395. When setting the SC standard as 8000, which is close to 7686 steps, the consistency test result was $Kappa = 0.5715$ ($P < 0.0001$), and it was acceptable.

CONCLUSION:

Based on the data, we suggest that SC target of 8000 steps per day can be used to determine whether Chinese preschool children meet the PA recommendations by the national guideline.

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- 3006** Board #52 May 31 3:30 PM - 5:00 PM
Online Walking- Really? Comparing Online Activity Courses With Traditional Face To Face Courses.
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As female students enter college they are given many opportunities to be physical active including fitness classes and student gym memberships. Despite many benefits and opportunities, many female college students are not achieving the recommended 10,000 steps per day (Clemente et al, 2016). Activity trackers provide additional short and long term motivation for becoming physically active (Fritz, 2014). An online activity tracker based course possesses unique opportunities to increase student autonomy and exercise self-efficacy. Both of which are related to physical activity levels. Findings will provide valuable insight into benefits and drawbacks of online activity courses. **PURPOSE:** This study sought to examine effects of an online fitness course on psychosocial aspects of physical activity (i.e. exercise self-efficacy and intention to be physically active) in female college students. **METHODS:** Participants ($N=42$, mean age = 20.1 ± 1.5 years) college undergraduate students. Study consisted of three groups. Experiential group contained 14 students enrolled in online walking. Control group one had 14 females students enrolled in face to face activity course and the other contain 14 students who never took an activity course. Each group was given a survey measuring exercise self-efficacy and intention to exercise at the start of the semester and then 15 weeks later.

RESULTS: Two 3(group) X 2 (time) RMANOVA were run to test the interactions. There were significant group by time interactions for both intention to continue exercising [$F(2, 39) = 9.26, p < .001, \eta_p^2 = .27$] and exercise self-efficacy [$F(2, 39) = 23.03, p = .001, \eta_p^2 = .17$] and both indicated large effect sizes (Cohen, 1969). The group by time interactions indicated that participating in activity courses whether online or face to face positively affected students' intention to exercise as well as their exercise self-efficacy. Control group had no significant changes.

CONCLUSIONS: The results of this study provided two valuable insights. First, this study provided evidence of the effectiveness of online courses in influencing students' intention to continue exercising and exercise self-efficacy. Second, these results demonstrated students can receive similar benefits from online courses as they receive from face to face activity courses.

- 3007** Board #53 May 31 3:30 PM - 5:00 PM
Health-Related Fitness Knowledge, Physical Activity, and Instructional Practices Among Male and Female Physical Educators
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Lifelong physical activity (PA) is an important outcome of physical education (PE) programs. To effectively promote student PA, educators must possess adequate health-related fitness knowledge (HRFK), utilize effective instructional practices related to HRFK, and model a physically active lifestyle. Research among US adults shows that females tend to be less physically active than male counterparts, however, no research has documented gender differences in HRFK nor instructional practices related to HRFK.

PURPOSE: To determine the relationship of HRFK, PA, and HRFK instructional practices among female and male physical educators.

METHODS: A three-part questionnaire was administered to physical educators ($N = 796$; 409 female) from seven US states. Part 1 of the questionnaire included the *International Physical Activity Questionnaire* (I-PAQ), measuring vigorous, moderate, and light PA min/wk. Part 2 included 10-items from *PE Metrics* Standards 3 & 4 Assessment, measuring participants' HRFK. Part 3 included the *Physical Education Curriculum Analysis Tool* (PECAT) to determine the extent to which participants teach and assess student HRFK. Survey responses were adapted to a 5-point likert scale. One-way ANOVA along with post-hoc t-tests were conducted and gender comparisons made.

RESULTS: Female physical educators scored significantly higher in HRFK (85% HRFK, $F[2,794]=4.17, t=2.85, p=.002$ [$r=.102, d=.21$]), and reported less weekly minutes of vigorous PA (142.2 min/wk, $F[2,794]=2.78, t=1.98, p=.024, [r=.08, d=.14]$) than male counterparts (82% HRFK, 157.5 min/wk vigorous PA). Females also reported significantly greater teaching of HRFK (14.8 vs. 13.9, $F[2,794]=3.09, t=2.37, p=.009, [r=.09, d=.17]$) and assessment of HRFK than male physical educators, approaching significance (9.7 vs. 9.3, $F[2,794]=1.24, t=1.57, p=.058, [r=.06, d=.11]$). No differences in moderate and light PA were observed.

CONCLUSIONS: In spite of participating in less weekly vigorous PA, female physical educators in the study demonstrated greater HRFK and emphasized teaching and assessing HRFK more, thus may be more effective in promoting health-related fitness and lifelong student PA.

- 3008** Board #54 May 31 3:30 PM - 5:00 PM
An Educational Intervention Expands Sports Nutrition Knowledge in Division II Athletic Staff
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College athletic staff are confronted with numerous day to day perils in attempting to advance the performance of their athletes with suitable nutrition playing a dynamic role in that task. Having adequate nutrition knowledge is key to providing satisfactory and appropriate information to improve performance. The ideal providers of such knowledge are Registered Dietitians with a specialty in Sports Dietetics who may not be obtainable or have scarce contact to athletes on a smaller, less resourced Division II campus. **Purpose.** First establish the knowledge base of those that have regular contact, who consistently provide nutrition education to athletes and formally explore if 3 nutrition education sessions can advance that knowledge. **Methods.** Division II athletic staff were asked 20 sports nutrition knowledge questions focusing on macronutrients, micronutrients, supplements, weight management, eating disorders, and hydration relating to sport performance in an online pre-survey. Three nutrition education sessions focusing on the survey material were administered to athletic staff by a Registered Dietitian. Succeeding education, post-surveys (same as pre-surveys) were taken online. Total percent correct finalized survey results. A Likert scale range measured self-efficacy, 1-not at all confident to 4-very confident. Pearson correlations and linear regressions were utilized to compare pre-/post-survey results and self-efficacy. **Results.** Twenty-six pre-surveys were completed (39.7±13.6 yo). There were no relationships with pre-surveys to age, gender, or title of participants. Ten pre-survey participants (41.7±12.9yo) likewise completed post-surveys. Percent total scores improved from pre-surveys (64.5±6.9) to post surveys (76.0±9.4), $p=0.017$. Self-efficacy increased from pre-surveys (2.7±0.4) to post-surveys (3.0±0.4), $p=0.012$. No differences in knowledge were seen between gender, title, or education level, in pre- vs

post-survey results. **Conclusion.** Educating an athletic staff with 3 nutrition education interventions amplifies their knowledge base and self-efficacy; regardless of gender, title, or education level. This study warrants the need for further research to examine the implementation of this new knowledge base from the athletic staff to the athletes.

3009 Board #55 May 31 3:30 PM - 5:00 PM
Gender Differences in Golf Performance After Various Warm-ups

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Distinct injury differences exist between genders in golf, however, performance improvement benefits have not been studied.

PURPOSE: To examine golf performance differences by gender following individual and combined warm-up components.

METHODS: Sixty-five (31 male, 34 female) proficient golfers performed 5 baseline swings, followed by 10 swings after seven randomly ordered warm-up combinations (aerobic exercise (AE); stretching (ST); specific activity (SP); aerobic exercise & stretching (AE+ST); aerobic exercise & specific activity (AE+SP); stretching & specific activity (ST+SP); and all 3 components (ALL)), on non-consecutive days. Club and ball flight characteristics were measured.

RESULTS: Clubhead speed (CHS) improved following AE, SP, AE+ST, AE+SP, ALL ($p \leq 0.001$), ST, and ST+SP ($p \leq 0.05$). Carry distance (CD) improved after AE, AE+ST, AE+SP, ALL ($p \leq 0.001$), SP, ST ($p \leq 0.01$), and ST+SP ($p \leq 0.05$). Significant improvements were also seen in ball speed (BSPEED) for AE, AE+ST, AE+SP, ALL ($p \leq 0.001$), SP, and ST ($p \leq 0.01$), however, ST+SP showed non-significant increases. For launch angle (LA), AE, ST, SP, AE+SP, and ALL (female) showed non-significant increases, whereas ST+SP, AE+ST, and ALL (male) showed non-significant decreases. Finally, in backspin (BSPIN), AE, ST, SP, AE+SP, ST+SP (male), and ALL (female) showed non-significant increases, whereas AE+ST, ST+SP (female) and ALL (male) had non-significant decreases.

CONCLUSION: There were no significant gender differences following a warm-up. AE was the most valuable element to complete for performance improvement, with the greatest increases seen after AE+SP, AE, and ALL. ST significantly decreased CD, BSPEED, and CHS, however, ST+SP showed significant increases in CD and CHS, suggesting that 30 seconds of SP off-sets any negative effects of static stretching. Performance also significantly increased with AE+ST, suggesting that pre-warming the body may also negate any harmful effects of static stretching. The overall reliability was high (0.831-0.989), suggesting golfers had consistent swings, thus the performance changes were a result of the warm-up components. This was further supported by significant changes in CHS and BSPEED but not LA or BSPIN, indicating that CD improved solely as a result of increased BSPEED attributed to increased CHS.

3010 Board #56 May 31 3:30 PM - 5:00 PM
Actions of The Nasf-ab In a City of The Extreme North of Brazil

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 (No relevant relationships reported)

PURPOSE: Analyze if the teams the Núcleo Ampliado de Saúde da Família e Atenção Básica (NASF-AB) - Extended Core of family health and primary health care - of Sistema Único de Saúde do Brasil (SUS) - Unified Health System - of Brazil, of the city of Macapá in the State of Amapá, It's act in accordance with what is proposed by the Ministry of health.

METHODS: The present study is a descriptive and explanatory research. It includes both qualitative and quantitative character. Which is used the monthly reports of the teams of the Extended Core of family health and primary health care from May to September 2018. The reports used to analyze belongs to 8 teams of NASF-AB that exist in the city of Macapá in the State of Amapá, how that teams work through matrix support each of which is composed of six distinct areas professionals among there are the Physiotherapist, social worker, nutritionist, psychologist, speech therapist and physical education professional.

RESULTS: The results obtained from the documentary survey allow a good analysis about NASF-AB professionals' actions, It was analyzed 3 among 9 available which are health actions, individualized care and home visits accompanied with the Estratégia Saúde da Família (ESF) - The family health strategy. The analysis took into account all the professionals that compose the teams and their actions of the

selected items. Among the data obtained it is essential to emphasize that of all health actions only 7.5% of them had participation of the physical education professional, while the psychologist was 23.8%. When analyzing the number of individualized care in absolute terms there is a large difference between the number of attendances of the psychology professional, which was 1625 individuals, and the social work professional, which in 5 months took care of 632 users.

CONCLUSION: The research evidenced that the attendances made by the NASF-AB teams, among the 3 items analyzed, It is below the expected level of what should be, especially when it's considered that the teams should work using the matrix support, which probably does not occur, If a chosen area is taken into account and the population selected It is understand that the population reach is still restricted. In front of exposed believes that should provide greater training for these professionals.

3011 Board #57 May 31 3:30 PM - 5:00 PM
A Seven Day Healthy Summer Camp Improved Body Composition And Lipid Profile In Obese Children

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PURPOSE: To investigate the effects of lipid profile and anthropometric measures in obese children based on a seven day participation at a health education camp (KIDS).

METHODS: Twenty children were enrolled in the KIDS (12 girls; 8 boys; 9.97±1.27 yrs.; 52.5±10.3 kg; 143.6±10.94 cm). The KIDS team was composed by a Physical Educator, Nutritionist, Psychologist, Physiologist and a Pedagogy which developed the multidisciplinary activities for parents and children. The parents attended the KIDS on the first two days to raise awareness about the healthy habits for the whole family. The children stayed for another five days. The blood sample for lipid profile and anthropometric data were collected before and after KIDS. The Student t test was applied to compare pre and post KIDS data. The level of significance was set at $p < 0.05$. **RESULTS:** The results are presented at table 1. **Table 1-** Anthropometric data and lipids profile (Mean±SD) before and after seven-day KIDS (n=20).

Parameters	PRE	POST	Δ (%)	p
BW (kg)	52.52±10.27	51.85±9.76	-1.13	<0.000
BMI (kg.m ⁻²⁽⁻¹⁾)	25.23±2.35	24.94±2.24	-1.13	<0.000
ΣST (mm)	64.85±15.0	58.53±12.28	-9.22	<0.000
BF (%)	45.11±8.18	41.65±6.71	-7.25	<0.000
FATM (kg)	24.05±7.40	21.94±6.45	-8.77	<0.000
LBM (kg)	28.47±5.46	29.91±4.83	+5.05	<0.000
TC (mg/dL)	161.15±32.45	130.74±27.0	-23,0	<0.000
TG (mg/dL)	130.32±96.0	50.05±19.86	-50,8	<0.026
LDL-C (mg/dL)	93.22±26.37	48.42±10.3	-26,5	<0.000
HDL-C (mg/dL)	46.79±11.50	69.89±22.0	+5,3	<0.000

BW-Body weight; BMI-Body mass index; ΣST-Skinfolds thickness sum (Subscapular and Tricipital); BF-Body fat; FATM-Fat mass; LBM-Lean Body Mass; TC-Total Cholesterol; TG-Triglycerides; LDL-C-Low Density Lipoprotein Cholesterol; HDL-C-High Density Lipoprotein Cholesterol. **CONCLUSIONS:** A seven-day health educational summer camp with multidisciplinary team and parent involvement induced a significant improvement in the lipid profile and anthropometric data of obese children. Financial support: CNPq # 430012/2016-0

3012 Board #58 May 31 3:30 PM - 5:00 PM
Recommendations for the Implementation of Physical Activity Intervention Evaluations in Leisure Centres

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Introduction: Conducting physical activity research in a real-world setting, such as leisure centres (LC's), faces many barriers. Because of this, most applied research has a limited scope of both setting and population. This research explores the barriers and possible solutions for implementing research into real-world settings.

Methods: During January 2018, a multicentre Randomized Controlled Trial aimed at increasing PA levels and member retention rates of LC's was piloted. The research was conducted at six different LC across England. In February and March of 2018, semi-structured telephone interviews with 12 total staff from the different LC's were conducted. Interviews were meant to gather feedback on the implementation of research study processes in the LCs and staff were prompted to reflect on specific barriers and success to the research implementation process. Data were analysed thematically using NVivo.

Results: Feedback indicated that communication between exercise professionals (EP), the sales staff, LC staff, and research team was impaired, largely due to the compartmentalized nature of the LCs and busy working hours. It was criticised that both recruitment procedure and delivery of intervention sessions were described in the same manual, therefore confusing staff as to which procedure was to be carried out by the sales team or EP's. Additionally, compared with sales teams, EPs were overall more confident in recruiting research participants.

Discussion: Based on these qualitative interviews, primary suggestions to aid the implementation of intervention studies in the leisure industry include 1) the necessity of appointing a study manager per LC, 2) scheduling regular conference calls between research staff and LCs to aid the intra- and inter-organisational exchange of information, and 3) the involvement of EPs in study recruitment and intervention delivery. To improve the staff's understanding of all study processes, the distribution of separate manuals for the recruitment procedures and intervention delivery is suggested. **Conclusion:** These recommendations can aid research implementation into real-world settings, and eventually translate into higher rates of LC use and increased PA at the population level.

3013 Board #59 May 31 3:30 PM - 5:00 PM
The Effect of Foam Rolling and Vibrating Foam Rolling on Exercise-Induced Muscle Fatigue

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PURPOSE: To evaluate the effectiveness of foam rolling (FR) and vibrating foam rolling (VFR) on the rehabilitation of exercise-induced muscle fatigue (EIMF).

METHODS: Sixty-six male college students (age: 24.5±2.5 yrs) were randomly divided into three groups: a control group (n=22), a FR group (n=22) and VFR group (n=22). All subjects performed a bout of bottom-up squats for obtaining EIMF. All subjects were measured for peak torque (PT), peak torque/body weight (PT/BW), average peak torque (APT) and total work (TW) by using an isokinetic test system and do the Visual Analogue Scale (VAS) before, 0.5h, 24h, and 48h after the squats. The only difference among groups was that the FR group and VFR group performed a 1-min FR exercise protocol and VFR exercise protocol separately before each post-EIMF protocol measurement (at 0.5h, 24h, and 48h). The data was analyzed by one-way ANOVAs with LSD post-hoc tests, and independent t-tests.

RESULTS: See below table for all results. At 0.5h after the EIMF protocol, PT, PT/BW, APT and TW significantly decreased in FR group, VFR group and control group (all p<0.01), and there were no significant group differences in these variables. At 24h after the EIMF protocol, T, PT/BW, APT and TW tended to be higher in the FR group and VFR group than in the control group, and there were significant group differences between FR group, VFR group and the control group (p<0.01), although there were no significant group differences between FR group and VFR group (P>0.05). At 48h after the EIMF protocol, PT, PT/BW, APT and TW were significantly higher in the FR group and VFR group than in the control group (P<0.01, p<0.05), there were significant group differences between FR group and VFR group (P<0.05).

CONCLUSIONS: Foam rolling and Vibrating Foam Rolling resulted in a faster recovery in muscle strength and muscle work following a bout of bottom-up squats.

In the same condition, the VFR seems to be better in the recovery in muscle strength and muscle work following a bout of bottom-up squats than the FR. The potential mechanism needs to be further investigated.

3014 Board #60 May 31 3:30 PM - 5:00 PM
Moving Beyond Healthcare To Health: A Preliminary And Descriptive Statistical Report On The Health Peers Programme In The War On Diabetes In Singapore In 2017

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INTRODUCTION: The Health Peers Programme illustrates how healthcare providers from multiple disciplines work together to pilot a community health programme in partnership with community stakeholders supported by government health initiatives in the early intervention of diabetes. **PURPOSE:** To determine the impact of a multidisciplinary community health programme focusing on early intervention of diabetes in individuals who are at risk or who have been diagnosed with diabetes.

METHODS: 137 volunteers were trained as Health Peers in 2017 through a structured programme developed by a sports physician, a dietician and a clinical psychologist to coach those at-risk or diagnosed with diabetes. Each health peer reached out to at least 2 residents in a housing estate within 6 months. An outreach included an initial house visit with face-to-face interactions and two subsequent contact sessions, involving face-to-face interaction sessions, online text messaging or teleconversation. The competency and confidence of the Health Peers to conduct health coaching were assessed post-training. A survey was conducted at 6 months post-outreach to assess the extent of translation from knowledge and awareness, to lifestyle changes by the residents. **RESULTS:** All Health Peers showed improvement in their competency post-training. Their confidence levels in health coaching showed increasing trends throughout the period of assessment. 88.9% of the residents reported an overall positive experience when interacting with the Health Peers. All of them reported that they would consult the Health Peers for assistance in their health goals. 87.3% agreed that the Health Peers have impacted their knowledge and awareness of diabetes and healthy living. 83.3% made positive changes to their eating habits and exercise based on the national recommendations after 6 months of health coaching. **CONCLUSION:** A successful and sustainable community health programme must aim to appeal and evoke ownership of its participants to champion chronic disease management and prevention by engaging them through their own experiences. This is achieved through a dynamic and structured programme developed by various expertise within the healthcare profession in collaboration with community stakeholders and supported by government health initiatives.

3015 Board #61 May 31 3:30 PM - 5:00 PM
Effect of 6-week Hypoxic Training on Plasma Metabolites in Overweight Females

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Overweight female population in China ranks first in the world. Overweight is a risk factor for many diseases. Hypoxic training can reduce body weight and improve metabolism. However, the mechanism of weight loss in hypoxia remains unclear.

PURPOSE: To examine the effect of hypoxic training on plasma metabolites in overweight females. **METHODS:** 40 overweight females (age: 31.30±5.15 years, body mass index: 30.11±4.35 kg/cm²) were selected and grouped into hypoxic training group (HT, n=20) and normoxic training group (NT, n=20). All subjects underwent a 6-week training, which included resistance training and endurance training for 30 minutes each, 3 times a week. Resistance training: dumbbells with 12RM, 8 actions, 2 groups for each action. Endurance training: treadmill with slope 0° at 60%-70% maximum heart rate. The HT group was trained under normobaric hypoxia (16% O₂). The NT group was trained in normoxia. The diet was not restricted. Body composition was detected before and after training. Plasma metabolites were analyzed by using liquid chromatography/mass spectrometry and principal component analysis. **RESULTS:** After training, the body fat and serum total cholesterol in HT group reduced more than that in NT group on average (8.37% vs 3.60%, p=0.035; 4.95% vs -14.28%, p=0.005). The metabolic characteristics were significantly different between HT and NT group, there were 50 endogenous metabolites (VIP>1 and p<0.05), of which 33 were increased and 17 were decreased. Major metabolites that changed with hypoxic training included sphingosine, sphingomyelin, phosphatidylcholine, L-valine, linoleic acid and oleic acid. **CONCLUSION:** Hypoxic training has a marked effect on the plasma metabolites in overweight females, which can improve the lipid metabolism by regulating the metabolic pathway of linoleic acid. These findings may lead to a better understanding of the mechanism of hypoxic training in weight loss.

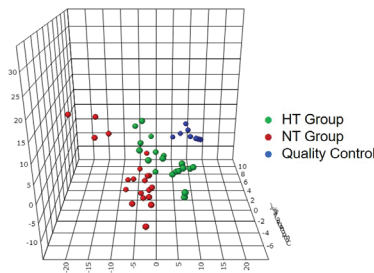


Figure 1. PLS-DA model of LC/MS metabolomics data for post-training between HT and NT group

3016 Board #62 May 31 3:30 PM - 5:00 PM
Top Down 1RM Testing May Facilitate Higher and More Reliable Maximal Strength Values Than Traditional <Bottom Up> Methodologies

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PURPOSE: Accurate determinations of individuals' maximal strength (1RM) are critical when evaluating the effectiveness of exercise interventions involving progressive resistance training. 'Bottom-up' testing methods (BT), involving progressions from low to maximal loads, are commonly employed in clinical and laboratory environments. Concerns about the reliability of this method in novice exercisers suggest that a different technique may be more effective. This study compared the reliability and effectiveness of BT testing to that of 'top down' 1RM testing (TDT), in which the initial testing load is greater than individual's 1RM and loads are progressively reduced until a successful repetition is completed. **METHODS:** 70 healthy adults (age = 45.03 ± 25.64 y) with diverse strength training experience were randomized into a reliability testing trial (n=33) or an optimal method trial (n=27) following a familiarization visit designed to introduce subjects to the pneumatic chest press (CP) and leg press (LP) and to determine their approximate 1RM using a sub-maximal method. Subjects in the reliability trial performed either TDT or BT 1RM testing on 3 occasions separated by at least 3 days, while subjects in the optimal method trial performed each method once in random order on different days. **RESULTS:** No between-group differences were identified at baseline with respect to age, BMI, previous training experience, or predicted leg and chest press 1RM for either trial. For the reliability trial, no significant between-group differences were identified in coefficient of variation over the three testing days for either the CP or LP. However, the BT group produced significantly higher CP and LP 1RM values on the second testing day (Cohen's *d* = -.67, *p* = .014; Cohen's *d* = -.70, *p* = .011, respectively). For the optimal method trial, no order effect across days was identified between BT or TDT. However, significantly higher CP 1RM values were obtained using TDT (Cohen's *d* = .92, *p* = .015). Untrained individuals in this sample obtained significantly higher LP 1RM values using TDT (Cohen's *d* = 2.72, *p* = .001) and older individuals obtained significantly higher CP values (Cohen's *d* = 1.37, *p* = .028) using TDT. **CONCLUSION:** TDT may produce higher and more reliable 1RM values than BT across a wide spectrum of ages and experience levels.

3017 Board #63 May 31 3:30 PM - 5:00 PM
Comparison between Caloric Expenditure Sitting on a Standard Chair, Stability Ball, and Balanced Active Sitting

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Chronic sedentary behaviors can be detrimental to health and increase the risk of mortality. Products, such as stability balls and active balanced sitting chairs, have recently emerged as a way to reduce sedentary behaviors in office settings. **PURPOSE:** To determine if differences in caloric expenditure and heart rate exist between a standard chair (SC), a stability ball (SB), and an active balanced sitting chair (ST). **METHODS:** Participants (n=20) performed a 10 minute reading task while sitting on a standard chair, a stability ball, and an active balanced sitting chair. All three conditions were randomized for each participant. Caloric expenditure and heart rate were monitored via a portable metabolic cart and a heart rate strap, respectively. Conditions were compared using a repeated measures ANOVA and significant comparisons were assessed through Bonferroni post-hoc analyses. **RESULTS:** Heart

rate response was greater on the ST (84±15 bpm) when compared to the SC (75±12 bpm; *p*<.01) and SB (73±12 bpm; *p*<.01). Total caloric expenditure on the ST (27.4±7.07 kcal) was greater than SC (16.55±3.07 kcal; *p*<.01) and SB (16.85±2.54 kcal; *p*<.01); however, no difference existed between SC and SB. Caloric expenditure per minute was greater on the ST (2.73±0.71 kcal) versus the SC (1.64±0.28 kcal; *p*<.01) and SB (1.69±0.26 kcal; *p*<.01). Additionally, the ST required increased MET values (2.35±0.49 METs) than the SC (1.437±0.28 METs; *p*<.01) or the SB (1.50±0.33 METs; *p*<.01). No significant differences were observed between the SB and SC for any of the comparisons. **CONCLUSION:** The ST produced a greater heart rate response and caloric expenditure than the SC or SB, indicating that active balanced sitting may be a feasible way to reduce sedentary office behaviors. Consistent with previous literature, there were no differences in heart rate or caloric expenditure between the SB and the SC during any condition. These results suggest that active sitting, which includes a strong balance component, may be crucial to increasing energy expenditure beyond that of sitting on a SC.

3018 Board #64 May 31 3:30 PM - 5:00 PM

Different Frequencies Of High-intensity Interval Training On Aerobic Fitness And Fatness In Overweight/obese Young Adults

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PURPOSE: To compare the effect of high-intensity interval training (HIIT) on aerobic fitness, body composition, and blood pressure. **METHODS:** Forty-seven overweight/obese young men aged between 18 to 30 years were randomly allocated to non-interventional control (CON; n=14), three HIIT sessions weekly (HIIT×3; n=14), two HIIT sessions weekly (HIIT×2; n=10), and one HIIT session weekly (HIIT×1; n=9). Each HIIT session consisted of 12 × 1-minute of 30-meter shuttle runs at 90% of heart rate reserve (HRR) and interspersed with 11 × 1-minute bouts of jogging at 70% HRR. Aerobic fitness, body fatness, and blood pressure were examined before, after 4 weeks and 8 weeks of the intervention. Aerobic fitness was measured by 20-meter shuttle multistage run test, body fatness was measured by bioelectrical impedance analyzer, and blood pressure was assessed by electronic sphygmomanometer. **RESULTS:** Aerobic fitness in all HIIT groups were significantly higher than CON at post-test. Percent body fat mass, absolute body fat mass, trunk fat mass, and systolic blood pressure in all HIIT groups were significantly lower than CON at post-test. The change of aerobic fitness (Δ% total running distance: *r* = 0.6, *p* < 0.01) was positively correlated with the exercise frequency of HIIT. The Δ% percent body fat mass (*r* = -110.5, *p* < 0.01), Δ% absolute body fat mass (*r* = -0.5, *p* < 0.01), Δ% absolute trunk fat mass (*r* = -0.4, *p* < 0.01) and Δ% systolic blood pressure (*r* = -0.4, *p* < 0.05) showed negative correlation with the exercise frequency of HIIT. **CONCLUSIONS:** Dose-response in the improvement of aerobic fitness, reduction of body fatness, reduction of systolic blood pressure among different exercising frequencies of HIIT were observed. HIIT, even with lower frequency (once weekly), improved aerobic fitness, body fatness, and blood pressure in overweight or obese young adults.

3019 Board #65 May 31 3:30 PM - 5:00 PM

The Experiences of College Students Enrolled in a Fitness Walking Class with Shelter Dogs

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Many four-year colleges and universities no longer require physical activity courses as part of student curricula but continue to offer elective physical activity courses. These elective courses are important given the benefits associated with physical activity, the low levels of physical activity found within the college student population, and the importance of establishing lifelong physical activity habits at earlier life stages. College and universities also stress the importance of community engagement within their courses. In the physical activity context, service-learning curricula has been used to teach responsibility, life skills, and values to students suggesting that addressing the physical activity needs of others, such as shelter dogs, within activity-based courses may benefit multiple entities. **PURPOSE:** The purpose of this study was to examine the experiences of students enrolled in a service-learning fitness walking course in which students walk local shelter dogs. **METHODS:** Data were collected over six full semesters and three summer sessions. During this time, the course was offered twelve times and a total 66 reflection papers

were submitted. These papers were guided by five questions constructed to assess the objectives of the course. Adopting a grounded theory approach, the papers were inductively analyzed first using open coding, followed by focused and axial coding. **RESULTS:** One central theme emerged under which several subthemes was identified. The central theme was the importance of walking to shelter dog physical and emotional well-being. As one subtheme, students described feeling motivated and obliged to attend class regularly so the dogs could get physical activity. Other subthemes included the importance of walking for humans, the importance of patience, enjoyment of interacting with the dogs, learning about the physical activity needs of dogs, and deconstructing stereotypes of shelter animals. **CONCLUSIONS:** The results of this study suggest that students enjoyed engaging in regular walks for the wellbeing of the shelter animals. While students did acknowledge that they were also getting physical activity, this was secondary. Findings suggest that multiple entities can benefit from service-learning physical activity courses and be sources of motivation for students.

3020 Board #66 May 31 3:30 PM - 5:00 PM
A Survey of HBCU Nutritional Habits, Attitudes About Health and Risk Perception

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PURPOSE: The purpose of this study was to explore nutritional habits, attitudes about health, and risk perception in an HBCU population of rural northeastern North Carolina. Specific targets of assessment included nutritional status, perceptions surrounding health risks, environmental risks and risk perception related to common diseases such as prediabetes (PD), high blood pressure (HBP), stroke, asthma, cancer and cardiovascular disease (CVD).

METHODS: A total of 300 university students, faculty and staff ($N = 300$, $M = 143$, $F = 157$, ages 18-65 yrs, $Mean = 23.39$ yrs, $SD = 8.40$ yrs), of any activity level, from all parts of campus were surveyed utilizing the REAP-S and RPS-DD instruments. SPSS correlations and Chi Square tests were used to analyze survey and demographic data.

RESULTS: A strong positive correlation was demonstrated between the beliefs of "I feel I have very little control over risks to my health" and "If I am going to get diabetes, there is not much I can do about it" ($N = 293$, $R = .524$, $p < .001$). Beliefs that exercising regularly could reduce risk strongly correlated to controlling weight gain ($N = 293$, $R = .737$, $p < .001$), as did eating healthy and reducing the risk of diabetes ($N = 292$, $R = .627$, $p < .001$). Increased consumption of sweets ($N = 295$, $R = .157$, $p < .007$) and processed meals ($N = 295$, $R = .125$, $p < .032$) correlated with beliefs related to a lack of control. A negative correlation was demonstrated between this perception and a willingness to make change ($N = 287$, $R = -.123$, $p < .036$), and beliefs that personal efforts would help control risk ($N = 294$, $R = -.192$, $p < .001$). Perceived risk for heart disease correlated with family CVD diagnosis ($N = 292$, $R = -.507$, $p < .001$), perceived cancer risk ($N = 287$, $R = .537$, $p < .001$), perceived HBP risk ($N = 283$, $R = .389$, $p < .001$), perceived stroke risk ($N = 289$, $R = .556$, $p < .001$), and perceived asthma risk ($N = 286$, $R = .340$, $p < .001$).

CONCLUSIONS: Findings suggest perceived control is a powerful indicator of perceptions of the effectiveness of positive health behaviors, and engagement in management behaviors. Family CVD diagnosis strongly impacted personal perceptions of risk for cancer, HBP, stroke, and asthma risk. Future research should evaluate effective interventions centered around healthy exercise and nutrition practices, with an emphasis on internal locus of control.

3021 Board #67 May 31 3:30 PM - 5:00 PM
Differences In Strategic Constructs Of The Transtheoretical Model Across The Levels Of Sitting Time

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Differences in Strategic Constructs of the Transtheoretical Model across the Levels of Sitting Time

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 The strategic constructs, such as processes of change, self-efficacy, and decisional balance, of the Transtheoretical Model (TTM) have been relatively neglected by researchers in spite of the fact that they potentially provide important insight into the content of behavior change interventions. As most criticisms of the TTM are targeted at the central organizing construct, the stages of change, due to its arbitrary stage

classification, the direct comparison between objective values attaching to a specific behavior and the strategic constructs is warranted. **PURPOSE:** To investigate the differences in strategic constructs of the TTM across objectively measured sitting time. **METHODS:** A total of 201 college students conducted a TTM questionnaire for sedentary behavior and worn an accelerometer for seven consecutive days in order to obtain objective sitting time. Multivariate analyses of variances (MANOVA) with post-hoc pairwise comparisons were conducted to determine mean differences in the strategic constructs across quintiles of sitting time. Tests for linear trends were conducted using orthogonal polynomial coefficients. A two-sided $P < 0.05$ was considered statistically significant. **RESULTS:** Compared with participants in higher quintiles of sitting time, 7 out of 10 processes of change (e.g., mostly consciousness raising [$\eta^2_p = 0.09$], followed by social liberation [$\eta^2_p = 0.08$], contingency management [$\eta^2_p = 0.08$], etc.) were used significantly more frequently by those in the lowest quintile ($p < 0.05$) with negative linear trends ($p_{trend} < .05$). No significant differences were found in the constructs of self-efficacy and decisional balance across the quintiles. **CONCLUSION:** Based on this preliminary analysis it appears that the use of certain processes of change would be more beneficial to reduce sitting time or to protect their current sitting time from relapse.

3022 Board #68 May 31 3:30 PM - 5:00 PM
Influence Of Non-cognitive Ability Scores On Physical Fitness Improvement: An Examination Using Longitudinal Data

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Recently, many activities have been conducted to improve physical fitness owing to the decline in children's physical fitness observed in Japan. Such activities have led to gradual improvements in physical fitness. With the commencement of a study to examine the educational effect of exercise promotion, this program entered a new stage. Specifically, we focused on motivation, perseverance, and positive attitudes that are emphasized in young children. These non-cognitive abilities are considered indispensable for future social success. A few studies have examined the relationship between physical fitness and non-cognitive abilities. Last year, we also presented findings of a study on the relationship between non-cognitive abilities and physical fitness of children using cross sectional data, and identified the need to examine the longitudinal relationship. **PURPOSE:** The present aimed to examine the influence of non-cognitive abilities on physical fitness improvement using longitudinal data. **METHODS:** We conducted physical fitness tests and a non-cognitive ability survey on 264 young children. Data were collected during the same period for 2 years. Participants were classified into the improved and non-improved groups based on the extent of change in their ranking in the class. Differences in non-cognitive ability scores in the first and second year were examined using a three-way ANOVA with physical fitness improvement, sex, and grade as factors. **RESULTS:** No significant interaction was confirmed between gender, grade, and physical fitness improvement in any year. A significant main effect of sex, grade, and physical fitness improvement was observed in the first year, and of sex and physical fitness improvement in the second year. Girls' non-cognitive ability score was significantly higher than that of boys. Among 4-year-olds, the non-cognitive ability score was significantly higher in the first year as compared to that in the second year. The non-cognitive ability score of participants in the improved group was significantly higher than that of participants in the non-improved group. **CONCLUSIONS:** The present findings confirmed that non-cognitive abilities have a positive effect on the extent of improvement in physical fitness.

3023 Board #69 May 31 3:30 PM - 5:00 PM
Breaking Up Prolonged Sitting Improves Cognitive Function In Qatari Females

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Within Qatar, 83% of the population participate in little or no physical activity (PA). A sedentary lifestyle is associated with impaired cognitive function. However, cultural barriers [i.e. Islamic traditional clothing (e.g. Abaya)], as well as the climate (i.e. hot and humid), reduce the ability of Qatari females to engage in PA. **PURPOSE:** Examine the effects of an ecologically valid PA intervention on cognitive function in Qatari females. **METHODS:** Eleven sedentary (sitting ≥ 7 h/day) females [median (minimum - maximum) age 27 (21 - 44) y; height 1.64 (1.57 - 1.74) m; body mass 57.8 (47.0 - 87.4) kg; body fat 36 (24 - 45) %] completed three trials. Trial one was a

familiarization. Trials two and three were identical, except in one visit the participants remained seated for 5-h (SIT), and in the other visit they interrupted their sitting time every 30-min with a 3-min walk (WALK) on a motorized treadmill at a moderate walking speed (rating of perceived exertion 12 - 14). Cognitive function was assessed using the Computerized Mental Performance Assessment System (COMPASS) at 15-min before baseline (-15-min), and then at 2.5-h and 5-h. The following tests were completed; serial-3 subtractions (2 min), serial 7 subtractions (2 min), simple reaction time (50 stimuli), rapid visual information processing [RVIP (5 min)], choice reaction time (50 stimuli), and Stroop (60 stimuli). The visual analogue scale for fatigue (VAS-F) was completed at the same time intervals. Linear mixed models were used to examine differences in COMPASS and VAS-F for condition (SIT, WALK), and time (-15-min, 2.5-h, 5-h). Data is reported as effect size; $\pm 90\%$ confident limit. **RESULTS:** There was a greater number of RVIP correct scores in WALK compared to SIT (0.84; ± 0.66). There was a quicker reaction time (RT) for RVIP in WALK compared to SIT (-0.66; ± 0.70). RVIP false was lower in WALK compared to SIT (-0.51; ± 0.73). Stroop RT was quicker in WALK compared to SIT (-0.96; ± 0.05). RT for congruent Stroop was quicker in WALK compared to SIT (-0.92; ± 0.68). VAS-F was lower in WALK compared to SIT (-0.40; ± 0.68). **CONCLUSION:** Interrupting prolonged sitting with moderate intensity walking offers an ecologically valid intervention to enhance cognitive function in Qatari females. Supported by Qatar University CHSS SEED grant (CHSS-SF-16-2).

3024 Board #70 May 31 2:00 PM - 3:30 PM

The Effects Of Regenerative Injection Therapy Compared To Corticosteroids For The Treatment Of Lateral Epicondylitis

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BACKGROUND: The lateral epicondyle is a common site for chronic tendinosis, a condition characterized by overuse and degeneration of a tendon due to repeated microtrauma. This leads to pain and functional limitations. There is a growing interest in non-surgical forms of treatment for this condition including provision of corticosteroid injections and regenerative injection therapy (provision of autologous blood and platelet rich plasma injections). **PURPOSE:** The study objective was to compare the effectiveness of corticosteroids compared to regenerative injection therapy for the treatment of chronic tendinosis at the lateral epicondyle (i.e. lateral epicondylitis). **METHODS:** Researchers systematically reviewed randomized controlled trials published in English language from 2008-2018. Databases used included PEDRO, Scopus, Pubmed, and CINAHL. Ten articles met our selection criteria as an RCT level of evidence with a total of 682 patients. Sackett's ratings adapted to include PEDRO scores helped assess study quality. Analyzed results focused on pain, function and follow-up time. Primary outcome instruments used included Visual Analog Scale, (VAS) and Disabilities of the Arm, Shoulder and Hand, (DASH). **RESULTS:** The corticosteroid groups demonstrated greater benefits in the short-term follow up (36 months; level 1A) and the regenerative injection therapy groups (both autologous blood and platelet rich plasma) demonstrated greater long-term improvements lasting for a period of about 2 years (1A level). One hundred subjects were randomized to receive corticosteroid (n = 49) or platelet rich plasma (n = 51) injections in a double blind RCT. A greater proportion of people reported a reduction of pain and DASH scores by >75% (clinically significant) in the platelet rich plasma group at the 6 months and one-year assessment period. **CONCLUSIONS:** Regenerative injection therapy results in greater long-term pain relief and improved function for people with lateral epicondylitis.

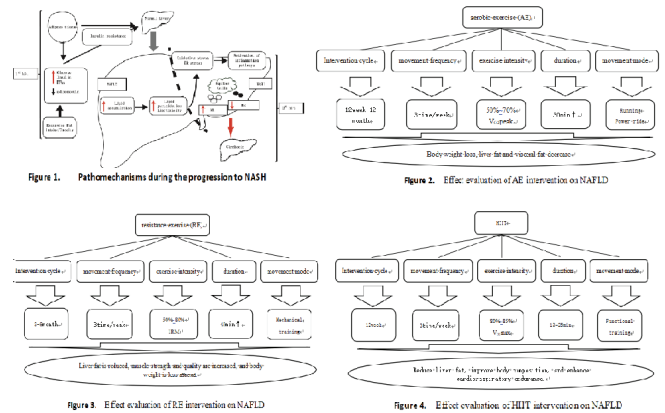
3025 Board #71 May 31 3:30 PM - 5:00 PM

Evaluation of Intervention Effects of Different Exercise Modes on Non-alcoholic Fatty Liver Disease

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PURPOSE: Based on the analysis of more than 1000 documents in the past 5 years and visiting physical activity experts, coaches and athletes, this paper discusses aerobic exercise (AE), resistance exercise (RE), and high-intensity interval training (HIIT) in non-alcoholic fatty liver disease (NAFLD). Discuss The main differences of intervention methods, intervention time, and intervention effects among the NAFLD people, To explore the targeting and dose-response relationship of different exercise models intervention in NAFLD.

METHODS: (1)Through searching in Pubmed,Web of science and other databases, articles were selected for analysis according to the corresponding inclusion criteria and exclusion criteria.(2)Expert survey.(3)Interview method. **RESULTS:** (1) AE, RE and HIIT can reduce hepatic steatosis and improve liver histology in NAFLD people, but their intervention effects are different. AE stands out in reduce body weight; RE stands out in reduce hepatic fat, decreases insulin resistance (IR) and increases muscle strength; HIIT has a significant effect in reducing hepatic fat and enhancing cardiovascular fitness. (2) the frequency, duration, and intervention period of AE and RE are similar; achieve the same or better intervention effect, HIIT only requires the 1/3 exercise time of the previous two.(3) People of different age, gender, physical fitness and disease degree have different choices in sports mode. Scientific monitoring and medical supervision are necessary conditions for improving the relationship between the dose and effect of exercise. **CONCLUSIONS:**RE may be more effective than AE in patients with poor cardiovascular fitness, sarcopenia, and NAFLD who are unable to tolerate or participate in AE; HIIT has certain advantages in the time-effect and dose-effect due to less exercise time and smaller amount of exercise, This is easy for the NAFLD people to accept, and it will facilitate long-term adherence in the future.



3026 Board #72 May 31 3:30 PM - 5:00 PM

Visualization Analysis of International Research of Physical Activity Promoted built environment

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Background: Recently, studies regarding the relationship between the building environment, physical activity, and health have flourished in the areas of public health promotion among urbanized countries. (Chen, 2014). The researchers found that land use structure, residential density, and street connectivity were positively correlated with the amount of daily moderate physical activity (Frank, 2005). Although the importance of building environment to promote physical activity has been emphasized, very little is known about the development trend and “hotspots” in this field. **Purpose:** Through sorting out the process of studies focused on international physical activity promoting-type built environment, this paper aimed to reveal the basic characteristics and research “hotspots” in this field through software analysis and to provide suggestions for future research. **Methods:** Based on the literature about international physical activity promoting-type building environment from the Web of Science, The researchers searched 3,678 research papers and references in the field of health promotion during 2004—2018 and used Citespace Version 5.2 (Chen, 2018) for bibliometric analysis and visualized analysis. **Results:** The results revealed that: (1) current studies mainly come from western countries (i.e., primarily the United States, Canada, and Australia); (2) the research “hotspots” focus on different forms of physical activity, obesity, and body mass index control in built environment. **Conclusion:** Transportation planning and management, urban planning, and behavioral science have focused on building environments that can promote physical activity. Majority of the research has mainly emphasized the relationships between health and built environment and physical activity assessments. While facing the serious problem of childhood obesity, it is important to consider building environment construction as one of the main solutions.

3027 Board #73 May 31 3:30 PM - 5:00 PM
Health and Wellness Coaching as a Promising Strategy to Better Health and Quality Of Life

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Health and wellness coaching (HWC) is a promising strategy and potentially highly effective approach for weight loss in short term and healthy behavior change. As a partnership process between the coach and the client, it emphasizes behavior change to better client health. Coming up as a new approach that focus on behavioral change without a diet prescription, HWC seems to be likely to promote body weight loss and improve quality of life. **PURPOSE:** the aim of this study is to present and evaluate HWC in promoting changes in body composition and to improve the self-assessment of quality of life. **METHODS:** 13 subjects completed the intervention. Body composition (Bodpod®) and quality of life (WHOQOL-bref) were assessed at baseline (P1) and after 12 weeks of HWC (P2). 12 HWC sessions were completed, which were held weekly (1 hour each) + 36 Physical Activity sessions (1 hour each, 3 times a week). No diet was prescribed during the whole process. Data was collected at the School of Physical Education and Sport, University of São Paulo. **RESULTS:** In P2, HWC sessions were associated with reductions in body weight (-2,16 kg) and fat mass (- 1,91 kg). From P1 to P2, we also observed little reduction in fat free mass (-0,25 kg). Great improvement in all aspects of self-rated quality of life was also shown (physical health, psychological domain, social relationship, environment and overall quality of life). These outcomes emphasize the effectiveness of HWC in promoting fat loss and behavioral changes with high impact in quality of life. **CONCLUSIONS:** HWC was able to promote weight loss, fat loss, to maintain fat free mass and to improve quality of life in a 12 week program, combined with an exercise program. Therefore, the strategy was effective in promoting better health, once it empowers individuals to take actions for their own health.

3028 Board #74 May 31 3:30 PM - 5:00 PM
Power Outputs During Performance of a Simple Transfer Task

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(No relevant relationships reported)

PURPOSE: The Gallon Jug Shelf Test (GJST) is a validated assessment of an older persons' capacity to transfer moderately heavy objects from a knee-high to a shoulder high shelf. Since power is a major determinant of performance during activities of daily living, we calculated power during the performance of the GJST.

METHODS: Subjects performed the GJST in a three-dimensional motion capture laboratory while standing with both feet on force plates. The task was performed in an open unit with immovable shelves to allow visualization of movement. The work done during when lifting a stationary gallon jug from low shelf to high shelf was calculated as shown in equation (1). $\Delta Work = m(a+g) \times \Delta h$ (1) Where: m: the mass of the gallon jar (kg); a: the jar's average acceleration (m/s^2); g: gravitational acceleration ($9.81 m/s^2$); Δh : difference in height between the bottom and top shelves (m) The power was calculated as the change in the work over the change in time (equation 2). $\Delta Power = \Delta Work / \Delta t$ (2) Where: Δt : the time spent lifting the jar between the two shelves (s) **RESULTS:** A mixed ANOVA was used to examine differences in work and power among trials and across repetitions (reps). For work, a Huynh-Feldt analysis revealed a significant difference across repetitions ($p=.050$, $\eta^2=.068$), while pairwise comparisons revealed significantly less work by the fourth (rep 2: $Mdiff=.016 \pm .005$; rep 3: $Mdiff=.012 \pm .005$) and fifth repetition (rep 2: $Mdiff=.01 \pm .007$; rep 3: $Mdiff=.014 \pm .007$) ($p<.05$). Similarly, a trend toward significance for differences in power across sets was detected ($p=.067$, $\eta^2=.064$). Pairwise comparisons showed significant declines in power between repetition 2 and repetitions 4 ($Mdiff=.002 \pm .001$; $p=.004$) and 5 ($Mdiff=.002 \pm .001$; $p=.015$), and between repetitions 3 and 4 ($Mdiff=.001 \pm .001$; $p=.004$; $p=.029$).

CONCLUSIONS: The GJST is a viable test of object transfer power and work that can also be used to evaluate fatigue in older persons.

3029 Board #75 May 31 3:30 PM - 5:00 PM
Differences In Male Vs Female Regional Body Composition Changes With Resistance Training

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(No relevant relationships reported)

Purpose: The purpose of this study is to analyze the effects of resistance training on regional body composition in normal-weight males and females.

Methods: A total of 31 (n=14 males) young volunteers were randomized to intervention (9 females, 7 males) and control groups (8 females, 7 males). Females had a body mass index (BMI) of $22.6 \pm 1.95 \text{ kg/m}^2$, and percentage of body fat (%BF) of $32.3 \pm 7.8 \%$; males had a BMI of $22.95 \pm 1.55 \text{ kg/m}^2$ and %BF of $18.14 \pm 6.22\%$. Body composition measurements were recorded using a dual-energy X-ray absorptiometry (DXA), and a maximal strength test was used on both upper and lower body at pre and post intervention. Left and right trunk, arms, and legs lean body mass (LBM) and body fat (BF) were recorded and percentage of change (% Δ) was calculated for each variable. The resistance training protocol consisted of 3 sessions per week for 3 weeks, using 7 exercises (i.e. bench press, barbell back squats, leg press, sit-ups, dead lifts, barbell rows, and jump squats) consisting of 10 repetitions per exercise for 3 sets.

Results: Non-parametric tests showed a statistically significant difference in exercising males ($p=0.001$) in left leg % Δ LBM ($3.05 \pm 1.68\%$) when compared to controls ($-2.32 \pm 2.14\%$). No statistically significant differences were found in any of the body composition variables for females in the resistance training group compared to the control group.

Conclusions: Our results suggest that males and females exhibit different regional body composition changes in response to the same resistance training program. Further research is needed to increase the understanding of sex-related differences in resistance training-induced regional body composition changes.

3030 Board #76 May 31 3:30 PM - 5:00 PM
Impact Of Sit-to-stand And Treadmill Work-station Use On Self-reported Musculoskeletal Pain.

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(No relevant relationships reported)

Purpose: This study examined the effects of a one year work-station intervention on perceived musculoskeletal pain. **Methods:** Sixty-six sedentary overweight office workers (mean \pm SD: age = 45.3 ± 12.3 years, BMI = $32.4 \pm 5.8 \text{ kg/m}^2$) participated in this 12-month study. Participants were cluster randomized to a control (C), (N = 21), a sit-stand desk (D), (N = 23), or a treadmill desk (T), (N = 22) group. Group T was asked to accumulate 2 h of walking and 1 h of standing at the workstation in bouts of 10 to 30 min daily. Group D was asked to accumulate standing for 3 h/day in bouts of 10 to 30 min. Group C did not receive a workstation that enabled behavior change at work and was encouraged to meet the federal physical activity guidelines during the study. All participants self-reported regional musculoskeletal pain using the Modified Nordic Musculoskeletal questionnaire at baseline and month 12. Musculoskeletal regions included the lower back, upper extremity (neck and shoulders), wrist and forearm, and lower extremity (knees, ankles, and feet). Random intercept logistic regression models accounting for repeated measures and the effects of cluster randomization were used to determine change in the likelihood (odds ratio-OR) of self-reporting the presence or absence of pain. Post-hoc pairwise comparisons with Tukey-Kramer corrections (for multiple hypotheses testing) were conducted to determine the location of any significant change. **Results:** There were no significant between group differences in self-reported OR for musculoskeletal pain at baseline. The 12-month intervention did not result in a significant change in self-reported pain in the two experimental conditions in any region. Participants within Group D had a significantly lower likelihood ($p = 0.027$; effect size = 0.10) of self-reporting upper extremity pain at month 12 (OR = 1.29) compared to baseline (OR = 1.78). **Conclusion:** While workstation interventions to decrease sedentary behavior yielded no reductions in self-reported pain over 12-months, increasing daily accumulated standing and/or walking time did not introduce new musculoskeletal pain in seated office workers. These findings may help alleviate concerns associated with change in musculoskeletal pain when introducing ergonomic solutions to break continuous workplace sitting.

3031 Board #77 May 31 3:30 PM - 5:00 PM
The Effect Of 10-week Walking Program On Self-regulation And Exercise Adherence In Sedentary Workers
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PURPOSE: The present study examined changes in self-regulation and self-efficacy in sedentary employees participating in a 10-week walking intervention.

METHODS: 68 sedentary employees were enrolled in a 10-week walking intervention. Subjects were randomly assigned (based on initial BMI and gender) to one of three groups consisting of two walking protocols: intermittent walking (Age = 46±9, BMI= 30.33±5.79 kg/m²) continuous walking (Age = 48±9, BMI= 30.53±6.17 kg/m²) or control group (Age = 42±10, BMI= 27.66±5.11 kg/m²). The two experimental groups received self-paced walking programs that were time and intensity matched, as well as, a mobile health intervention with weekly strategies to improve self-efficacy and self-regulation skills via text messages, e-mails and videos. The control group received a self-pace walking program only. All groups completed a self-regulation and self-efficacy measured by questionnaire and walking behavior measured by a wrist worn accelerometer at baseline, week 6 and week 11.

RESULTS: Results from the mixed ANOVA showed group and time interaction $F(4,130) = 8.017, p < .001$, and a large effect $\eta^2 = .198$. The continuous group significantly improved overall self-regulation and its sub-scales from pre-test to week 6 and post-test ($p < 0.05$). Self-efficacy decreased significantly from pre-test to week 6 ($p = .047$) and post-test ($p = .008$) for all groups. Walking activity changed significantly $F(4,130) = 2.526, p = .044, \eta^2 = .072$, with the continuous walking group significantly increasing walking from pre-test to week 6 ($p = .033$), and a significant higher percentage of change compared to the control group from pretest to post test ($p = 0.042$).

CONCLUSIONS: For sedentary employees a continuous walking program is a better approach to improve self-regulatory skills and may provide a more feasible approach to prescribing exercise in sedentary office employees. Intermittent physical activity may have some positive impact on self-regulatory skills, however the amount of time and frequency of the bouts need to be tested to determine a feasible approach to include physical activity and meet daily obligations as well.

3032 Board #78 May 31 3:30 PM - 5:00 PM
Self-efficacy To Reduce Sedentary Behavior: Differences Between Depressed And Healthy Populations
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 (No relevant relationships reported)

Excessive sedentary behavior (SB) is associated with increased health risks, including risks of poor mental health, such as depression. Previous research demonstrates depressed individuals exhibit increased barriers to health-related behaviors, such as exercise, compared to non-depressed individuals. Examining differences in self-efficacy to overcome barriers to reduce SB in depressed versus non-depressed populations is necessary to design effective SB interventions. **Purpose:** To examine how self-efficacy for overcoming barriers to reduce SB differs between depressed and non-depressed adults. **Methods:** Participants with self-reported major depressive disorder (MDD, $n = 144$) and healthy adults ($n = 1,243$) completed an online survey regarding self-efficacy to overcome barriers to reduce sedentary behavior on a Likert scale ranging from 1 (not at all confident) to 10 (100% confident). Questions examined barriers related to social norms, time, fatigue, motivation, pain/health, resources/environment, and mood. Barriers were compared between depressed and healthy adults with independent-samples t-tests and effect sizes (Cohen's d). **Results:** Participants with MDD reported significantly lower self-efficacy compared to healthy individuals ($p < 0.05$) for overcoming each barrier. The largest difference between groups was seen for mood ($d = 0.75$). Patients with MDD also reported lower self-efficacy for overcoming barriers related to motivation ($d = 0.48$), fatigue ($d = 0.45$), environment/resources ($d = 0.43$), pain/health ($d = 0.34$), social norms ($d = 0.23$) and time ($d = 0.20$). For MDD, self-efficacy to overcome barriers was lowest for mood while social norms was the lowest for healthy adults. **Conclusion:** As confidence in overcoming barriers for reducing SB differs between depressed and healthy adults, intervention strategies that are effective in healthy adults may not be effective for those with depression. It may be necessary to consider the relatively larger impact of mood, motivation, and fatigue on confidence to reduce SB in depressed populations. Future research is needed to examine how addressing low self-efficacy for overcoming different barriers influences the ability to reduce SB in those with depression.

3033 Board #79 May 31 3:30 PM - 5:00 PM
Research and Commercial Utilization of Wearables Among Healthy Adults: An Exploratory Comparative Analysis
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 Reported Relationships: Z.H. Lewis: Salary; Beachbody.

Electronic activity monitors, commonly known as wearables, have proliferated both in research and in consumer use. However, there is limited reports on how wearables are operationalized in physical activity interventions in comparison to how they utilized by consumers. **PURPOSE:** To describe and evaluate the findings of two studies that evaluated the use of wearables among generally healthy individuals. **METHODS:** Study 1—Medscape, Medline, PsycInfo and Cochrane databases were searched in 2017. Included studies were assessed using an intensity scale that measured the extent of wearable usage. The intensity scale assessed duration, personalization, reach, and frequency of the wearable within the intervention with a higher intensity score reflecting higher usage. Study 2—Participants ($n = 33$, 78.8 % Female, 51.5% aged 18-24 years, 56.3% White, 27.07±6.7 kg/m²) were recruited to participate in an online survey. Participants were eligible if they were an adult and if they owned a wearable device aimed to promote physical activity. The intensity scale utilized in Study 1 was used in Study 2. Independent T-Tests were performed to compare intensity scores between Study 1 (effective interventions only) and Study 2. **Summary of RESULTS:** Study 1—22 citations, reporting on 25 unique interventions arms, met the inclusion criteria. Of these, 7 found significant group differences in physical activity and/or weight loss outcomes. These studies utilized several wearable features (86.7%) and allowed participants to interact with the wearable at their own discretion (51.1%). Study 2—72.7% and 42.4% reported positive physical activity and weight outcomes after using their wearable. Participants often use their device daily (87.9%) and use multiple wearable features (75.8%). The intensity scores from Study 2 (18.2 ± 2.7) were higher than Study 1 (15.4 ± 3.9) ($t = -5.6, p < 0.05$). In particular, consumers reported higher frequency of use than effective research interventions ($t = -5.7, p < 0.01$). **CONCLUSION:** Wearables are not utilized similarly within interventions as they are with commercial consumers. Interventions should consider more mandated use of the wearable in the study design to reflect the consumer experience. This will aid in determining the effectiveness of wearables to promote physical activity and weight loss.

3034 Board #80 May 31 3:30 PM - 5:00 PM
Exploring the Physical Activity Counselling Practices of Foundation Doctors: A Qualitative Study
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Purpose: Physician have an enormous role in physical activity (PA) promotion for the purpose of prevention and management of non-communicable diseases. Thus, this study explored the PA counselling practices of medical doctors when in their foundation year as this is the time that serves as a bridge between medical school and specialty/general practice training.

Methods: A qualitative study was undertaken amongst 11 Foundation Doctors (FD) in the Manchester University National Health Service (NHS) Trust using a purposive sampling approach. In-depth interviews were conducted, transcribed verbatim and analysed thematically

Results:

Codes	Sub-Themes	Overarching themes	Quotes
FD PA levels	PA Practise	PA COUNSELLING ATTITUDE AND PRACTISE	'In secondary care I will say the PA advice is more of the physios role because we don't have time. I think we get them medically fit for discharge while the therapy team can encourage physical activity'
Involvement of other health professionals	PA Role Perception Belief		
PA Recommendations and Guidelines Health Benefits of PA Exercise and/PA type	Knowledge about PA		
Clinical Settings	Level of Care		
Patient Body Size	Obesity and PA counselling	BARRIERS	'We are very busy, often staying late. I think it is put lower down the priority order compared to other jobs'
Lack of Undergraduate Teaching and Role Model	Limited Knowledge and Guidance		
Patients Knowledge about PA and Health	Public Awareness	FACILITATORS	Lot of people think PA is important but they have not really thought about talking to patient about it. So highlighting it in a teaching session might bring FD to a consciousness of it and hopefully inculcate it in practise'
Foundation Teaching Sessions Clinical Settings	Favourable setting		

Conclusion: FD PA counselling practise is low and attitude was particularly poor while in the hospital setting. Lack of training and support from consultants were major hindrances noted. Unexplored opportunities exist for foundation doctors to champion PA both in primary and secondary care

3035 Board #81 May 31 3:30 PM - 5:00 PM
Are Fitness Club Members More Likely To Meet Physical Activity Guidelines Than The General Adult Population?
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PURPOSE: There is a need for research examining if having a fitness club membership is associated with meeting the physical activity recommendations. Hence, the aims of the present study were 1) to assess total physical activity level at onset and after 12 months of fitness club membership and 2) investigate if having a fitness club membership is associated with increased physical activity and higher prevalence of meeting current physical activity recommendations than the general population. In addition, we wanted to identify demographic and social-economic variables and compare this in participants with high and low exercise involvement.
METHODS: The participants (n=250) answered an electronic questionnaire at inclusion covering demographic and social-economic factors. Self-reported exercise involvement at the fitness club was obtained after three, six and 12 months. Total physical activity level was measured by ActiGraph GT1M in a sub-cohort (n = 125) at inclusion and after 12 months. Adherence to current physical activity recommendations was defined as ≥ 150 minutes/week of moderate to vigorous physical activity (MVPA) in bouts of ≥ 10 minutes.
RESULTS: At both time-points, more than half of the participants had low physical activity level. No significant changes in total physical activity level were found from inclusion to 12 months. Although, daily bouts of MVPA increased with 8.9% ($p = \geq 0.05$). Muscle-strengthening activity were reported by 54.4% (in mean 1.9 (± 1.0) days/week) and 44.3% (in mean 1.5 (± 1.0) days/week) at inclusion and after 12 months, respectively. The prevalence of meeting 150 minutes of weekly MVPA increased with 9.9% from inclusion to 12 months, with no significance changes ($p = \geq 0.05$). After three, six and 12 months, few differences in demographic and socio-economic variables were shown between participants with high and low exercise involvement.
CONCLUSIONS: Fitness club members have higher prevalence of meeting the current physical activity recommendations compared to the adult population. Although,

more than half of the participants had low physical activity level at both inclusion and after 12 months, suggesting that a fitness club membership in itself might not be sufficient to meet the current physical activity recommendations.

3036 Board #82 May 31 3:30 PM - 5:00 PM
How Best to Use Your Limited Cardiovascular System Training Equipment Budget: A Case Study
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PURPOSE: The Student Life and Wellness Center (SLWC) at Utah Valley University (UVU) spent \$300,540 on its current fleet of 46 pieces of cardiovascular system training equipment (cardio equipment). UVU students pay for gym equipment from student fees. SLWC managers want to know how to use their cardio equipment budget and gym space efficiently to benefit students most. **METHODS:** All the cardio equipment was purchased from Life Fitness (Rosemont, IL). The equipment reports usage data to Life Fitness, and we retrieved that data from their Halo Fitness Cloud. All the equipment has been in use for 24 months except the treadmills which have only been in use for 3 months. **RESULTS:** Overall use (distance, hours, and workouts) was compared. Use/month/dollar was compared, in order to best understand the value and popularity of each device.

Equipment	Price	Distance/month	Distance/month/dollar	Hours/month	Hours/month/dollar	Workouts/month	Workouts/month/dollar
Number	\$	Miles	Miles	Hours	Hours	Number	Number
Treadmill (15)	\$6,880.23	261.722 ²	.038 ²	54.662 ¹	.008 ¹	231.267 ¹	.034 ¹
Elliptical (12)	\$5,710.30	211.143 ²	.037 ²	37.699 ¹	.007 ¹	133.333 ¹	.023 ¹
Upright Bike (6)	\$5,999.00	513.352 ¹	.086 ¹	35.400 ¹	.006 ¹	148.667 ¹	.025 ¹
Recumbent Bike (7)	\$6,499.00	534.197 ¹	.082 ¹	41.834 ¹	.006 ¹	180.286 ¹	.028 ¹
PowerMill Climber (4)	\$6,999.00	569.440 ¹	.081 ¹	77.990 ¹	.011 ¹	402.000 ¹	.057 ¹
FlexStrider Trainer (2)	\$9,665.00	31.580 ¹	.003 ¹	5.415 ¹	.001 ¹	31.500 ¹	.003 ¹

¹ p < .05 compared to Treadmill
² p < .05 compared to Elliptical
³ p < .05 compared to Upright Bike
⁴ p < .05 compared to Recumbent Bike
⁵ p < .05 compared to PowerMill Climber
⁶ p < .05 compared to FlexStrider Trainer

DISCUSSION: Powermills are the most used equipment in our sample: whether measured as distance, hours, or workouts. They are also the best overall value. FlexStriders cost the most money and were used the least. **CONCLUSION:** Through simple analysis of automatically-recorded data, UVU can use student money effectively. Students will have the equipment they like to use, and less student fees will be needed as costly unpopular equipment will not be purchased in the future. Gym managers should be able to serve their clientele better with similarly-simple analyses.

3037 Board #83 May 31 3:30 PM - 5:00 PM
Utilizing Technological Devices to Enhance Prevention of Type II Diabetes Mellitus
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PURPOSE: To evaluate the inclusion of technology, a Fitbit Flex and smartphone, into the popular lifestyle modification program: the Diabetes Prevention Program - Group Lifestyle Balance Program (DPP - GLB). The DPP - GLB Program has shown great success in reduction of progression toward T2DM. However, it was unknown how integrating technology would affect overall program outcomes, which included the attainment of 150 minutes of physical activity (PA)/week and weight loss trending toward 7%.
METHODS: Men and women over the age of 40, and at risk for prediabetes, were recruited. The study included an initial four weeks of baseline PA testing, followed by 12 weeks of lifestyle intervention. Individualized weight loss and PA goals were set. Participants self-randomized to the control (N = 11) or the technology group (N = 13). Session participation was high. Technology participants missed 8.3% of sessions, while control participants missed 18.2% of sessions.
RESULTS: Participants were aged 66.24 (SD = 7.38) years. At baseline, 21% of participants were overweight, and 79% were obese. Using a generalized estimating

equation to estimate average weight lost, participants lost 0.46 lbs/week. One hundred percent of technology participants lost weight, while 73% of control participants lost weight. Only 7.7% of technology participants reached the 7% weight loss goal, while 27.2% of control participants reached the 7% weight loss goal. Both groups lost similar amounts of weight in averages, with technology participants losing an average of 7.35 lbs and control participants losing an average of 7.79 lbs. At study conclusion, 37% of participants were overweight, and 63% were obese. Although statistical significance was not found, we believe clinical significance was found. The majority of participants (63%) self-reported inactivity during the initial meeting. Technology participants averaged PA tracking for 72.5 days while the control group averaged 47.7 days of PA tracking of 77 days available.

CONCLUSIONS: Monitoring PA with technology can reinforce positive lifestyle changes to encourage users and increase activity due to instant feedback from the device. Participants can be successful with weight loss by going through the GLB Program, with or without technology, reinforcing the importance of lifestyle modification.

3038 Board #84 May 31 3:30 PM - 5:00 PM
The Correlative Relationship Between Fitness Goals and Wearable Usage: An Observational Double-Blind Study

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Background:

Wearable devices, such as Fitbits, Apple Watches, and numerous fitness devices, have become an increasing trend in those attempting to improve and/or monitor their physical activity. These devices incorporate various features that may elicit behavior change, however there is limited information on which features are utilized most. In addition, there is limited information on whether the usage of wearables varies by fitness goals. The present study observes wearable users and examines any correlative relationships between wearable usage and individual fitness objectives.

Methods

Consenting males and females ages 18 and older who owned any variation of wearable devices were given a 15-minute survey containing questions regarding the type of wearable owned, wearable usage, fitness activity, fitness goals, and opinionated questions. Descriptive statistical analysis using means and frequencies were utilized to describe the sample. Spearman correlation analyses were used to determine the relationship between the participant's reported fitness goal and reported usage of various wearable features. All analyses were conducted using IBM SPSS Version 25.

Results

Of the participants to complete the survey (n=33), the majority were female (78%) and were between 18 and 24 years old (51.5%). Most participants worked out 3-4 times a week (37%) and used their wearable daily (87.9%). Participants reported that their primary fitness goal was to lose weight (42.4%), build muscle (21.2%), lose fat (18.2%), and improve mobility (18.2%). The most prevalent features used were the virtual rewards/badges (69.7%), exercise alert notifications (62.5%), and goal-based challenges (42.5%). The correlation analyses showed a weak correlation between the fitness goal and reported device utilization (r<1.0 on all utilization variables).

Conclusion

Our preliminary analyses show weak correlations between reported fitness goal and usage of wearables. These results suggest that how individuals use their wearable device (which impacts the exposure to embedded behavioral change techniques) negligibly impacts and is negligibly affected by their fitness goal. However, more research is needed to further evaluate the relationship between these variables.

3039 Board #85 May 31 3:30 PM - 5:00 PM
The Effects of a Pilot Translational Health In-School Program on Physical Fitness and Health Outcomes

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Low levels of physical activity and physical fitness are associated with adverse medical conditions including type 2 diabetes and cardiovascular disease. Significant declines in physical activity are most notable in children as they transition to adolescence in middle school making this a critical age to promote a physically active lifestyle that confers health benefits. Several existing programs have used multiple courses and activities to promote active lifestyle behaviors in middle school adolescents. We theorized that a single in-school elective course may be an effective strategy to promote health outcomes in adolescents. **PURPOSE:** To examine the effects of a multidimensional translational health in nutrition and kinesiology (THINK) in-school

pilot program encompassing nutrient/exercise physiology education, laboratory experiences, and structured physical activities on physical fitness, physical literacy, and nutrition knowledge.

METHODS: Participants from a public middle school were enrolled in the THINK elective course (n=33, 22 males; 11 females; 11.97±0.03 yrs). The program was administered two hours/day, two days/week for 16 weeks. Participants were evaluated at baseline and post-intervention for physical fitness, elements of physical literacy, and nutrition knowledge. **RESULTS:** THINK students evidenced a 5.88 mmHg reduction in mean arterial pressure (p=0.05), along with the following improvements in physical fitness: a 4.55 lb increase in muscular strength, a 72.19 ft increase in distance covered during the NIH 2-minute walk test, a 2.34 in increase in lower body power, and 3.64 increase in the number of sit-ups performed in one minute (p≤0.01 for all). There were no significant changes in BMI or flexibility. Additionally, THINK students exhibited significant increases in nutrition and kinesiology (p<0.01) signifying a better understanding of the value of physical activity and nutrition for health promotion/disease prevention. **CONCLUSIONS:** A multidisciplinary THINK program employing kinesiology/nutrition science education, laboratory skills, and physical activities in one course can result in significant improvements in physical fitness, physical literacy, and nutrition science education.

3040 Board #86 May 31 3:30 PM - 5:00 PM
Perceived Quantity of Physical Activity as a Reflective Measure in Muscle and Bone Strength

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Perception plays a powerful role in shaping health outcomes. An active lifestyle, provides mechanical load needed to strengthen and maintain both muscle and bone health. Many recommendations on the quantity of physical activity needed for health benefits exist however it is unclear if individuals perception of their activity habits relates to muscle and bone strength benefits. **PURPOSE:** To determine if those who perceived that they get the right amount or more than needed amount of exercise, have greater muscle and bone strength.

METHODS: 79 participants, 41 females and 38 males (age (yrs) 29.2 + 10.8, height (cm) 166.5 + 9.2, body fat % 24.6 + 9.3) performed a relative grip strength (RGS) test using a hand grip dynamometer, 1 repetition maximum leg extension test (1RM), and a vertical jump test using a Vertec (PP). Bone Strength Index (compression) (BSIc) and polar Strength-Strain Index (SSIp) were measured using peripheral Quantitative Computed Tomography (pQCT). A questionnaire stated "Do you feel you get too much exercise, too little exercise, or about the right amount of exercise?" Welch's t-tests detected differences in muscle function and bone strength based on perception of exercise quantity (Above and Below).

RESULTS: 41 participants perceived they got the "right amount of exercise or above" (Above) and 29 participants reported that they got below the right amount of exercise (Below). Perception of the Above group resulted in greater muscle function tests compared to the Below group (Average PP: 11.5% (p=0.004), RGS: 5.7% (p=0.004). "Right amount of exercise or above" resulted in greater bone strength (SSIp) at both the radius (11.7% (p=0.055) and tibia (13.3% p=0.02).

CONCLUSIONS: Participants' perception on quantity of exercise reflected their bone and muscle strength. Those who perceived that they get the appropriate or a higher amount of exercise had greater bone and muscle strength values compared to participants' who perceived they exercised less. Perception of getting the "right amount of exercise or above" compared to "below right amount of exercise" was a good indicator of greater bone and muscle strength.

3041 Board #87 May 31 3:30 PM - 5:00 PM
Investigating the Relationship Between Social Media Use and Reported Rates of Exercise

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Purpose: Social media has a large impact on body image and confidence. This study aims to gather information and examine correlations on the relationship between social media use and reported rates of exercise.

Methods: An observational study of participants (n=33) that own a wearable fitness device was conducted. Approximately 79% of participants were female, 52% of participants were aged 18-24, 30% aged 25-34, 12% aged 35-54, and 6% aged 55 and older. Participants completed a questionnaire asking them to describe their exercise and social media habits. Participants classified themselves as having an intermediate

(51.5%), advanced (33.3%) or beginner (15.2%) proficiency in exercise. Descriptive statistics with means and frequencies were used to identify trends in social media use and exercise frequency. The relationship between social media use and exercise frequency were assessed through Spearman Correlation and Chi-Squared procedures. All analyses were conducted using IBM SPSS Version 25.

Results: Participants reported exercising once a week (3.0%), 1-2 times per week (24.2%), 3-4 times per week (39.4%), 5 or more times per week (30.3%), or not currently exercising (3.0%). The preferred exercise type was aerobic (69.7%), followed by resistance (21.2%) and balance (9.1%). No participants reported posting their exercise to their social media accounts but 27.3% follow a fitness model or blog. There was a strong correlation between exercise frequency and following a fitness model or blog ($r=-0.3$, $p=0.05$) but the direct relationship was nonsignificant ($\chi^2=5.4$, $p=0.3$).

Conclusion: Our results suggest that there is a correlation between people who follow fitness models or exercise blogs and exercise frequency. Our research also suggests that there may be an underlying mediating variable driving this relationship. We plan to conduct a focus group to ask specific questions regarding social media's influence on exercise. Future research should look at the mediating relationship between social media use and exercise frequency.

3042 Board #88 May 31 3:30 PM - 5:00 PM
Incarcerated Young Women's Exercise and Sleep Behaviors: A Needs and Feasibility Study

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Incarcerated young women (ages 16 to 21 yo) are at high risk for future drug abuse. Both regular exercise and adequate restorative sleep have been shown to reduce drug use and other harmful behaviors. Existing programs for incarcerated youth to reduce future drug use do not address healthy lifestyles or incorporate Positive Youth Development models. Implementing such a program requires understanding these young women's current physical activity and sleep attitudes and behaviors.

PURPOSE: Determine whether wearable technology can be applied in a close custody setting. Establish current attitudes and behaviors related to sleep and physical activity of incarcerated young women. **METHODS:** Incarcerated young women completed an anonymous survey concerning physical activity and sleep attitudes and behaviors, using a 5-point agreement response scale. 46 of approximately 75 young women consented to participate. Descriptive statistics are presented. A convenience sample of 9 young women wore a Fitbit for a week. **RESULTS:** No regular physical activity program is provided for these young women. However, the majority felt that they were "built for exercise" and "have the skills for exercise." There was strong agreement that "when active they enjoy it" at 4.2 ± 0.8 . The majority of girls felt that they "needed more sleep." And being "sleepy" significantly correlated with self-reported being "grumpy" (p less than 0.001). Girls do not have access to computers, and we were able to implement a system of recharging and downloading the wearable units that was feasible and acceptable for staff. Girls used the Fitbits as directed. Only 2 of 9 girls achieved the goal of at least 8 hours sleep per night, despite the prescribed lights out and awakening times that should allow more than 9 hours sleep each night. Only one girl achieved more than 10,000 steps each day. **CONCLUSION:** Incarcerated young women's sleep and physical activity do not meet recommended guidelines. Both are domains where these high-risk emerging adults still can make choices despite close custody. A Positive Youth Development program to enhance these behaviors and increase their self-efficacy for health choices could add to existing programs to deter future drug use and other harmful behaviors. Supported by the Paul R. Vogt endowment and Ramona and Thomas McDonald donations.

3043 Board #89 May 31 3:30 PM - 5:00 PM
Listening To Music While Exercising Increases The Risk For Noise-Induced Hearing Loss

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(No relevant relationships reported)

Music has an ergogenic effect on exercise performance, improves motivation, decreases exertion, and delays the onset of fatigue. However, loud sound levels from music can cause permanent damage to the inner ear resulting in noise-induced hearing loss (NIHL).

PURPOSE: The purpose of this study was to assess the risk of NIHL among students utilizing campus recreational facilities and examine whether music used as a motivator was associated with increased risk for NIHL.

METHODS: One hundred and nineteen students were recruited from the main fitness center on college campus. Physical activity level was recalled using a modified short version of the International Physical Activity Questionnaire. Music intensity levels

were assessed by a sound pressure level mannequin with a built-in microphone. Thirty second samples were taken in 5 second intervals using participant's personal listening devices. Average, minimum, and maximum sound levels were recorded in decibels (dBA). The estimated risk for NIHL was established based on the average sound level and duration of exposure using NIOSH criteria. Participants indicated whether music was a motivator during a workout. Descriptive statistics were performed for all variables. Chi-square analyses evaluated relations between risk for NIHL, gender, and music as a motivator. T-tests assessed the difference in average loudness level and gender.

RESULTS: Participants were college students (51.3% males, 48.7% females). Majority of participants (89.1%) used music as motivation while exercising (93.4% male and 84.5% female, $p>0.05$). Twenty four percent of participants were at risk for NIHL, approaching statistical significance for gender (29.5% males vs 19% females, $p=0.056$). The average sound levels for the participants were 88.8 ± 10.3 dBA and statistically significant for gender (90.9 ± 10.6 dBA for males, 86.5 ± 9.4 dBA for females, $p=0.017$).

CONCLUSIONS: Every fourth college student listening to music while exercising was at risk for NIHL. NIHL is an avoidable cause of permanent hearing impairment. Recommendations for safe use of personal listening devices during workouts include keeping volume at a safe level, below 85 dBA, and limiting time spent using the device during workouts.

3044 Board #90 May 31 3:30 PM - 5:00 PM
Connected Health Exercise Consultation Case Study: A Weight Management Strategy Post Gastric Bypass Surgery

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(No relevant relationships reported)

Weight regain is not uncommon post gastric bypass surgery (GBS). A connected health (CH) platform has the potential to improve adherence to lifestyle recommendations to support long-term weight management.

Purpose: Describe the process of delivering a CH intervention to support in-person exercise consultations in a case study example. **Methods:** A sedentary 59-year old female (18-years post GBS) with a BMI=37.9 kg/m² was assessed at baseline, 12 and 24-weeks with the 6-minute walk test (6-MWT), 17-item Block Brief Dietary Fat Intake Screener and the 10-item Block Fruit-Vegetable-Fiber Screener. An activity monitor worn on the wrist tracked the daily physical activity (PA) level and a chest strap Heart Rate monitor recorded structured exercise (SE) over the 24-weeks. Bluetooth technology downloaded PA and SE related data to a smartphone using a fitness application with CH capability. The CH intervention consisted of two 30-minute in-person exercise consultations (Week 1 and 4) plus six follow-up telephone calls (Weeks 5-24) with individualized feedback and guidance from a clinical exercise physiologist. Short-term progressive PA and SE goals were negotiated over the 24-week period with an initial prescription (Weeks 1-4) of 8,000+ steps/day and SE on 2+ days/week (60-90 minutes/week). **Results:** The mean daily step count was 12604 and 14630 steps/day and the mean SE minutes were 106 and 90 minutes/week for Weeks 1-12 and Weeks 13-24 respectively. Baseline, 12, and 24-week 6-MWT distances were 514.6, 567.7, and 630.9 meters, predicted daily values for total fat were 87.1, 75.1, and 72.7 grams, fruit/vegetable servings were 4.8, 2.6, and 4.4/day and dietary fiber were 12.5, 7.1, and 10.2 grams respectively. Body weight was 94.6, 80.6, and 71.6 kg respectively. **Conclusion:** In this case study example, the subject demonstrated adherence to using wearable technology to track PA related behavior and participate in this CH intervention. **Future directions:** CH may provide a process to remotely deliver weight management support between in-person clinical visits. Research is required to evaluate the impact of CH interventions in a bariatric patient population. Supported by Mayo Clinic and Arizona State University Project Honeybee

3045 Board #91 May 31 3:30 PM - 5:00 PM
University Staff Physical Activity Inventory (USPAI)

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The work-related environment has been implicated as a factor involved in the declines of physical activity (PA) in the United States and abroad. Although, the collective literature would suggest that reductions of risk for multiple chronic health conditions has been associated with physically active lifestyles meeting or exceeding 150 minutes/week. Staff in a University setting may experience unique work-related challenges that may inhibit his-or-her ability to achieve recommended daily levels of PA. Few studies exist; however, that have evaluated PA among University staff members. **PURPOSE:** To explore self-reported levels of PA among staff members at Biola University.

METHODS: Eligible survey respondents (N = 320) were men (n = 108, 40.3 ± 13.1 years of age, 168.0 ± 8.5 cm in height, 74.8 ± 14.3 kg in weight, and an average body

mass index (BMI) of 26.4 ± 4.7 kg/m² and women ($n = 212$, 39.7 ± 13.3 years of age, 164.2 ± 8.1 cm in height, 69.8 kg in weight, and an average body mass index (BMI) of 26.03 ± 6.5 kg/m²) who reported being staff members from Biola University. Participants completed the International Physical Activity Questionnaire (IPAQ), using the Survey Monkey® platform. Workers were grouped by type of job (administration, staff and facilities). Total daily sitting time and metabolic equivalent (MET) minute activity-specific (leisure, household, occupational, and transport) and total weekly PA were calculated. **RESULTS:** A Multivariate Analysis of Variance MANOVA revealed significant ($p < 0.05$) main effects for job type, total minutes of PA per week, and grand total PA per week. Post-hoc analyses revealed facilities had significantly greater minutes of work PA and total weekly PA than staff and administration. There was no significant ($p > 0.05$) difference between job types in quantity of leisure, transport, and household PA. An independent T-test was employed to evaluate gender differences for total minutes of work PA and overall minutes of weekly PA. Significant ($p < 0.05$) differences were observed for gender and total work PA, but not for overall PA. Men were significantly more active at work than women. **CONCLUSION:** Mean weekly minutes of overall PA exceeded minimal weekly recommendations among all job titles and sexes.

3046 Board #92 May 31 3:30 PM - 5:00 PM
Physical Therapy Students Knowledge And Attitudes of Nutrition

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(No relevant relationships reported)

PURPOSE: Physical therapy has incorporated health promotion as a part of practice, which includes nutrition. A search of university curriculum within the state of Texas revealed no nutrition courses within entry-level doctoral physical therapy programs or at prerequisite level. Furthermore, little research has been conducted on the knowledge and attitudes of nutrition in physical therapists. Therefore, the purpose of the present study was to determine knowledge and attitudes of nutrition in current physical therapy students. **METHODS:** Subjects included doctoral physical therapy students from across the range of years of study in professional preparation programs. This research was conducted online (Qualtrics), which included a Nutrition Knowledge Test (NKT) (32 possible points) and an attitude scale (55 possible points). The survey was disseminated by doctoral physical therapy program directors to students and analyzed using ANOVA. **RESULTS:** A complete sample of $n = 605$, the mean NKT score was 22.43 ± 3.43 (70.1%). Though there was no correlation between attitudes and knowledge of nutrition ($.026, p = .526$), physical therapy students revealed high regard for nutrition with the mean attitude score being 47.13 ± 4.32 (85.7% agreeableness with positive nutrition statements). There was also a significant difference in NKT scores when comparing groups who had taken a nutrition course and those who had not, 22.81 ± 3.56 and 21.66 ± 3.46 ($p < .001$), respectively. Those individuals who had completed 3 or more nutrition courses showed the largest improvement on the NKT (~7%). Additionally, the Midwestern region presented with the most students' programs having a nutrition course, held the highest NKT scores (22.67 ± 3.19), highest regard towards nutrition (47.44 ± 4.22) and were most satisfied with level of understanding of nutrition (69.8%). It is important to note that though there was an increase in NKT scores with increase in nutrition courses, the difference was only 2.36 points on the NKT. **CONCLUSION:** Based on relatively small changes in NKT and desires expressed during this survey, integrating nutrition competencies within current required courses may be the most appropriate intervention.

3047 Board #93 May 31 3:30 PM - 5:00 PM
Relationship Between Socialization and Weight Changes Using Among Individuals That Use Wearable devices

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Over the past few years, the use of fitness-tracking wearable devices, or wearables, has increased. They have many features that allow users to monitor their activity, measure pulse rate, and communicate their progress with other users. Accessible and streamlined user interfaces assist individuals in weight management while sharing their results with others in their social groups. Prior research has shown evidence for a positive association between weight loss and in-person socialization during workouts. However, research on virtual socialization within wearable devices and changes in weight is limited.

PURPOSE: To investigate the relationships between socialization and changes in body weight after wearable use.

METHODS: Individuals that owned a wearable device were eligible for this observational study. Surveys were completed electronically via Qualtrics Online Survey Platform. Participants accessed the survey through social media, email, and in-person recruitment ($n=33$, 78.8% Female, 51.5% aged 18-24 years, 56.3% White, 27.07 ± 6.7 kg/m²). Data was analyzed using SPSS Version 25. Chi-square tests and Spearman correlations were used to evaluate the relationship between changes in weight and in-person socialization (e.g. work out buddies) or device socialization (e.g. interactions with likes, comments, leaderboards, etc.).

RESULTS: Participants reported both an increase (33.3%) and a decrease (66.7%) in weight since using their wearable. There was prevalent use in the various socialization techniques (in-person = 42.4%, likes and comments = 30.3%, and leaderboards = 27.3%). In accordance with previous studies, there was a moderate association between in-person socialization and weight loss ($r = -0.49, p = .02$). There were no significant associations between changes in weight and usage of leaderboard features ($r = -0.18, p = 0.42$) or likes and comments features ($r = -0.07, p = 0.77$).

CONCLUSIONS: Our analysis did not find a significant relationship between reported weight change and virtual socialization. However, there was a moderate relationship between reported weight change and reports of working out with a partner. Due to the small sample size, no definite conclusions can be drawn but future research should continue to investigate in-person versus virtual socialization on weight outcomes.

3048 Board #94 May 31 3:30 PM - 5:00 PM
Exercise is Medicine Programs: Public versus Private Healthcare Provider Interest and Needs

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(No relevant relationships reported)

Purpose: Park Prescriptions (ParkRx) incorporating healthcare provider referrals for park-based physical activity (PA) are a type of Exercise is Medicine (EIM) program to improve patient physical and mental health through outdoor PA. This study explored public vs private healthcare provider 1) PA counseling practices, 2) knowledge/interest in ParkRx, and 3) barriers and resources needed to implement ParkRx programs. We anticipate private providers to be more receptive to ParkRx.

Methods: An e-survey was administered in Spring/Summer 2018 to healthcare providers in Kansas, Missouri and North Carolina. Participants were recruited via flyers, emails, community-healthcare partnerships, and snowball sampling techniques. Modified validated survey items examined PA counseling practices, knowledge/interest in ParkRx programs, and barriers and resources needed. Descriptive statistics and independent samples t-tests explored study objectives including differences by public (i.e., Hospital, HMO, VA) versus private (i.e., consultant; solo/group) practice.

Results: Providers ($n=223$) were mostly public (57.4%) versus private (42.6%). The majority of providers ask about patient PA habits (75.0%) in a lot/all of check-ups ($M=5.0, SD=1.5$). However, private providers ask about PA habits and provide verbal counseling more often than public providers, $t(168.4) = -2.10, p = 0.038, t(168.10) = -3.20, p = 0.002$ respectively. Very few providers give written PA prescriptions (10.8%). Few providers knew about ParkRx programs (13.9%), but 81.6% expressed interest in program development. Public providers were more willing to implement a ParkRx program $t(181.9) = 2.40, p = 0.017$. When implementing ParkRx, public providers place greater importance on evidence of park-based PA $t(221) = 2.40, p = 0.017$, evidence of patient interest $t(221) = 2.30, p = 0.022$, a patient portal with PA resources $t(221) = 2.84, p = 0.005$, and incorporation into EHR electronic $t(178.9) = 2.55, p = 0.012$.

Conclusions: Healthcare providers underutilize written PA prescriptions and awareness of EIM programs such as ParkRx is limited. EIM initiatives should target both public and private healthcare providers, but remain cognizant of differences in implementation needs.

3049 Board #95 May 31 3:30 PM - 5:00 PM
The Effects of Sit To Stand Workstations on Perceived Leisure

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(No relevant relationships reported)

With the increase in sedentary behaviors, workplaces are using new ways to improve activity by giving employees the option to stand while working. However, research has not fully examined the impact of workplace wellness initiatives on participants' perceived freedom to participate in leisure activities. **PURPOSE:** The purpose of this study was to evaluate the effects of a sit-to-stand (STS) workstation intervention on leisure function over 12 months. **METHODS:** Faculty and staff volunteers from a university ($N=24$) were randomly assigned to a control group ($n=11$) or STS group ($n=13$). STS participants were required to stand at the desk for a minimum of two hours per workday. The Leisure Diagnostic Battery (LDB)-Function was used to assess perceived freedom in leisure. The LDB includes a 25-item survey regarding social comfort, environment, decision making, and communication with others. A

repeated measures ANOVA was used to analyze results. **RESULTS:** Two outliers were removed from analysis. All assumptions were met. A significant difference occurred between groups ($F_{2,22}=5.14, p=.01$). A significant time effect did occur from pre-test to 6 ($p=.02$) and pre-test to 12 months ($p=.02$). The main effect for group was not significant ($p>.05$). The CG decreased by .05 points from baseline to 6 months and increased by .09 from 6 to 12 months ($p>.05$). A dependent t -test revealed the STS group significantly decreased by .26 points from baseline to 12 months ($p=.00$). **CONCLUSION:** The STS group decreased feeling less free to engage in leisure activities from baseline to 12 months. Similar to current research, this data demonstrates that workplace interventions may not improve leisure activity participation. However, this study only measured self-reported freedom in leisure. Future research should objectively measure leisure activity participation.

ACKNOWLEDGEMENTS: This project was funded by the University of Central Oklahoma, Research and Sponsored Programs office.

3050 Board #96 May 31 3:30 PM - 5:00 PM
Associations Between Neighborhood-level Measures Of Socioeconomic Status And School-reported Health-related Physical Fitness.

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PURPOSE

We previously reported pervasive musculoskeletal fitness deficits and high obesity prevalence at a proxy predominantly Hispanic elementary school in Corpus Christi, Texas. It's unclear whether these are linked with neighborhood level measures of socioeconomic status (SES). This study investigated associations between school-reported health related physical fitness and neighborhood-level measures of SES, i.e., area deprivation index (ADI), median household income, park density, and number of park amenities that support physical activity (PA).

METHODS

The study sample consisted of 41 elementary and middle schools in Corpus Christi Independent School District (student enrollment is 79% Hispanic). Percentages of students who achieved healthy fitness zone (HFZ) classification on FitnessGram® outcomes in 2016-2017 was generated from Texas Education Agency database. School zip codes, corresponding median household incomes, park density, and park amenities that support physical activity were retrieved using Google search engine, US Census Bureau American FactFinder tool, and Geographic Information System (GIS) mapping tools, respectively. ADI was obtained using Neighborhood Atlas. Park density was the ratio of the number of parks to land area (in square kilometers) of respective zip codes. Land area was measured using GIS tools. Linear regression models and resulting standardized beta coefficients informed the magnitudes of associations between outcomes. Statistical significance was set at $p < .05$.

RESULTS

Median household income was negatively associated with the percentage of students who achieved HFZ on the measure of cardiorespiratory fitness ($\beta = -.406; p = .006; 95\% \text{ CI } [.000, .000]$). The number of park amenities that support physical activity ($\beta = .524; p = .000; 95\% \text{ CI } [.003, .008]$) and ADI ($\beta = -.420; p = .004; 95\% \text{ CI } [-.027, -.005]$) were positively and negatively associated with the percentage of students who achieved HFZ classification on BMI, respectively.

CONCLUSION

The current findings suggest that park authorities should invest and ensure equity in the number park amenities that support physical activities across neighborhoods with low and high deprivation indices. The association between median household income and cardiorespiratory fitness warrants further investigation.

3051 Board #97 May 31 3:30 PM - 5:00 PM
Medical Students' Knowledge and Attitudes to Physical Activity and Health and to Physical Activity Counseling

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PURPOSE: Physical activity (PA) counseling in the health care setting is regarded as a promising avenue to increase population level PA. Equipping future physicians with the necessary knowledge is crucial. The aim of this survey was to assess the knowledge on and attitude towards PA and health, as well as PA counseling at a large German Medical School.

METHODS: a 15-item online survey was conducted. The study has been approved by the University Ethics Committee.

RESULTS: 145 students (106 females, 73%) returned the questionnaire. 118 (81%) reported not knowing the WHO PA recommendations. Only 15 (10.3%) respondents could identify the recommendations correctly. 108 (74%) reported having learnt

anything on the health effects of PA. 106 (73%) wished more information on this topic. 97% and 96% of respondents considered PA to be important or very important in the prevention and therapy of chronic diseases respectively. 99% judged PA counseling to be physicians' task. Weekly reported PA was as follows: 9 (6%) no exercise, 19 (13%) > 1 hr, 47 (32%) 1-2 hrs, 41 (28%) 2-4 hrs, and 29 (20%) < 4 hours. 32 (22%) respondents were in the entry phase of their studies, 87 (60%) in the midphase and 26 (18%) in their final, practical year. Gender was not associated with the importance of PA in prevention and therapy, with physicians' PA counseling role and with perceived need for more information on PA and health. High overall PA volume was only associated with physicians' PA counseling role (Spearman's rho .224, $p > 0.01$). The importance of PA in therapy was associated with the importance of PA in prevention (Spearman's rho .595, $p > 0.01$). PA counseling as physicians' role was associated with PA in prevention (Spearman's rho .402, $p > 0.01$) and PA in therapy (Spearman's rho .406, $p > 0.01$) respectively. **CONCLUSIONS:** Medical students are interested in learning about the health effects of PA, consider PA important in the prevention and therapy of chronic diseases, and see PA counseling as physicians' task, with no difference between males and females and students according to their study phase. Also no association was found between respondents' PA and health related views and their volume of PA. A self-selection bias in respondents cannot be ruled out.

3052 Board #98 May 31 3:30 PM - 5:00 PM
Comparison Of Energy Expenditure Of Overground And Motorized Treadmill Running In Healthy Chinese Young Adults

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PURPOSE: Overground and motorized treadmill running are popular types of exercise training. Compared to motorized treadmill running, overground running has no external motor and depends on subject's own motor to acceleration and deceleration. However, it is still unexplored for the difference of cardiometabolic demands of overground running when compared with treadmill running at the same speed. The purpose of this study was to compare the oxygen consumption at the same speed of overground and treadmill running in Chinese young adults. **METHODS:** 40 healthy Chinese young adults (21 male, 24.8±2.04 years; 19 female, 23.8±1.95 years) volunteered to participate in the study. After the anthropometric data collection, body composition assessment, 6 min running bouts energy costs of different speed (7km/h, 8km/h, 9km/h) of overground and treadmill running were measured. The energy costs of subjects were measured by a portable gas analyzer (MetamaxTM 3B, Germany). Overground trials were completed in an indoor sports stadium, and treadmill (Rodby RL3500E, Sweden) running were completed in the same stadium to minimize environmental influences on performance. The variables including heart rate, oxygen consumption ($\dot{V}O_2$) and RPE were collected within 6 minutes during each overground and treadmill running test. **RESULTS:** The gross overground running metabolic energy cost of male at 7km/h, 8km/h and 9km/h was higher when compared to the treadmill testing mode (0.242 ± 0.02 vs. 0.225 ± 0.02 ml/kg/m, $P < 0.01$; 0.249 ± 0.02 vs. 0.219 ± 0.02 ml/kg/m, $P < 0.01$; 0.244 ± 0.02 vs. 0.215 ± 0.02 ml/kg/m, $P < 0.01$). We also found significant differences of female between the two modes with the treadmill being lower (0.231 ± 0.02 vs. 0.217 ± 0.02 ml/kg/m, $P < 0.01$; 0.232 ± 0.02 vs. 0.213 ± 0.01 ml/kg/m, $P < 0.01$; 0.228 ± 0.02 vs. 0.207 ± 0.01 ml/kg/m, $P < 0.01$) at speed of 7 km/h, 8km/h and 9km/h. **CONCLUSIONS:** The results demonstrate that, for all experimental velocities in men and women, the energy cost of overground running is higher than the treadmill running. It is critical that these differences are taken into account when prescribing training intensities on whether the overground running or the treadmill running to a training protocol.

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3053 Board #99 May 31 3:30 PM - 5:00 PM
Comparison of Progressive Single and Multiple Sets of Resistance Training on Muscle Strength and Power

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Controversial research findings have yet to determine whether single or multiple sets of resistance training protocol is more effective than the other. **PURPOSE:** To compare the effects of low volume progressive single set and traditional multiple sets of resistance training on muscle strength, power, and field tests in the upper and lower

body. **METHODS:** Total 20 participants were randomly assigned to single set (ST, n=10), and multiple sets groups (MT, n=10). The ST group trained for one set with a maximum of six reps. The first rep started at 70% of one repetition maximum (1RM) and increased by 5% after each rep until they reached 90% of their 1RM and then the last rep was performed at 100% of 1RM. The MT group trained at 70% of 1RM for 10 reps with 3 sets. Both groups trained 3 times per week for 8 weeks using the squat and chest bench press. 1RM squat, 1RM bench press, anaerobic power, vertical jump, and medicine ball throw in upper and lower body were measured at baseline and after 8 weeks of training. Two-way repeated measures ANOVA were used to determine an interaction effect between trial and treatment groups factors for each dependent variable. Main effects of trials and the treatment groups were also tested. **RESULTS:** There was no significant interaction effect between trial and treatment groups for all dependent variables. Main effect results show that both ST (percentage change = 20%, $p < .001$) and MT (24.05%, $p < .001$) groups significantly increased 1RM squat, compared to their baseline. 1RM bench press was also increased in both ST (6.82%, $p < .005$) and MT (13.9%, $p < .002$) groups. No significant differences in 1RM squat and 1RM bench press were found between the two training groups. Anaerobic power in ST (22.8%, $p < 0.001$) and MT (8.6%, $p < .002$) groups was significantly increased, compared to their baseline. However, there were no significant differences in anaerobic power of upper body. Vertical jump in ST (13.54%, $p < .001$) and MT (6.43%, $p < .049$) groups was significantly increased, compared to their baseline. There was no significant increase in the medicine ball throw from both groups. **CONCLUSIONS:** The results imply that low volume progressive single set training (ST) protocol is as effective as traditional multiple sets training (MT) protocol for increasing muscle strength and power.

3054 Board #100 May 31 3:30 PM - 5:00 PM
Effects of a Multifactorial Exercise Intervention on Falls Risk Factors: Comparing Age and Falls History
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In the US, older adults experience an estimated 29 million falls per year resulting in 7 million injuries. Multifactorial exercise interventions (INT) are effective in reducing falls risk. Yet, it remains poorly understood how age and previous history of falls impacts INT aimed to reduce falls risk.

PURPOSE: To compare the effects of a multifactorial exercise INT on time (pre, post), age group (50-59, 60-69, 70-79, 80+ years), and faller status [fallers (1 or more falls in past year), non-fallers] on right & left leg strength (RLS & LLS), foot & hand reaction time (FRT & HRT), 30 second sit-to-stand (STS), and timed up and go (TUG). **METHODS:** One hundred eighty-three older adults (71.0±6.6 years, 1.7±1 m, 81.5±17.2 kg) participated in a multifactorial INT, Stay Active and Independent for Life (SAIL). Participants met for 1h, 3x/week for 10 weeks; exercises included aerobic, balance, strength, and stretching exercises. RLS & LLS (normalized to body mass), FRT & HRT (ms), STS (number of repetitions) and TUG (s) were assessed pre and post-INT. A 2 (time) x 4 (age group) x 2 (faller status) MANOVA was conducted to assess differences among factors. Post-hoc analysis was conducted for significant interactions ($\alpha < 0.05$).

RESULTS: Main effects were attained for time and age group ($p < 0.05$). Participants were stronger (RLS, pre=24±.08, post=28±.09; LLS, pre=23±.08, post=27±.09) and improved leg endurance (STS, pre=12.36±3.22, post=14.54±4.01) after INT. FRT was faster from pre (306.6±49.8) to post (299.6±43.6). For age group, 60-69 had greater RLS and LLS (.26±.10, .26±.09) than 70-79 (.25±.09, .24±.08). In 60-69 (14.32±3.94) group, STS was higher than 70-79 (12.96±3.4) and 80-90 (11.66±3.87). TUG scores were faster for 60-69 (7.00±1.52) compared to 70-79 (7.73±1.54) and 80-89 (9.09±2.12). No other statistically significant differences were found ($p > 0.05$).

CONCLUSION: In line with previous literature, SAIL was effective at reducing falls risk factors, supporting SAIL to be an effective INT. Multifactorial INT are an effective strategy to combat falls as they target multiple risk factors. Outcomes of 60-69 age group suggest INT should be adjusted for advanced age. However, including falls efficacy and quality of life may give more insight into improvements. Supported by grant from Potomac Health Foundation.

3055 Board #101 May 31 3:30 PM - 5:00 PM
Virtual Reality Exercise on College Students' Mood and Rating of Perceived Exertion

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PURPOSE: This study examined differences in college students' mood and rating of perceived exertion (RPE) during immersive virtual reality (VR), non-immersive VR, and traditional biking sessions.

METHODS: Forty-nine college students (34 females; $M_{age} = 23.6$) completed three separate 20-minute biking exercise sessions: 1) immersive VR biking on VirZoom VR bike using PlayStation 4; 2) non-immersive VR biking on Gamercize bike using Xbox 360; and 3) traditional biking on Spirit Fitness XBU55. Their mood was assessed via the Brunel Mood Scale (anger, confusion, depression, fatigue, tension, and vigor) during each session. RPE was evaluated by the Borg Rating of Perceived Exertion every 4 minutes. Repeated measures ANOVA was used to compare the mean differences in mood and RPE among these 3 exercise sessions.

RESULTS: Overall, significant differences were observed between biking sessions for mean RPE [$F(2, 98) = 3.58, p = 0.03, \eta^2 = 0.07$] and all mood variables [$F(2, 96) = 3.84 - 278.56, p < 0.05, \eta^2 = 0.07 - 0.85$], except for tension ($p > 0.05$). Post hoc Bonferroni comparisons indicated immersive VR had significantly higher anger compared to non-immersive VR (1.09 ± 0.21 vs $1.5 \pm 0.66, p < 0.01$); non-immersive VR had significantly higher confusion compared to immersive VR (1.51 ± 0.69 vs $1.26 \pm 0.53, p = 0.01$) and traditional biking (1.51 ± 0.69 vs $1.20 \pm 0.4, p < 0.01$), respectively; immersive VR had significantly lower depression compared to traditional biking (1.07 ± 0.18 vs $1.34 \pm 0.68, p = 0.03$); both immersive VR (1.86 ± 0.72 vs $2.47 \pm 0.87, p < 0.01$) and non-immersive VR (1.81 ± 0.74 vs $2.47 \pm 0.87, p < 0.01$) had significantly lower fatigue compared to traditional biking; immersive VR had significantly higher vigor compared to non-immersive VR (3.70 ± 0.93 vs $1.30 \pm 0.47, p < 0.01$) and traditional biking (3.70 ± 0.93 vs $1.15 \pm 0.38, p < 0.01$), respectively; immersive VR had significantly lower mean RPE compared to traditional biking (10.18 ± 1.84 vs $12.86 \pm 2.13, P < 0.01$).

CONCLUSIONS: Findings suggest a commercially-available VR-based exercise bike (VirZOOM) may be a motivating interesting and enjoyable physical activity promotion tool for healthy young adults.

3056 Board #102 May 31 3:30 PM - 5:00 PM
High Intensity Interval Training in a Natural Setting: An Intrapersonal Perspective

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High intensity interval training (HIIT) is an extremely challenging workout associated with negative affect for participants (Ekkekakis et al., 2011; Foster et al., 2015). HIIT is often perceived as appropriate only for people who are experienced and relatively fit exercisers and as a poor option for deconditioned or previously sedentary exercisers (Hardcastle et al., 2014). Almost all HIIT research has been conducted in controlled, laboratory settings and focused on physiological adaptations. Little is known about the affective experiences of HIIT participants in real-life settings.

PURPOSE: To examine the experiences of HIIT participants in a real-life outdoor boot camp.

METHODS: Qualitative interviews were conducted with 16 boot camp participants whose length of time participating in HIIT ranged from two months to eight years.

RESULTS: Three main findings: 1. People of widely varying fitness levels, ages, body types, and exercise backgrounds were able to enjoy and successfully perform HIIT workouts. According to body mass index categories, 64% of study participants were either overweight or obese. Ages ranged from 26 to 58 years; 2. Participants reported the alternating intensity levels were motivating and allowed them to work at near maximal intensity for short intervals, knowing low intensity intervals would soon provide needed recovery. The ability to customize the intensity and duration of intervals made HIIT workouts easier to complete than moderate intensity workouts extending over long periods of time; 3. Social support within the boot camp was crucial to successful performance and enjoyment of HIIT workouts. Participants reported that social support enabled them to endure workouts at higher intensity levels than would have been possible if exercising alone.

CONCLUSIONS: HIIT is appropriate for people of varying fitness levels and exercise experience. Built-in recovery intervals motivate people to maximize effort during high intensity intervals. Social support during HIIT was central to participants' ability to complete difficult workouts.

3057 Board #103 May 31 3:30 PM - 5:00 PM

The Effect of a Behavioral Weight Loss Intervention With or Without Exercise on Depressive SymptomsKelliann Davis, FACSM, Renee Rogers, John Jakicic, FACSM.
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Depressive symptoms have been associated with less weight loss in some behavioral weight loss interventions (BWL), and although it has been speculated that adding moderate-to-vigorous physical activity (MVPA) may improve outcomes, the relationship is not well understood. **PURPOSE:** To examine the relationship between weight loss, MVPA participation, and depressive symptoms over time in subjects enrolled in a BWL.

METHODS: Secondary analyses of depressive symptoms and weight loss in sedentary subjects ($n=379$; 45.0 ± 7.9 years; $BMI=32.4\text{kg}/\text{m}^2\pm 3.8$) enrolled in a BWL and randomized to a reduced calorie diet (DIET, $N=104$), diet plus a moderate dose of MVPA (MOD-EX, $N=97$), or diet plus a high dose of MVPA (HIGH-EX, $N=102$) were completed. All groups reduced energy intake (1200-1800 kcal/day), received weekly intervention sessions (months 1-6), followed by 2 group and 2 telephone contacts per month (months 7-12). MOD-EX was prescribed unsupervised MVPA that progressed to 150 min/wk, and HIGH-EX was progressed to 250 min/wk. Depressive symptoms (CES-D) and weight were assessed at 0, 6, and 12 months.

RESULTS: Weight decreased [6mo: $-9.18\pm 5.9\text{kg}$; 12mo: $-10.0\pm 7.8\text{kg}$] and depressive symptoms modestly increased from baseline to 6 months [BL: 6.45 ± 2.34 ; 6mo: 7.05]($p<0.001$) and baseline to 12 months [BL: 6.45 ± 2.34 ; 12mo: 6.93]($p<0.05$), with no significant differences between randomized groups. There was a modest, yet significant correlation between baseline CES-D score and weight change at months 6 ($r=.126$) and 12 months ($r=.122$)($p<0.05$). Subjects who completed 6 months of the intervention ($n=337$) had significantly lower baseline CES-D scores compared to the non-completers ($n=42$)($p<0.05$), but there were no differences for 12 month completers ($p=.49$).

CONCLUSIONS: The data revealed an inverse relationship between baseline depressive symptoms and success in the BWL. This relationship was not different between DIET, MOD-EX, and HIGH-EX, indicating that exercise participation may not influence this relationship. While depressive symptoms increased slightly over time regardless of group assignment, the 6 month completers had lower baseline depressive symptoms than non-completers. Thus, baseline depressive symptoms may be an important marker of both success and attrition in a BWL.

3058 Board #104 May 31 3:30 PM - 5:00 PM

Cardiorespiratory Effects Of A Multicomponent Exercise Program On Individuals Diagnosed With Alzheimer's Disease: Pilot StudyFlávia B. Machado, Óscar Ribeiro, Joana Meireles, Arnaldina Sampaio, Joana Carvalho. University of Porto, Porto, Portugal.
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Dementia, particularly Alzheimer's disease (AD), is one of the major causes of impairment and dependence in the world. Besides the cognitive decline, that characterize AD, this neurodegenerative disease progresses along with functional impairment, and adversely affects physical conditioning. Recent guidelines reinforce the need to implement effective interventions to mitigate the impact of AD. Physical exercise could be significant in improving functional and cognitive performances in these individuals. Cardiorespiratory fitness has been directly associated with different health-related parameters, brain health, neurocognitive performance and ability to perform daily activities. Submaximal incremental treadmill tests have been used to measure aerobic fitness in healthy older adults and seems to be appropriate for those diagnosed with dementia. **PURPOSE:** The aim of this study was to evaluate the impact of a multicomponent exercise program on peak oxygen consumption.

METHODS: According to the 2011 *NINCDS-ADRDA* criteria, and in a mild to moderate stage of disease, 15 community-dwelling individuals diagnosed with probable AD were referred from the Neurology Department of a Hospital Centre to participate in this study. VO₂ peak was measured through an incremental treadmill test using a modified Bruce protocol, designed for older individuals, previously tested with AD subjects. **RESULTS:** Results from Wilcoxon Signed Rank test revealed a slight increase on VO₂ peak [19,11(3,61); 20,60(4,40)]; $p=0,594$] and on time to reach it [5,58(1,48); 6,17(2,23)]; $p=0,575$] which may be explained by a potential benefit of exercise on peripheral factors such as muscular resistance and coordination, both essential to success on endurance tests. **CONCLUSIONS:** Data from both evaluation moments suggest that AD subjects cardiorespiratory fitness is under the established partners for independent healthy older adults. These results reinforced the importance to create cost-effective strategies, and to use gold standard evaluation instruments, to mitigate or prevent the physical conditioning decline, determinant to their autonomy on activities of daily living.

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3059 Board #105 May 31 3:30 PM - 5:00 PM

Sedentary Time and Physical Activity Pattern in Women after an Interdisciplinary Program to Treat ObesityCamila A M de Oliveira, Mariana C. Villani, Caio B. Messias, Amanda S. Moraes, Silvano S. Gil, Maria Gabriela S. Cuesta, Luiz Henrique L. Affonso, Suzana M R Teixeira, Cauê V. La Scala Teixeira, Ricardo J. Gomes, Danielle A. Caranti. Universidade Federal de São Paulo, Santos, Brazil.
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The result of interventions for body weight reduction is not rare disappointing. Adjustments in daily-life physical activities and in sedentary time in response to exercise may undermine the negative energy balance caused by the interventions, reducing their efficacy.

Purpose: To determine the effects of an interdisciplinary program (IP) to treat obesity on sedentary and physical activity (PA) time. **Methods:** A total of 14 obese women (39.33 ± 5.77 years and $BMI 34.14\pm 2.99$) participated in a 16-week program consisting of 3 sessions/week lasting 2 hours each. Physical exercise was carried out for 1 hour in every session, followed by psychological, nutritional or physical therapy intervention. For sedentary time and PA determination participants wore an accelerometer for seven consecutive days before and during the last week (LW) of IP. The difference between Pre and LW values was determined by repeated measure one-way ANOVA. Pearson's correlation test was also performed. Significance was set at 5%. The protocol was approved by Unifesp Ethics Committee (#2.579.851). **Results:** Following IP, body weight change ranged from -5.90 to $+2.40$ Kg. However, the program failed ($p>0.05$) in promoting a significant mean reduction on body weight (Pre 94.06 ± 8.35 ; Post 93.07 ± 8.56 Kg). Neither the time (min/day) spent sedentary (Pre: 568 ± 63 ; LW: 600 ± 75), in light (Pre: 257 ± 47 ; LW: 267 ± 64) or moderate/vigorous (Pre: 24 ± 10 ; LW: 24 ± 14) PA nor the number of steps/day (Pre: $6,392\pm 1,530$; LW: $6,808\pm 2,874$) changed in LW compared to the period pre-intervention ($p>0.05$). The correlation between changes in body weight with changes in time in sedentary (-0.068), light (-0.233), moderate/vigorous (-0.292) PA and steps/day (-0.289) was also not significant ($p>0.05$). **Conclusion:** Even though we did not find a significant correlation between variation in body weight and variation in time sedentary/active, the lack of change in sedentary and PA time despite the addition of 3 sessions of exercise/week suggests the occurrence of a compensation to minimize the increase in daily energy expenditure caused by exercise, contributing to the resistance to body weight reduction. Our results also demonstrate a failure in adopting a more active life style after participating in an IP.

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3060 Board #106 May 31 3:30 PM - 5:00 PM

Water Intake During Resistance Training Affects Arterial Stiffness In Normotensive Healthy AdultsDaniel Rodriguez¹, Nakazato Koichi², Naoki Kikuchi², Gustavo Allegretti¹, Francisco Luciano Pontes Jr.³, Aylton Figueira Jr.¹.
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(No relevant relationships reported)

Resistance training (RT) may induce arterial stiffness (AS) which is associated with increased risk of myocardial infarction and stroke, the two leading causes of death in the developed world. However, there are a lot of variables and situations that can influence AS such as water intake (WI).

PURPOSE: To determine the influence of WI during RE on arterial stiffness. **METHODS:** Young adult men ($n=17$, 23.1 ± 6.3 years old; 174.0 ± 5.4 cm height; 76.4 ± 13.3 kg weight) with at least 1 year of previous experience in RT and previously hydrated performed in two different occasions (one week interval between them) an RT session (3 sets, 8-12 repetition of 12 exercises for all major muscle groups at 70-80% of 1RM) with [WI session (500ml of water)] and without (NWI session) water intake. Aortic stiffness was measured before, immediately after, and 30 and 60 min after the RT session via Ankle-brachial pulse wave velocity (PWV). Repeated measures ANOVA was conducted to compare RT sessions differences (Rest, after, 30min, 60 min). Between-RT sessions differences at each moment were examined using appropriate post hoc analyses.

RESULTS: Increase in post-exercise PWV for the NWI session compared to rest was observed. Moreover WI values were lower than NWI for all post-exercise measures. Table 1. Pulse wave velocity (PWV) in meters per second (m/s) before, immediately after, 30 and 60 min after WI and NWI resistance training sessions.

RT session	Rest	After	30 min	60 min
No water	11.3±1.5	12.3±1.1	12.3±1.2	*12.5±1.0
Water	11.5± 0.6	*11.5±1.2	*11.3±1.2	*11.8±1.1

* Significant difference between no water and water sessions ($p < 0.05$). #Significant RT session by time interaction/difference in relation to Rest ($P < 0.05$). Results are presented in mean and standard deviation.

CONCLUSION: WI during RT may be beneficial to reduce the negative impact of RT on arterial stiffness. This was evidenced by the maintenance of PWV values after WI session and increased values after NWI. From this investigation alone we cannot determine whether WI is influencing the PWV measurement or which physiological mechanisms were influenced by WI.

3061 Board #107 May 31 3:30 PM - 5:00 PM
Outcomes On Physical Activity Levels By Minimal Contact Intervention At A University Setting: Preliminary Results

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 (No relevant relationships reported)

PURPOSE: To compare the effects of an intervention program of minimal contact using Whatsapp® and Fitbit® over the levels of physical activity on a university population.

METHODS: We designed a 12-week intervention program of minimal contact on a university population. Participants were randomly assigned into two groups: intervention (IN) and control (CO). From a total of 177 participants, 19 (11 men, 8 women, aged 18 - 32) completed the program and had the complete accelerometry information measured with the wGT3X-BT® accelerometer. The program consisted of messages sent by Whatsapp® every week based on The Canadian 24 hrs movement: sweat, step, sleep and sit. All the messages were based on the motivational self-determination theory. The participants also wear a portable Fitbit Flex® 2 for 12 weeks. We evaluated the moderate to vigorous physical activity (MVPA) levels and sedentary behaviors in minutes/day and percentage of weekly wearing time by accelerometry using the IPEN criteria. We compared the outcomes by group (t-test, U Mann-Whitney) and time (paired T-test, Wilcoxon).

RESULTS: Both groups met the recommendations of MVPA in high proportion (IN=83.3%, CO=85.7%, >150 min/w). There were no significant differences in MVPA nor sedentary levels between groups at baseline and after 12 weeks. MVPA (in time and percentage) and time in sedentary activities decreased, however, the percentage of sedentary activities increased in IN group but decreased in the CO group. Nonetheless, these differences were not significant. Sedentary behaviors were very high in both groups. Independently of the intervention and the assessment moment, subjects spent more of the 60% of the wearing time on sedentary activities (Table).

CONCLUSIONS: This intervention was not effective to increase MVPA levels or decrease sedentary behaviors. Probably more time is needed to improve the entire 24 hrs movement component and/or the minimal contact should be more supervised in this sample.

	Pre			Post		
	Intervention (n = 12)	Control (n = 7)	P	Intervention (n = 12)	Control (n = 7)	P
MVPA (min/day)	46.7 ± 21.9	50.1 ± 23.4	0.755	45.9 ± 21.1	49.7 ± 18.5	0.698
MVPA (%)	5.6 ± 2.5	5.8 ± 3.0	0.966	5.5 ± 2.6	5.7 ± 2.4	0.862
Sedentary (min/day)	536 ± 67.5	573.1 ± 64.7	0.257	529.5 ± 76.0	558.8 ± 87.7	1.0
Sedentary (%)	63.6 ± 5.1	66.1 ± 6.8	0.383	64.6 ± 7.8	64.2 ± 3.1	0.904

Data expressed as mean ± standard deviation. There were no significant differences for pre vs post assessments ($p > 0.05$). MVPA: Moderate to vigorous physical activity; (min/day): Average daily time on that activity; (%): Percentage of the whole week spent on that activity.

3062 Board #108 May 31 3:30 PM - 5:00 PM

Using the Immediate Blood Pressure Benefits of Exercise to Improve Exercise Adherence

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A single exercise session evokes blood pressure (BP) reductions that are immediate and persist for ≥24hr, termed *postexercise hypotension* (PEH). Self-monitoring of PEH may foster positive outcome expectations of exercise, and thus, enhance exercise adherence among adults with hypertension. **PURPOSE:** To compare the efficacy of self-monitoring of exercise (EXERCISE) versus exercise plus PEH (EXERCISE+PEH) for exercise adherence and BP control among adults with hypertension. **METHODS:** Adults with high BP were randomized to EXERCISE (n=12) or EXERCISE+PEH (n=12). Subjects underwent supervised, moderate intensity aerobic exercise training for 40-50min/session, 3d/wk for 12wk, and were encouraged to exercise unsupervised at home ≥30min/d, 1-2d/wk. All subjects self-monitored exercise using a calendar recording method. EXERCISE+PEH also self-monitored BP before and after exercise. Adherence was calculated as [(# of exercise sessions performed ÷ # of possible exercise sessions) X 100%]. BP was measured pre- and post-training. **RESULTS:** Healthy, middle-aged (52.3±10.8y) men (n=11) and women (n=13) with hypertension (136.2±10.7/85.2±8.9mmHg) completed exercise training with 87.9±12.1% adherence. EXERCISE+PEH demonstrated greater adherence to supervised training (94.3±6.6%) than EXERCISE (81.6±13.2%; $p=0.007$). In addition, EXERCISE+PEH performed 32.6±22.5min/wk more unsupervised home exercise than EXERCISE ($p=0.004$), resulting in greater overall study exercise adherence (107.3±18.7%) than EXERCISE (82.7±12.2%; $p=0.002$). Post- versus pre-training, BP was reduced -7.4±11.3/-4.9±9.9mmHg ($ps < 0.025$) with no statistical difference between EXERCISE (-5.2±13.3/-3.6±6.1mmHg) and EXERCISE+PEH (-9.9±11.3/-6.1±6.9mmHg; $ps > 0.344$). **CONCLUSIONS:** This study is the first to demonstrate that PEH self-monitoring is an efficacious tool to improve exercise adherence among adults with hypertension. Future research among a larger, more diverse sample is needed to confirm these novel findings and determine whether EXERCISE+PEH translates to better BP control relative to EXERCISE self-monitoring alone.

3063 Board #109 May 31 3:30 PM - 5:00 PM
Health and Fitness Improvements in Deconditioned Firefighters

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PURPOSE: To observe longitudinal changes in health and fitness among deconditioned professional American firefighters using High Intensity Functional Training (HIFT). **METHODS:** This HIFT was part of a credit-bearing educational experience (course-based) in which 13 undergraduate students participated in a service activity that met the needs of a community partner (Fire Services) and allowed them to gain deeper understanding of course objectives, knowledge and skills at a Committee on Accreditation for the Exercise Sciences accredited university, under the supervision of two ACSM exercise physiologists and one CSCS certified professors. Behavior change (BCG transtheoretical model), body composition (BC skinfolds, waist/hip ratio, circumferences), aerobic capacity (AC Bruce, step test), balance (BL, BESS), muscular strength (MS, handgrip), muscular endurance (ME, push-up, leg press), and flexibility (FX, seat-reach) measures were collected among 23 male firefighters (mean ± SD, age = 33.3 ± 10.2 yrs; height, 182.3 ± 6.5 cm; body mass index, 29.9 ± 4.9) at baseline, at 10 and 20 weeks. **RESULTS:** Measures of BCG, BC, AC, BL, MS, ME and FX significantly changed over time (RMANOVAs; $p < 0.05$). Follow-up post hoc analyses indicated that all measures significantly improved from baseline to the end of training ($p < 0.05$). **CONCLUSIONS:** The results of the current longitudinal HIFT suggest that measures of health and fitness among deconditioned U.S. firefighters significantly improved over 20 weeks. These results highlight the importance of (1) developing

an exercise programming that is designed for the active-duty firefighter population to maintain the beneficial adaptations in health and fitness and (2) including exercise science majors in relevant community experiential learning service activities.

3064 Board #110 May 31 3:30 PM - 5:00 PM

Effects of a Weight Management Intervention on Holiday Weight Change And Body Image in Inactive Overweight Midlife Postmenopausal Women

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INTRODUCTION: The holiday season is linked to weight gain which has also been related to distress about self-attitudinal aspects of body image (BI) inclusive of physical appearance and perceptions about physical fitness and health. The impact of a weight management intervention on holiday weight change and BI in midlife females has not been investigated.

PURPOSE: This study aimed to examine the effects of an 11-week weight management intervention on holiday weight change and BI in inactive overweight postmenopausal women. **METHODS:** Females (n=18; 54.7±3.9 yrs; BMI=30.5±4.5 kg/m²) completed an 11-week weight management program (supervised exercise with nutrition education) with three phases: 1) Pre-Holiday (PreH; 5 weeks), 2) Holiday Period (HP; Thanksgiving 2017 through New Year's Day 2018; unsupervised social media support only), and 3) Post-Holiday (PostH; 6-weeks). Weight and BI [Multidimensional Body-Self Relations Questionnaire subscales] were assessed at four times: 1) Baseline 1 (B1); 2) Follow-up 1 (F1; post PreH); 3) Baseline 2 (B2; post HP, baseline for PostH); and 4) Follow-up 2 (F2; final measure after PostH). Data analysis utilized one-way repeated measures ANOVAs and Pearson's correlations.

RESULTS: Weight change was highly variable from B1 to F2 (range=-6.0 to 5.1 kg) although no significant changes occurred (B1=79.5±12.7 kg; F1=79.2±12.4 kg; B2=79.9±12.8 kg; F2=79.9±12.4 kg; p=.33, ES_{B1-F2}=.03). Contrarily, Appearance Evaluation (B1=2.4±0.6, F1=2.5±0.8, B2=2.6±0.9, F2=2.7±0.8; p=.01; p=.004; ES_{B1-F2}=.52), Fitness Orientation (B1=2.7±.6; F1=3.0±.7; B2=2.9±.5; F2=3.0±.7; p=.013; ES_{B1-F2}=.43), and Health Orientation (B1=3.1±.7; F1=3.4±.6; B2=3.4±.6; F2=3.5±.6; p < .001; ES_{B1-F2}=.65), increased. No changes in the subscales of Body Areas Satisfaction, Overweight Preoccupation and Self-Classified Weight subscales were detected (all p ≥ .05). Change in weight was related to change in both Fitness and Health Orientation (B1 to F2; r=-.50; p=.03; and r=-.54; p=.02; respectively), but it was not related to changes in Appearance Evaluation (r=-.22, p=.37). **CONCLUSIONS:** Our preliminary pilot study suggests that the 11-week weight management intervention attenuated holiday weight gain while positively influencing body image in overweight midlife females.

3065 Board #111 May 31 3:30 PM - 5:00 PM

Association between Quadriceps Strength and Self-Reported Physical Activity in Individuals with Knee Osteoarthritis

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Limited quadriceps strength is common with knee osteoarthritis (OA) and may lead to activity avoidance and low physical activity (PA) levels. **PURPOSE:** To investigate the association between quadriceps strength and self-reported PA in individuals with knee OA. Secondary analyses evaluated the association between a change (Δ) in quadriceps strength and self-reported PA following a 4-week physical therapy intervention designed to improve lower extremity strength. **METHODS:** Ninety individuals with radiographic knee OA were enrolled in the current study (43% male; Kellgren-Lawrence grade: 2-4). Assessments occurred at baseline, post intervention, and 4 weeks after intervention completion. At each testing visit, participants completed the Physical Activity Scale for the Elderly (PASE), the Western Ontario and McMaster Universities Arthritis Index pain subscale, and a quadriceps maximal voluntary isometric contraction (MVIC) performed at 70° of knee flexion measured with an isokinetic dynamometer. Multiple regression analyses were conducted to assess the association between MVIC normalized to body mass (nMVIC - predictor variable) and PASE after accounting for age, body mass index, radiographic OA severity, and pain. **RESULTS:** For all participants at baseline, there was a significant association between greater nMVIC and greater PASE ($\Delta R^2=0.049$, $p=0.033$) after accounting for covariates. When stratified by sex, nMVIC was not associated with PASE (Males: $\Delta R^2=0.045$, $p=0.197$; Females: $\Delta R^2=0.011$, $p=0.432$). There was no association between the Δ nMVIC and Δ PASE following the intervention (Total: $\Delta R^2=0.043$, $p=0.072$; Males: $\Delta R^2=0.071$, $p=0.106$; Females $\Delta R^2=0.008$, $p=0.585$), or

4 weeks post intervention (Total: $\Delta R^2=0.001$, $p=0.845$; Males: $\Delta R^2=0.009$, $p=0.629$; Females: $\Delta R^2=0.002$, $p=0.773$). **CONCLUSIONS:** Although greater quadriceps strength was associated with greater self-reported PA, nMVIC only explained 4.9% of the variance in PASE. Post intervention, a change in strength was not associated with a change in PA. Therapeutic interventions aimed at increasing strength may not lead to a subsequent increase in PA. Future studies should investigate the influence of interventions incorporating PA and strength on health and physical function in individuals with knee OA.

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3066 Board #112 May 31 3:30 PM - 5:00 PM

Effect Of Hiit On Bmd And Body Composition For College Female Students With Eating Disorder

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(No relevant relationships reported)

Purpose: To study the effect of high intensity interval training (HIIT) on bone mineral density (BMD) and body composition for college female students with high risk of eating disorder for improvement of physical status. **Methods:** A total of 97 female college students (20.40 yrs) were invited to join the EDI-3 estimate, and 23 of them were judged to have high risk of eating disorder. The 23 students were randomly divided into two groups, the HIIT group (n=12) and the control group (n=11). The HIIT group performed 12 weeks HIIT program particularly designed for them: vehemently pedaling bike for 30 seconds and then resting for 10 seconds, repeating the circle for three times. The training was carried out every other day during the 12 weeks. In contrast, no intervening was taken for the control group during the 12 weeks. Before and after 12 weeks, BMD of total body of all subjects was detected by DEXA, and body composition was measured by BIA. **Results:** 12 weeks later, (1) the BMD of the HIIT group increased significantly ($p<0.05$), from 1.897±0.097 to 1.928±0.126 for the head, from 1.778±0.060 to 1.800±0.065 for the trunk, and from 1.943±0.066 to 1.962±0.128 for the legs. The total body showed a very significant increase ($p<0.01$), from 1.926±0.058 to 1.968±0.107 g/cm². (2) Their averaged weigh was increased from 58.863±6.698 to 60.463±6.651, muscle mass was increased from 38.650±3.144 to 39.125±2.92, and BMI also varied obviously ($p<0.05$). Moreover, the basal metabolism was increased from 1259.375±72.018 to 1269.50±66.345 for the training group students. However, fat mass had no change ($P>0.05$). **Conclusions:** 12 weeks HIIT for female college students with high risk of eating disorder could make their BMD and body composition to improve obviously.

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Impact Versus Resistance Training For Bone In Young Women: Preliminary Findings Of The OPTIMA-Ex Trial

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(No relevant relationships reported)

PURPOSE: The OPTIMA-Ex (Osteoporosis Prevention Through Impact and Muscle-loading Approaches to Exercise) trial aims to compare bone responses to two known osteogenic stimuli - impact exercise and resistance training in young women with lower than average bone mass.

METHODS: The trial is a three-arm, single-blind, single-centre, randomised controlled exercise intervention targeting healthy but sedentary women aged 18-30 years with lower than average bone mass (T-score ≤ 0). Participants were randomised to a 10 month, twice-weekly, either supervised high intensity impact training (IT), high intensity resistance training (RT) or home-based low intensity exercise (active control) (CON). Preliminary DXA (Medix DR) outcomes for lumbar spine (LS), dominant (D) and non-dominant (ND) femoral neck (FN); D and ND distal 1/3 radius (RAD) areal bone mineral density (aBMD) have been examined per-protocol, using repeated-measures ANCOVA adjusted for compliance, age, height, weight, total lifetime physical activity, dietary calcium and baseline values. DXA results are reported as mean difference \pm SE, statistical significance set at $p \leq 0.05$.

RESULTS: A total of 51 women (age=22.2±3.6 years; height=1.64±0.62 m; weight=58.1±8.7 kg) have been randomised (IT=17, RT=17, CON=17) with no between-group differences at baseline. Follow-up data is available for 22 participants (IT=6, RT=8, CON=8). Compliance currently differs between groups (IT=66.5±17.2%, RT=67.3±12.3%, CON=87.5±13.7%; $p=0.011$). There are no between-group differences in aBMD at any site. However, there are significant within-group differences in our primary outcome of LS aBMD for both IT (0.046±0.020 g/cm²; $p=0.044$) and RT (0.049±0.018 g/cm²; $p=0.019$). Additional within-group differences are present for ND FN (0.031±0.012 g/cm²; $p=0.027$) and ND RAD (0.047±0.020 g/cm²; $p=0.036$) aBMD for RT. A significant within-group difference is evident for ND (0.057±0.023 g/cm²; $p=0.027$) and D (0.061±0.024 g/cm²; $p=0.029$) RAD aBMD for CON.

CONCLUSIONS:

Although minimal statistical power limits the conclusions that can be drawn from these preliminary data, results indicate both RT and IT improve spine bone mass, while RT may provide a broader osteogenic stimulus in young adult women with lower than average bone mass. Data collection is ongoing.

3068 Board #114 May 31 3:30 PM - 5:00 PM

The Feasibility and Efficacy of a Behavioral Intervention to Promote Appropriate Gestational Weight Gain

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Nearly half of all women gain above gestational weight gain (GWG) recommendations and physical activity (PA) has been shown to decline during pregnancy. Much work remains in understanding how to promote appropriate GWG and PA during pregnancy. **PURPOSE:** This study assessed the feasibility and efficacy of a pilot behavioral intervention on GWG and PA behaviors. **METHODS:** Women (n=45) 14-20 weeks gestation enrolled in a behavioral intervention. Physicians "prescribed" the intervention to low risk patients. The intervention included self-monitoring, support, and optional walking groups. Process evaluation measures regarding usage and acceptability of study components were obtained. PA was objectively measured at baseline and 35 weeks. The percentage of participants with appropriate GWG was calculated. Control data was obtained from the same clinic where participants were recruited. **RESULTS:** Overall, the intervention was acceptable to participants; attrition was low (6.7%), weekly contact was high (87%), and self-monitoring was high (Fitbit worn on 82% of intervention weeks; weekly weighing on 81%). Facebook (40% of weeks) and study website use (19%) was low, as was walking group attendance (7% attended a single group). Participants reported a lack of discussions about the study with their physician. Results showed no significant difference between intervention and control participants in the percentage who gained excess weight (p=0.37). There was a significant decrease in moderate-to-vigorous PA in intervention participants (p<0.0001). **CONCLUSION:** Continued efforts for promoting PA and appropriate GWG are needed. Although acceptable, the intervention was not efficacious. Future intervention research should consider/report feasibility and acceptability indices through process evaluation. Trainings for, or input from, prenatal healthcare providers on how to best encourage and support patients' engagement in healthy behaviors, such as PA, are warranted.

3069 Board #115 May 31 3:30 PM - 5:00 PM

Blood Lipid Profile Differences After a 12-Month Sit-to-Stand Workstation Intervention

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(No relevant relationships reported)

A reduction in sedentary behavior has been associated with improvements in metabolic health. Because a disproportionate number of working hours for office-based employees are spent engaged in sedentary behavior, an increase in workplace activity is substantiated. **PURPOSE:** The purpose of this study was to determine if the use of a sit-to-stand workstation (STS) effected blood lipid profiles following a 12-month intervention. **METHODS:** Participants of the study included volunteer faculty and staff of the University of Central Oklahoma who were randomly assigned to a control group (CG) or an intervention group (IG). A STS was provided to the IG with participants being instructed to stand at least 2 hours every work day. Blood lipid profiles were used to measure high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), total cholesterol (TC), and blood glucose (BG) at baseline, 6, and 12-months of the intervention. The data was analyzed using a repeated-measures ANOVA. **RESULTS:** No significant differences were found between groups (p>.05). Small, non-significant improvements occurred for the IG in HDL and LDL over time and a significant change in BG across all groups took place over time (F_{2,23}=8.05, p=.00). Descriptive statistics can be found in Table 1. One outlier was removed from analysis. **CONCLUSION:** Significant differences did not occur between STS participants and those using a typical workstation; however, some benefits may be gained from breaking up bouts of sedentary behavior. Future research may examine the effects of longer standing time to ascertain the efficacy of the STS.

Table 1

Blood Lipid Profile Statistics at Baseline, 6 months, and 12 months

	Intervention Group		Control Group	
	n	M (SD)	n	M (SD)
HDL pre (mg/dL)	13	60.54 (19.84)	11	58.64 (16.33)
HDL 6 months (mg/dL)	13	58.54 (17.13)	11	58.55 (15.69)
HDL 12 months (mg/dL)	13	60.69 (18.03)	11	63.27 (16.47)
LDL pre (mg/dL)	12	104.50 (46.25)	9	97.00 (20.06)
LDL 6 months (mg/dL)	12	105.67 (36.89)	9	96.78 (29.88)
LDL 12 months (mg/dL)	12	104.25 (46.38)	9	93.22 (35.35)
TC pre (mg/dL)	15	175.91 (24.08)	11	175.91 (24.08)
TC 6 months (mg/dL)	15	182.29 (36.95)	11	180.00 (26.26)
TC 12 months (mg/dL)	15	187.07 (39.53)	11	191.91 (23.91)
BG pre (mg/dL)	14	95.73 (8.66)	11	90.73 (10.08)
BG 6 months (mg/dL)	14	89.53 (5.88)	11	85.82 (12.05)
BG 12 months (mg/dL)	14	91.53 (11.51)	11	89.00 (11.22)

Note: M=mean, SD=standard deviation, n=population

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Effects of a Brief Lifestyle Intervention for Office Workers

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PURPOSE: Our study assessed the impact of a brief lifestyle intervention (LI) using a novel fitness application on body composition and fitness in office workers. **METHODS:** Insufficiently active office workers (n = 22) participated in a four-week randomized pilot trial. Individuals were randomized to either information-only control (CON; n = 10, age = 34.3 ± 14.6 years, 63.6% female, 80% white) or intervention (LI; n = 12, age = 37.6 ± 14.8 years, 91.7% female, 100% white) groups. CON was provided access to online physical activity and nutrition information with short assessments. LI was trained in-person on a mobile fitness application, that provided short (~2 minutes) daily workouts, alternating muscle groups each day; daily logging of waist circumference, and a tracking system for "treats" (i.e., high sugar/starch foods). In person measures were conducted pre- and post-intervention. Anthropometric measures included height, weight, body fat percentage, and waist circumference (WC). Fitness was measured via handgrip dynamometry (strength), sit-and-reach (flexibility), and 30-second chair stand test (muscular endurance). Independent-samples t-tests were used to examine group differences on baseline characteristics. Both within-group (paired-samples t-tests) and between-group (ANCOVA with baseline scores as covariate) changes scores were analyzed. **RESULTS:** No significant baseline differences were found between groups. Significant changes were found for LI on WC (mean Δ = -3.2 ± 4.3 cm; t = 2.57, p < 0.05), chair stand (mean Δ = 4.9 ± 4.8 repetitions; t = 3.52, p < 0.01), and flexibility (mean Δ = 2.9 ± 3.6 cm; t = 2.84, p < 0.05). Significant changes were found for CON for chair stand (mean Δ = 2.9 ± 3.1 repetitions; t = 2.92, p < 0.05). No significant between group differences were found for change scores. **CONCLUSION:** Our data suggest the novel fitness application could be a viable option to improve body composition and fitness among insufficiently active office workers. Future investigations should aim to validate our pilot study with larger sample sizes and consider additional measures of health and fitness.

3071 Board #117 May 31 3:30 PM - 5:00 PM

Muscle Damage and Inflammatory Response from Volume-Equated Resistance Exercise with Short vs Long Rest Interval

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(No relevant relationships reported)

Resistance exercise is considered the most efficient method for the improvement of muscular strength, power and endurance. However, it is not possible to explain in their entirety the mechanisms that bring the benefits of neuromuscular fitness levels. **PURPOSE:** The aim was to analyze the effects of rest period length between resistance exercise (RE) sets on inflammatory response (cytokines and leukocyte)

and muscle tissue damage. **METHODS:** Ten trained men with at least one year of consistent resistance training experience were selected to participate (26.40 ± 4.73 years, 80.71 ± 8.95 kg, 176.03 ± 6.11 cm, $9.86 \pm 3.25\%$ body fat, bench press relative strength: 1.27 ± 0.27 kg/kg-1 of body mass) and to perform two workouts sessions separated by one week. Each session consisted of five sets of 10 repetitions performed at 85% of 10 repetition maximum on barbell bench press followed by the leg press exercise, with either 1- or 3-minute of rest between sets. Circulating concentrations of creatine kinase (CK), lactate dehydrogenase (LDH), Interleukin 6 (IL-6), and tumoral necrosis factor alfa (TNF- α), were measured at pre-exercise (Pre), and post 3h (except for IL-6), 6h, 12h and 24h. The rate of perceived exertion (RPE) was recorded after each set on both visits. **RESULTS:** After the statistical analysis, we found increases triggered by the 1-minute of rest period length in CK main-effect for time-points ($p = 0.0001$) and rest conditions ($p = 0.0014$), occurring in from 6h to 24h post-exercise compared with the Pre-exercise. For CK the AUC did differ ($p = 0.0005$) between the 1-minute (4572.4 ± 1169.5 u/L.h⁻¹) and 3-minute (3330.1 ± 715.9 u/L.h⁻¹) rest conditions. In addition, we observed an increase in TNF- α for different time-points, mainly in 6h and 12h. Similarly, increases in IL-6 were observed for all post-exercise time-points (6h, 12h and 24h) compared to Pre-exercise data. For the RPE, the short rest period length demonstrated significant increases compared to the longer rest condition (SH, $p < 0.001$; LP, $p < 0.001$). **CONCLUSION:** The short rest condition promoted a greater overall damage of muscle tissue with a longer duration of the inflammatory process of this tissue. Supported by CAPES Brazil: 2.034.476.

3072 Board #118 May 31 3:30 PM - 5:00 PM
Exergaming Intervention in Sedentary Middle-Aged Adults Improves Cardiovascular Endurance, Balance and Lower Extremity Functional Fitness

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(No relevant relationships reported)

BACKGROUND: Interactive video game technology has been extensively utilized in rehabilitative settings. However, few studies have explored the potential benefits of interactive video games as an exercise instrument for middle-aged adults who do not have a gym membership or who otherwise cannot regularly make it to their local fitness center. Features of interactive "exergaming" (modeling proper exercise biomechanics, increasing self-monitoring of behavior, encouraging participants to set health-related goals, and rewarding regular use) may help promote physical activity and consequently improve balance, cardiovascular endurance and functional fitness. **PURPOSE:** To compare balance, cardiovascular health and functional fitness in relation to exercise tests in sedentary adults before and after exergaming ($n = 12$, 56 ± 4 yrs, 162.1 ± 10.9 cm, 79.2 ± 19.1 kg, $39.6 \pm 7.7\%$ fat mass). **METHODS:** Subjects initially underwent balance, cardiovascular endurance and functional fitness tests before engaging in exergaming for 20 min/3d/wk. After 8 weeks, balance, cardiovascular health and functional fitness were retested. **RESULTS:** Exergaming improved Single-Leg-Stand time (3.2 ± 0.4 s to 7.9 ± 1.4 s, $p < 0.05$), Sit-To-Stand repetitions (14.2 ± 1.7 to 16.8 ± 1.3 , $p < 0.05$) and YMCA 3-Minute Step Test heart rate recovery (103 ± 7.9 to 95 ± 3.2 , $p < 0.05$) while eliciting an habitual voluntary moderate-intensity exercise level in previously sedentary individuals. **CONCLUSIONS:** Exergaming increased cardiovascular endurance, balance and lower extremity functional fitness while meeting American College of Sports Medicine guidelines for moderate-intensity exercise. Exergaming should be considered a viable option for home exercise programs to meet ACSM physical activity recommendations and improve overall quality of life.

3073 Board #119 May 31 3:30 PM - 5:00 PM
Effects Of Yoga And Tai Chi On Mental Health, Pain, And Balance In College Students

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Psychological disorders affect up to 50% of college students. Mind-body exercises such as tai chi and yoga have been effective for decreasing mental distress and pain and improving balance, but little is known about these outcomes in the college-aged population.

Purpose: This primary aim of this study was to determine the effectiveness of yoga and tai chi on mental health, pain, and balance in college students. **Methods:** Participants included 46 undergraduate students (13 males, 33 females; age: $M = 23.9$ years, $SD = 7.4$) enrolled in a yoga class (15), tai chi class (16), or a lecture class for the control group (15). Measures of depression, anxiety, stress, pain, and balance were administered at baseline (before the classes began) and at the middle (7 weeks) and end of the semester (14 weeks). A repeated-measures ANOVA was used with time

(baseline, mid, end) and Group (yoga, tai chi, control) to examine the effects of the interventions. In addition, focus group interviews were conducted at the end of study. **Results:** At baseline, the yoga group had higher anxiety and depression scores than the tai chi group. No other differences were apparent at baseline. Over time, yoga group showed decreased anxiety and depression from baseline to 14 weeks, and in depression from baseline to 7 weeks. Though no other significant differences were noted, there was a pattern of decreasing means across all measures of mental health and pain and improvement in balance in the yoga and tai chi groups. Additionally, focus group findings revealed students favored yoga over tai chi. Tai chi benefits included brief distraction from school and possibly improved sleep but was found to be boring and at times more stressful due to time being taken away from academic work and with learning the sequential steps. Yoga was the "bright spot" in the week and more students felt it decreased stress, minimized potential for anxiety attacks, served as a disconnect from the external world, improved pain and mobility and served as a way to connect with friends. **Conclusion:** The preliminary results suggest that implementation of yoga is acceptable and feasible in college students and has the potential of playing a protective or preventive role in promoting mental health.

3074 Board #120 May 31 3:30 PM - 5:00 PM
The Impact of Text Messaging on Baccalaureate Nursing Students' Physical Activity: Single Case Design

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PURPOSE: Find the effect of text messaging on physical activity (PA), physical fitness (PF), and physical activity self-efficacy (PASE) of nursing students.

METHODS: A single-case design, concurrent 4-randomized baselines across subjects, and an 8-week text-messaging intervention were used. Participants (Ps) were selected based on results from PA health risk factors, the International Physical Activity Questionnaire (IPAQ), the Physical Activity Appraisal Inventory-Adolescence and Young Adult Version (PAAI). Selected Ps had high or low PA and PASE, and low or moderate PA health risk. Ps (P1-P5: 1 male, 4 female, mean age = 21) were randomized to 5, 7, 10, or 13 day baselines (BL) and completed 3 or 4 BL PF tests and 4 PF retests in week 2 (W2), 4 (W4), 6 (W6), 8 (W8) of intervention. PF tests were resting and post-walk HR and BP, weight, height, BMI, waist-hip ratio (WHR), hand grip strength, VO_2 max from the treadmill 6-minute walk test (T6MWT). PA and PASE were measured by the IPAQ and PAAI at W4 and W8 of intervention. All Ps wore pedometers to measure objective PA throughout the intervention. The 2-SD-band method was used to compare BL data with W2, W4, W6, and W8 data. **RESULTS:** Self-reported PA increased from BL in P2, P3, P4, and P5 by 9.5, 2.9, 11, and 7.8 hrs, respectively. Statistically significant increases were noted in PF in 4 Ps. P1: Resting HR (BL-W6-W8 $\downarrow 9.3$ b/min); Resting SBP (BL-W6-W8 $\downarrow 8$ mmHg); WHR (BL-W6-W8 $\downarrow 4\%$), post-walk SBP (BL-W4-W6-W8 $\downarrow 16.7$ mmHg), distance traveled in T6MWT (BL-W4-W6-W8 $\uparrow 53.7$ m), VO_2 max (BL-W6-W8 $\uparrow 1.7$ mL/kg-min). P2: resting SBP (BL-W2-W6-W8 $\downarrow 9$ mmHg); WHR (BL-W6-W8 $\downarrow 0.04$); post-walk HR (BL-W2-W4-W6-W8 $\downarrow 6.8$ b/min), post-walk SBP (BL-W2-W6-W8 $\downarrow 22.5$ mmHg). P4: resting HR (BL-W6-W8 $\downarrow 5.8$ b/min); weight (BL-W6-W8 $\downarrow 0.5$ kg); post-walk -SBP (BL-W6-W8 $\downarrow 25.3$ mmHg). P5: WHR (BL-W2-W6-W8 $\downarrow 0.03$); post-walk HR (BL-W2-W4-W6-W8 $\downarrow 23.8$ b/min), post-walk SBP (BL-W4-W6-W8 $\uparrow 19.4$ mmHg); distance traveled in T6MWT (BL-W2-W4-W6-W8 $\uparrow 53.7$ m). PASE increased from BL in P1, P2, P3, and P5: 40, 100, 360, 710, respectively. **CONCLUSIONS:** The results suggested that text-messaging may be effective in increasing nursing students' PA, PF, and PASE.

3075 Board #121 May 31 3:30 PM - 5:00 PM
Effects Of Sit-to-stand Desk And Treadmill Workstations On Sedentary Behavior And Physical Activity

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Purpose: To compare the efficacies of treadmill and sit-to-stand workstations in decreasing daily sedentary behavior (SED) during a 12-month, cluster-randomized trial with an intent to treat design in sedentary overweight office workers. **Methods:** Sixty-six office workers (7 male, 59 female, age \pm SD = 45.3 ± 12.3 y., BMI \pm SD = 32.5 ± 5.7 kg/m²) were cluster randomized to one of 3 groups: (i) seated desk control (C) (N=21), (ii) sit-to-stand desk (D) (N=23), or (iii) treadmill desk (T) (N=22). Change in mean daily SED, standing and stepping time were measured using activPAL™ accelerometers adhered to the dominant thigh at baseline (B), month-3 (M3), month-6 (M6) and month-12 (M12). Inclusion in analyses required ≥ 4 valid accelerometer wear days (i.e., ≥ 10 h. of wake wear time). Missing mean daily SED, standing and stepping

hours were imputed using multiple-imputation. Between and within group differences in mean daily wake-time spent SED, standing, and stepping after M3, M6 and M12 were analyzed with random intercept mixed linear models accounting for repeated measures and clustering effects. Bonferroni corrections were used during pairwise post-hoc comparisons to correct for multiple hypotheses testing. **Results:** Mean monitoring time (i.e., mean sensor wear days and daily time) did not significantly vary between or within groups. There were no significant within group changes in mean daily SED time. Mean daily standing time significantly increased in group D from B to M3 (Mean \pm SD = 1.03 \pm 2.24 h [7.72%], $p = 0.03$, Cohen's D = 0.46), which was sustained through M12. Similarly, group T increased mean standing time from B to M3 (Mean \pm SD = 1.23 \pm 2.56 h [13.28 %], $p = 0.025$, Cohen's D = 0.48), but these increases were negated at M12. Mean daily stepping time increased significantly in group D from B to M12 (Mean \pm SD = 0.81 \pm 1.61 h [2.65 %], $p = 0.019$, Cohen's D = 0.50). No significant between group differences in SED, standing or stepping time were observed at M3, M6, or M12. **Conclusion:** Workstation-based workplace interventions may result in moderate short-term daily reductions in SED and increased physical activity among seated office workers. Sustaining these short-term behavioral improvements may not be achievable through passive environmental modifications alone, and may require additional active behavior change strategies.

3076 Board #122 May 31 3:30 PM - 5:00 PM
Impact Of 12 Week Pedometer Based Interventionson Long Termincrease In Physical Activity Inpreviously Sedentary Adults

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 (No relevant relationships reported)

PURPOSE: Sedentary life style increases the risk of cardiovascular disease. In previous studies we have demonstrated that 12 week pedometer based interventions aimed at increasing physical activity by 10% each week to achieve a goal of 10,000 steps/day resulted in increase in moderate physical activity (MPA) among sedentary adults at the end of 12 weeks. We wanted to study if this increase in MPA has been sustained in the long term in these adults.

METHODS: A total of 55 adults aged > 50 years were randomized to be in three groups. Group 1 with no intervention, Group 2 received pedometer only and Group 3 with pedometer plus interactive motivational website which provides strategies to increase their physical activity by 10% each week for 12 weeks. A 7 day log of duration and intensity of physical activity using an accelerometer (Actigraph GTX3) were obtained in all the three groups at baseline, 12 and 52 weeks. Data was analyzed with repeated measures ANOVA including group, time, and interaction between group and time was conducted to account for repeated measurements over three time points. False discovery rate control under dependency of Benjamin and Yekutieli was employed to adjust for dependent multiple tests

RESULTS: There is no significant change in physical activity at the end of 12 weeks or 52 weeks in the control group. There is a statistically significant increase in amount of time spent in MPA, and amount of time spent in bouts (10 minutes of MPA) at the end of 12 weeks compared to baseline in Pedometer and pedometer + website group. These gains were however not seen at the end of 52 weeks with the exception of physical activity in bouts. There is statistically significant increase in the physical activity in bouts at the end of 12 and also at 52 weeks compared to baseline in both pedometer and pedometer +website groups.

CONCLUSIONS:

12 week pedometer based interventions have shown long term increase activity in physical activity in bouts at the end of 52 weeks.

3077 Board #123 May 31 3:30 PM - 5:00 PM
Barefoot Running As A Treatment For Plantar Fasciitis In The Runner: A Case Series

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PURPOSE: Plantar fasciitis is the most common running related injury associated with the foot and represents ~8% of all running injuries. The median recovery time for plantar fasciitis is ~5-months. Following the failure of conservative management for a female runner with plantar fasciitis, we trialled an alternate day treatment strategy of barefoot running on a grass surface (10 - 15 minutes). This approach was successful and was published as a medical case report. This abstract aims to describe the results of an emerging case series (n=4) using a similar approach. **METHODS:** Four amateur runners (2 male, 2 female, age 27-45 years) were diagnosed as having plantar fasciitis. In all cases, the failure of conservative management led to them being prescribed a

barefoot running intervention on grass. Patients were instructed to complete 10-15 minutes (dependent on pain tolerance) of barefoot running every second day and record pain scores using the visual analog scale (VAS) every morning. **RESULTS:** Mean pain intensity (scored out of 10) at the beginning of the intervention was 5.4 \pm 1.5 (range 3.5 - 7). After 6 sessions of barefoot running, mean pain intensity had reduced to 2.0 \pm 1.6 (range 2.0 - 4.0). All patients demonstrated an improvement in pain intensity after 4-sessions. Three patients sustained this improvement up to session 6 and one patient reverted to their original pain score (4). The two female patients demonstrated an immediate and sustained reduction in pain. The two male patients initially remained unchanged or increased pain intensity before improving. **DISCUSSION:** The results of this emerging case series suggest that this intervention is at least well tolerated in runners with chronic plantar fasciitis. The fact that the intervention contains the activity known to worsen symptoms may suggest this approach has some promise. However, it is not possible to infer cause and effect from a case series and the improvements shown in this series may be due to other factors such as the passage of time or a reduction in fear avoidance behaviour.

3078 Board #124 May 31 3:30 PM - 5:00 PM

Aquatic High Intensity Interval Training Improves Cardiorespiratory Fitness of Sedentary Adults

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PURPOSE: The purpose of this study was to determine the effects of five weeks of aquatic high intensity interval training (HIIT) on cardiorespiratory fitness and body composition in sedentary young adults. **METHODS:** Eleven participants [9 female (20.0 \pm 0.71 yr), 2 male (23.5 \pm 2.12 yrs)] completed 18 sessions: A) a pre-program testing session; B) a familiarization session; C) 15 exercise sessions; and D) a post-program testing session. The participants completed 3 sessions per week for 5 weeks. Each session consisted of a 5-minute warm-up, 25 minutes of exercise, and a 5-minute cool down. The exercise portion consisted of 25 exercise intervals lasting 10-30 seconds and used combinations of 8-12 different exercises. Twenty-two standard aquatic upper body, lower body, and full body aerobic exercises, most of which utilized aquatic dumbbells or hand paddles, were used in an HIIT protocol during each exercise session. The HIIT intervals during the first week were 10 seconds and increased by 5 seconds each week ending with 30-second HIIT durations during the fifth week. The active recovery intervals were 50 seconds during the first week and decreased by 5 seconds each week ending with 30-second recovery durations during the fifth week. **RESULTS:** Significant improvements in body composition, submaximal and peak heart rate, submaximal VO₂, and peak VO₂ occurred from pre- to post-program. **CONCLUSION:** To our knowledge, this is the first study to evaluate the effectiveness of standard aquatic aerobic exercises in a HIIT protocol. Improvements in cardiorespiratory fitness and exercise economy were observed in sedentary individuals. This form of exercise may be more tolerated in obese individuals or patients with physical limitations for land-based exercise.

Table 1. Data are mean \pm SD.

Variable	Baseline	5 weeks	p-value
Body Composition (% body fat)	32.55 \pm 5.57	30.55 \pm 6.31	0.004
GXT VO ₂ Peak (mL/kg/min)	30.53 \pm 4.38	31.95 \pm 5.08	0.035
GXT Stage 1 VO ₂ (mL/kg/min)	15.72 \pm 2.18	14.11 \pm 2.30	0.013
GXT Stage 1 HR (bpm)	138.91 \pm 5.58	136.64 \pm 5.22	<0.001
GXT Stage 2 VO ₂ (mL/kg/min)	21.74 \pm 3.11	19.25 \pm 3.50	0.031
GXT Stage 2 HR (bpm)	169.18 \pm 5.72	164.45 \pm 5.56	<0.001
HR Peak (bpm)	198.91 \pm 3.45	192.00 \pm 5.22	<0.001

3079 Board #125 May 31 3:30 PM - 5:00 PM

Active Video Gaming: Appropriate Tool to Improve Fitness in Pediatric Renal Transplant Recipients?

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 (No relevant relationships reported)

Renal transplanted children are at increased risk for cardiovascular diseases due to reduced cardiovascular fitness. **PURPOSE:** 1) To evaluate cardiovascular fitness, motor coordination, physical activity and health-related quality of life (HRQL) in pediatric renal transplant recipients and 2) to find out, if active video gaming provides a sufficient stimulus for an improvement in these items. **METHODS:** Twenty renal

transplant recipients (TX, 13.5 ± 3.4 yr; 152.0 ± 21.1 cm; 52.2 ± 20.5 kg) and 33 healthy controls, matched for sex, pubertal stage, regular physical activity and attended school (CON, 13.1 ± 3.2 yr; 157.2 ± 17.7 cm; 49.0 ± 15.9 kg) completed a cycling or treadmill spiroergometry, a motor coordination and a maximal hand grip strength test. HRQL was determined with a validated questionnaire and activity of daily life was recorded as steps per hour with a physical activity monitor. Thirteen patients out of TX (12.9 ± 3.4 yr; 152.1 ± 21.5 cm; 53.8 ± 22.2 kg) participated in a 6-week exercise video game intervention. They were instructed to exercise 3x/week at home and were contacted weekly for adherence. All tests were repeated after the intervention. **RESULTS:** Cardiovascular fitness ($\dot{V}O_{2peak}$: 28.6 ± 7.8 vs. 41.7 ± 8.5 mL·min⁻¹·kg⁻¹; $P < 0.001$), motor coordination (MQ_{total} : 59.7 ± 17.5 vs. 105.8 ± 14.9; $P < 0.001$), physical activity (steps·h⁻¹: 458 ± 171 vs. 687 ± 280; $P = 0.001$) and HRQL (75.0 ± 14.9 vs. 85.2 ± 7.58; $P = 0.017$) were significantly reduced in TX compared to CON. Maximal hand grip strength was similar in both groups. After six weeks of exergaming, daily physical activity significantly increased from 481 ± 176.5 to 602 ± 226 steps·h⁻¹ ($P = 0.043$). However, compliance turned out to be low and cardiovascular fitness, motor coordination and HRQL remained unchanged. **CONCLUSION:** Cardiovascular fitness, motor coordination, physical activity and HRQL are markedly reduced in pediatric renal transplant recipients. Despite low compliance, six weeks of active video gaming provided a stimulus for an increase in daily physical activity in these patients, but did not improve fitness.

3080 Board #126 May 31 3:30 PM - 5:00 PM
Effect of Dual-Task Performance Among Young Adults

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Numerous studies have shown that dual-task demands involving exercise lead to a decline in performance on one or both tasks, but the direct effects of exercise intensity and type are less known. **PURPOSE:** To examine the dual-task performance of reaction time while standing or walking or fast-paced walking on a treadmill while completing tasks of varying complexities. **METHODS:** Using within-subject and a repeated measures design a total of 32 participants (Male=21.03±2.79; Female=17) performed six different conditions involving Go/No-Go (GNG) movement tasks while treadmill standing/walking/fast-pace walking (2 task - congruent/incongruent x 3 intensities). Dual-task reaction time was measured during GNG movement task required subjects to strike virtual stimulus that is green while avoiding the red target. The directions were then reversed to create an incongruent condition. All participants performed 3 minutes of each exercise condition on a Motek-instrumented V-gait treadmill integrated with a 180° virtual reality projection screen which created the environment of GNG task. **RESULTS:** A repeated measures ANOVA with a Greenhouse-Geisser correction showed that mean reaction time differed significantly between exercise conditions, $F(3.425, 106.177) = 14.157, p < .01$. Post hoc tests using the Bonferroni correction revealed that Go-task while walking condition was faster than Go-task while standing an average of .039 ($p < .01$), NoGo-task while standing an average of .074 ($p < .01$), NoGo-task while fast-paced walking an average of .031 ($p < .01$). There were no significant differences between Go-task while walking, fast-paced walking and NoGo-task while walking. **CONCLUSIONS:** This novel research methodology suggests that walking-induced physiological arousal may lead to improved dual-task performance over a standing position (Schaefer et al., 2010). Further study with group comparison is warranted.

3081 Board #127 May 31 3:30 PM - 5:00 PM
Implementation of Exercise Training Programs in Dialysis Patients

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PURPOSE:

To determine the effect of functional exercise guided by a kinesiologist in addition to the basic exercise program of cycling during dialysis on dialysis treatment adequacy (Kt/V) and physical performance of dialysis patients. **METHODS:** 29 dialysis patients participated in the study. We tested their condition with 6-minutes walking test (6MWT), 10 repetitions sit-to-stand test (STS10), handgrip strength test (HG) and with measurement of their Kt/V. We randomized patients in two groups - one experimental (EXP) and one active control group (CON). The exercise program for both groups was performed three times per week over the course of two months. The EXP group attended a guided functional exercise before the dialysis procedure and after that performed a cycling session during dialysis. CON participated in equal intradialytic exercise program as EXP without prior functional exercise. After two months we repeated the baseline tests. **RESULTS:**

27 patients completed the study. Both groups have a significant increase in 6MWT ((EXP (510.08 ± 68.69 m vs. 561.62 ± 94.98 m; $p=0.002$), CON (456.86 ± 78.86 m vs. 487.07 ± 76.16 m; $p=0.000$)) and in STS10 ((EXP (27.94 ± 5.98 s vs. 17.46 ± 4.52 s; $p=0.000$), CON (31.40 ± 7.80 s vs. 26.13 ± 8.85 s; $p=0.000$)) compared with baseline values. In HG there was a significant difference only in EXP (30.46 ± 8.4 kg vs. 36.00±9.76 kg; $p=0.000$), with no significant difference in CON (baseline: 26.14 ± 4.87 kg vs. 26.79 ± 4.26 kg; $p=0.295$) when comparing with their baseline values. Both groups also increased their Kt/V score. EXP improve their score from 1.49 to 1.65 ($p=0.006$) and CON from 1.59 to 1.81 ($p=0.001$) When comparing both groups, we can see a greater increase in EXP in STS10 ($p=0.004$) and in HR ($p=0.000$) compared to the CON. There were no statistically significant difference between groups in 6MWT ($p=0.053$) and in Kt/V ($p=0.00$). **CONCLUSION:** Both types of exercise are effective in improving aerobic endurance and strength of lower limbs. However we believe that, if we want to improve various motor skills, cycling during dialysis alone is not enough. Our research showed us that functional training led by kinesiologist in dialysis centre is practical, feasible and effective in improving the physical function of hemodialysis patients combined with well established practice of intradialytic cycling.

3082 Board #128 May 31 3:30 PM - 5:00 PM
Maximal Oxygen Uptake Responders Versus Non-responders Show Differing Cognitive Responses to Movement-based Video Game Training

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There is evidence that aerobic exercise training improves cognitive control including working memory, attention, and goal management via improved brain perfusion, exercise-induced neurogenic factors, and structural adaptations. There is also evidence that cognitive training itself has beneficial effects on cognition via plasticity in neural networks and structural adaptations. However, it is unclear if these adaptations are found equally in those who experience increases in maximal aerobic capacity versus those that do not. **PURPOSE:** Determine cognitive adaptations associated with older adults performing 8 weeks of training on a video game (BBT) that combined cognitive and physical training. It was hypothesized that positive cognitive adaptations would be greater in participants increased maximal aerobic capacity as compared those who did not. It was also hypothesized that participants would show an improvement in cognitive function after the intervention regardless of whether maximal aerobic capacity improved or not. **METHODS:** Fifteen lightly active older (67.6 ± 4.4 yrs) participants completed 8 weeks of training, 3 days per week (24 sessions total) on BBT. Physical task difficulty was adaptive in the game based on real-time heart rate measurements. Cognitive task difficulty was adaptive and included task switching, selective attention and working memory challenges. Participants were assigned to either a maximal aerobic capacity responder group (Responders) who increased $\dot{V}O_{2max}$ ($n=7$) or a non-responder group (Non-Responders) that did not increase $\dot{V}O_{2max}$ ($n=8$). Cognitive assessments included behavioral and neural measures of working memory, sustained attention and goal management. **RESULTS:** Analysis of Covariance (ANCOVA) did not reveal any differences in post-test cognitive variables between Responders and Non-responders. However, when groups were combined, Paired T-Tests showed improvements in the following cognitive variables: Reaction Time Variability in working memory tasks ($p < .05$) and Impulsivity in attention-based tasks ($p < .05$). **CONCLUSION:** Participants who increased maximal aerobic capacity did not experience greater improvements in cognitive control variables as compared to participants who did not. However, the group as a whole did improve measures of cognition.

3083 Board #129 May 31 3:30 PM - 5:00 PM
Sex Differences In The Acute Effect Of Stair-climbing On Postprandial Blood Glucose Levels

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PURPOSE: To examine sex differences in postprandial glucose (PPG) during moderate intensity stair climbing of various durations following consumption of a mixed meal. The PPG response is strongly associated with cardiometabolic disease risk and women remain understudied in biomedical science. **METHODS:** Five males (24.0±3.9y) and nine females (23.7±2.7y) consumed a mixed meal containing 675 kcal (33% fat, 53% carbohydrate, 14% protein) and glucose levels were monitored for 1 hour. On three subsequent visits, participants consumed an

identical meal combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after subjects finished the meal. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour.

RESULTS: All results were normalized for body weight. There was no difference in post-exercise PPG at 30min for any of the trials in men (Δ -0.05 \pm 0.12 to 0.28 \pm .23mg/dL/kg, p = 0.69 to 0.29). In women there was a significant difference in post-exercise PPG at 30min for the 10min trial (Δ -0.537 \pm 0.074mg/dL/kg, p <0.001) but not for the 1min or 3min trials. There was no difference in glucose area under the curve (AUC) or incremental area under the curve (iAUC) for any of the trials in men (Δ -2.22 \pm 4.39 to 5.32 \pm 5.68 mg/dL/kg/min, p = 0.64 to 0.40 and Δ -0.86 \pm 2.749 to 5.70 \pm 7.76 mg/dL/kg/min, p = 0.77 to 0.38). In women there was a significant difference in AUC for the and iAUC for the 10min trial (Δ -11.45 \pm 2.22mg/dL/kg/min, p <0.001 and Δ -10.51 \pm 2.99mg/dL/kg/min, p <0.01) but not for the 1min or 3min trials. No interaction was seen between trial and sex for post-exercise PPG at 30min (p =0.65, η_p^2 =0.15), AUC (p =0.70, η_p^2 =0.13), or iAUC (p =0.80, η_p^2 =0.09)

CONCLUSIONS: Men and women showed a similar responses in PPG following moderate intensity stairclimbing of various durations.

3084 Board #130 May 31 3:30 PM - 5:00 PM
Club Fit: A Physical Activity, Education, and Mentoring Service Learning Program

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 (No relevant relationships reported)

INTRO: In the United States, obesity affects about 12.7 million children and adolescents, with minority and low-income populations at an increased risk. Development of a positive association and regular engagement in physical activity at a young age promotes the transition of these habits into adulthood. School-based physical activity programs benefit communities as well as students and schools. The implementation of a physical activity based service learning program provides a mutually beneficial partnership between pre-service teachers and the elementary students. **PURPOSE:** The purpose of this study was to determine the effect of a 9-week fitness intervention and education program for under-served 5th grade students. **METHODS:** Club Fit! consists of a 9-week program with bi-weekly 60-minute exercise sessions. Physical Education Teacher Education pre-service teachers (n =21) served as mentors to 5th grade students (n =35) enrolled at a local elementary school. The pre-service teacher/mentor to student/mentee ratio was 1:1 - 1:2. Pre-service teachers alternated leading lessons focused on health and skill-related physical fitness components, such as paddle tennis, yoga, jumping rope, and locomotor skills. Basic educational concepts from the components of physical fitness were incorporated, including comparing heart rate before and after activity and distinguishing between muscular strength and endurance. Each session concluded with journal questions reflective of the day's concepts and activities. Prior to the program, pre-service teachers trained to use the FitnessGram assessment protocols and Healthy Fitness Zone standards (HFZ). Four FitnessGram Performance Standards were assessed pre- and post-program: Back Saver Sit and Reach, One Mile Run, Curl-Ups, and Push-Ups. Paired t-tests were used to assess the pre and post values for all four FitnessGram Performance Standards. **RESULTS:** Students improved performance in all measured FitnessGram components: Back Saver Sit and Reach (Left: p = 0.00922=, Right: p = 0.00319); One Mile Run (p = 2.279E-7); Curl-Ups (p = 0.000261); Push-Ups (p = 0.00159). **CONCLUSION:** Students improved in all four FitnessGram components and HFZ standards were met for all comparable components. The fitness intervention increased levels of health-related fitness.

3085 Board #131 May 31 3:30 PM - 5:00 PM
The Effect of Multimodal Training on Mobility in MCI Patients: A Pilot Randomized Controlled Trial

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Due a growing number of new cases of dementia and the lack of pharmacological treatment for prodromal stages of dementia, the study of non-pharmacological interventions becomes more necessary. Although Mild Cognitive Impairments (MCI) patients begins to show mobility decreases, especially in dual-task (DT), some studies exams if the physical exercises can improve this deficit. **PURPOSE:** To investigate the effect of multimodal training (MT) on mobility in single task (ST) and DT in elderly with MCI. **METHODS:** Fifteen MCI patients, aged \geq 60 years-old, participated in this pilot randomized controlled trial. At baseline, patients were submitted to three visits: (1) anthropometric measurements, anamnesis and neuropsychological tests; (2) cardiovascular test on treadmill; (3) mobility tests: 8-foot up and go (8UG) in ST and DT (motor and cognitive tasks). Ten participants were randomized and allocated

to an experimental group (EG = 5), with multimodal physical training, including aerobic exercises, strength, balance and stretching; or in a control group (CG = 5). After three months of intervention, both groups were reevaluated. An independent t-test and effect size (ES) analysis were performed through the deltas (post-pre) of the groups. **RESULTS:** The EG presented improvements in general mobility (SMD=0.71 [moderate], 95%CI=0.06, 1.37) and in all mobility tests compared to the CG (TS 8UG: SMD=0.62 [moderate], 95%CI=0.65, 1.90; coefficient of variability (CoV) 8UG: SMD=0.14 [trivial], 95%CI=-1.10, 1.38; DT 8UG: SMD=1.12 [large], 95%CI= 0.23, 2.48; cost of DT (CDT) 8UG: SMD=1.09 [large], 95%CI= -0.26, 2.44). **CONCLUSION:** MT has a positive effect on mobility in elderly patients with MCI, mainly in DT, contributing to the preservation of functional mobility in this group. Supported by CNPq (301483/2016-7) and FAPERJ (E-26/ 203.193/2016).

3086 Board #132 May 31 3:30 PM - 5:00 PM
The Role Of A Sit-to-stand Workstation And Its Effects On Work Productivity

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The prolonged sedentary nature of office work has been shown to induce high levels of discomfort, leading to decreased worker productivity. Many modalities, including ergonomic-adjustable chairs, treadmill desks, and light-activity promotion have been used as interventions to combat worker distress and productivity. The sit-to-stand (STS) workstation is another tool aimed at improving workers' focus and productivity. **PURPOSE:** Therefore, the purpose of this study is to evaluate the efficacy of a STS workstation on work productivity. **METHODS:** All participants were volunteer faculty and staff of the University of Central Oklahoma randomly assigned to a control (n =10) or STS workstation intervention (n =8) group. Both groups filled out the *Health and Work Performance Questionnaire* at the base-line, 6-month, and 12-month mark of the study to measure productivity. Absolute productivity is a subjective measure of an employee's work output. Relative productivity is a subjective comparison of the employee's work output to another employee in a similar position. The control group was instructed to continue their day as normal while the intervention group was instructed to stand at least 2 hours per work day, if possible. **RESULTS:** There was no interaction effect for absolute productivity ($F_{2,15}=.91$, $p=.42$) from baseline to 12 months with a moderate effect size (0.68). However, a decrease was seen in the control group from baseline (85 +/- 7.07) to post-test (73.08 +/- 28.07) with a strong effect size (1.69), while the STS workstation group increased from baseline (86.25 +/- .88) to post-test (88.75 +/- 8.35). Relative productivity showed no interaction effect as well ($F_{2,15}=.89$, $p=.44$) from baseline to 12 months. The control group saw a decrease from start (1.09 +/- .17) to finish (1.07 +/- .10) while the intervention group saw an increase from start (1.10 +/- .12) to finish (1.19 +/- .26). **CONCLUSIONS:** Overall, the STS workstation did not show a significant improvement in work productivity compared to the control group. However, a positive trend was seen in the intervention group towards perceived greater work production. **ACKNOWLEDGEMENTS:** This study was funded by the University of Central Oklahoma, Research and Sponsored Programs office and Areawide Aging Agency.

3087 Board #133 May 31 3:30 PM - 5:00 PM
College Students' Acute Sedentary Behavior, Step Counts, and Situational Interest during Virtual Reality

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PURPOSE: This study examined differences in college students' acute sedentary behavior, steps, and situational interest during immersive virtual reality (VR), non-immersive VR, and traditional stationary biking sessions. **METHODS:** Forty-nine college students (34 females; $\bar{X}_{age} = 23.6 \pm 3.4$ years; $\bar{X}_{BMI} = 23.8 \pm 3.1$ kg/m²) completed three separate biking sessions: 1) immersive VR bike (VirZoom VR bike, PlayStation 4); 2) non-immersive VR bike (Gamerize bike, Xbox 360); and 3) traditional stationary bike (Spirit Fitness XBU55 bike). Participants' percentage of sedentary time (%ST) and steps were tracked using ActiGraph GT3X+ accelerometers, with situational interest examined using the validated Situational Interest Scale. One-way MANOVA examined differences for all outcomes between the three exercise sessions. **RESULTS:** Significant differences were observed for all outcomes between the three exercise sessions, $F(1, 135) = 67.9-277.2$, $p < 0.01$; $\eta^2 = 0.42-0.79$, except for %ST ($p > 0.05$). In detail, immersive VR resulted in significantly higher steps than non-immersive VR and traditional biking, respectively (2,033.8 \pm 423.4; 1,412.7 \pm 193.5; 1,546.4 \pm 288.0). Moreover, participants reported significantly higher situational

interest during immersive VR (3.5 ± 0.4) than non-immersive VR (2.1 ± 0.5) and traditional biking (1.7 ± 0.4). Specifically, immersive VR compared to non-immersive VR and traditional biking, respectively, observed significantly greater novelty (3.78 ± 0.4 ; 2.2 ± 0.7 ; 1.3 ± 0.4), challenge (3.7 ± 0.4 ; 2.9 ± 0.6 ; 2.3 ± 0.7), attentional demand (3.2 ± 0.6 ; 1.5 ± 0.7 ; 1.5 ± 0.5), exploration intention (3.7 ± 0.5 ; 2.3 ± 0.5 ; 1.9 ± 0.6), and instant enjoyment (3.1 ± 0.6 ; 2.2 ± 0.7 ; 1.3 ± 0.4). Noteworthy, non-immersive VR was observed to be significantly higher than traditional biking in all 5 subscales of situational interest as well.

DISCUSSION: Observations suggested immersive VR biking to promote greater steps and situational interest over non-immersive VR and traditional biking, with non-immersive VR observed superior to traditional biking for situational interest, suggesting VR biking may be an attractive exercise modality in this population. Future experimental designs assessing these outcomes are warranted.

3088 Board #134 May 31 3:30 PM - 5:00 PM
Effects of Resistance Training on Physical Fitness and Arterial Compliance in Normotensive Obese Women

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Purpose

The purpose of this study was to determine the short-term effects of resistance training (RT) on arterial compliance and physical fitness in obese women with normal blood pressure.

Methods

A total of 16 participants (10 control/6 intervention) were included in the analyses (age: 23.5 ± 4.1 years; body mass index: 33.6 ± 2.9 m/kg²). Pre- and post-intervention assessments included cardiorespiratory tests, arterial stiffness assessments, and leg press (LP) and bench press (BP) one repetition maximum tests (1RM). Trainings consisted of seven strength exercises performed at an intensity of 80% 1RM until 550 calories have been expended.

Results

Analysis of variance (ANOVA) showed significant interaction effects (time x group) in LP ($p=0.001$) and BP ($p=0.001$) tests. Further, pairwise comparisons showed significant increases in LP ($p<0.001$) and BP ($p<0.001$) total weight lifted in the RT group after the intervention (20.55 ± 12.22 kg and 6.1 ± 4.54 kg respectively), but not in the control group (-2.26 ± 8.96 kg and 0.58 ± 2.26 kg respectively). There were no statistically significant changes found for arterial compliance.

Conclusions

Short-term high intensity RT had positive effects on muscle strength in obese women with normal blood pressure with no negative effects on arterial compliance.

3089 Board #135 May 31 3:30 PM - 5:00 PM
Weekly Activity Maintained While Adding Training Among Post Bariatric and Obese Participants

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 (No relevant relationships reported)

It is suggested that a barrier to weight loss during exercise training is associated with increased compensatory sedentary activity (CSA). While studies report a positive association between physical activity and improved weight loss in post bariatric (PB) and obese individuals, the effectiveness for the different types of physical activity interventions and CSA reported is often equivocal. **Purpose:** To evaluate if vigorous or moderate continuous exercise regimens maintain or increase energy expenditure of individuals during exercise training. **Methods:** Eight PB individuals [7 female, 1 male; Body Mass Index (BMI) = 34.95 ± 7.6] and ten obese individual [7 female, 3 male; BMI = 38.99 ± 6.5] participated in a supervised 12 week three days per week treadmill exercise training program. The PB high intensity interval group exercised at 80% of their age adjusted heart rate reserve (HRR) for 4 one minute intervals interspersed with 4 minute recovery bouts at 50% of the HRR for weeks 3 through 6. Exercise was increased to 6 one minute bouts at the same HRR intensity and recovery time for weeks 7 through 12. The obese continuous moderate intensity group exercised for 20 minutes at 60% HRR for weeks 3 through 6 and 20 minutes at 65% HRR for weeks 7 through 12. Both exercise interventions included a 2-week run-in to avoid injuries. Energy expenditure (MET-hrs) was measured using micro activPALs for the pre-exercise week and weeks 3, 9 and 12. **Results:** Overall, there were no significant differences between groups for MET-hrs for any week. MET-hrs increased ($p < .05$) from the pre-exercise week (212.1 ± 4.96) during the intervention (week 3: 221.87 ± 8.01 ; week 9: 218.22 ± 11.19), and remained elevated post-intervention (week 12: 216.35 ± 7.5). Post-intervention MET-hrs had decreased from week 3, but were not significantly different from week 9 MET-hrs. There was 85% compliance for all

training sessions for both groups. **Conclusion:** Post Bariatric surgery patients increased METs from vigorous intensity exercise intervention similar to obese individuals in moderate continuous exercise training. Although METs for week 12 declined for both groups, it remained above baseline and appears there was no evidence of CSA for either group.

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3090 Board #136 May 31 3:30 PM - 5:00 PM
Efficacy of a Virtual Reality Fitness Program for Enhancing Muscular Fitness and Body Composition

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Reported Relationships: K. Delcastillo: Industry contracted research; The study was funded by an industry grant.

PURPOSE: The purpose of this study was to compare the effects of a time-efficient virtual reality (VR) training system versus a traditional exercise (TE) program on measures of muscular fitness, body composition, and enjoyment.

METHODS: Nineteen untrained young men (height: 175.8 ± 4.2 cm; weight: 81.9 ± 15.8 ; age: 23.3 ± 3.9) were randomly assigned to 1 of 2 experimental groups: A virtual reality (VR) protocol consisting of a computer-guided exercise-based program using a cable pulley resistance that took a half hour to complete ($n = 10$), or; a traditional exercise (TE) protocol, consisting of a combination of resistance training and cardiorespiratory training that took 1.5 hours to complete ($n = 9$). The training intervention lasted 8 weeks. Testing was carried out pre- and post-study for changes in measures of maximal muscle strength (1 repetition maximum [1RM] for the bench press and leg press), upper body muscular endurance (50% of 1RM for the bench press), and body composition (fat free mass, skeletal muscle mass, and body fat percentage) assessed via multifrequency bioelectrical impedance analysis. The level of enjoyment of the respective exercise programs was assessed post-study using the modified 8-item Physical Activity Enjoyment Scale.

RESULTS: Main effects for time were observed for 1RM bench press ($F = 71.030$; $p < 0.001$), 1RM leg press ($F = 64.021$; $p < 0.001$), upper body muscular endurance ($F = 43.059$; $p < 0.001$), lean body mass ($F = 5.345$; $p = 0.034$) and skeletal muscle mass ($F = 6.968$; $p = 0.017$). No main effects for time were noted with respect to changes in body fat. A time-group interaction was observed for tests of 1RM leg press ($p = 0.004$) and upper body muscular endurance ($p = 0.033$), with TE showing significantly greater increases compared to VR. No between-group differences were noted for any other outcome variable.

CONCLUSIONS: Despite greater improvements in some performance-related measures for TE, our findings suggest that the specific VR program studied is a viable strategy to improve muscular fitness and lean mass while requiring a limited time commitment in a young, untrained population. Moreover, participants in VR reported a high level of enjoyment with the program, which may help to foster long-term adherence.

3091 Board #137 May 31 3:30 PM - 5:00 PM
Student Engagement in Classroom Physical Activity Breaks

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(No relevant relationships reported)

Purpose: Students are sedentary for approximately 92% of the day. Classroom physical activity (PA) breaks are known to decrease sedentary behavior (SB). However, little consideration has been given to the environmental and behavioral factors influencing how students engage in classroom PA breaks. Therefore the purpose of this study was to understand how perceived classroom climate and sedentary behavior impact students' total moderate to vigorous physical activity (MVPA).

Methods: Students ($n=112$) housed in 1st and 2nd grade classrooms across two school districts participated in a one-day study protocol using a classroom climate survey and accelerometers to investigate student engagement in a five minute classroom PA break. Descriptive statistics, bivariate correlation analyses between variables and mediation analyses using linear regression were conducted to explore direct and indirect effects.

Results: Over half of the students were females (56.3%) and second graders (51.8%). Correlations were found between perceived classroom climate to sedentary behavior ($r = -.31$, $p = .001$) and total MVPA ($r = .34$, $p < .001$). Sedentary behavior was negatively correlated with total MVPA ($r = -.71$, $p < .001$). The mediation model explained 27% of the total MVPA variance ($p < .001$). Perceived classroom climate had a direct effect on sedentary behavior ($B = -.04$, $SE = .01$, $t = -3.09$, $p < .05$). Sedentary behavior had a direct effect on total MVPA ($B = -.45$, $SE = .06$, $t = -7.69$, $p < .05$). Student perceived classroom climate did not have a significant direct effect on total MVPA ($p = .09$) but did have significant indirect effect through sedentary behavior (indirect effect = $.02$, bootstrap $SE = .007$, 95% bootstrap $CI = .005$, $.030$), meaning that a participant who scores 1 point higher on perceived classroom climate survey, on average, .02 minutes higher on total MVPA through sedentary behavior.

Grade, sex, and PA break type were controlled in the analyses. **Conclusions:** Providing students with classroom PA breaks may not be enough. Student's PCC shape how they engage in classroom PA breaks. Teachers must develop a positive classroom climate where PA is encouraged and affirmed.

3092 Board #138 May 31 3:30 PM - 5:00 PM
Osteogenic Response After Six Months of High-Intensity, Low-Impact Exercise

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Purpose: Lagree Fitness exercise offers high-intensity, low impact workouts that combine resistance, endurance, core, and cardio training. These classes are offered as alternatives to traditional weight bearing resistance training; however, it is unknown whether this training method has osteogenic effects on bone similar to traditional resistance training. To provide such insight, we assessed changes in bone after six months of the high-intensity training using the Lagree Fitness Megaformer in men and women.

Methods: 31 healthy participants began a 6 month, 3x per week, 25 minute group lead, Lagree Fitness training course on the Megaformer. The data from 19 women and 4 men (45.1 ± 20.9 years of age), weight (150.5 ± 41.5 lb), height (66.5 ± 6.5 in) were analyzed; eight participants did not complete the course and were excluded from data analysis. All participants completed a lumbar spine, bilateral hip, and total body scan on a GE Lunar iDXA dual-energy x-ray absorptiometer at baseline and within 10 days of completing 72 training sessions.

Results: There were no significant osteogenic effects on lumbar spine bone mineral density (BMD) (P=.102), femoral neck BMD (P=.519), or total hip BMD (P=.481) in this sample. There was also no significant changes in total body bone mineral content (BMC). While there were no statistically significant changes in total body BMD (P=.186), total arm BMD (P=.125) and total leg BMD (P=.111), there were apparent positive increases that may be promising and suggests the necessity for further data collection with a larger sample. There were similar positive effects on total arm BMC (P=.292) with statistically significant increases in total leg BMC (P<.035). The increase from baseline of total arm lean mass (LM) (P<.009) was significant, and increases in total body LM (P=.069) approached significance. Change in total leg LM (P=.382) was not significant.

Conclusion: In the absence of weight bearing exercise, high-intensity exercise on the Lagree Fitness Megaformer provided significant increase in total leg BMC, and promising increases in BMC and BMD across other body regions. However, there were no significant osteogenic effects on the hips and lumbar spine typically of importance in osteopenic populations.

3093 Board #139 May 31 3:30 PM - 5:00 PM
Physical Activity Breaks in the College Classroom: Student Engagement Factors

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Most college classes require long periods of sedentary behavior and attention demanding tasks. College students, as emerging adults, are moving through a key developmental stage, in which it is critical to instill lifelong health behaviors. Physical activity breaks (PABs) in college settings are novel, but have been shown to be potentially beneficial regarding concentration and academic performance (Babkes Stellino, et al., 2017). **PURPOSE:** To explore college students' barriers to, and reasons for, engagement in a PABs intervention. **METHODS:** College students were invited to participate in video-led or live instructor-led PABs consisting of cardio-strength based exercises or yoga during a 6-week summer college course. Students were asked to write out the reason(s) they chose to engage in the PAB, or not, each day a PAB was offered. At the end of the 6-week course, students also completed an open-ended survey intended to understand their overall reasons for engagement, and barriers to participation in PABs. Basic thematic analysis was conducted to explore why students chose to engage in PABs or chose to opt out. **RESULTS:** Common reasons reported for engaging in PABs were enjoyment, needing a break from lecture, and contributing to the research. Enjoyment levels were higher when various modes of PABs were offered. Students mentioned a greater personal connection, and a desire to put forth more effort when a live instructor led the activity, particularly for yoga PABs. PABs were viewed as a break from class, and considered a valid exercise bout for some students. This was motivating for some students, but reported as a limitation for others who had already exercised or were going to exercise later that day. Not feeling well, being unprepared or just not wanting to participate, were reported as the main barriers to engagement in the PABs. **CONCLUSION:** It is important to understand what motivates college students to engage, or not, in PABs, in order to better tailor future

programs that will appeal to a greater majority of students. Findings will contribute to the continued exploration of the benefits that PABs can have for college students in the college classroom.

3094 Board #140 May 31 3:30 PM - 5:00 PM
Effects Of Exercise Intensity Provided In The Exercise Classes On The Establishing Exercise Habits

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We provided Japanese adult women who have not been having exercising regularly habits and through an exercise intervention (group exercise class like a fitness sports club) succeeded in establishing exercise habits. We considered that providing vigorous intensity exercise, presence or absence of a goal setting, and social support might be effective in establishing exercise habits. In particular, there are indications that low exercise intensity is preferable for establishing exercise habits. However, success experiences of difficult (vigorous intensity) exercise enhance confidence, which may contribute to establishing exercise habits in Japanese adult women.

PURPOSE: To examine the effects of differences in exercise intensity provided in the exercise classes on the establishing exercise habits and changing in self-efficacy of exercise and health-literacy related to behavioral changing such as health and exercise habits.

METHODS: We recruited 27 participants (volunteers) in this intervention (exercise classes). Participants were 20-64-year-old healthy Japanese women who have not been having exercising regularly habits, confidence in physical fitness, and athletic ability. They separated randomly moderate- to vigorous-intensity (2-8 METs) exercise class (MV group, n=14) and low- to moderate-intensity (2-4 METs) exercise class (LM group, n=13). We instructed 90 min/session some exercises 24 sessions (twice a week for 3 months) and lectured about association with health and physical activity (exercise) for both groups.

RESULTS: There were 4 participants (28.6%) in MV group and 5 participants (38.5%) in LM group who dropped-out. The establishing exercise habits after the 1-yr from the end of intervention were not significantly different between two groups (20%, 50%). Self-efficacy (11.8 ± 2.5 → 11.5 ± 3.4 points, 8.8 ± 3.5 → 9.4 ± 2.7 points) and health-literacy (18.3 ± 2.9 → 18.5 ± 2.1 points, 16.5 ± 4.0 → 17.0 ± 5.1 points) did not significantly different from baseline and differ significantly interaction between the two groups.

CONCLUSION: It was concluded that exercise intensity contributed little to increasing self-efficacy, health-literacy and establishing exercise habit. It may be important to definite goal setting (goal contents) or social support to improve them.

3095 Board #141 May 31 3:30 PM - 5:00 PM
Accuracy Of Dual Task To Distinguish Elderly With Alzheimer's From Healthy Controls

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 (No relevant relationships reported)

Alzheimer's disease (AD) is the most prevalent dementia in the world. Indeed, the expectations are that this number will triple in the coming decades. Clearly, accessible interventions to prevent and treat the disease have been crucial, as well as, identify preclinical individuals. Despite clinical diagnosis are still focused on episodic memory deficits as the gold standard for AD, some studies suggest that because of the damages caused by the disease in prefrontal and temporal areas, along with, impairment in executive function AD could also have a motor signature that could be access through gait and Dual task (DT) tests. the accuracy of these tests to distinguish healthy from AD elderlies.

PURPOSE: To verify the sensitivity and specificity of DT and DT cost to distinguish elderly with AD from healthy controls.

METHODS: We evaluated older adults over sixty years old. DT performance was measured by gait velocity (m/s), DT cost (DTC= ([single task - dual task] / single task) × 100)) and the number of evoked words (DTanimals). We also included Sit to Stand, 8 Foot up and go and STEP test to measure functional capacity. Cognitive functions were evaluated through MMSE, RAVLT and Trail (A and B). T test and Mann-Whitney test were used to compare the two groups. The sensitivity and specificity of the tests were explored through the ROC curve. **RESULTS:** The final sample consisted of 82 participants, being 39 healthy elderly and 43 diagnosed with AD. There was a significant difference between the Healthy and AD groups in all DT variables and MMSE; DT (p < 0.001), DT cost (p < 0.001), MMSE (p < 0.001). Moreover MMSE (area = 0.974; sensitivity = 92.9%; specificity = 82.1%; p < 0.001) showed better accuracy than DT (area = 0.901; sensitivity = 80.5%; specificity = 86.8%; p < 0.001) and DTC variables (area = 0.816; sensitivity = 82.7%; specificity = 76.3%; p < 0.001). The cut-off point of DT was 9.55.

CONCLUSIONS: DT analysis was able to differentiate AD from Healthy elderly with great accuracy and a moderate sensitivity and specificity. Performance in dual task should be more investigated as a possible motor biomarker of AD.

3096 Board #142 May 31 3:30 PM - 5:00 PM
Effects Of Bingocize® On Quality Of Life, Fall Risk, And Health Knowledge In Community-Dwelling Older Adults

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(No relevant relationships reported)

Quality of life (QOL) is an important aspects of overall well-being in older adults. QOL is associated with functional, physical, and psychological health; all of which can be improved with increased physical activity. A high fall risk is associated with low physical function and QOL. One in four older adults experiences a fall each year, making it necessary to focus public health interventions towards decreasing fall risk and improving QOL in older adults. Bingocize® is a health promotion program designed to promote health, health knowledge, physical activity, and social engagement among older adults. **PURPOSE:** The purpose of this study was to determine the effects of the new version of Bingocize® on QOL and fall risk in community-dwelling older adults (N=36; mean age 73.63 ± 6.97). **METHODS:** Participants were clustered and randomly assigned to (a) experimental (n=19; participating in Bingocize® program, which included the bingo game, exercise, and health education) or (b) control (n=17; only played bingo). Each group completed a 12-week intervention that consisted of two 45-60 minute sessions per week. Pre and post data assessments included the TUG, 30-second chair stand, 4-staged balance, handgrip strength, WHOQOL-BREF, PANAS, and a health knowledge quiz. A mixed design analysis of variance (ANOVA) was used to compare intervention effects. Associations were significant at p≤0.05. **RESULTS:** There were no significant interactions for any of the variables, with the exception of positive affect (PA) (F (1,34) = 5.66, p = 0.02, power = 0.64) and handgrip strength (F (1,34) = 8.31, p = 0.007, power = 0.80). There was also a significant main effect for time for health knowledge. Post hoc analysis using independent samples t-tests were conducted on PA (t (33) = 2.39, p = 0.023, two-tailed) and handgrip strength (t (34) = 2.85, p = 0.007, two-tailed). **CONCLUSION:** Participating in the Bingocize® health promotion program can produce a meaningful and detectable change in handgrip strength and PA in community-dwelling older adults.

3097 Board #143 May 31 3:30 PM - 5:00 PM
Tailored Domain-Specific Sedentary Behavior Intervention on Reducing Sedentary Time

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(No relevant relationships reported)

PURPOSE: To continue the advancement of sedentary behavior intervention, it is important for researchers to design the intervention based on the theoretical model and contextual information of sedentary behavior. Therefore, the purpose of this study is to identify the feasibility of tailored domain-specific sedentary behavior intervention on reducing sedentary behavior time using contextual information of sedentary behavior. **METHODS:** A total of 43 adults (age ≥ 18) were participated in this study. A randomized controlled trial with a covariate adaptive randomization was used. Participants were randomly assigned to three groups: 1) tailored domain-specific intervention group; 2) standard intervention group; and 3) control group. Behavioral strategies to reduce sedentary behavior included educational meeting and materials, goal setting and feedback, and self-monitoring based on theoretical background for two intervention groups. Additionally, contextual information of sedentary behavior was given to tailored intervention group. Participants' sedentary behavior time was measured at baseline, 1st and 2nd intervention week by accelerometers, and contextual information of their sedentary behavior was obtained from the Sedentary Behavior Record instrument. Two-way (Group × Time) repeated measures analysis of variance was conducted for comparison for changes in total time spent in sedentary behavior among the three groups.

RESULTS: Thirty-six out of 43 participants who wore the Actigraph during at least 10 hours per day for at least four days were included in this study. There was a significant interaction between group and time, F(3.9, 63.6) = 3.94, G-G p = .007, $\eta^2_p = .193$. Simple effect analysis results showed that sedentary behavior time at each time point were not significantly different for the control group, F(1.7, 18.9) = 0.48, G-G p = .597, $\eta^2_p = .042$, and the standard intervention group, F(1.8, 20.1) = 1.76, G-G p = .198, $\eta^2_p = .138$. The sedentary behavior time, however, differed among three times for tailored domain-specific intervention group, F(1.7, 18.8) = 14.00, G-G p < .001, $\eta^2_p = .560$.

CONCLUSIONS: The tailored domain-specific sedentary behavior intervention using contextual information of sedentary behavior was effective, reducing sedentary behavior time for adults.

3098 Board #144 May 31 3:30 PM - 5:00 PM
Stage Ofbehavior Change In Regards Of Physical Activity, Health And Quality Of Life Among Health Professionals From Health Institutions

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(No relevant relationships reported)

Purpose: To analyze the factors associated to the stage of behavior change among professionals from health institutions. **Methods:** The sample consisted of 1054 professionals (247 male and 807 female). The dependent variable was the irregularly active group of the behavioral stage questionnaire (proposed by Prochaska, 1988). The independent variables were: gender, physical activity, steps number, sleep, negative mood, presence of diseases, health perception, and quality of life. **Statistical analysis:** Binary Logistic Regression Odds Ratio (OR) and its respective 95% confidence intervals (CI) were used to associate the study variables. **Results:** Factors associated with irregularly active behavior change were: gender, physical activity, sleep, negative mood, presence of disease, health perception and quality of life. On the other hand, steps number was not associated with the stage of irregularly active behavior change (see table below). **Conclusion:** The irregularly active group had a positive association with female sex, as well as a higher probability of belonging to groups that did not comply with the recommendation of physical activity, dissatisfaction with sleep, with a higher frequency of negative mood, with diseases, negative health perception and a low quality of life.

Factors associated with irregularly active stages of behavior change (Pre-Contemplative, Contemplative, Preparation) with gender, physical activity, factors related to health and quality of life

Variable	Significant (p < .05)	OR	CI 95%	Variable	Significant (p < .05)	OR	CI 95%
Sex				Quality of Life			
Male		1		Physical Domain			
Female		1.47	(1.07 – 2.01)	High		1	
Recommendation Physical Activity				Low	< .001	2.4	(1.81 – 3.19)
(≥ 150 min/week)		1		Psychological Domain			
(< 150 min/week)	< .001	6.24	(3.38 – 11.5)	High		1	
Step number				Low	< .001	2.1	(1.60 – 2.79)
(≥ 7000 steps)		1		Social Domain			
(< 7000 steps)	.58	2.2	(.97 – 5.33)	High		1	
Sleep satisfaction				Low	< .001	2.0	(1.53 – 2.79)
(Satisfied / Very satisfied)		1		Environmental Domain			
(Indifferent / Dissatisfied / Very Dissatisfied)	< .001	2.3	(1.75 – 3.18)	High		1	
Negative Mood				Low	< .001	2.4	(1.80 – 3.22)
(Never / Sometimes)		1		General Quality of Life			
(Frequent / Very frequent / Always)	.04	1.4	(1.01 – 2.04)	High		1	
Presence of Disease				Low	< .001	2.8	(2.12 – 3.76)
No		1					
Yes	.001	1.5	(1.19 – 2.09)				
Health Perception							
Positive		1					
Negative	< .001	2.5	(1.66 – 3.77)				

3099 Board #145 May 31 3:30 PM - 5:00 PM
The Effect of a Foot Exercise Protocol on Intrinsic Muscle Volume

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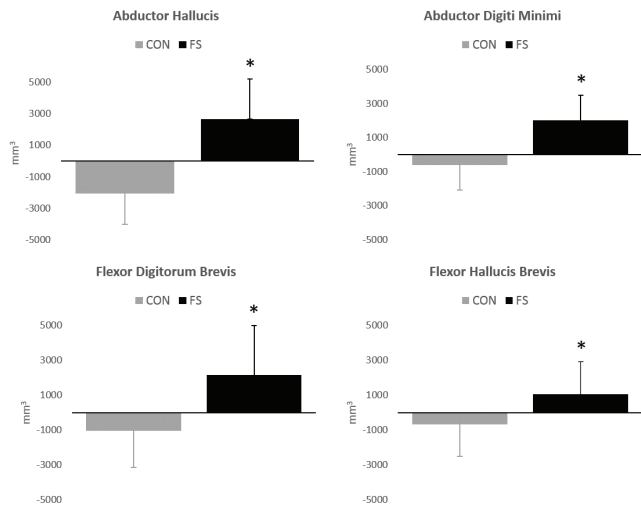
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Musculoskeletal injuries of the foot may be partially attributed to weakness of the intrinsic muscles, which are crucial to foot stability during dynamic activities. Perhaps because of their small size, the potential for strengthening these muscles is highly under-appreciated. Therefore, treatment of foot problems is often focused on externally supporting the foot rather than strengthening it. **PURPOSE:** To determine the effect of a foot exercise intervention on the volume of plantar intrinsic foot muscles.

METHODS: 34 recreational runners were randomly assigned to either a Control (CON) or Foot Strengthening (FS) group. The CON group was assigned to a placebo lower limb stretching protocol while the FS group performed a foot exercise protocol for 8 weeks. Running mileage and training pace were controlled weekly throughout the study for both groups. The right foot of all subjects was imaged using MRI at baseline (T0), as well as at week 8 (T8). Cross-sectional areas (CSA) of the whole length of the Abductor Hallucis (AbH), Abductor Digiti Minimi (AbDM), Flexor Hallucis Brevis (FHB), and Flexor Digitorum Brevis (FDB) were measured by a researcher blinded to both group assignment and time (T0 or T8) The Intraclass Correlation values for repeatedly measuring CSA for this tester was ICC_{3,1} = 0.97 (0.96-0.98). **RESULTS:** There was a significant difference in volume and CSA for all muscles measured for the FS group between T0 and T8 (p<0.05). Muscle volume in the FS group increased

by 22.4% for the AbH, 17.1% for AbDM, 17.7% for FHB, and 8.8% for FDB. No changes were noted in the CON group. **CONCLUSION:** The foot exercise protocol significantly increased the volume of intrinsic foot muscles in a healthy and physically active population of recreational runners. This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001, FAPESP 2015/14810-0.



Changes in muscle volume in the CON and FS groups (positive indicates an increase in size and negative indicates a decrease in size). * Significant difference from CON (p<0.05).

3100 Board #146 May 31 3:30 PM - 5:00 PM
The Effect Of Exercise Training And Increasing Non-exercise Physical Activity On Glyca Levels

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Purpose: Aerobic training has been shown to have a beneficial effect on GlycA, which is a marker of inflammation. However, it has not been previously reported if an intervention with aerobic training and increasing non-exercise physical activity can further reduce GlycA. Thus, the purpose of the present study is to determine the impact of the combination of aerobic training and increasing non-exercise physical activity on GlycA levels compared to aerobic training alone in obese adults. Methods: Obese adults (N=30) were randomized to an aerobic training, (AERO), aerobic training and increasing non-exercise physical activity, (AERO-PA) or a control (CON) group for 6 months. Both exercise groups performed supervised aerobic training (50%-75% VO2 max) at a dose of 12 kcals per kg per week. Along with exercise training, the AERO-PA group had the goal of increasing non-exercise physical activity ~3,000 steps above baseline levels. Archived blood samples were obtained at baseline and at follow-up and subsequently analyzed by LipoScience for GlycA after the completion of the study (LabCorp, Morrisville, NC). An ANCOVA was used to evaluate the change in GlycA across the intervention groups with adjustment for the baseline value. Person correlations were run to evaluate the change in GlycA with weight, body composition, and fitness variables. Results: Significant within groups reductions in GlycA were observed in the AERO (-43.1 μmol/L, CI: -74.1 to -12.2) and the AERO-PA groups (-31.2 μmol/L, CI: -61.2 to -1.1), but this change was not significant compared to the CON group (-15.4 μmol/L, CI: -41.8 to 11.0). The change in GlycA in exercisers was not associated with the change in fitness (r=-0.18, p=0.47), waist circumference (r=-0.37 p=0.13), weight (r=-0.31, p=0.21), body fat (r=-0.28, p=0.26) or change in steps of non-exercise physical activity (r=0.35, p=0.16). Conclusion: Neither aerobic exercise training or aerobic training and increasing non-exercise physical activity reduced inflammation levels in obese adults measured by GlycA. Changes in GlycA are not associated with body composition, non-exercise physical activity, or fitness changes associated with aerobic exercise training.

3101 Board #147 May 31 3:30 PM - 5:00 PM
Power and Strength Training Produce Similar Improvements in Performance in Individuals with Parkinson's Disease

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 (Sponsor: Kevin Jacobs, FACSM)
 (No relevant relationships reported)

PURPOSE: Loss of motor function is a cardinal symptom associated with Parkinson's disease (PD), with many studies indicating that muscular strength and power decrease as the illness progresses. Although literature supports the efficacy of resistance training to improve motor function in persons with PD, no study has compared the impact of strength and power training on measures of strength, power, balance and functional movement in PD patients. **METHODS:** Thirty-five participants diagnosed with mild to moderate PD were randomized into a 12-week strength or power training program (2 times per week). Measures of muscular strength (1RM), peak power (PP_{rel}), balance (Berg balance assessment, dynamic posturography, modified falls efficacy scale), and functional movement (timed up-and-go) were assessed before and after training. **RESULTS:** No significant group effect was found. Significant increases in leg press (MD = 54.89 kg ± 7.41; η²=.749; p < .0001) and chest press (MD = 7.33 kg ± 3.46; η²=.518; p < .0001) strength, as well as in leg press (MD = 106.89 W ± 24.73 η²=.358; p < .0001) and chest press power output (MD = 52.12 W ± 13.51; η²=.299; p < .0001) were seen for the entire sample. There was also a significant decrease in Berg scores for the sample (MD = -1.68 ± .551; η² =.192, p = .009). No other differences were detected across the training period. **CONCLUSION:** Strength and power training produced similar improvements in measures of strength and power in individuals diagnosed with PD. Although Berg scores decreased significantly following training, these declines were not considered clinically significant. We postulate that the lack of improvement in balance and functional movement scores for either intervention may be due to the failure to include movement-specific drills in the training protocol. Future research should continue to examine the differential effects produced by strength and power training in PD patients and should include a functional training phase designed to elicit improvements in balance and daily function.

3102 Board #148 May 31 3:30 PM - 5:00 PM
The Impact Of A Workplace Wellness Program On Employees In A University Setting

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The Affordable Care Act of 2010 contained incentives for worksites to develop workplace wellness programs and employee wellness programs, which have shown positive outcomes to companies in various dimensions of wellness. Historically, studies have examined one dimension of wellness and typically within a corporate setting. **PURPOSE:** To evaluate the effectiveness of an educational wellness intervention on overall well-being based on the eight dimensions of wellness in university faculty and staff. **METHODS:** Employees (N = 12, 72.7% female; 81.8% white) underwent an 8-week intervention called the Employee Wellness Institute. Employees met once a week with each session highlighting one of the eight dimensions of wellness. Demographics, anthropometrics, physical activity, nutrition, and overall wellness were pre and post intervention. Statistical analysis utilized a paired-t test and Cohen's d for effect size. **RESULTS:** Within each dimension of wellness there was an average increase of 8% in Physical, 3% in Emotional, 3% in Social, 2% in Occupational, 4% in Spiritual, and both Environmental and Intellectual had the largest increase at 9% which was statistically significant (p=0.011). **CONCLUSION:** Data supports the hypothesis that employees would improve their proficiency within the 8-dimensions of wellness as well as physical activity, although not all improvements were statistically significant. Within a short 8-week intervention, employees had increase their overall wellness up to 9% in some dimensions. If the employees had access to a year-round program that continuously strived to improve their wellness, or if more employees had access to such a program, the overall wellness of an entire faculty/staff of a university may improve. Thus, future research and practice efforts should implement and evaluate year-long worksite wellness programs for university employees.

3103 Board #149 May 31 3:30 PM - 5:00 PM
Efficacy Of A Recess-based Intervention On Academic And Health Outcomes In Elementary School Children
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Both cardiorespiratory and muscular fitness are important for overall health and may benefit academic related outcomes in children. However, few intervention studies have examined the impact of an intervention that has emphasized both components on academic or cognitive outcomes. Furthermore, school recess may be an ideal time to promote physical activity and fitness and has been a relatively understudied setting in relation to these outcomes. **PURPOSE:** To evaluate the preliminary efficacy of a 3-month recess-based combined fitness intervention (INT; consisting of both aerobic and muscular fitness activities) on cognition (inhibition and working memory), classroom behaviors (engaged and off-task behaviors), fitness (cardiorespiratory and muscular), and moderate to vigorous physical activity (MVPA) in elementary school-age children. **METHODS:** Schools (n=2) were randomized to either the INT (n=27, sex: 66.7% male, age: 8.8±0.1 years) or control group (CON; n=27, sex: 42.3% male, age: 9.4±0.1 years). Baseline and post-intervention measures included a flanker test (inhibition), list sorting test (working memory), classroom behavior observation (on- and off-task behaviors), 20-meter shuttle run (cardiorespiratory fitness), muscular fitness battery (muscular fitness), and accelerometry (MVPA). Process evaluation measures were recorded daily, weekly, and post-intervention. ANCOVA models were adjusted for baseline score, age, and other covariates. An independent samples *t*-test was used to compare percent of time spent in MVPA during recess between schools. **RESULTS:** Percent of time spent in MVPA during recess was significantly higher in the INT compared to the CON group (INT=41.7±2.1%; CON=30.4±0.2, *p*<0.001). No other significant differences were observed. Although participant enjoyment and INT acceptability was high, the average participation in INT sessions was 19.4% (ranging from 0 to 95.6%). **CONCLUSION:** This pilot study demonstrated some preliminary support that offering a combined fitness program is feasible and can increase percent of time spent in MVPA during recess. Future research is warranted to determine if the INT can impact academic or cognitive outcomes. Supported by: University of Massachusetts Amherst Graduate School Dissertation Research Grant

F-57 Free Communication/Poster - Maternal and Child Health

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

3104 Board #150 May 31 2:00 PM - 3:30 PM
The Associations between Maternal Body Mass Measures and Macronutrient Intake on Insulin Sensitivity Measures during Late Pregnancy
 Brittany R. Allman, Aline R. Andres, Eva C. Diaz Fuentes, Elisabet Borsheim. *Arkansas Children's Nutrition Center, Little Rock, AR.*
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(No relevant relationships reported)

PURPOSE: To determine associations between maternal body mass measures (body mass index [BMI], gestational weight gain [GWG]) and macronutrient intake (protein, carbohydrate [CHO], fat) on insulin sensitivity (IS) and fasting glucose (GLU) in late pregnancy in normal weight (NW, n = 87), overweight (OW, n = 67) and obese (OB, n = 31) women. **METHODS:** Participants were recruited early in pregnancy (<10 wk). A 100-gram oral glucose tolerance test (OGTT) was done following an overnight fast at 30 wks to calculate the metabolic clearance rate of glucose (MCR, mg·kg⁻¹·min⁻¹). Dietary intake of animal (AP) and plant (PP) protein (g·kg⁻¹·d⁻¹), fat (g) and CHO (g) were estimated using 3-d food records. Correlations between GLU and MCR with AP, PP, fiber, fat, CHO, GWG, and early pregnancy BMI were assessed using Pearson correlations. Multiple linear regression was used to model MCR and GLU with the independent variables. Data are mean ± SD. **RESULTS:** MCR (NW: 10.1 ± 0.8; OW: 8.3 ± 1.1; OB: 6.7 ± 1.0 mg·kg⁻¹·min⁻¹, *p* < 0.0001) and PP (NW: 0.39 ± 0.12; OW: 0.32 ± 0.09; OB: 0.27 ± 0.09 mg·kg⁻¹·min⁻¹, *p* < 0.0001) differed between groups. Fasting GLU was higher in OW compared to NW (NW: 79 ± 6; OW: 83 ± 7 mg/dL, *p* = 0.008), and AP was lower in OB compared to NW groups (NW: 0.67 ± 0.25; OB: 0.52 ± 0.18 g, *p* = 0.004). CHO intake was higher in NW vs. OB (*p* < 0.05). MCR correlated with AP (*r* = 0.21, *p* = 0.047) and BMI (*r* = -0.62, *p* < 0.0001) in NW, and with fat (*r* = -0.39, *p* = 0.001) and BMI (*r* = -0.58, *p*

< 0.0001) in OW. GLU correlated with BMI (*r* = 0.37, *p* = 0.001) in NW, with fat (*r* = 0.29, *p* = 0.025) and BMI (*r* = 0.31, *p* = 0.016) in OW, and with PP (*r* = -0.41, *p* = 0.035) in OB. Most parsimonious models: In OW, fat (β = -0.02, *p* < 0.001) and BMI (β = -0.41, *p* < 0.0001) were associated with MCR; and PP (β = -30, *p* = 0.008) and fat (β = 0.14, *p* = 0.002) associated with GLU. In OB, PP (β = 5.8, *p* = 0.011) and fat (β = -0.02, *p* = 0.005) were independently associated with MCR; and PP (β = -44.6, *p* = 0.003) and CHO (β = 0.03, *p* = 0.043) associated with GLU. **CONCLUSIONS:** Higher fat intake and BMI, and low PP intake in OW pregnant women is associated with lower IS. Higher fat and CHO intake, and low PP intake in OB pregnant women is associated with decreased IS. Thus, to improve insulin regulation and glucose metabolism, OW and OB pregnant women may benefit from increasing PP intake and ensure optimal macronutrient intake.

3105 Board #151 May 31 2:00 PM - 3:30 PM
Maternal Exercise and DHA Levels During Pregnancy Influences Infant Body Composition
 Cody J. Strom, Christy Isler, Kelley Haven, Ed Newton, Kimberly Kew, Blake R. Rushing, Samantha McDonald, Linda E. May. *East Carolina University, GREENVILLE, NC.*
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(No relevant relationships reported)

Nearly 14% of U.S. children aged 2-5 years are obese. Evidence indicates that obesity develops *in utero* and is affected by several maternal factors. Maternal exercise is shown to reduce the risk of delivering high-birthweight infants. However, previous studies restricted their exercise exposure to aerobic training; thus, the effects of other common exercise modes on infant body composition are unknown. Maternal diet, specifically DHA levels, is also suspected to affect infant size. Maternal DHA is shown to improve infant birth weight and decrease fat mass. However, it is unclear as to whether this association is affected among exercising mothers. **PURPOSE:** To determine the relationships between different maternal exercise modes and maternal plasma levels of DHA on infant body composition. **METHODS:** Thirty-six healthy, low-risk, women with a singleton pregnancy (<16 weeks) were randomized to one of four intervention groups: aerobic (n=13), resistance (n=4), circuit (n=6)(aerobic + resistance) or non-exercising control (n=13) group. Participants exercised 3x/week for 50 minutes at moderate intensity for ~20 weeks. Maternal plasma was collected at 16 and 36 weeks of gestation and analyzed for DHA levels using liquid chromatography/mass spectrometry. At one month of age, infant body composition was assessed via skinfold technique. ANCOVA models were performed to determine independent associations between maternal exercise mode, maternal DHA levels, and infant percent body fat (%BF). **RESULTS:** Infants born to aerobic- or circuit-trained mothers had significantly lower %BF compared to infants born to resistance-trained mothers (*p*=0.045, *p*=0.048), respectively. After controlling for infant sex, 16-week maternal DHA levels, and fasted state, maternal exercise exhibited no effect on infant %BF (*F*, 0.57; *p*=0.6865). Maternal DHA levels at 16 weeks (*F*, 1.30; *p*=0.2887), 36 weeks (*F*, 1.13; *p*=0.3742) or across pregnancy (~20 weeks) (*F*, 1.27; *p*=0.3026) did not associate with infant %BF, after controlling for maternal exercise mode, sex, and fasted state. **CONCLUSION:** The current data supports the relationship between maternal exercise modes with aerobic activity on infant body composition. The data suggests that exercise mode may be a more important modulator of infant body composition than maternal DHA levels.

3106 Board #152 May 31 2:00 PM - 3:30 PM
The Effects of Exercise Mode During Pregnancy on Maternal Metabolism
 Samantha Michelle McDonald, Christy Isler, Kelly Haven, Edward Newton, Linda E. May, Cody Strom. *East Carolina University, Greenville, NC.*
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(No relevant relationships reported)

Maternal metabolism is the strongest predictor of fetal growth and development; thus, it is imperative that women maintain a healthy pregnancy to ensure optimal health of their offspring. Evidence demonstrates that chronic exercise training exhibits potent metabolic effects (e.g., insulin sensitivity), indicating a healthier metabolic profile. In healthy pregnancies, however, the effects of prenatal exercise and various modes of exercise on maternal metabolism are unclear. **PURPOSE:** To determine the effects of exercise mode on maternal metabolism during pregnancy, in a sample of healthy women with singleton pregnancies. **METHODS:** At 16 weeks gestation, healthy pregnant women were randomized to one of four intervention groups: aerobic (AT), resistance (RT), circuit (CT) and non-exercising control (CON). Supervised exercise sessions consisted of 50 minutes of moderate-intensity (40-59% VO_{2peak}) exercise, three times per week. Fasting blood samples were collected via venipuncture and fingerstick at 16 and 36 weeks gestation to assess maternal glucose and lipid profiles. ANOVA models were performed to determine the effects of exercise mode on maternal glucose, total cholesterol (TC), triglycerides

(TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL) and lactate (LT) at 36 weeks and the change from the 2nd to 3rd trimester. **RESULTS:** Seventeen pregnant women had complete metabolic data. Prenatal exercise exhibited no effect on glucose or lipid profiles at 36 weeks (glucose: $p=0.48$; TC: $p=0.29$; TG: $p=0.48$; HDL: $p=0.25$; LDL: $p=0.79$; LT: $p=0.96$) or their change between the 2nd and 3rd trimesters (glucose: $p=0.45$; TC: $p=0.87$; TG: $p=0.31$; HDL: $p=0.65$; LDL: $p=0.81$; LT: $p=0.37$). Similarly, no effects were found for exercise modes at 36 weeks (glucose: $p=0.76$; TC: $p=0.41$; TG: $p=0.24$; LDL: $p=0.49$; LT: $p=0.69$) or across pregnancy (glucose: $p=0.83$; TC: $p=0.40$; TG: $p=0.32$; LDL: $p=0.61$; LT: $p=0.70$), with the exception of HDL at 36 weeks. CT mothers exhibited lower HDL levels compared to controls ($p=0.04$). **CONCLUSIONS:** In healthy pregnancies, prenatal exercise and various modes of exercise do not appear to positively nor negatively affect maternal metabolism. Further research should include larger samples and more rigorous assessments of glucose and lipid metabolism (e.g., HbA_{1c}, HOMA-IR, CRP).

3107 Board #153 May 31 2:00 PM - 3:30 PM
Effects of Evidence-Based Materials and Local Resources on Knowledge/Beliefs and Physical Activity Levels During Pregnancy

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 (No relevant relationships reported)

PURPOSE: Physical activity (PA) during pregnancy is safe and effective for improving maternal and infant health; however, only 23% of pregnant women exercise in accordance with guidelines, and this number is likely even lower in rural Kentucky. The purpose of this study is to determine the impact of evidence-based educational materials and access to local resources on PA levels and knowledge/beliefs about PA during pregnancy. **METHODS:** Women were recruited from a rural obstetric clinic (8-12 weeks gestation). PA levels were assessed using a fitness tracker and the Pregnancy Physical Activity Questionnaire. Knowledge/beliefs about PA during pregnancy were assessed via surveys. Stage of readiness to exercise was assessed using the transtheoretical model. Participants were randomly assigned to an intervention (IG) or control group (CG). The IG received evidence-based educational information regarding PA during pregnancy and free access to six local fitness facilities. All baseline assessments were repeated during late pregnancy (32-39 weeks). To assess obstetric outcomes, a survey was emailed to each participant after delivery. **RESULTS:** 63 women enrolled in the study (age=29.7±4.9 years, pre-pregnancy BMI= 26.2±6.3 kg/m², household income=\$78,589, average step count in 1st trimester=7,108 steps), and 45 have completed the study (follow-ups are ongoing). There were no differences in baseline variables between groups. In the IG, 13 women utilized PA services (prenatal yoga: 8, gym: 2, both: 3). There was no difference between groups in PA (assessed via change in step counts from early to late pregnancy) ($p=.81$). However, there was a trend for the IG to accumulate less sedentary time compared to the CG during late pregnancy ($p=0.12$). There were no differences in knowledge ($p=0.8$) or beliefs ($p=0.3$) regarding PA during pregnancy between groups. The IG was at a later stage of the transtheoretical model than women in the CG during late pregnancy ($p=0.04$). **CONCLUSION:** The intervention was unsuccessful at significantly increasing PA levels and knowledge/beliefs. Yoga was the most commonly utilized activity among IG women, and while beneficial, is unlikely to alter step counts. Future interventions need more than educational materials and access to resources in order to have a substantial impact on PA-related outcomes.

3108 Board #154 May 31 2:00 PM - 3:30 PM
Strategies And Challenges In Recruiting Overweight/ Obese Pregnant Women For A Behavioral Lifestyle Intervention Program

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 (No relevant relationships reported)

Pregnancy may serve as a unique window for lifestyle behavioral change because of increased concern for health and well-being in expectant mothers. **PURPOSE:** To report the recruitment efforts and results undertaken in a behavioral lifestyle intervention administered during and after pregnancy. **METHODS:** The Health in Pregnancy and Postpartum (HIPP) Study is an ongoing randomized controlled trial that targets excessive weight gain during pregnancy and promotes weight loss after delivery. The target population includes overweight or obese women who are pregnant ≤ 16 weeks, white or African American, aged 18-44 years, and do not have exercise contraindications. Women are recruited through OB/GYN clinics in metropolitan Columbia, SC. Interested women who meet the initial inclusion criteria (i.e., age, race,

gestational age, and pre-pregnancy BMI) are screened by phone for medical exclusions or other study exclusions. A script based on principles of motivational interviewing is used to ensure women consider pros and cons of each study condition, and if still interested in participating, they are scheduled for baseline visit. **RESULTS:** Of the 1,547 women initially eligible and interested, only 822 (53.1%) could be reached by phone for further screening and 161 (19.6%) were found ineligible. Of the 661 eligible women screened by phone, 387 (58.5%) scheduled baseline measurements. Top reasons women were ineligible include: incompetent cervix (3.3%), insulin-dependent diabetes (3.0%), and doctor contraindicated exercise during pregnancy (2.7%). After accounting for cancelled or no show ($n=126$) and in progress ($n=4$) appointments, 257 (66.2%) women have completed the in-person portion of baseline measurements, resulting in the overall recruitment yield of 16.6% (257/1547). Women who cancelled or did not show up at baseline visits were less likely to have their own cell phone ($p=0.02$) or a smart phone ($p<.004$), receive <20 texts/day ($p<.0001$), have access to a computer ($p=.007$), or have ever downloaded a podcast ($p=.0008$); women were more likely to miss or cancel appointments in April, July, and December ($p<.0001$). **CONCLUSION:** Recruitment of women in early pregnancy for a behavioral lifestyle intervention appears challenging, particularly among women with limited phone access.

3109 Board #155 May 31 2:00 PM - 3:30 PM
Evidence-based Educational Brochures Influenced Beliefs And Improved Knowledge Regarding The Benefits Of Exercise During Pregnancy

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Purpose: Women who are pregnant report receiving little or no advice about physical activity during pregnancy from their provider. The purpose of this study was to assess the effectiveness of an evidence-based educational brochure on both immediate and two-week retention of knowledge about exercise during pregnancy.

Methods: Thirty-two women of childbearing age (age: 25.0 ± 4.0 years, body mass index: 29.5 ± 6.5 kg/m²) completed a survey before exposure to an evidence-based educational brochure regarding exercise during pregnancy. Post surveys were taken immediately after viewing the educational brochure and again 2-weeks later.

Results: After exposure to educational brochures, survey scores on both surveys were significantly higher immediately-post and two-weeks post compared to baseline survey scores [Survey 1 (assessing beliefs) – pre: 79.2±8.9%, post: 92.6±7.4%, 2-weeks post: 92.0±6.5%, $p < 0.001$; Survey 2 (assessing knowledge) – pre: 65.3±16.4%, post: 81.3±14.9%, 2-weeks post: 78.8±12.4%, $p < 0.001$]. No significant differences detected between immediate post and 2-weeks post for either Survey 1 ($p = 0.72$) or Survey 2 ($p = 0.52$); suggesting the information was retained.

Conclusion: An evidence-based educational brochure is effective for improving and retaining information regarding exercise during pregnancy. Health care providers should consider providing patients with this information in order to improve knowledge and patient-provider communication on this topic.

3110 Board #156 May 31 2:00 PM - 3:30 PM
Maternal Water Exercise And Its Effects On Weight Gain And Fetal Outcomes: A Meta-analysis

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Physical activity during pregnancy is known to bring benefits not only for the mother but also for the fetus. Water-based exercises have been recommended as an adequate modality of exercise during pregnancy, however, no meta-analysis has analyzed the effects of water exercise programs on maternal weight gain and fetal outcomes including birthweight. **PURPOSE:** To conduct a systematic review and meta-analysis of randomized controlled trials to investigate the effects of prenatal water-based exercise on maternal weight gain and fetal outcomes. **METHODS:** Eligible trials were identified by a structured search of MEDLINE, EMBASE, ISI Web of Science, Scopus, and SportDiscus up to October 2018. Data were retrieved comparing standard care with standard care plus prenatal water exercise (at least once a week) for at least one of the following outcomes: maternal weight gain, gestational age at delivery, and/or fetal birthweight. Study selection and data extraction were performed by two independent reviewers. Random-effects meta-analysis was conducted for mean difference between exercise and control groups (PROSPERO registration: CRD42016039473). **RESULTS:** Our search yielded 1846 publications of which 1562 were assessed for eligibility. In total, 9 studies were eligible and included in the meta-analysis. Pregnant

women who engaged in a water exercise program showed a significant difference in total maternal weight gain (5 RCTs, n=561, OR -1.00 [95% CI -1.55, -0.45], p<0.001) compared to standard care only. No significant effects on gestational age at delivery (8 RCTs, n=1442, OR 0.04 [95% CI -1.02, 1.10], p=0.94) and birthweight (8 RCTs, n=1427, OR -24.32 [95% CI -86.44, 37.80]) were found. **CONCLUSION:** Water exercise during pregnancy controls maternal weight gain without influencing the duration of pregnancy or baby weight. Health care providers can consider suggesting water-based exercises during pregnancy to promote appropriate weight gain.

3111 Board #157 May 31 2:00 PM - 3:30 PM

Ripple Effect Of Lifestyle Interventions During Pregnancy On Untreated Partners' Weight

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(No relevant relationships reported)

Weight loss interventions have a positive "ripple effect" on untreated partners, but ripple effects in pregnancy are unknown. **PURPOSE:** To determine whether prenatal lifestyle interventions that reduced gestational weight gain in pregnant women had a positive "ripple" effect on untreated partner weight. **METHODS:** To determine whether prenatal lifestyle interventions that reduced gestational weight gain in pregnant women had a positive "ripple" effect on untreated partner weight. **RESULTS:** 122 partners (100% male, 23% Hispanic, 82% married, 48% obese) were randomized to intervention (N=59) or usual care (N=63). There was no intervention or intervention by time interaction effect on partner weight (P = 0.7953). Partner weight trended higher, but weight changes were not statistically significant (P = 0.1204) from study-entry to 35 weeks' gestation (Mean 0.19 kg; 95% CI -0.73 to 1.24) or to 12 months postpartum (Mean 0.82 kg; 95% CI: -0.84 to 1.12 kg). **CONCLUSIONS:** There was no evidence of a ripple effect on partner weight. Partner weight gain was 0.82 kg from pregnancy to 12-months postpartum. Partners of pregnant women appear not to experience sympathy weight gain. Supported by National Institutes of Health Award Number R01HL118208.

F-58 Free Communication/Poster - Systematic Reviews and Meta-Analyses

Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

3112 Board #158 May 31 2:00 PM - 3:30 PM

The Effectiveness Of Tai Chi For Rehabilitation Of Post-stroke Patients: A Meta-analysis

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(No relevant relationships reported)

Stroke has been a growing public health concern that affects 33 million patients each year worldwide. Most seriously, stroke's prevalence rate increases each year worldwide. In recent years, tai chi is becoming an increasingly popular means of improving balance function and gait in patients with stroke. However, the clinical effects of tai chi beyond conventional physical therapy remain controversies. **Purpose:** To systematically evaluate the effectiveness of tai chi for rehabilitation of post-stroke patients. **Methods:** Randomized controlled trials (RCTs) examining the effects of a tai chi training during 4 to 12 weeks for patients with stroke were included by searching 11 electronic databases until September 2018. Two reviewers independently extracted data and scored methodological quality by using the Physiotherapy Evidence Database scale. **Results:** 18 RCTs involving 1080 patients were identified for meta-analysis. Meta-analyses were performed using RevMan 5.3 and Stata 12.0. **Results:** Our work showed that tai chi was superior to usual rehabilitation for balance function (standard mean difference [SMD], 1.90; 95% confidence interval [CI], 1.14 to 2.66; P < 0.00001), gait speed (mean difference [MD], 0.25 m/s; 95% CI, 0.05 to 0.45; P = 0.01), Fugl-Meyer assessment (SMD, 1.22; 95% CI, 0.15 to 2.30; P = 0.03) and ADL (SMD, 2.21; 95% CI, 0.57 to 3.85; P = 0.008). **Conclusion:** Based on the current evidence and heterogeneity among studies, tai chi

with duration of 4 to 12 weeks can be cautiously recommended to effectively enhance the balance function, gait speed, motor ability of lower extremities, and activities of daily life of post-stroke patients.

3113 Board #159 May 31 2:00 PM - 3:30 PM

Exercise Effects On Cognitive Function And Adls In Alzheimer'S Disease: A Meta-analysis

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BACKGROUND: Alzheimer's Disease (AD) is the worldwide leading cause of senile dementia and affects approximately 5.3 million Americans. It is a healthcare issue which is accelerating at a rapid pace. While categorized as a disorder which cannot be cured or slowed, a convincing body of evidence has revealed protective effects of physical activity in mitigating symptoms and delaying progression of the disease.

PURPOSE: To investigate the effects of physical activity interventions on cognitive function and Activities of Daily Living (ADLs) in patients with AD. Based on these results, the design of exercise programs for individuals affected by AD are suggested. **METHODS:** A Meta-Analysis was performed to analyze the effectiveness of different exercise modalities in ameliorating cognitive and functional symptoms of AD. Seven specific inclusion criteria were developed to include studies which contained exercise programs designed to improve or maintain aerobic fitness, strength, ADL performance or any combination of thereof.

RESULTS: Fourteen studies, which included 769 patients diagnosed with AD who were 65 years of age or older met the inclusion criteria for the analysis. Calculations for Effect Size (ES) and Confidence Interval (CI) showed that exercise interventions had a moderate positive effect on cognitive function (ES=0.52; CI=0.15-0.89; p<0.001), and a large positive effect on performance of ADLs (ES=0.76; CI=0.19-1.33; p<0.001). Furthermore, interventions that included an aerobic component (Aerobic Training and Multimodal Training) positively influenced cognitive function, while interventions that included resistance and functional training (Resistance Training and Multimodal Training) improved performance in ADLs.

CONCLUSION: While a large variability was found in study design, intervention, duration, and assessment measures, exercise was usually shown to have positive effects on measures of decline in AD. Exercise programs should be incorporated in the management of AD patients. The choice of exercise modality should include both aerobic and strength/functional components to achieve maximum benefit in cognitive function and ADLs performance. Multimodal Training, which includes activities across the metabolic spectrum, shows the greatest promise as an exercise intervention in AD.

3114 Board #160 May 31 2:00 PM - 3:30 PM

Insulin Resistance Adaptations To High-Intensity Interval Versus Moderate-Continuous Training In Health And Disease: A Meta-Analysis

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(No relevant relationships reported)

Besides the well-known physical fitness benefits of high-intensity interval training (HIIT) over moderate-intensity continuous training (MICT), the effect on other cardiometabolic risk factors, such as insulin resistance, is not yet well defined. **PURPOSE:** to investigate the overall effects of HIIT and MICT on insulin resistance as well as subgroups analyses in i) population: healthy (H), overweight/obese (O), metabolic syndrome (MetS), type-2 diabetes (T2D); ii) age: < 30 y, 30-50 y, > 50 y; iii) training duration: < 5 wk, 5-10 wk, > 10 wk; iv) men ratio: < 0.4, 0.4-0.6, > 0.6; and v) type of exercise: cycling vs running. **METHODS:** randomized controlled trials were identified through a systematic search in PubMed. After the selection, 17 studies were included. Small-study effects were analyzed through contour-enhanced funnel plots and the Egger's test. The standardized mean difference (Cohen's d) was the outcome used, it was calculated with the random-effects model, applying the DerSimonian-Laird estimator for the between-study variance (τ^2). Effect sizes (ES) were classified as trivial (d < 0.2), small (d = 0.2 - 0.5), medium (d = 0.5 - 0.8), and large (d > 0.8). A sensitivity analysis was performed using the leave-one-out cross-validation method. Positive and negative ES represent a favorable effect for HIIT and MICT, respectively. **RESULTS:** the overall effect presented a medium ES (d = 0.53, p = 0.035), with a τ^2 = 0.85 and significant small-study effect (p = 0.01). The population subgroup had a large ES for O (d = 1.77, p = 0.02), trivial ES for H (p = 0.8), and MetS (p = 0.7), and small ES for T2D (p = 0.6). The age subgroup had a large ES for 30-50y (d = 0.87, p = 0.09), and trivial ES for < 30 y (p = 0.5) and > 50 y (p = 0.5). The training duration subgroup had a large ES for < 5 wk (d = 0.97, p = 0.055), trivial ES for 5-10 wk (p = 0.6), and small ES for > 10 wk (p = 0.6). The men ratio subgroup had a large ES for > 0.6 (d = 1.43, p = 0.03), and trivial ES for < 0.4 (p = 0.9) and 0.4-0.6 (p = 0.8). The type of exercise subgroup had a large ES for cycling (d = 0.83, p = 0.02) and trivial

ES for running ($p = 0.5$). CONCLUSIONS: despite a medium overall ES, the effects of HIIT and MICT on insulin resistance vary considerably. HIIT may be superior to MICT in improving cardiometabolic health in an overweight/obese population, men, and cycling exercise.

3115 Board #161 May 31 2:00 PM - 3:30 PM
An Alternative Model For A Meta-analysis On Exercise And Blood Pressure In Older Adults

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PURPOSE: Using a traditional random-effects model, a recent meta-analysis by Herrod et al. (2018) reported statistically significant reductions in both resting systolic blood pressure (SBP) and diastolic blood pressure (DBP) as a result of aerobic, resistance, and combined aerobic and resistance exercise in adults with a mean age of 65 years and older. However, a recently proposed and alternative method, the inverse heterogeneity model (IVhet), has been shown to provide more robust findings. The purpose of this study was to apply the IVhet model to these previous meta-analytic findings. **METHODS:** Data from 41 randomized controlled trials representing 96 groups (52 exercise, 44 control) were pooled using the IVhet model. In addition, absolute and relative differences between the IVhet and random-effects model were calculated. Data were reported using the mean difference (exercise minus control) with non-overlapping 95% confidence intervals considered statistically significant. **RESULTS:** Using the IVhet model, statistically significant reductions in resting blood pressure were found as a result of aerobic exercise (SBP, -4.7 mmHg, 95% CI, -7.7 to -1.8; DBP, -2.0 mmHg, 95% CI -3.13 to -0.89), SBP but not DBP for resistance training (SBP, -7.0 mmHg, 95% CI, -10.5 to -3.4; DBP, -1.2 mmHg, 95% CI -2.7 to 0.31), and both SBP and DBP for combined aerobic and resistance training (SBP, -5.5 mmHg, 95% CI, -8.3 to -2.7; DBP, -3.7 mmHg, 95% CI -4.8 to -2.7). When compared to the random-effects model, findings from four of the six mean differences in blood pressure were smaller, ranging from -0.82 to -0.19 mmHg (6.1% to 41.0%) while all six 95% CI were wider, ranging from 0.24 to 1.56 mmHg (11.5% to 36.8%). **CONCLUSIONS:** These findings suggest that with the exception of changes in DBP as a result of resistance training, exercise (aerobic, resistance, combined aerobic and resistance) reduces resting SBP and DBP in older adults. Importantly, these findings are generally smaller than those previously reported, a factor that could have practical implications. Future studies should consider using the IVhet model when conducting an aggregate data meta-analysis.

3116 Board #162 May 31 2:00 PM - 3:30 PM
The Effect Of Qigong On Chronic Obstructive Pulmonary Disease: A Systematic Review And Meta-analysis

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PURPOSE: This review aims to investigate the effect Qigong on chronic obstructive pulmonary disease (COPD).

METHODS: All randomized controlled clinical trials published in English or Chinese and involving the use of Qigong by patients with COPD were searched in PubMed/MEDLINE, Cochrane Library, Embase, PsycINFO, Cambase databases, CNKI, and WanFang databases from their respective inception to June 2018. The meta-analysis was conducted using the Revman 5.3. The quality of the included trials was assessed using the Jadad rating scale. Two researchers independently completed the inclusion, data extraction, and quality assessment.

RESULTS: Fourteen RCTs with 1274 COPD patients met the inclusion criteria. The meta-analysis revealed that the FEV1, FEV1%, FEV1/FVC% and 6MWD was significantly enhanced in the experimental group (FEV1 mean difference [MD] = 0.29, 95%CI: 0.09 to 0.48; FEV1% MD=6.09, 95% CI: 3.15 to 9.04; FEV1/FVC% MD=4.20, 95% CI: 1.88 to 6.51; 6 months: MD=57.52, 95% CI: 17.48 to 97.57) than the control group. There was no significant difference in FVC between the experimental group and the control group ($P > 0.05$).

CONCLUSION: Qigong exercise can improve the lung function and exercise ability of COPD patients. However, future research with better quality RCTs needs to explain the mechanism of the positive effect of Qigong on COPD. (This study was supported by Fundamental Research Funds for the Central Universities at SWU Grant 1709240.)

3117 Board #163 May 31 2:00 PM - 3:30 PM
Evidence for Kinesio Taping in Management of Myofascial Pain Syndrome: A Systematic Review and Meta-analysis

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Myofascial pain syndrome (MPS) is one of the most common neuromuscular system diseases and is also easily misunderstood in pain clinic. And kinesio taping has been gradually used by physiotherapists or pain clinicians in the pain clinic as a clinical support treatment for MPS. However, no evidence-based medical data is available to support the advantageous effect of kinesio taping on MPS over other treatments at post-intervention and follow-up. **PURPOSE:** To evaluate the effectiveness of kinesio taping for managing MPS in terms of pain intensity, pressure pain threshold, range of motion (ROM), muscle strength and disability. **METHODS:** PubMed, EBSCO, ScienceDirect, Web of Science, Cochrane Library and Physiotherapy Evidence Databases were searched from database inception to January 2018. Randomised controlled trials (RCTs) that used kinesio taping as the main treatment protocol for participants diagnosed with MPS were included. Two reviewers independently screened articles, scored methodological quality by using Cochrane risk-of-bias tool and extracted data. The primary outcomes were pain intensity, pressure pain threshold and ROM at post-intervention and follow-up. The secondary outcomes were muscle strength and disability at post-intervention and follow-up. **RESULTS:** Meta-analyses of 15 RCTs involving 713 patients, showed that kinesio taping was more effective than other treatments in improving pain intensity (mean difference [MD] = 0.94 cm, 95% confidence interval [CI]: -1.55 cm to -0.32 cm, $p=0.003$) and ROM (standardised mean difference [SMD] = 0.32, 95% CI: 0.12 to 0.52, $p=0.002$) at post-intervention. Kinesio taping was also superior to other non-invasive techniques in relieving pain intensity at follow-up (MD = -0.68 cm, 95% CI: -1.22 cm to -0.13 cm, $p=0.02$). **CONCLUSION:** The latest evidence statistically supports the use of kinesio taping over other treatments for relieving the pain intensity and range of motion of patients with myofascial pain syndrome at post-intervention. Kinesio taping is also statistically superior to other non-invasive techniques in relieving pain intensity at follow-up. However, no significant superiority of kinesio taping was found in pressure pain threshold, muscle strength and disability.

3118 Board #164 May 31 2:00 PM - 3:30 PM
Sprint Interval Training or High-intensity Interval Training to Improve VO_{2max} In Sedentary Individuals? A Meta-analysis.

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PURPOSE: To evaluate improvements in VO_{2max} in sedentary adults aged 18-55 comparing sprint interval training (SIT) vs high intensity interval training (HIIT) vs continuous cardiovascular training (CCVT).

METHODS: A systematic literature search (key terms: HIIT, endurance, interval training, SIT, and VO₂) was conducted of electronic databases (PubMed, Scopus, Sport Discus, Science Direct, Web of Science, Google Scholar) to ascertain appropriate studies. The inclusion properties for the studies were: sedentary individuals between the ages of 18-55 free of comorbidities other than being overweight or obese; included a continuous training group; completed a pre and post VO_{2max} graded exercise test. These search criteria yielded 20 studies evaluating HIIT protocols totaling 527 subjects in the interval group and 214 subjects in the CCVT group. There were nine studies studying a SIT protocol with 111 total subjects in the interval group and 85 subjects in the CCVT group.

RESULTS: Statistics and effect sizes were calculated using G*Power software (Heinrich-Heine-Universität Düsseldorf) with a post-hoc two-tailed designed t-test with α error at .05. Training, regardless of type, increased VO_{2max}. HIIT increased VO_{2max} by 11.421%, whereas SIT increased it by 10.353%, followed by CCVT with an increase of 7.361%. Cohen's d provided effect sizes comparing HIIT, SIT, and CCVT training groups. Both HIIT and SIT had large Cohen's d effect sizes at 1.053 and 0.764, respectively, compared to a moderate effect size of 0.506 for the CCVT group. **CONCLUSIONS:** Both HIIT and SIT are valid options for increasing the VO_{2max} of sedentary individuals with a relatively small commitment time needed. This could have implications for participant adherence to the protocol. Both HIIT and SIT had a significantly positive effect on the participant's VO_{2max} when compared to the CCVT group. However, CCVT also improved their VO_{2max}. Therefore, any sustained physical activity is beneficial for sedentary adults to improve VO_{2max}.

3119 Board #165 May 31 2:00 PM - 3:30 PM
Aerobic Exercise And Balance In Adults Over 50 Years: Meta-analysis Of Randomized Controlled Trials

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(No relevant relationships reported)

Various interventions have combined aerobic exercise with strength, power or balance training and the direct effect on balance in older adults. The specific effect of aerobic exercise on balance is unclear. **PURPOSE:** The purpose of this study was to analyze the effect of aerobic exercise on balance in older adults. **METHODS:** The systematic search was made on academic scientific bases: Academic Complete Search, ProQuest, PubMed, Science Direct and Sport Discuss, using the Boolean phrase: (aerobic exercise OR aerobic training) AND (adult* OR aging* OR senior* OR older adult*) AND (balanc*) NO (diet or nutrition) NO (Animal) And random*. The inclusion criteria were: publications in English or Spanish, full text, older adult (people and women), people over 50 years, experimental and quasi-experimental studies, treatment focused on aerobic exercise and dynamic or static balance indistinctly of the type of test. We analyzed 4496 studies and only 11 investigations met the inclusion criteria, obtaining 56 effect sizes (TE) in 590 subjects. The moderator variables were age, sex, level of physical activity, health condition, N per study, duration of the session and exercise modality. **RESULTS:** The overall effect size for the experimental conditions was $TE = 1.083$, ($p \leq 0.05$) (95% CI: 0.63 - 1.53, $Q = 679.07$, $p = 0.00$, $I^2 = 99.55$); the effect size of the control group was $TE = 0.056$, ($p = 0.685$) (95% CI: -0.14, .25, $Q = 11.48$, $p = 0.009$, $I^2 = 73.88$). There were no differences in differences between the control groups of TE ($n = 16$) and experimental group ($n = 40$) ($F = 2.73$, $p = .104$). The Cochran's Q test for the experimental group presents values that indicate that the calculated effect sizes have high heterogeneity according to Borenstein, et al. (2009). In addition, the Egger test was applied and this gave the following data $t = 4.55$, $gI = 54$, $p = 0.000$ *, accepting the alternative hypothesis indicating that there is asymmetry; procedure that detected a publication bias. **CONCLUSION:** Aerobic exercise (AE) exerts a positive effect on the balance of older adults; therefore, AE training is a valid strategy to counteract the loss of balance in older adults.

F-59 Free Communication/Poster - Athlete Nutrition

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

3120 Board #166 May 31 2:00 PM - 3:30 PM
NCAA Division III Football Players Dietary Intake: In Season vs. Off Season

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(No relevant relationships reported)

Excess caloric intake leads to weight gain which contributes to an increase in health risks such as those associated with metabolic syndrome. **PURPOSE:** The purpose of this study was to examine the diet of division III football players in and off season and to identify the differences between skilled and unskilled players. **METHODS:** Twenty-two players [18.9 + 0.79 yr] completed in (F, Fall) and off season (S, Spring) testing. Data included height, weight, body composition and a 24 hour diet recall using the 5-pass method. Nutrition data were analyzed using Food Processor software. In and off season data were compared using a paired sample t-test. Repeated measures ANOVA was used to test for differences between skilled and unskilled players. This study was approved by the Linfield College Institutional Review Board. **RESULTS:** All players gained weight (F: 86.1 ± 13.1 kg; S: 92.0 ± 12.8 kg, $p = 0.033$) by spring. The weight gain was associated with an increase in percentage body fat (F: 13.8 ± 4.6 ; S: 16.3 ± 4.4 , $p = 0.028$). All players decreased total caloric intake in the spring (F: 5553 ± 1922 kcal; S: 3972 ± 1384 kcal, $p = 0.0008$). There were no differences in the macronutrient distribution (%kcal) at either time point (Fat: F: $37.3 \pm 5.9\%$; S: $37.3 \pm 9.1\%$; Carbohydrate F: $47.5 \pm 6.8\%$, S: $46 \pm 11.0\%$ Protein F: $15.2 \pm 3.8\%$; S: $16.87 \pm 4.5\%$). The player's relative protein intake (g/kg) was lower in the off season (F: 2.60 ± 1.36 ; S: 1.87 ± 0.97 ; $p = 0.036$). Sodium and cholesterol consumption decreased from F to S but remained above the daily recommended intake for all players. There were no differences in total calories, macronutrient composition, relative protein intake, sodium or cholesterol between the skilled and unskilled players. A majority of the players meals were consumed at the college dining hall. **CONCLUSION:** Body weight and percent body fat increased from F to S with an associated increased caloric intake during the season. The players consumed large amounts of calories with a high percentage of fat during the season. All players decreased caloric intake in the off season. The change in body weight and body composition may increase health

risks in the long run. It is important for players to make dietary choices to maximize performance and reduce long term health risks within the constraints of eating at the college dining hall.

3121 Board #167 May 31 2:00 PM - 3:30 PM
Rapid Weight Loss Negatively Affects Body Composition and Serum Creatinine in Elite Judokas

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The most frequently used rapid weight loss (RWL) methods in weight-sensitive sports were dehydration and decreased energy intake, with RWL accompanied by many adverse health effects. **PURPOSE:** To evaluate the effects of 7-day RWL intervention on body composition and biomarkers of creatine metabolism in eight elite judokas during a pre-competition period. **METHODS:** The participants voluntarily participated in this study. Strategy of weight loss included restriction of fluid and food intake, and started 7 days before competition. During the first six days, dietary changes included restricted intake of fluids and macronutrients (35% reduction in total caloric intake), followed by a total food restriction on the last day (a weigh-in day). **RESULTS:** RWL induced a significant drop in weight (81.7 ± 10.7 kg at baseline vs. 76.8 ± 10.3 kg at follow-up; $P < 0.001$), fat mass (12.6 ± 5.6 kg vs. 9.2 ± 4.0 kg; $P = 0.003$) and fat-free mass (69.1 ± 7.3 kg vs. 67.6 ± 7.7 kg; $P = 0.05$), accompanied by an increase in serum creatinine levels at follow up (104.0 ± 10.5 $\mu\text{mol/L}$ vs. 114.9 ± 10.2 $\mu\text{mol/L}$; $P = 0.009$). **CONCLUSIONS:** An acute restriction of food and fluid intake appears to negatively affects fat-free mass and indices of kidney function in judokas. Decreased tubular secretion of creatinine due to poor fluid intake (and excretion) might be a possible cause of elevated serum creatinine and a potential kidney stress after RWL, which requires further investigation. This project was partly supported by the Serbian Ministry of Education, Science and Technological Development (175037 and 179011), the Provincial Secretariat for Higher Education and Scientific Research (142-451-2473 and 114-451-710) and the Faculty of Sport and Physical Education, University of Novi Sad (2018 Annual Award).

3122 Board #168 May 31 2:00 PM - 3:30 PM
Intentions Matter When it Comes to Body Composition Changes in DIII Athletes Over Summer Break

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In Division III, coaches cannot require athletes to report summer workouts, but can suggest what should be done to be ready the upcoming season. Coaches also cannot cut an athlete based on knowledge of a lack of summer workouts. **PURPOSE:** To determine whether athlete intentions lead to efficacious outcomes in DIII athletes over summer break. It was hypothesized that due to lack of accountability, body composition intentions over summer break would not be achieved. **METHODS:** Fifty-one student athletes (32 women, 19 men; 20 ± 1 years old) had their body composition assessed in May in addition to their intention(s) regarding body composition changes over summer break (increase muscle mass and/or decrease fat mass or no change). Body composition was again assessed in August of the following school year. **RESULTS:** Only an intention to increase muscle mass or decrease body fat mass led to no significant change in either variable. When athletes had the combined intention of increasing muscle mass and decreasing fat mass, a significant decrease in body fat percentage was observed (-1.8 ± 2.3%; $p = 0.017$). Independently, the increase in muscle mass ($+1.33$ ± 2.3kg; $p = 0.063$) and decrease in fat mass (-1.1 ± 2.2kg; $p = 0.094$) were not significant. **CONCLUSIONS:** Thus, these data suggest in order to achieve a decrease in fat mass, that has a significant impact on percent body fat, this intention should be combined with the intention to increase muscle mass. Additionally, singular intentions did not evoke intended body composition changes.

3123 Board #169 May 31 2:00 PM - 3:30 PM
The Effect of Feedback on Pre-Game Hydration Status of Division II Collegiate Basketball Players.

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Proper hydration is vital to peak athletic health and performance. Although hydration status is relatively simple to monitor, regular hydration testing is rarely implemented in sport regardless of competition level. Consequently, many athletes enter competition unaware of their hydration status, preventing opportunities to begin in an optimal state of readiness. **PURPOSE:** To evaluate the effect of hydration testing and simple feedback on pre-game hydration status of collegiate basketball players. **METHODS:** Twenty men's collegiate basketball players from a single NCAA Division II university participated in this study during the 2016-17 (N = 14) and 2017-18 (N = 12) seasons. In Season 1, players' urine specific gravity (USG) and body weight (BW) were assessed 1-2 hours prior to the start (PRE) of eight pairs of regular season conference games (16 games total) played on consecutive days (Fri & Sat). In Season 2 (10 games), players' USG was assessed 4-5 hours before game time, at which time they were provided feedback about their hydration status. USG was reassessed 1-2 hours prior to game time, along with BW. USG was measured using a hand-held clinical refractometer. Hydration status was defined as: hyperhydrated (HYP; USG < 1.005), euhydrated (EUH; 1.005 ≤ USG < 1.020), moderately hypohydrated (MOD; 1.020 ≤ USG < 1.025), and severely hypohydrated (SEV; USG ≥ 1.025). BW was measured using a digital scale, with players wearing similar clothing each time. **RESULTS:** PRE hydration status, based on proportional distribution, was significantly different between Season 1 and Season 2 (P < 0.001). In Season 1, 41.4% of players were EUH and 24.9% were MOD at PRE compared to 82.3% and 4.6% in Season 2, respectively. While 27.1% of players were SEV at PRE in Season 1, no players were SEV at PRE in Season 2. There was no change in PRE USG from Fri (1.018 ± 0.008) to Sat (1.019 ± 0.008) in Season 1 (P = 0.077), but PRE USG on Sat (1.010 ± 0.005) was significantly lower than on Fri (1.011 ± 0.006) in Season 2 (P = 0.015). **CONCLUSION:** The implementation of hydration testing and simple feedback significantly improved pre-game hydration status of collegiate basketball players compared to hydration testing alone. Athlete monitoring, when combined with proper feedback and education, can be used effectively to optimize athletic readiness.

3124 Board #170 May 31 2:00 PM - 3:30 PM
Perceptions of Food Group Recommendations in Division II Athletes

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PURPOSE: The purpose of the project was to conduct a needs assessment in order to make targeted nutrition education available to athletes at an NCAA Division II university. **METHODS:** 82 athletes (10 males, 72 females) completed a survey designed to explore eating patterns, to assess basic nutrition knowledge, and to determine nutrition topics about which participants wanted to receive nutrition information. Survey items included nutrition education preferences, gender, height, weight, activity level, nutrition knowledge questions, as well as how many servings of fruits, vegetables, grains, dairy and protein they typically consumed and how many servings they thought they needed. Guidelines for quantities and examples were provided. **RESULTS:** Hydration and protein were the topics most frequently requested (74% and 72% of those making requests). Daily caloric and food group needs were estimated using information from the 2015-2020 Dietary Guidelines based on age, gender, and activity level. Consumption patterns (C) and perceived needs (PN) were compared to recommendations (R). C < R for vegetables (81.7%), fruits (41.5%), protein (61%), grains (86.6%), and dairy (81.7%). PN < R for vegetables (29.3%), fruits (9.8%), protein (53.7%), grains (85.4%), and dairy (48.8%). PN < C for vegetables (6.1%), fruits (15.9%), protein (67.1%), grains (43.9%), and dairy (13.4%). **CONCLUSION:** Since athletes were aware that their consumption of vegetables was lower than recommended, they may be receptive to strategies for incorporating vegetables into their diets. Awareness of the need for information about protein was reflected by their requesting information on the topic and by the consistency of the percentage of athletes with protein C<R and PN<R. Apparently low consumption of and awareness of the need for carbohydrates such as grains may be affecting performance among these athletes. Dairy consumption was lower than the perceived need for dairy, suggesting the need for information in this area. Basic nutrition education relating to food groups is relevant for this group of NCAA Division II athletes.

3125 Board #171 May 31 2:00 PM - 3:30 PM
Food Servings Ingested Before And After An Intervention Program In A University Setting

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 (No relevant relationships reported)

PURPOSE: To compare the food servings ingested by food groups after a 12-week intervention program to promote physical activity in a university setting. **METHODS:** 66 (32 men, 34 women) subjects belonging to the university community (teachers, students, administrative staff) of three different University Centers of the University of Guadalajara were evaluated on their food habits. They were asked about their daily food intake employing a food frequency questionnaire by standardized staff during the interview process. Each subject described how many days per week he/she usually ate each food and the usual amount they consumed on those days. A daily average of food group servings was calculated. Servings' size were determined according to Mexican System for Equivalent Foods. The sample was divided into three groups: Device group (D, participants wore an accelerometer), Device plus counseling group (DC, participants wore an accelerometer and received a series of tips by a website to promote the physical activity and to change health-related behaviors), and Control group (CO, participants received no intervention). Comparisons were considered significant at a p-value < 0.05. **RESULTS:** Subjects' age, body weight, and stature were: 24 ± 7 y 21 ± 7 years, 69.9 ± 12.9 y 57.9 ± 13.0 kg; y 172.1 ± 8.4 y 160.1 ± 8.4 cm, for men and women, respectively. Cereals was the food group most consumed and Legumes the less one for all groups. Considering the average, the intake of Fats increased for all groups. However, Seeds group decreased significantly in the D and CO groups only. No other significant difference was observed. **CONCLUSIONS:** The addition of non-contact counseling was associated with no change in Seeds group in comparison with the other groups. Maybe this kind of intervention might not be effective to modify food intake in this population.

Table. Food servings ingested by Food Group in the studied Groups (n=66)

	Device (n = 25)		Device plus counseling (n = 25)		Control (n = 16)	
	Pre	Post	Pre	Post	Pre	Post
ASF	6.0 ±3.1*	5.4 ±2.7	6.0 ±3.0	5.0 (2.0 - 14.0)	7.7 ±3.9	7.1 ±3.0
Dairy	2.0 (0.0 - 7.0)**	3.0 (0.0 - 11.0)	2.6 ±1.6	2.0 (0.0 - 4.0)	3.6 ±1.5	3.4 ±1.9
Legumes	1.0 (0.0 - 6.0)	1.0 (0.0 - 6.0)	0.0 (0.0 - 1.0)	0.0 (0.0 - 3.0)	1.0 (0.0 - 2.0)	1.0 (0.0 - 2.0)
Cereals	6.0 (3.0 - 18.0)	8.2 ±4.0	7.8 ±3.8	7.0 (3.0 - 24.0)	10.3 ±5.9	8.0 (1.0 - 28.0)
Vegetables	2.0 (0.0 - 5.0)	2.0 (0.0 - 8.0)	2.0 (1.0 - 6.0)	2.0 (0.0 - 7.0)	1.5 (0.0 - 12.0)	2.0 (1.0 - 6.0)
Seeds	2.0 (0.0 - 11.0)	1.0 (0.0 - 7.0) ^a	0.0 (0.0 - 11.0)	0.0 (0.0 - 3.0)	1.0 (0.0 - 9.0)	0.5 (0.0 - 3.0) ^a
Fats	3.0 (0.0 - 16.0)	4.0 (2.0 - 16.0) ^a	4.0 (0.0 - 17.0)	5.0 (1.0 - 15.0) ^a	3.5 (0.0 - 15.0)	5.0 (2.0 - 22.0) ^a
Fruits	3.6 ±2.0	3.0 (1.0 - 10.0)	3.0 (1.0 - 11.0)	3.0 (1.0 - 11.0)	2.5 (0.0 - 13.0)	4.2 ±2.6
Sugars	2.7 (0.0 - 12.0)	2.0 (0.0 - 8.0)	2.0 (0.0 - 10.0)	1.0 (0.0 - 5.0)	2.0 (0.0 - 8.0)	2.0 (0.0 - 7.0)

ASF: Animal source foods. * Mean ± standard deviation. ** Median (min - max). ^a p < 0.05 pre vs post.

3126 Board #172 May 31 2:00 PM - 3:30 PM
Collegiate Athletes That Consumed Adequate Energy Post-concussion Reported Fewer Days Of Concussion-related Symptoms

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(No relevant relationships reported)

PURPOSE: To determine whether meeting overall calorie intake impacts the number of days an athlete has concussion-related symptoms following diagnosis.

METHODS: Fourteen Division I collegiate athletes with a mean age of 20.14 ($SD=1.027$) who were diagnosed with a concussion were randomly placed in a control group ($n=7$) or intervention group ($n=7$). In both groups, daily caloric intake was compared to total daily caloric needs and the individual was coded as met or did not meet energy needs. Concussion related symptoms were assessed using the Sports Concussion Assessment Tool (SCAT5) Symptom Evaluation Form. For the intervention group, four single serving packets of a carbohydrate supplement were provided following immediate impact at the suspicion of a concussion or within 30 to 60 minutes of diagnosis (two servings immediately at suspicion or following diagnosis of concussion, and one serving every other hour within the first 4 hours following the initial servings), and two single serving packets during daily concussion protocol evaluation until the athlete reported no symptoms. A 2x2 Factorial ANOVA was conducted on the total number of days of concussion symptoms with respect to daily average calories being met (AvgCalories) and comparing the control and intervention groups (Control/Intervention).

RESULTS: Statistically significant differences were found in a number of days of concussion symptoms between those who met average daily caloric needs and those who did not, $F(1, 14) = 7.826, p<.05$. No statistically significant difference was seen in the number of days of concussion symptoms between athletes who were in the control group and the intervention group, $F(1, 14) = 0.936, p=.356$. Although a statistical significance was not observed in the number of days of athlete symptoms, an average decrease in the number of days was observed in the intervention ($M = 4.43, SD = 2.37$) when compared to the control ($M = 8.57, SD = 5.09$), $t(7) = 2.357, p = .151$.

CONCLUSION: In this population, athletes that meet their daily caloric needs had fewer days that they experienced concussion related symptoms compared to the subjects that did not meet their caloric needs. This preliminary research suggests that it is beneficial to assure that individuals are aware of their caloric needs and strive to meet them following the diagnosis of a concussion.

3127 Board #173 May 31 2:00 PM - 3:30 PM
Body Composition And Food Consumption Of A Group Of Trekkers Of sãO Paulo - Sp, Brazil

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(No relevant relationships reported)

The demand for physical activities in the nature has increased a lot and one of the most practiced modalities in Brazil is the trail. The trail is characterized by open paths amidst nature and it is considered the main form of access to preservation areas and lush landscapes. Due to the lack of national literature regarding trekkers, it is justified the importance of studying these sportsmen. **PURPOSE:** Evaluate the body constitution and the food consumption of a group of trekkers of São Paulo, Brazil.

METHODS: Cross-sectional study, approved by the Research Ethics Committee of the Mackenzie Presbyterian University, performed with trekkers of both sexes, who consented to participate in the research. To assess body composition showed the weight, height, skinfolds and body circumferences. The percentage of body fat was calculated by the Body Density (D) calculation proposed by Durnin and Womersley (1974) and subsequent conversion of D by the Siri's equation (1961). The body fat percentage classification was made according to Lohman et al. (1992). The food consumption was evaluated by a 24-hour Recall. The macronutrients, fatty acids, vitamins A, C, E, calcium, magnesium and iron were calculated using Avanutri® Software version 4.0. We used the recommendations of the Institute of Medicine (2001) and the Brazilian Society of Cardiology (2013). The analysis of the average difference between nutrients and anthropometric variables was made by Student's t test and Analysis of Variance (ANOVA). **RESULTS:** 14 trekkers were evaluated with an average age of 29 years, 50% female and 50% male. It was observed that 35.71% of the participants were overweight and 50.0% showed a high fat percentage. Men had higher stature and weight, while women presented higher fat percentage and biceps skinfold ($p<0.001$). It was found adequate intake of macronutrients, but the consumption of saturated fats and cholesterol was high. There was also a high prevalence of inadequacy about calcium consumption and greater intake of lipids by men ($p<0.05$). **CONCLUSIONS:** It is recommended that the trekkers search for guidance on food and nutrition, seeking a good performance and greater utilization of this experience with nature.

3128 Board #174 May 31 2:00 PM - 3:30 PM
Association Of The Adequate Intake Of Macronutrients Between Strength Levels From 1RM In University Athletes

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(No relevant relationships reported)

PURPOSE: To analyze the association between the proportions of athletes with adequate macronutrient intake with one repetition maximum (1RM) on bench press in college athletes.

METHODS: 164 (103 men, 61 women) college athletes from different sports were evaluated. 24-h dietary recalls were administered to estimate the macronutrient intake. Carbohydrate (CHO), protein (PRO) and fat (FAT) intake were calculated and adjusted for body weight (g/kg/day). Consumption was classified as "adequate" if the athlete consumed the recommended minimum amounts for each macronutrient: 5 g/kg/day of CHO, 1.2 g/kg/day of PRO, and 0.5 g/kg/day of FAT. Bench press 1RM test was performed to determine the maximal strength. Then, 1RM was classified into sex-specific quartiles: (Men: Q1 <57.8 kg, Q2 57.8 - 66.8 kg, Q3 66.9 - 80.3 kg, and Q4 >80.3 kg; Women Q1 <35.1 kg, Q2 35.2 - 39.6 kg, Q3 39.7 - 48.8 kg, and Q4 >48.8 kg) of displaced weight (kg). The proportion of athletes with an adequate intake of each macronutrient was compared between 1RM quartiles and analyzed by sex. Similarly, the proportion of subjects with adequate intake were compared between macronutrients within quartiles. Chi-square and multiple Z tests (with Bonferroni adjustment) were used to determine significant differences between groups. Significant differences were deemed at a p -value ≤ 0.05 .

RESULTS: There were no significant differences in the proportions of adequate intake between 1RM quartiles for all three macronutrients, for both men and women ($p>0.05$). However, while analyzing the proportion of subjects with adequate macronutrient intake within quartiles, CHO was the one with the lowest proportion on men for all quartiles. The same pattern was observed in women except for Q1 (Table). **CONCLUSIONS:** No association between adequate macronutrients intake and 1RM bench press strength levels were observed. However, CHO was the macronutrient with the lowest proportion of athletes achieving the minimum recommended intake.

Table. Proportion of participants with adequate macronutrient intake by 1RM strength quartile.						
		Q1	Q2	Q3	Q4	p-value
Men	PRO	13 (93%) ab	28 (90.3%) a	27 (84.4%) a	24 (92.3%) a	0.734
	FAT	14 (100%) b	29 (93.5%) a	30 (93.8%) a	24 (92.3%) a	0.786
	CHO	8 (57%) a	20 (64.5%) b	18 (56.2%) b	11 (42.3%) b	0.412
	p-value	0.005	0.004	0.001	<0.001	
Women	PRO	7 (70%)	20 (83.3%) a	13 (86.7%) a	10 (83.3%) a	0.744
	FAT	9 (90%)	21 (87.5%) a	15 (100%) a	10 (83.3%) a	0.483
	CHO	6 (60%)	6 (37.5%) b	4 (26.7%) b	2 (16.7%) b	0.166
	p-value	0.303	0.001	<0.001	0.001	

Data expressed as frequencies (%). Different letters denote significant differences between nutrients within quartiles ($p<0.05$).

3129 Board #175 May 31 2:00 PM - 3:30 PM
A Comparison Study of Energy Expenditure and Nutrition Intake in Amateur Athletes in Long Distance Running

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(No relevant relationships reported)

PURPOSE: By analyzing the energy expenditure figures of each group (training group, marathon group and cross-country running group) and their nutrition intake figures, some reasonable suggestions were given to solve the problem of nutrition intakes in daily training or competition.

METHODS: The energy expenditure data were collected by wearing 3-axis accelerometer (ActiGraph GT3X, USA) when 10 amateurs did 10km training, 6 amateurs did marathon competition, and 6 amateurs did 50-100 km cross-country running. They were asked to recall and record all the foods and beverages during competition or training. After measuring energy expenditure during their exercises, and recording the process of nutrition supplement, we compared the differences in energy expenditures of different groups, and analysis the relativity between energy expenditures and nutrition intakes.

RESULTS: (1) The energy expenditure figure of training group was 0.66 ± 0.10 kcal/kg/km, which was observably less than those of marathon group (1.22 ± 0.32 kcal/kg/km) and cross-country group (1.20 ± 0.18 kcal/kg/km) ($P < 0.01$); however, there was no any obvious difference between the marathon group and cross-country group ($p > 0.05$); (2) The calorie of supplement intakes was 756.17 ± 387.80 kcal/kg/km, which was significant lower than the calories of energy expenditure (2331.61 ± 939.30 kcal/kg/km) in 22 amateurs. However, there was a positive correlation between energy expenditure and supplement intake among the 22 amateur athletes ($r = 0.950, P < 0.01$). **CONCLUSIONS:** (1) The energy expenditure level during daily training was obviously lower than which during competition in amateur runners; (2) The nutrition intake didn't meet the demand of energy cost during long distance running although the runners had followed the principle of "the more energy cost, the more supplement will need".

3130 Board #176 May 31 2:00 PM - 3:30 PM
The Exercise Microbiome Project: An 8 week Cardiovascular Intervention on the Human Gut Microbiome

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INTRODUCTION: The effects of diet and exercise are well studied in connection with human health. However, the relationship between the human gut microbiome (HGM) and exercise is not well understood. **PURPOSE:** The purpose of this study was to examine possible changes to the HGM diversity and composition resulting from an 8-week intervention of cardiovascular exercise (CVE). **METHODS:** Twenty-seven participants (20 F and 7 M) aged 18-25 years were recruited. Inclusion/exclusion criteria were determined using the AHA/ACSM pre-screening questionnaire along with screening for historical factors that might impact the microbiome. Fecal samples for HGM profiling were collected weekly, during three phases of the project: baseline (4 wks; no CVE), intervention (8 wks; CVE 3x wk), and washout (4 wks; no CVE). Pre/post VO_2 max and body composition analyses were conducted. Heart rate ranges for the CVE intervention were pre-determined by the subject's VO_2 max test. Gut microbiota were profiled using 16S rRNA gene sequencing. Microbiome sequence data were analyzed with the QIIME 2 bioinformatics platform. **RESULTS:** To track changes in each subject's HGM, community richness and composition were compared to the week 1 (baseline) values for each subject. One week after the CVE began there was a significant change ($p = 0.0001$) in the HGM composition. This change persisted through week 11, when the CVE program stopped and microbial compositions abruptly returned to baseline values. Interestingly, in week 8, some individuals seem to have returned to a composition similar to baseline. Reasons for this anomaly are unclear. Additionally, each individual's community richness and compositions were compared to the prior week to understand week-to-week changes, demonstrating a significant shift ($p = 0.0002$) in composition at week 8, indicating settlement into a novel HGM composition. The week to prior week community richness showed significant decreases in weeks 7-9 ($p = 0.02$). This was followed by a significant increase in week 12 ($p = 0.017$). **CONCLUSION:** The CVE intervention showed significant changes in HGM richness and composition that correlated with the beginning and the end of the CVE intervention. These changes indicate that exercise has a clear impact on the HGM and further studies are needed to uncover the underlying mechanism.

F-60 Free Communication/Poster - Micronutrients

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

3131 Board #177 May 31 2:00 PM - 3:30 PM
Oral Calcium Loading Before Exercise Influences PTH and CTX Responses

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Timing of calcium (Ca) ingestion relative to exercise may attenuate observed increases in parathyroid hormone (PTH) and c-terminal telopeptide of type I collagen (CTX, a marker of bone resorption). Controlled Ca supplementation studies have typically used doses of ≥ 1000 mg, but it is not known how much Ca is absorbed. **PURPOSE:**

to quantify Ca absorption during exercise when preceded by a high (H: 1015 mg) or low (L: 215 mg) Ca-containing meal and determine effects on serum PTH, CTX, ionized Ca (iCa), and total Ca (tCa). **METHODS:** Healthy, cycling-trained men ($n = 10$, aged 20-45 y) underwent two identical 1-hour cycling bouts at $\sim 75\%$ HRmax. In a randomized, cross-over design utilizing dual calcium tracers, participants were provided with a H or L Ca meal 2 hours before exercise. Each meal included 15 mg of $^{44}\text{CaCO}_3$. A bolus dose of 2.5 mg of $^{42}\text{CaCl}_2$ was administered 4 hours before exercise followed by a constant infusion of $^{42}\text{CaCl}_2$ at 0.0125 mg/hr that continued through exercise and a 1-hour recovery. Gut absorption was determined from the appearance of the oral tracer in plasma relative to the rate of disappearance of the IV tracer using compartmental modeling. Blood was sampled every 15 minutes during exercise and recovery. Urine was collected prior to the meal, immediately before exercise, and at the end of recovery. **RESULTS:** Ca absorbed was 2.5 times higher with H versus L (H: 295 ± 158 mg; L: 116 ± 50 mg; $p = 0.007$); there was no difference in urinary Ca excretion (H: 22 ± 15 mg; L: 21 ± 18 mg). Changes in iCa during exercise were not different (H: -0.03 ± 0.11 mg/dL; L: -0.08 ± 0.24 mg/dL; $p = 0.46$). H prevented the increase in CTX during exercise (H: -0.03 ± 0.04 ng/mL; L: 0.02 ± 0.05 ng/mL; $p = 0.03$), but the increase in PTH during exercise (H: 12.7 ± 16.7 pg/mL; L: 11.3 ± 16.5 pg/mL; $p = 0.80$) did not differ for H and L. During recovery, CTX was lower for H (H: 0.03 ± 0.05 ng/mL; L: 0.10 ± 0.06 ng/mL; $p = 0.003$); PTH did not differ (H: -10.3 ± 14.9 pg/mL; L: -9.5 ± 14.5 pg/mL; $p = 0.88$). There were no differences between H and L for iCa during recovery or tCa during exercise or recovery. **CONCLUSION:** Ca absorption was higher in H versus L, but there was no difference in urinary excretion, suggesting that absorbed Ca was retained. The H Ca load was effective in attenuating the increase in CTX despite no attenuation of the PTH response. Supported by DoD Grant W81XWH-12-1-0364.

3132 Board #178 May 31 2:00 PM - 3:30 PM
Short-Term Low Choline Intake May Not Negatively Affect Strength Gains in Older Adults

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 (No relevant relationships reported)

PURPOSE: The micronutrient choline is a precursor to acetylcholine (ACh), which mediates skeletal muscle contraction and force production. We previously reported that 12 weeks of low choline consumption ($\sim 50\%$ of Adequate Intake [AI]) impaired strength gains in older adults in response to resistance exercise training. The purpose of this study was to investigate whether low choline consumption for a shorter period of time has negative effects on muscle responses to resistant exercise (RE) in older adults. **METHODS:** Thirty one, 50-to-65-year-old, generally healthy men and women were randomly assigned to one of three choline intake groups (Low, 3.6 ± 0.6 mg/kg/d, $n = 10$; Med, 6.0 ± 0.6 mg/kg/d, $n = 11$; High, 8.8 ± 0.8 mg/kg/d, $n = 10$) and underwent 3 weeks of diet and RE intervention (leg press and extension, 2x/week, 3 sets, 8-12 reps, 75% of maximum strength [1RM]; 4 bouts of maximal isometric force production on leg extension). 1RM and EMG tests were performed before and after intervention. **RESULTS:** While all three groups experienced significant increases in strength, there was no difference between choline groups in changes in 1RMs (Leg press, Low: $12.4 \pm 12.0\%$, Med: $17.5 \pm 10.7\%$, High: $15.8 \pm 10.7\%$, $p = 0.588$; Leg extension, Low: $17.9 \pm 13.0\%$, Med: $15.3 \pm 18.8\%$, High: $5.9 \pm 12.2\%$, $p = 0.209$). Similarly, no differences were observed in EMG amplitudes or average/peak isometric force outputs between groups. **CONCLUSION:** These data suggest that less than a month of low or high choline intake may not affect strength gains in older adults. It appears that only a prolonged period of low choline intake may have negative effects on muscle responses to RE.

3133 Board #179 May 31 2:00 PM - 3:30 PM
Vitamin D Status and Biobehavioral Health in U.S. Navy Explosive Ordnance Disposal Operators

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 (No relevant relationships reported)

Vitamin D (VITD) is essential for musculoskeletal health and, thus, plays a critical role in human performance, especially in specialized military groups such as U.S. Navy Explosive Ordnance Disposal (EOD). As the premier combat force for countering explosive hazards, EOD must perform optimally in the most austere environments. Accumulating evidence also indicates that VITD may help to prevent certain diseases and reduce all-cause mortality risk. To safeguard health and EOD mission success, it is critical to evaluate factors that influence biobehavioral health in this elite group. **PURPOSE:** The primary purpose of this study was to assess VITD status

in EOD operators. A secondary purpose was to evaluate the associations between VITD and biobehavioral correlates (i.e., body composition, mood). **METHODS:** In 72 EOD operators (86% Caucasian), VITD was measured using a blood test (25-hydroxyvitamin D3). Body fat percentage (BF%), bone mineral content (BMC), maximal volume of oxygen uptake (VO_{2max}), muscular strength (one-repetition max; back squat, bench press), blood lipids, blood pressure, posttraumatic stress disorder symptoms, and depression symptoms were also assessed. Pearson product-moment correlation analyses were used to evaluate associations between VITD and biobehavioral characteristics. **RESULTS:** Mean \pm SE were as follows: age = 34.2 ± 0.8 y; BF% = 17.6 ± 0.4 ; VITD = 39.0 ± 1.0 ng/mL; and VO_{2max} = 47.9 ± 0.7 ml/kg/min. Associations with VITD were: BF% ($r = -.33$) and android fat ($r = -.36$), both $p < .01$; VO_{2max} ($r = .24$), blood triglycerides (TGs; $r = -.30$), and diastolic blood pressure (DBP; $r = -.25$), all $p < .05$. No correlations were observed with strength, BMC, other blood lipids, or behavioral health. **CONCLUSION:** EOD operators in this study were generally healthy with respect to VITD levels and all other measures. The negative association between VITD and BF% is consistent with accruing data in both military and athletic populations. It also reflects the prevailing hypothesis that in overweight individuals, VITD can become sequestered within fat tissue. Inverse relationships with android fat, TGs, and DBP are in line with reports that VITD deficiency is linked to cardiovascular disease risk factors. Future studies will evaluate VITD status with neurocognitive function and genetic variants of stress physiology.

3134 Board #180 May 31 2:00 PM - 3:30 PM
**Influence Of Vitamin D Status On The Post-exercise
 Hepcidin And Interleukin-6 Response In Trained
 Athletes**

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 (No relevant relationships reported)

PURPOSE: Iron deficiency and reduced iron status have potential negative performance implications for athletes, particularly endurance runners. Hepcidin has a key role in iron homeostasis and is known to be influenced by interleukin (IL)-6. Emerging research from clinical populations indicates that vitamin D supplementation can reduce both circulating hepcidin and IL-6 levels hence could improve iron availability and increase performance. Exercise is known to increase both IL-6 and hepcidin levels, but the influence of vitamin D status on this response is unknown.

METHODS: Twenty trained participants (24 \pm 4 years; 184.3 \pm 6.5 cm; 79.8 \pm 7.5 kg; 55.7 \pm 6.5 mL/min/kg) divided into 3 activity groups (endurance runners n=6; resistance trained n=6; team sports n=8) gave informed consent to take part in this study. Following an overnight fast, participants completed a sub-maximal and graded treadmill test to volitional exhaustion. Venous blood samples were collected pre, post, 1 h and 3 h post-exercise. Blood was analysed for serum total 25-hydroxy vitamin D at pre-exercise only; plasma hepcidin-25, plasma IL-6 and serum iron concentrations were assessed at all time points.

RESULTS: Pre-exercise vitamin D values were similar between groups (90.2 \pm 32.5 nM, $p=0.563$). Hepcidin increased significantly after exercise ($F_{(1,1,18,4)}=36.81$ $p<0.001$) with values peaking at 3 h post-exercise (pre 17.13 \pm 12.15 ng/mL; 3 h post-exercise 38.44 \pm 23.92 ng/mL). Both iron and IL-6 concentration increased significantly in response to exercise ($F_{(1,9,32,2)}=44.1$ $p<0.001$ and $F_{(2,1,36,4)}=18.92$ $p<0.001$, respectively). No significant interactions or group differences were found for hepcidin ($p=0.121$ and $p=0.409$), iron ($p=0.529$ and $p=0.297$) or IL-6 ($p=0.709$ and $p=0.175$). There was a significant negative correlation between peak hepcidin and relative VO_{2peak} ($\rho=-0.468$ $p=0.038$). There was a trend for a negative relationship between vitamin D values and % change in hepcidin from pre-exercise to 3 h post-exercise ($r=-0.431$ $p=0.058$) and a trend for a positive relationship between vitamin D and peak IL-6 values ($r=0.410$ $p=0.072$).

CONCLUSIONS: Higher serum Vitamin D levels have the potential to reduce the post-exercise hepcidin response and therefore could have positive implications on athletes' post-exercise iron status.

3135 Board #181 May 31 2:00 PM - 3:30 PM
**Evaluation of Vitamin K Intake and Its Relation to Bone
 Mineral Density**

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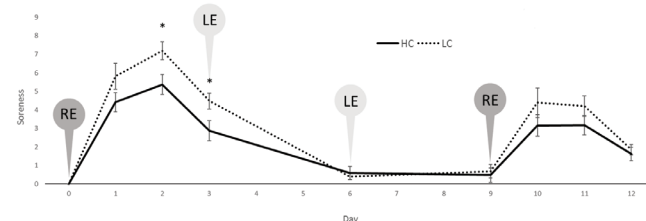
Vitamin K is a required nutrient important in bone health. Some researchers have reported that vitamin K can help to prevent bone fractures. **PURPOSE:** To explore whether a relationship exists between vitamin K intake and bone mineral density (BMD) among athletes, 18 to < 35 years of age and ≥ 35 years of age. **METHODS:**

This was a cross-sectional study, where 198 athletes were measured for total body BMD (TBBMD), lumbar spine BMD (LBMD), and dual femoral neck BMD (FNBMD) with dual-energy X-ray absorptiometry (DXA). Athletes also completed a food frequency questionnaire (FFQ) to determine their average daily intake of Vitamin K intake, as phyloquinone (also known as vitamin K₁). Athletes were separated into two age groups: 18 to < 35 years of age (57 women; 42 men) (28.10 \pm 3.86 years of age) and ≥ 35 years of age (60 women; 39 men) (46.21 \pm 8.80 years of age). Pearson correlation models were used to correlate all three BMD sites with vitamin K intake. Alpha levels were set *a priori* at $p<0.05$. **RESULTS:** In the 18 to < 35 years of age group, mean vitamin K intake was 370.75 \pm 265.82 mcg/day. Significant correlations were reported between all three BMD sites and vitamin K intake in this age group (n=99): TBBMD $r=-0.254$, $p<0.05$; LBMD $r=-0.248$, $p<0.05$; FNBMD $r=-0.278$, $p<0.05$. In the ≥ 35 years of age group, mean vitamin K intake was 406.27 \pm 267.99 mcg/day. There was no significant correlation between vitamin K intake and any of the three BMD sites in the ≥ 35 years of age group (n=99). **CONCLUSION:** Our results demonstrate that the average vitamin K intake in these athletes was over 300% of the Dietary Reference Intakes (DRI), where 97.1% of female athletes and 79.2% of male athletes met and exceeded their respective DRI (90 mcg/day for women, 120 mcg/day for men). It is unclear, however, why a negative relationship existed between vitamin K intake and BMD in athletes 18 to < 35 years of age, and no relationship existed in athletes ≥ 35 years of age. A prospective study should be conducted to better elucidate these relationships. This study was not funded.

3136 Board #182 May 31 2:00 PM - 3:30 PM
**Short Term High Intensity Resistance Exercise-
 induced Muscle Soreness Is Attenuated with Dietary
 Cholesterol**

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 (No relevant relationships reported)

Inflammation plays an important role in muscle soreness after the high-intensity resistance exercise. Cholesterol is essential for mediating inflammation through regulating membrane homeostasis and facilitating cell signaling. **PURPOSE:** The purpose of this study was to investigate the effects of dietary cholesterol on the exercise-induced soreness levels. **METHODS:** 16 untrained, healthy young men (n=12) and women (n=4) performed a short-term high-intensity resistance exercise consisting of unilateral leg press and extension with 5 sets and repetitions until failure at 85% 1RM in the Resistance Exercise (RE) sessions and 3 sets/10 repetitions at 50% 1RM in the Light Exercise (LE) sessions. The RE was performed on the starting day (day 0) and day 9 while the LE was performed on day 3 and 6. Participants were randomly assigned to either a Low Cholesterol Intake (LC, n=7) or a High Cholesterol Intake (HC, n=9) group. Soreness levels were recorded with a Soreness Visual Analogue Scale. Overall soreness was defined as the average soreness from Day 1 to 12. **RESULTS:** The overall soreness levels in LC were 91.6 \pm 3.6% higher than HC ($P=0.044$). Two days after the first RE, soreness levels reached to the highest point in both groups and were higher in LC than HC ($P=0.028$). The soreness in LC on Day 10 was lower than Day 2 ($P=0.021$). There was no significant difference between groups after the second RE. **CONCLUSIONS:** The soreness levels peaked at two days after the first resistance exercise in both groups, which is consistent with the Delayed Onset Muscle Soreness. The lower overall soreness in HC than LC might suggest that the higher level of dietary cholesterol promoted a more efficient recovery via the regulation of inflammation and thus lowered the soreness levels. However, the levels of the biomarkers such as creatine kinase and C-reactive protein were unknown and should be analyzed in future studies to investigate the effects of cholesterol on the exercise-induced inflammation.



* $P<0.05$, significant difference between HC and LC groups on the day. Data are Mean \pm SEM.

F-61 Free Communication/Poster - Nutrition and Children

Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

**3137 Board #183 May 31 2:00 PM - 3:30 PM
Effects of Fruit and Vegetable Consumption on Physical Activity Levels in Elementary School-Aged Children**

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(No relevant relationships reported)

PURPOSE: This study will examine the association of fruit and vegetable consumption at school on physical activity and academic achievement among children from disadvantaged backgrounds. Concern for this topic arose from the awareness that childhood obesity and the diseases that accompany it such as diabetes and hypertension are continuing to rise, all while participation in physical activity is declining. Meals served in school could potentially intervene and help to reverse these statistics, especially for underprivileged children where many rely on this food to satisfy their daily nutritional needs. This project seeks to discover relationships between these factors in order to optimize the success of young students from different backgrounds. **METHODS:** This is a cross-sectional, mixed-methods study designed to compare the association of fruit and vegetable consumption on physical activity and academic performance in a sample of underserved grade-school children. The student sample will come from the UCP Beta Downtown campus. There will be 50 student subjects from each grade 3 to 5 that will be selected from each class roster, using systemic random sampling. Teachers and parents of participants will also be asked to participate in focus groups and fill out short multiple-choice questionnaires. **RESULTS:** Results showed that children in the 3rd - 5th grades spend over 70% of their day being sedentary, roughly 20% of time throughout the day was spent participating in light physical activity, and less than 10% of daily living was spent participating in moderate-to-vigorous physical activity (MVPA). These same children also did not meet the recommended dietary intake for fruit and vegetable consumption, as on average they consumed less than one fruit or vegetable serving per day. **CONCLUSIONS:** It is necessary to educate the nation's children on healthy eating options, as well allow more opportunity for higher intensity physical activity. School-based interventions are critical to reach children of diverse backgrounds. These interventions could help begin the reversal of current trends in the fight against obesity.

**3138 Board #184 May 31 2:00 PM - 3:30 PM
Preschool Children in Childcare Settings Do Not Consume Healthy Snacks Despite Menus That Meet Recommended Dietary Standards**

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(No relevant relationships reported)

Preschool snack menus must meet the Dietary Guidelines for Americans, however, what is actually served and consumed by children is not restricted, potentially affecting consumption of a healthy diet.

PURPOSE: Compare preschool snack menus that meet recommended dietary guidelines to what is served and consumed by children. **METHODS:** Fifty-two preschool children (mean±SD, age 3y 9m ± 4m) from a university early childhood center participated in a 10-week study. Dietary intake was measured by trained investigators using direct observation for pre and post snack analysis. Energy and nutrient content was completed using Food Processor Nutrition Analysis by ESHA. Food color was determined by observation during analysis to determine if the color of food affected consumption of certain snacks. A food preference survey was administered orally by investigators to children immediately after each snack. **RESULTS:** There was a significant ($p<0.05$) difference for total kilocalories (kcal) between menu (168 ± 48), served (269 ± 129) and consumed (179 ± 137). There was a significant ($p<0.05$) difference for grams of carbohydrate between menu (23.9 ± 8.5g), served (39.9 ± 18.7g) and consumed (27.1 ± 19.6g). There was a significant ($p<0.05$) difference for grams of fat for menu (5.7 ± 3.2g) and consumed (5.4 ± 5.8g), compared to served (8.5 ± 5.7 g). There was a significant ($p<0.05$) difference for grams of protein for menu (5.7 ± 2.0g) and consumed (5.8 ± 4.2 g) compared to served (8.7 ± 4.2g). The majority of food served was white (47.4%), brown (14.0%), or orange (19.0%) in appearance indicating a larger amount of processed/prepackaged foods consumed. Minimal food was served with the colors of yellow (4.7%), red (9.0%) or green (2.2%); colors normally associated with fruits, vegetables, and lean meats. Children consumed about 23.1% of meats and 50% of vegetables that were served to them,

which was significantly ($p<0.05$) lower than dairy (75.2%), fruits (72.6), and grains (77.0%). Children consumed a high amount (84.2%) of the fats/sweets served to them. Children described the snack food as yummy (85.3%), okay (6.4%), or yucky (8.3%). **CONCLUSIONS:** The results indicate that snack menus meeting recommended dietary standards may not match what children are served or consuming for snack, potentially contributing to long-term health consequences.

**3139 Board #185 May 31 2:00 PM - 3:30 PM
Construction And Validation Of a Digital Instrument For The Evaluation Of Children Nutritional Status**

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BACKGROUND: Self-assessment of body image refers to the internal representations of their body structure and physical appearance in relation to themselves and others. Silhouette scales can be an alternative to assess the nutritional status in children. **PURPOSE:** Develop and indicate metrical qualities of a digital instrument for evaluation of nutritional status in children. **METHOD:** 414 children, aged between seven and 10 years old were assessed for the following measures, Circumferences (neck, shoulder, chest, relaxed arm, wrist, waist, abdomen, hip, proximal thigh, medial thigh, distal thigh, leg, ankle); diameters (biliocrystal and biacromial); stature; body weight. Descriptive statistics were performed using simple frequency, position and dispersion measurements. The normality of the data was tested by Kolmogorov Smirnov test was used. The inferential tests were performed, validity coefficient of content, Spearman's correlation, using SPSS version 20.0® and considering $p<0.05$. **RESULTS:** The instrument is composed of nine three-dimensional body figures developed from average values of body measurements of 200 children aged 7 to 10 years. These figures represent a continuum of excessive thinness (BMI 12.0 kg/m²) to severe obesity (BMI 29.0 Kg/m²). The application of this instrument consists of the presentation of the figures, with the following instructions, 1) (real) and 2) (ideal). The dissatisfaction with the body image is obtained by subtracting the real from the ideal. The validity coefficient of content presented values higher than 0.90 for the image clarity, practical relevance and representativeness of the item, obtained through the evaluation of 10 judges. For the validation of the criterion, the children with excess weight indicated the greatest real figures, as well as the highest values of discrepancy, regardless of gender, boys ($r=0.36$, $p<0.01$) and girls ($r=0.52$, $p<0.01$). **CONCLUSION:** It is concluded that the developed instrument demonstrated good psychometric qualities, becoming a viable option for evaluating children's body image.

**3140 Board #186 May 31 2:00 PM - 3:30 PM
Low Cruciferous Vegetable Intake is Associated with Elevated Inflammation in Preadolescent Girls**

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(No relevant relationships reported)

Subclinical chronic inflammation, measured by C-reactive protein (CRP), is strongly linked to cardiovascular disease (CVD) in adults. CRP has been shown to be elevated in some children and is considered a potential risk factor for early onset CVD. Strategies to reduce chronic inflammation among children is paramount. In adults, higher cruciferous vegetable intake has been associated with lower inflammation. **PURPOSE:** To examine the relation between cruciferous vegetable intake and CRP among preadolescent girls. **METHODS:** Among girls aged 9-12 yrs (N=296), cruciferous vegetable intake was measured by the Youth/Adolescent Questionnaire and categorized as >0-0.25, 0.26-0.50, >0.50 servings per day. Fasting serum CRP (mg/L) was measured by the Beckman Coulter AU5812 Clinical Chemistry Analyzer. Girls with CRP values >10mg/L were excluded. CRP levels were categorized by normal, moderately increased risk, and high risk for CVD according adult cut-offs (CRP <1, ≥1-3, >3 mg/L). Multinomial logistic regression with covariates of BMI percentile, maturation, and physical activity was used to evaluate CRP category relation with cruciferous vegetable intake. **RESULTS:** Mean age, BMI, and CRP levels were 10.8±1.1 yrs, 20.7±5.1 kg/m², and 1.3±1.8 mg/dl, respectively. The proportion of girls in the normal, moderate, and high risk CRP categories were (N%): 218 (69.2%), 50 (15.9%), 47 (14.9%). Average cruciferous vegetable intake was 0.27±0.3 servings/day. Low cruciferous vegetable intake (>0-0.25 servings/day) was significantly associated with a CRP level of 1-3mg/L (RRR=3.5, 95% CI 1.1-11.3; P=0.04).

CONCLUSIONS: Cruciferous vegetable intake among girls aged 9-12 years was low overall. The lowest intake was associated with the CRP risk category considered to confer a moderately elevated risk of CVD among adults. Enrichment of the diet with cruciferous vegetables is an intervention strategy that should be tested in girls to reduce inflammation and CVD risk early, regardless of BMI status. Supported by National Institute of Child Health and Human Development (HD074565) and the National Cancer Institute (P30CA023074)

F-62 Free Communication/Poster - Education and Funk

Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

3141 Board #187 May 31 2:00 PM - 3:30 PM Pathology Classification And Exercise Adherence: A JTA Educational Approach To Providing Community-Based Exercise Programs

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(No relevant relationships reported)

Pathology Classification and Exercise Adherence: a JTA Educational Approach to Providing Community-Based Exercise Programs

PURPOSE: The purpose of this study was to determine if pathology classification is a significant predictor of adherence to a community-based exercise program. **METHODS:** A cohort study design was implemented, evaluating the Lyndon Health/Fitness Intervention Program (HFIP). Subjects ($N = 44$) had a mean age of 65.82 ($SD = 10.00$) years, participated in a 6-week exercise program consisting of 60 min per session, two days per week. Each subject's Primary Healthcare Provider identified the pathology classification and exercise adherence was defined as the number of sessions attended out of 12 possible sessions. Data were analyzed via an independent groups 2-way analysis of variance (2-way ANOVA), simple linear regression, and multiple linear regression. **RESULTS:** No significant interaction was found for Pathology x Gender in regards to exercise adherence ($F(1,2) = 0.363, p = .698$). There was no significant difference between exercise adherence for gender ($F(1,1) = 0.299, p = .588$), or for pathology ($F(1,4) = 1.823, p = .146$). Pathology classification was found to be significant predictor of exercise adherence ($F(1,31) = 4.560, p = .041$). **CONCLUSION:** While pathology classification was a statistically significant predictor of exercise adherence, only 10.0% of the variance in adherence could be predicted from this model (adjusted $R^2 = .100$). Necessary future research in this area should consider larger and more diverse samples, longer duration exercise programs, and following-up with subjects after program conclusion. Furthermore, the Lyndon HFIP was facilitated in conjunction with a senior-level, undergraduate exercise science course, and served as an applied means to elucidate imbedded ACSM Job Task Analyses (JTA) required of Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredited exercise science programs. The Lyndon HFIP appeared to be a feasible means to promote student learning while expanding community-based exercise opportunities.

3142 Board #188 May 31 2:00 PM - 3:30 PM Program Directors' Perspectives On Coaes-mediated Caahep Accreditation For The Exercise Sciences

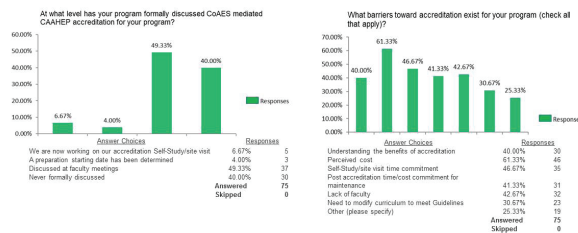
Carlton R. Insley, III¹, Susan M. Muller¹, Sidney R. Schneider¹, William Coale². ¹Salisbury University, Salisbury, MD. ²Committee on Accreditation for the Exercise Sciences, Indianapolis, IN. (Sponsor: Walt Thompson, FACSM, FACSM)
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Reported Relationships: **C.R. Insley:** Other (please describe): Not sure if this constitutes a required disclosure. The authors Insley and Muller volunteer services at the CoAES (ACSM). The author Coale is a part-time employee at the CoAES (ACSM).

For viability, college medical faculty must provide quality programs in an enrollment-competitive market. Accreditation, credentialing, and licensure contribute to health practice prosperity. Kinesiology-related domain programs (exercise science, exercise physiology etc.) have incomplete achievement in program accreditation, credentialing, and licensure.

PURPOSE: To assess Program Directors' perspectives on CoAES-mediated CAAHEP accreditation for the Exercise Sciences. **METHODS:** A 19-question survey was developed and validated by an expert committee. Upon IRB approval, an exploratory study was conducted. Results were anticipated to offer data clarifying the Program Directors' perspectives, and enabling CoAES insight to forward a more positive accreditation path. Electronically solicited, 75 individuals from approximately 500

commercially identified Kinesiology-related programs (undergraduate and graduate) with published e-mail addresses, offered responses. Utilizing descriptive statistics, response analyses were performed in context of survey items. **RESULTS:** The following data graphs represent salient features of survey results:



CONCLUSION: Respondents indicated several major barriers; one of which being 40% of faculty had never discussed pursuing accreditation. The CoAES is challenged to disseminate accreditation information to promote accreditation discussions, and mitigate barriers perceptions. Data support CoAES' Accreditation Ambassador/Mentor Program, which addresses noted needs.

3143 Board #189 May 31 2:00 PM - 3:30 PM Retrieval Practice Improves the Recall and Transfer of Learning of Physiology Information.

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PURPOSE: It is well-documented that retrieval practice can enhance the recall of both complex and simple information when compared to more typical methods of learning such as repeated studying (i.e., reading). Evidence is also accumulating that retrieval practice can enhance higher orders of thinking, such as the ability to critically evaluate research articles (Dobson, Linderholm and Perez, 2018) and transfer of learning (Butler, 2010). One purpose of this investigation was to explore the effects of retrieval practice on transfer of learning with physiology information. A second purpose was to compare recall and transfer of physiology information following retrieval practice versus a judgment of learning task (JOL) that may be easier for students to implement on their own. **METHODS:** Participants were randomly assigned to learn three short (~500 words) physiology texts using each of the following strategies: 1. studying a text four consecutive times (SSSS), 2. studying and then retrieving a text two consecutive times (SRSR), and 3. studying a text four consecutive times while completing multiple JOL during the second and fourth repetitions (SJSJ). Recall and transfer of learning were both assessed one week after the participants learned the texts, and the results were analyzed using repeated measures ANOVAs. **RESULTS:** The SRSR strategy facilitated significantly greater recall than the SSSS strategy (21.35 ± 1.08 vs. $17.35 \pm 0.86, p < 0.05$), and both the SRSR and SJSJ strategies lead to significantly greater transfer than the SSSS strategy (44.60 ± 2.55 and 41.79 ± 2.63 , respectively, vs. $36.07 \pm 2.40, p < 0.05$). **CONCLUSION:** These results demonstrate that retrieval practice enhances both recall and higher order thinking about physiology information and that covert retrieval, as experienced in a JOL task, may provide similar benefits.

3144 Board #190 May 31 2:00 PM - 3:30 PM Effects Of A Situated Environment On Classroom Community, Connectedness, And Learning In Exercise Science Students

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(No relevant relationships reported)

Clinical exercise science programs require rigorous academic preparation often taught in traditional classroom and lab settings. However, employers also require students to develop strong interpersonal professional skills necessary to be successful in the field. Incorporating situated learning in the exercise science classroom provides opportunities for students to develop social interaction, theory application, critical thinking, and problem solving skills. A greater sense of classroom community is understood to significantly enhance students' internalization of learning and the development of these desired professional skills. **PURPOSE:** The purpose of this research is to explore students' perceptions of overall classroom community, connectedness, and learning in both a situated and traditional classroom environment. **METHODS:** 53 undergraduate exercise science students (age [yrs] = 22.21 ± 2.96 , males = 35.8%; females = 62.3%) who had participated in either a situated learning course or a traditional learning course completed Rovai's (2002) Classroom Community Survey at the end of the semester. A one-way ANOVA was performed to

determine if there were any significant differences between the two groups ($\alpha = .05$). **RESULTS:** The results demonstrated significant differences between the groups across all three variables of overall classroom community ($p < .00$), connectedness ($p = .02$), and learning ($p < .00$). The situated learning group demonstrated significantly higher mean scores. **CONCLUSIONS:** Students' perceive higher levels of overall classroom community, connectedness, and learning when participating in a situated learning experience. Incorporation of these types of learning environments in exercise science degree programs may enhance professional skill development and successful employment within the field.

3145 Board #191 May 31 2:00 PM - 3:30 PM
Contemporary Conflict Management in the Sports Medicine Setting

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Purpose. Conflict management is an important aspect in the administration and organization of sports medicine teams. Health care professionals attempt to exert personalities, influences, biases that may create points of misunderstanding within everyday team operations. **Methods.** This review gathers contemporary information and theories towards conflict and conflict management, including definitions of current terminology and current concepts. This study also identifies opportunities that team members may utilize when dealing with conflict. Four main types of conflict are discussed and are juxtaposed with sports medicine scenarios. These types include: goal related conflict, affective conflict, procedural conflict, and cognitive conflict. A review of recent literature also provides strategies for dealing with conflict and creating commitment within team members. **Results.** Potential effects and benefits of various conflict management approaches are discussed. Evidence is then presented to further understand and appreciate the elements involved with conflict when intertwining healthcare professionals in a sports medicine setting. **Conclusion.** In conflict management, recognizing that all team members have differing viewpoints can serve as a resolution point which encourages team members to embrace their differences. Finally, a case study summarizes the theories for conflict management.

3146 Board #192 May 31 2:00 PM - 3:30 PM
The Promotion Of Physical Activity By Craft Breweries In Knoxville, Tennessee

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A growing body of research supports a positive relationship between physical activity (PA) and alcohol consumption within various sample populations. Anecdotally, producers of craft beer appear to specifically market to active consumers via sponsorship competitions, charity biking, and hosting of regular PA events (e.g., group runs). Currently, no empirical data exists regarding the promotion of PA promotion by craft breweries. **PURPOSE:** Determine the prevalence and type of PA promoted by craft breweries located in a single community. **METHODS:** Operators of 13 craft breweries located in Knoxville, TN were solicited to complete an electronic survey capturing type and frequency of common PA-related events (e.g., running, biking, fitness classes) hosted over an average month, as well as associated promotions (e.g., discounted beers). Census tract data was tabulated for each brewery location. Descriptive statistics and frequency scores were computed to quantify the promotion of PA across surveyed craft breweries. **RESULTS:** A response rate of 77% was achieved. Participating breweries (N=10) were located in areas that are populated by predominately white (80.9±14.0%), young-to-middle aged adults (35±5y), and that generally consist of a higher proportion of renter-occupied housing units (63.1±18.8%). All respondents indicated that the respective establishment hosted at least one type of PA event. Over an average month, 25 group runs (mean=4±1), 18 group fitness classes (6±3), and 16 group biking events (3±1) were held across seven, three, and five breweries, respectively. In nine of the ten breweries, patrons attending active events are eligible for one or more of the following promotions: \$1USD off all beers (50%), discounted first beer (30%), discounted two beers (10%), and one free beer (20%). **CONCLUSIONS:** A majority of craft breweries in Knoxville, TN host one or more types of group activities multiple times per month, with specific beer promotions for participating patrons. These data provide preliminary evidence for the promotion of PA by craft breweries within a community setting. Further research is necessary to determine the impact and reach of such events, as well as operators' motivations to pair the promotion of PA with the consumption of craft beer.

3147 Board #193 May 31 2:00 PM - 3:30 PM
Effects of Exercise Habits on Working Memory of College Students

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PURPOSE: Working memory is the process of storing information by human body and processing by way of thinking. Relevant studies have shown that exercise have positive impacts on working memory of human body, but previous studies mostly focused on the forms of exercise, and the subjects were mostly children or elderly people. So, this study aimed to explore whether exercise can affect the working memory of college students by comparing who have the exercise habit with who have been sedentary.

Methods: 12 students from the Capital University of Physical Education and Sports were taken as subjects. According to the exercise habits, 6 subjects with exercise habits were divided into exercise group and 6 subjects with sedentary were divided into control group. The E-prime software was used to program the 2-Back task to measure the working memory of subjects. The experimental procedure was divided into four blocks. The first and third blocks were simple tasks, the second and fourth blocks were complex tasks. The SPSS23.0 was used to analyze the experimental data.

RESULTS: The behavior data were analyzed with 2 (exercise habit group)*2 (task type) repeated measurement ANOVA to investigate the responsiveness of different exercise habits to 2-Back task. The results showed that for accuracy, the main effect of task type was not significant $F(1,10)=2.923, p=.118$, and the interaction effect between task type and group was significant $F(1,10)=6.245, p=.032$, indicating that the subjects with exercise habits had higher accuracy than those who with sedentary, but there was no difference in accuracy when performing simple and complex tasks. For the response time, the main effect of task type was not significant $F(1,10)=.125, p=.731$; the interaction effect of task type and group was not significant $F(1,10)=.048, p=.831$, indicating that there was no difference in response time between subjects in the process of two tasks, and there was no significant difference in the reaction time between subjects with exercise habits and sedentary.

Conclusion: Exercise habits may have positive effects on working memory of college students, especially on accuracy of completing working memory process, and the related brain mechanisms need to be further studied.

F-63 Free Communication/Poster - Musculoskeletal and Ultrasound

Friday, May 31, 2019, 1:00 PM - 6:00 PM

Room: CC-Hall WA2

3148 Board #194 May 31 3:30 PM - 5:00 PM
Reduced Cardiorespiratory Fitness and Greater Body Fatness Will Develop As A Consequence of Chronic Ankle Instability

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Our laboratory has recently reported significant declines in daily physical activity (PA) performed in humans and mice as a result of Chronic Ankle Instability (CAI), which will likely accelerate the development of unhealthy characteristics. **PURPOSE:** To assess the impact of CAI on cardiorespiratory fitness and body composition.

METHODS: Thirty-four subjects participated in the study. Seventeen subjects with CAI were matched for sex (10 females, 7 males/group), age (22.1±2.6yr and 22.2±3.0yr; Mean±SD), height (167±8cm and 168±8cm), and weight (70.5±7.3kg and 66.7±7.5kg), to subjects with no history of ankle injury, respectively. Subjects reported to the Health Risk Assessment Lab for one session. Subjects completed the foot and ankle ability measure (FAAM and FAAMSport) and the NASA physical activity questionnaire. Subject's body composition was assessed by DEXA. Afterward, subjects performed a treadmill maximal exercise test. Every minute of the treadmill test the subjects rated their exertion using the Borg RPE scale (6-20 scale). For the treadmill test we used a two-minute progressive test until volitional fatigue was attained. **RESULTS:** No differences were observed between groups for age ($p=0.86$), height ($p=0.79$), and weight ($p=0.15$). Body composition was different ($p=0.0002$) between the CAI and Control group (33.9±6.0% and 24.6±6.8%, respectively). VO2max (ml/kg/min) was significantly different ($p<0.0001$) between CAI and Control groups (30.2±4.8 and 49.2±7.5, respectively). Time to maximal exercise test completion ($p=0.02$) and VEmax ($p=0.008$) were different between groups. Maximal

HR was not different ($p=0.96$) between groups however resting HR was different ($p=0.0001$) between the CAI and Control groups (77.3 ± 7.5 bpm and 64.9 ± 8.1 bpm, respectively). FAAM ($p<0.0001$), FAAMsport ($p<0.0001$) and NASA ($p<0.0001$) were all observed to indicate differing activity levels between the groups. **CONCLUSIONS:** CAI in college-aged adults results in significantly reduced PA and cardiorespiratory fitness levels accompanied by significantly greater body fatness. Our findings suggest these serious negative health outcomes will rapidly develop as a consequence of the recurrence of this musculoskeletal injury as a young adult.

3149 Board #195 May 31 3:30 PM - 5:00 PM
Early Brace Progression Following Anterior Cruciate Ligament Reconstruction Leads to Improved Knee Range of Motion

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Loss of passive knee extension (KE) following anterior cruciate ligament (ACL) reconstruction is a common deficit after surgery, and has been associated with prolonged pain, quadriceps weakness, and gait impairments. Recent literature indicates that it is also predictive of an increased risk of osteoarthritis due to altered knee kinematics. Post-operative bracing may limit the ability to achieve full terminal KE; however, the effects of various brace progressions have received little attention. **PURPOSE:** To quantify the time to achieve baseline KE and knee flexion (KF) after ACL reconstruction following an early versus delayed brace progression. **METHODS:** 18 ACL-reconstructed subjects were allocated into an early brace progression ($n=9$; 4F, 5M; 21.2 ± 4.9 y; 27.6 ± 5.1 kg/m²) or delayed brace progression ($n=9$; 3M, 6F; 22.8 ± 5.6 y; 24.4 ± 3.0 kg/m²) group. The delayed group was weight bearing as tolerated (WBAT) with a post-operative brace locked in full extension for ambulation for 4 weeks. After 4 weeks, the brace was unlocked with a transition to a hinged knee sleeve at 2 months. The early group was WBAT with the post-operative brace locked in full extension for 1-2 weeks. Subjects were gradually weaned from crutches at 1-3 weeks with complete discontinuation of the brace at 3-6 weeks. KE and KF were measured with a goniometer. Independent t-tests were used to compare differences between groups ($\alpha<0.05$). **RESULTS:** There were no significant differences between groups for baseline KE (early: $-5.7\pm 2.2^\circ$; delayed: $-4.6\pm 3.5^\circ$; $p=0.43$) and KF (early: $142.6\pm 5.2^\circ$; delayed: $142.4\pm 8.6^\circ$; $p=0.97$). There were significant differences between groups post-surgery in time to achieve baseline KE (early: 12.8 ± 9.3 days; delayed: 40.4 ± 16.6 days; 68.4% difference; $p<0.001$) and KF (early: 31.6 ± 8.8 days; delayed: 55.6 ± 13.8 days; 43.2% difference; $p<0.001$). No subjects were noted to have increased knee laxity. **CONCLUSIONS:** Early brace progression was more effective than delayed brace progression in reducing the time to restore baseline KE and KF. Early restoration of knee motion following ACL reconstruction may limit post-operative complications, such as knee stiffness, anterior knee pain, delay in strength recovery, and gait impairments. Adjustment of post-operative brace protocols can have a profound impact on clinical outcomes.

3150 Board #196 May 31 3:30 PM - 5:00 PM
The Detection of Knee Joint Sounds under Different Loading Conditions using Vibroarthrography

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Creptus of the knee may mirror structural changes of the joint during motion. Although the magnitude of these sounds increases with greater cartilage damage, it is unclear whether knee joint sounds also reflect joint loading. **PURPOSE:** To reveal whether the magnitude of knee joint sounds differs across defined dynamic loading conditions using vibroarthrography. **METHODS:** Twelve healthy volunteers (26 ± 3.59 years, 7 females) participated in the randomized-balanced crossover study. Knee joint sounds were recorded (linear sampling, 5512 Hz) by means of two acoustic sensors (microphones), one placed on the medial tibial plateau and one on the patella. Two activities of daily life (standing up from and sitting down on a bench; descending stairs) and three open kinetic chain (OKC) knee extension-flexion cycles (passive movement, 10% and 40% loading of the individual one repetition maximum) were performed. Each participant carried out three sets of five repetitions and three sets of 15 steps downwards (stairs), respectively. For data analysis, the mean noise volume for each loading condition was determined. The resulting values were expressed as relative difference to the individual OKC passive movement value. Friedman test and Bonferroni-Holm adjusted post-hoc test were performed to detect differences between conditions. **RESULTS:** The OKC passive movement sound ranged from .0001 to .003 a.u. ($\pm 43.6 - 69.3$ dB) at the medial tibia and from .001 to .03 a.u. ($\pm 60.6 -$

87.7 dB) at the patella. Significant differences between joint sound amplitudes for all movements, both measured at the medial tibial plateau ($\text{Chi}^2=20.7$, $p<0.001$) and at the patella ($\text{Chi}^2=27.6$, $p<0.001$) were obtained. The corresponding median differences for the tibia sensor were: stand/sit: 236%, stairs: 675%, OKC₁₀: 291%, OKC₄₀: 384%; and for the patella sensor: stand/sit: 158%, stairs: 260%, OKC₁₀: 75%, OKC₄₀: 78%. **CONCLUSION:** Overall, the larger the supposed knee joint loading was, the louder was the recorded knee creptus. Consequently, vibroarthrographically assessed knee joint sounds can differ across knee joint loading conditions. Future studies should further support these findings using inverse dynamics as a measurement of knee joint loading.

3151 Board #197 May 31 3:30 PM - 5:00 PM
Glenohumeral And Hip Range Of Motion Are Associated In Softball: Implications For Performance And Injury

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 (No relevant relationships reported)

Effective ball release during throwing requires coordination between the upper extremity (UE) and lower extremities. Deficits in UE and lower extremity (LE) range of motion (ROM) have been associated with decreased throwing performance and musculoskeletal injury. **PURPOSE:** To determine the association between glenohumeral and hip ROM in softball athletes. **METHODS:** 28 NCAA Division I female softball athletes participated (Age: 18.8 ± 1.5 years, Height: 168.1 ± 6.8 cm, Weight: 70.6 ± 9.3 kg). ROM tests included: glenohumeral internal rotation (GIR) and external rotation (GER), hip internal rotation (HIR) and external rotation (HER). All ROM tests were completed bilaterally and an average of three trials was utilized for data analysis. ROM measurements were analyzed individually, as well as a total ROM for the UE (TGROM) and LE (THROM). Data was stratified by pitcher vs. position players, dominant (DOM) vs. non-dominant (NDOM) UE and LE. Normality was assessed using a Shapiro-Wilk test. Correlations between UE and LE ROM were analyzed utilizing Pearson correlations or Spearman-Rho correlations, as appropriate. Significance was set *a priori* at $p<0.050$. **RESULTS:** Pitchers demonstrated significant correlations between DOM GIR and DOM HIR (Correlation: 0.845, $P=0.017$), as well as between DOM GIR and NDOM HER (Correlation: 0.79, $P=0.034$). Pitchers also demonstrated correlations between DOM GIR and DOM THROM (Correlation: 0.770, $P=0.043$), as well as DOM GIR and NDOM THROM (Correlation: 0.785, $P=0.036$). Position players did not demonstrate any significant correlations between glenohumeral and hip ROM. **CONCLUSION:** Pitchers demonstrated significant correlations between glenohumeral and hip ROM, while position players did not. The positive correlation in pitchers may indicate that effective pitch performance is dependent on efficient coordination between the glenohumeral joint and hip. Proper hip ROM is necessary for an athlete to effectively transfer energy to the glenohumeral joint. Changes in hip ROM may lead to adaptations in glenohumeral ROM, both positive and negative; future research should focus on understanding these possible adaptations.

3152 Board #198 May 31 3:30 PM - 5:00 PM
Return To Play Testing In Individuals With ACL-Reconstructed Knees: Does Timing Of The Assessment Matter?

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Context: Traditional return to play assessments following anterior cruciate ligament reconstruction (ACLR) identify large muscular deficits at 6 months post-surgery. This is concerning with majority of patients being cleared for sports on time alone. It is unknown if individuals post-ACLR show improved outcomes if assessed later than 6 months post ACLR. The purpose of this study was to examine patient function in individuals stratified by months post-ACLR. **Methods:** A total of 293 individuals with ACLR (23.2 ± 10.1 years, 142 Female, 6.4 ± 9 mo post-ACLR) participated in the study. Participants were stratified based on the timing of their evaluation in months since ACLR: 5-6 mo: $n=122$, 6-7 mo: $n=102$, 7-8 mo: $n=43$, 8-9 mo: $n=26$. Subjective knee function was assessed through the International Knee Documentation Committee (IKDC) Subjective Form. Mass-normalized maximal voluntary isometric contraction (MVIC) and limb symmetry indexes (LSI) were collected on knee extensor and flexor muscle groups. Non-parametric statistics were run due to violation of the assumption of normality. Measures of subjective and muscular function were compared through Kruskal-Wallis with *post-hoc* partial eta squared values for effect sizes.

Results: There were significant difference between the 5-6 mo. vs 6-7 mo groups ($\eta^2=.04$) and the 5-6 mo vs 8-9 mo groups ($\eta^2=.04$) for subjective function ($P=.04$). There were significant differences between the 5-6 mo vs 8-9 mo groups ($\eta^2=.07$) and the 6-7 mo vs 8-9 mo groups ($\eta^2=.04$) for MVIC Extension ($P=.14$). No differences were seen between groups for MVIC for knee extension ($P=.14$) or flexion ($P=.97$) or knee flexor LSI ($P=.60$) (Table 1).

Conclusions: There are significant differences which demonstrate progressively increasing subjective function and knee extension symmetry when tested at later timepoints from surgery. However, the observed values are low suggesting even at 9-months post ACLR patients are demonstrating deficits that may be improving.

Table 1: Between Group Differences: Median (IQR)

Mo. Post-ACLR	5-6	6-7	7-8	8-9	P-Value	Effect Size (η^2)
IKDC	79.7 ^{ab} (70.1, 88.5)	83.9 ^a (74.5, 92.0)	79.3 (73.6, 88.8)	89.1 ^b (75.8, 92.3)	.019 ^a .026 ^b	.04 ^a .04 ^b
MVIC Extension (Nm/kg)	1.46 (1.16, 1.87)	1.60 (1.26, 2.03)	1.59 (1.23, 2.07)	1.65 (1.39, 2.05)	-	-
MVIC Flexion (Nm/kg)	.737 (.51, 1.01)	.76 (.59, .98)	.77 (.57, .89)	.66 (.51, 1.11)	-	-
MVIC Extension LSI (%)	60.0 ^b (49.8, 76.2)	67.9 ^c (52.2, 79.1)	67.7 (59.2, 80.0)	76.7 ^{bc} (64.0, 90.5)	.002 ^b .021 ^c	.07 ^b .04 ^c
MVIC Flexion LSI (%)	89.5 (71.0, 105.0)	84.2 (68.8, 98.1)	88.5 (66.7, 99.2)	84.3 (69.4, 95.8)	-	-

^a Significant difference between 5- and 6-month groups. ^b Significant difference between 5- and 8-month groups. ^c Significant difference between 6- and 8-month groups.

3153 Board #199 May 31 3:30 PM - 5:00 PM

The Effect of Icing with Varying Degrees of Compression on Quadriceps Intramuscular Temperature

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Clinically, compression is often applied in combination with ice. Amongst practitioners, elastic wrap is the most common type of external compression, while plastic wrap has become increasingly popular because it can be discarded without returning it to the treatment facility. However, few studies have investigated the magnitude of tissue cooling among different types of external compression applied to an ice bag.

PURPOSE: To evaluate and compare the cooling effectiveness of wetted ice bag applied with elastic wrap compression or held in place with plastic wrap but with no added compression on intramuscular and skin surface temperatures.

METHODS: Ten male participants (36±9 yo) received ice packs made with wetted ice applied simultaneously to a standardized area on the anterior aspect of the quadriceps for 30 minutes. The ice pack was secured with low compression (plastic wrap) to the right anterior thigh and high compression (elastic wrap) to the left anterior thigh. Skin and intramuscular (1 and 2 cm plus one-half skinfold measurement) temperatures of the vastus lateralis were measured continuously during a 10-minute baseline period, 30-minute treatment period, and a 60-minute recovery period.

RESULTS: Intramuscular temperatures decreased from baselines of 35.1 ± 1.1°C at 3 cm and 34.4 ± 1.3°C at 1 cm, to 23.1 ± 4.9°C at 3 cm and 17.8 ± 5.2°C at 1 cm by the end of the elastic compression treatment. Intramuscular temperatures decreased from baselines of 35.4 ± 0.9°C at 3 cm and 34.4 ± 0.9°C at 1 cm, to 24.5 ± 6.7°C at 3 cm and 17.9 ± 4.4°C at 1 cm by the end of the plastic wrap control treatment (Fig. 1). Although the mean difference between compression treatments was 45.1 ± 8.3 mm Hg ($P = 0.0001$), no difference was observed between treatments in terms of the magnitude of reduction in skin and intramuscular temperature at both 1 cm ($P = 0.475$) and 3 cm ($P = 0.421$) regardless of compression pressure.

CONCLUSIONS: The magnitude of temperature reduction was comparable using either elastic wrap with high compression or plastic wrap with minimal compression. Plastic wraps are a practical alternative for clinicians as they may be disposed of by the patient or athlete without having to stay at the treatment facility.

3154 Board #200 May 31 3:30 PM - 5:00 PM

Impact of Musculoskeletal Injury and Pain in Lacrosse Officials: Implications for Clinical Care and Preparedness

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PURPOSE: Lacrosse officials come from different backgrounds, ages and training levels, but all function as athletes while refereeing. Anecdotal evidence shows that mild-to-severe musculoskeletal pain is common in this population. We need to understand the scope of the problem to help keep these adults active over the long-term and engaged in the sport. The purposes of this study were to: 1) determine the prevalence, location and impact of musculoskeletal pain, and 2) identify physical or training-related correlates of pain. **METHODS:** A specific anonymous survey was developed and distributed to members of the national US Lacrosse Officials Development Program and 1,441 were returned complete. Respondents were 52.0 ± 12.9 yrs, 79.5% male and 63.5% represented east coast regions. 51.1% never played lacrosse, and 37.8% of former players participated through post-collegiate years. Pain sites and severity (0-10 numerical pain rating), previous injuries and current impact of pain on officiating duties were captured. **RESULTS:** Pain was present in 18.1% - 40.1% of officials primarily at the foot, shoulder, back and knee. Pain severity during rest and exercise averaged 4.3 - 4.6/ 10 pts, respectively. A total of 437 officials reported diagnoses of osteoarthritis ([OA]; knee 48.7%, hip 10.5%, spine 10.1%, shoulder 8.0%) and 247 reported OA in more than one joint. Correlates of these pain symptoms included former lacrosse injury (22.6% have long-term pain today) and weight gain in last five years (r range = -.053-.186; all $p < .05$). Current participation in running as a sport was inversely related to pain symptoms. Officials with any diagnosis of OA more often reported frequent or continual difficulties with a) running the entire field distance, b) starting and stopping on the field, c) keeping pace, d) focusing on multiple actions of players at once, and e) enjoying the officiating duties than officials with no OA (Mann Whitney U tests all $p < 0.0001$). **CONCLUSION:** Officials are unrecognized athletes, and many may benefit from clinical care support at the field before, during and after games to help manage musculoskeletal pain, especially during regulation games or tournaments. Pain relief may translate to better engagement in lacrosse officiating duties, improvement in player safety and enjoyment of the officiating role.

3155 Board #201 May 31 3:30 PM - 5:00 PM

Age Related Error of the Measurement of the Tibialis Posterior Muscle via Ultrasound Imaging

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PURPOSE: The tibialis posterior (TP) is a key muscle in controlling foot function and is associated with several lower extremity pathologies. Being able to assess the strength, activity and size of the TP across ages plays an important role in treating and understanding pathologies associated with the TP. It may be more difficult to image the TP of older individuals due to fatty infiltration and fibrosis. The purpose of this study evaluated the reliability of ultrasonic measurements of the TP in young and older adults. **METHODS:** Legs of 23 individuals (older (O) n=7; younger (Y) n=16) were imaged via ultrasound (6-15ML probe, GE Logiq S8) and the cross-sectional area (CSA) and thickness of the TP was recorded. To measure the TP, the probe was held at a point 30% and 50% between the knee joint line and the inferior tip of the lateral malleolus. Subjects inverted their foot and videos of the contraction cycle were recorded. Two separate still-shots of the muscle at rest were saved from the recorded videos at each location to make size measurements. This process was performed on both anterior and posterior sides of the leg. To assess reliability, intraclass correlation coefficients (ICC) and the standard error of the measurement (SEM) were calculated. An independent t-test was used to determine differences in the measurement error between age groups. **RESULTS:** The average TP CSA at the 30% point for the anterior view was 3.96 ± 1.05 cm², and the posterior was 4.00 ± 1.06; at the 50%, the anterior was 3.43 ± 1.09 cm², and the posterior was 3.55 ± 1.09. Excellent reliability was seen when comparing repeated measurements for anterior and posterior area and thickness measurements for both younger and older individuals (ICC=.937-.999), however, there was a significant difference in the SEM for TP thickness (O = 0.06 ± 0.02cm; Y = 0.035 ± 0.01cm, $p=.008$) and CSA (O = 0.11 ± 0.07cm; Y = 0.046 ± 0.01cm, $p=.02$). **CONCLUSIONS:** Repeated measurements showed excellent reliability in both groups. There was a greater error in the measurement in the older adults. Despite

showing excellent reliability, these results show that age does affect the accuracy of the measurement of the TP muscle size assessed by ultrasound imaging; however, it would also be beneficial to be able to assess quality of muscle tissue.

3156 Board #202 May 31 3:30 PM - 5:00 PM

No Differences in Sub-Cortical Motor Region Activity for Knee Motor Control Following Anterior Cruciate Ligament Reconstruction

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PURPOSE: Emerging research has indicated that anterior cruciate ligament reconstruction (ACL-R) is associated with neuroplasticity. It has been speculated that these findings may have future implications on rehabilitation and ACL-R outcomes. However, most of this research has focused on cortical plasticity rather than sub-cortical plasticity. The purpose of this project was to determine the effects of ACL-R on sub-cortical portions of the cortical-subcortical motor loop. **METHODS:** A healthy group of active participants (n=16, age=23.2±3.5 years, height=1.7±0.1 m, weight=69.7±14.3 kg) and a left ACL-R group (n=15, age=21.7±2.7 years, height=1.7±0.1 m, weight=70.4±15.8 kg, 38.1±27.2 months' post-surgery) were locally recruited. Functional magnetic resonance imaging (fMRI) and T1 structural imaging were performed to analyze brain activation during a unilateral left (involved) 45° knee extension/flexion at a rate of 1.2 Hz for 4 blocks of 30 seconds interspersed with 30 seconds of rest. The right putamen and right sub-thalamic nuclei (STN) served as seed regions, and the two groups were contrasted using a mixed-effects general linear model with *a priori* cluster threshold of p<.05. **RESULTS:** Compared to the control group, the ACL-R group displayed no differences in right putamen and right STN activation during the unilateral motor task. **CONCLUSION:** These results indicate that ACL-R may not influence the motor control loop at the sub-cortical level. Therefore, motor control and motor learning, as it relates to the subcortical structures, may not be affected by ACL-R. As a result, neurorehabilitation after ACL-R should use priming techniques to target specific cortical regions that previous studies have indicated as being affected by ACL-R.

3157 Board #203 May 31 3:30 PM - 5:00 PM

Performance and Return to Sport Following Latissimus Dorsi and Teres Major Tears in Professional Baseball Pitchers

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Purpose: Determine the performance and return to sport (RTS) rate in professional baseball pitchers following LD/TM tears treated operatively and non-operatively, and to compare RTS rate and performance between pitchers who sustained a LD/TM tear and matched controls. The authors hypothesize there is a high RTS rate in professional baseball pitchers following LD/TM tears with no significant difference in RTS rate or performance, specifically related to primary outcome performance variables: WHIP ((walks +hits)/innings pitched), fielding independent pitching (FIP), and wins above replacement (WAR)) between cases and controls for both operative and non-operative treatment. **Methods:** All professional baseball pitchers who sustained a LD/TM tear between 2011-2016 were included. Demographic and performance data (pre and post injury) for each player was recorded. Performance metrics were then compared between cases and matched controls within both operatively non-operative treatment. **Results:** Overall, 120 pitchers had a documented LD/TM tear; (42 (35%) were major league players). Most players (107 (89.2%)) were treated non-operatively. Average time to return to the same level of competition for pitchers treated non-operatively was 170.7 +/- 169.7 days while for those treated operatively was 406 +/- 146.83 days. The RTS rate among players treated non-operatively and operatively was identical at 75%. Players treated non-operatively had no change in FIP or WAR following injury but had a higher (i.e. worse) WHIP after injury (p=0.039), and performed significantly worse in several secondary performance metrics, including number of games played per year (p<0.001). Players treated operatively had no change in any measured performance metrics following surgery. No difference existed between cases and controls in the primary performance variables. **Conclusion:** LD/TM tears occur more frequently in professional pitchers than previously recognized and reported. The majority of LD/TM tears are treated non-operatively. RTS rate for professional baseball pitchers following LD/TM tears treated operatively or non-operatively is 75%. Players treated non-operatively saw a decline in several performance metrics while players treated operatively had no significant difference in performance after surgery.

3158 Board #204 May 31 3:30 PM - 5:00 PM

Characterizing the Prevalence of Cam-Type Hip Impingement in Women's Professional Ice Hockey Players

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(No relevant relationships reported)

Purpose Recent studies have demonstrated an increased prevalence of femoroacetabular impingement (FAI) in elite men's ice hockey players, yet little is known about the hips of players in the National Women's Hockey League (NWHL). The primary purpose of this study was to determine the prevalence of radiographic cam-type FAI in women's professional ice hockey players. The secondary purpose was to analyze the relationship between the presence of cam deformity and hip ROM; clinical impingement signs; and age of menarche. **Methods** Clinical, radiographic and demographic data were collected for NWHL players during pre-participation physicals. Alpha angles were measured on 45° Dunn radiographs, with alpha angles >55° defined as cam-positive. Spearman correlations were performed to analyze the relationship between alpha angle and both ROM measurements and menarchal age. Players were grouped into those with and without cam lesions and group differences were assessed using the student's t-test. **Results** Twenty-seven athletes were included. Nineteen (70%) had alpha angles >55°; 14 (52%) had bilateral cam deformity. Average menarchal age was 13.9 ±1.5 years. There was a significant association between age of menarche and alpha angle (right hips, p=0.01; left hips, p=0.04). There was no significant association between alpha angle and either hip ROM or clinical impingement signs. **Conclusion** This study suggests that elite female ice hockey players have a higher prevalence of cam-type morphology than the general population. The positive association between alpha angle and age of menarche lends additional support to the etiological hypothesis of the cam lesion resulting from activity-related stress at the proximal femoral physis; players with earlier menarche (and therefore earlier physeal closure) seem to be less vulnerable to the development of cam deformity of the proximal femur. Thus, professional women's ice hockey players have a high risk of developing cam-type morphology of the proximal femur, although each player's age of menarche may mediate her individual risk for cam lesion development.

3159 Board #205 May 31 3:30 PM - 5:00 PM

Clinical Outcomes of Ultrasound-Guided Percutaneous Patellar Tendon Scraping

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(No relevant relationships reported)

Purpose: To report the clinical outcomes of patients with patellar tendinopathy treated with ultrasound-guided percutaneous patellar tendon scraping.

Methods:

Design: Retrospective case series

Setting: Academic sports medicine clinic

Patients: Nine patients with patellar tendinosis (total of 10 tendons). Six patients had primary patellar tendinosis and three had persistent pain despite surgery. Mean age was 21.2 years old. Four were competitive athletes, 4 were recreational athletes and 1 has ceased sport participation.

Interventions: All patients underwent ultrasound-guided patellar tendon scraping using a 14-gauge needle, followed by a brief rehabilitation period before returning to sport. Main Outcome Measures: Patient reported outcome measures (PROM), including the Victoria Institute of Sport Assessment Questionnaire-Patellar Tendon and Lower Extremity Functional Scale; time to return to sport and; adverse events.

Results: All patients with primary patellar tendinosis met the minimal clinically important difference (MCID) for their PROM with 1 patient experiencing a symptom relapse. The average time to return to competitive sport was 2.67 weeks. In the post-surgical group, one of the three patients experienced a significant clinical improvement durable for 16 months. No adverse events were reported for any patient.

Conclusions: Ultrasound-guided percutaneous patellar tendon scraping may result in improved patient-reported outcome scores and facilitate a safe, rapid return to sports in cases of primary patellar tendinopathy. Results were less reliable for persistent pain after surgery.

3160 Board #206 May 31 3:30 PM - 5:00 PM

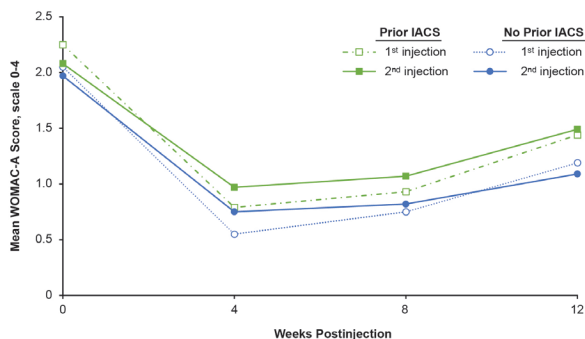
Initial/Repeat Triamcinolone Acetonide Extended-Release (TA-ER) Reduces Osteoarthritis Knee Pain Regardless of Prior Intra-Articular Corticosteroids (IACS)

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(No relevant relationships reported)

PURPOSE: Repeat IACS are common in the management of knee osteoarthritis (OA), but efficacy may diminish over time, and recurrent use has been associated with articular damage. This post hoc analysis of a Phase 3b, single-arm, open-label study was designed to evaluate repeat injection of TAER in patients with knee OA who had received prior IACS. **METHODS:** Patients ≥40 y with symptomatic knee OA for ≥6 mo received the 1st TA-ER injection on Day 1 and the 2nd injection at the first visit (Wk 12, 16, 20, or 24) at which repeat dose criteria were met (benefit from and tolerated the 1st injection without safety concerns and clinical indication to receive the 2nd injection). Patients who received 2 injections were evaluated every 4 wks up to 52 wks after the 1st injection. Treatment-emergent adverse events (TEAEs) and index knee radiography were evaluated. Exploratory efficacy endpoints included Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) A (pain). **RESULTS:** Of 208 enrolled patients, 179 received 2 injections. Of these, 95 (53.1%) had prior index knee IACS. Median time to 2nd injection was 16.4 wks (prior IACS) and 16.9 wks (no prior IACS); in both subgroups ~20% did not need the 2nd injection until Wk 24. Mean WOMAC-A scores were comparable in both groups and decreased ~50-75% following each injection (Figure). Incidences of serious and Grade 3/4 TEAEs were low and similar in both groups. There were no indications of chondrolysis, osteonecrosis, subchondral insufficiency fractures, or clinically significant subchondral bone changes in either group. **CONCLUSION:** TA-ER provided substantial analgesia for 12-24 wks postinjection that did not diminish with repeat administration and/or prior IACS use. Safety profiles were consistent with the overall population and previous reports. TA-ER may be a potential long-term nonoperative management strategy for knee OA pain.

Figure. Comparison of mean WOMAC-A (pain) scores following the 1st and 2nd TA-ER injections for patients with and without prior index knee IACS.



IACS, intra-articular corticosteroid; TA-ER, triamcinolone acetonide extended-release; WOMAC, Western Ontario McMaster Universities Osteoarthritis Index.

3161 Board #207 May 31 3:30 PM - 5:00 PM

Acute and Longitudinal Effects of Pitching on Passive Range of Motion in Division I Athletes

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(No relevant relationships reported)

PURPOSE: To assess passive range of motion (ROM) measurements acutely over time and how this acute change alters over the course of a baseball season. **METHODS:** Seven healthy male NCAA Division I baseball pitchers were measured prior to the start of the season. Each pitcher was assessed for passive shoulder and elbow ROM, with measurements taken after each pitching bout during the season.

Pitching bouts were allotted to early season, mid-season, or late season. In addition to ROM measurements, pitch volume, pitch type, and ball velocity were also collected for analysis.

RESULTS: Following a pitching bout, passive shoulder external rotation decreased by 7% ($p = 0.000$) during the early season. However, passive shoulder internal rotation was significantly reduced during the early season (-37%; $p = 0.001$), mid-season (-30%; $p = 0.000$), and late season (-42%; $p = 0.000$). Further, total motion also decreased during the early season (-12%; $p = 0.000$), mid-season (-6%; $p = 0.000$), and late season (-9%; $p = 0.000$). In terms of pitch type, increasing the volume of fastballs thrown had a moderate correlation with loss of passive shoulder external rotation during the late season ($r = -0.705$). Increasing the volume of curveballs thrown had a moderate correlation with total motion lost during the late season ($r = -0.665$) as well as with passive elbow extension lost during mid-season ($r = -0.760$).

CONCLUSIONS: Passive ROM is significantly impacted immediately after throwing. This decrease continues to be present throughout all parts of the baseball season. Moreover, a moderate correlation of fastballs and curveballs to losses in passive ROM indicates that attention to pitch type may be warranted, particularly during the middle and latter parts of the baseball season.

3162 Board #208 May 31 3:30 PM - 5:00 PM

Long-Term Characteristics of Injured Shoulders in Overhead Sports: A Gender Comparison

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(No relevant relationships reported)

Overhead sports require high levels of mobility and force produced by the shoulder joint. Additionally, gender differences in glenohumeral joint mobility and upper extremity strength are apparent in various athletic populations. Previous studies have found relationships in shoulder range of motion (ROM) and strength in several shoulder injuries. However, data are lacking regarding the long-term effects of shoulder injuries and considerations with respect to gender. **PURPOSE:** To determine the long-term effects of shoulder injuries on shoulder ROM and strength and examine gender differences in collegiate overhead athletes. **METHODS:** 35 male (age: 20.3 ± 1.2yr, mass: 84.1 ± 9.7kg) and 25 female (age: 19.6 ± 0.8yr, mass: 70.8 ± 10.9kg) overhead athletes fully participating in NCAA division I baseball, softball, volleyball, or tennis were recruited and divided into injury history group and healthy group depending on the existence of a history of shoulder injury. Active ROM of shoulder internal rotation (IR), external rotation (ER) and horizontal adduction (HAD) were measured using a digital inclinometer. Isometric shoulder IR and ER strength were assessed using a hand-held dynamometer and normalized by body mass. A two (group) by two (gender) factorial ANOVA was used to evaluate the dominant shoulder ROM and strength. Cohen's d effect sizes were calculated to assess the magnitude of differences. **RESULTS:** Females showed significantly lower IR ROM ($p = .03$, $d = 0.88$), IR strength ($p = .04$, $d = 0.83$), and ER strength ($p = .04$, $d = 0.86$) in the injury history group versus the healthy group, whereas there were no group differences in males ($p > .05$). Additionally, male overhead athletes had lower IR ($p = .01$, $d = 0.67$) and HAD ROM ($p = .01$, $d = 0.85$) and greater IR strength ($p = .02$, $d = 0.64$) compared to female overhead athletes. **CONCLUSION:** The results of this study indicate that shoulder injuries may have longer-lasting effects in female overhead athletes compared to male athletes. Furthermore, male overhead athletes demonstrated larger differences in posterior shoulder tightness and rotator cuff strength imbalances compared to female overhead athletes. This study may have significant implications for protocols aimed at preventing shoulder reinjury for specific genders in overhead sports.

3163 Board #209 May 31 3:30 PM - 5:00 PM

Skin Compatibility with 3d Printed Splints And Casts

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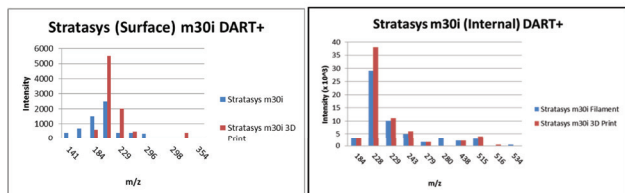
(No relevant relationships reported)

PURPOSE: 3D printed limb orthotics offer hygienic advantages over traditional technology because no padding is needed. We investigated biocompatibility and chemical profile of 3D printed material in contact with skin. **METHODS:** Patient-specific 3D printed ABS polymer casts from multiple sources of feedstock were evaluated according to ISO 10993 standards used by FDA for review of biocompatibility. The effect of post-processing with acetone vapor was evaluated as an independent variable. Cytotoxicity testing using L929 fibroblast reactivity, sensitization by Kligman Maximization methods in Guinea Pigs and irritation evaluation by intracutaneous injection in New Zealand White Rabbits of 3D print extractions were conducted under GLP conditions. In addition, mass spectrometry of filament feedstock and 3D printed casts was performed on solvent extractions using DART methods. **RESULTS:** Finished casts met criteria for permanent contact with skin

and limited contact with mucosal membranes. Mass spectrometry findings indicated that changes in ABS polymer occurred with 3D printing and post-processing in both surface and internal chemistry.

However, these chemical changes did not compromise biocompatibility assessed under ISO 10993. **CONCLUSIONS:** Patient-specific 3D printed, ABS orthotics met industry standards for biocompatibility for extended patient skin contact despite changes in material chemistry from feedstock. Therefore, testing and adherence to specific manufacturing controls is necessary to assure patient safety. Mass spectrometry assessment of composition of ABS polymers may serve to continually monitor product quality of 3D printed medical devices in accordance with 21 CFR 820.30.

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3164 Board #210 May 31 3:30 PM - 5:00 PM

Pubertal Timing is Not Related to Anterior Cruciate Ligament Laxity in Young Adults.

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(No relevant relationships reported)

Females sustain ACL injuries more often than males, especially among physically active adolescents and young adults. Studies suggest that increased estrogen during the ovulatory phase of the menstrual cycle is related to ephemeral increases in ACL laxity, and thus elevated injury risk. These hormonal factors may partially explain the sex-bias in injury risk, since males do not experience the same estrogen spikes and thus avoid these bouts of elevated risk. Little is known, however, about how variability in estrogen exposure within females affects inter-individual differences in injury risk. One factor that may play a role in cumulative estrogen exposure is age at menarche, since it relates to total number of cycles experienced. Our prior work shows links between age at menarche, pubertal growth patterns, and biomechanical risk for ACL injury. It is possible that age at menarche also has an impact on ACL injury risk through effects on laxity.

Purpose: To determine if age at menarche is related to female ACL laxity.

Methods: Subjects were recreationally active undergraduate and medical school females (N=15) and males (N=20). Males served as a control group, in which pubertal development timing was assessed as age at achieving adult height (recall). Age at menarche and current menstrual status in females were assessed by recall questionnaire. Telos™ stress radiography was used to assess ACL laxity. Statistical analysis consisted of an independent samples t-test to compare laxity in males and females. Linear regression analysis was used to determine whether laxity was related to pubertal timing within each sex.

Results: The t-test found no significant sex difference in ACL laxity (female mean \pm SD = 3.0 ± 1.8 mm; male mean \pm SD = 3.7 ± 1.7 mm; $P = 0.26$). In males, regression analysis demonstrated no relationship between age at achieving adult height and knee laxity: slope = -0.03 (95% CI: $-0.38 - 0.31$); intercept = 4.34 (95% CI: $-1.60 - 10.39$); $r^2 = 0.003$; $P = 0.83$. Similarly, females exhibited no relationship between knee laxity and age at menarche: slope = -0.17 (95% CI: $-0.95 - 0.61$); intercept = 5.15 (95% CI: $-4.87 - 15.16$); $r^2 = 0.02$; $P = 0.65$. The absence of regression relationship persisted after controlling for current menstrual cycle status.

Conclusion: ACL laxity in females appears to be unrelated to age at menarche.

Sponsor: DAGMEC

3165 Board #211 May 31 3:30 PM - 5:00 PM

Accuracy of Ultrasound Imaging of the Lisfranc Joint Complex

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(No relevant relationships reported)

Lisfranc injuries account for 1 in 55,000 injuries yearly and are associated with poor outcomes and high complication rates. Superficially connecting the medial

cuneiform and second metatarsal, the dorsal Lisfranc ligament is easily visualized with ultrasound. Ultrasound can provide quick, cost effective diagnosis but is not currently standard in clinical practice.

PURPOSE: This study sought to compare measurement accuracy of the dorsal Lisfranc ligament using ultrasound, external software, and gross anatomic dissection, with an additional anatomic study of the joint complex. **METHODS:** Ultrasound images of 22 embalmed cadaveric feet (13 male, 9 female, 79.5 ± 13.3 years) were obtained using a 6-13MHz linear array. Dorsal Lisfranc ligament length and joint space were measured and compared between methodologies.

Images were also re-measured using ImageJ software. Specimens were dissected to evaluate dorsal, interosseous, and plantar Lisfranc ligaments. Joint complex morphology was documented. **RESULTS:** Ultrasound (8.39 ± 1.26 mm) and ImageJ measurements (8.26 ± 1.76 mm) of the dorsal Lisfranc ligament did not differ significantly, but both were significantly different ($p < 0.05$) than gross dissection (10.8 ± 1.84 mm). There were no significant differences in dorsal joint space measures between ultrasound (2.19 ± 0.49 mm) and ImageJ (2.05 ± 0.52 mm), but both were significantly different ($p < 0.05$) than dissection measurements (1.04 ± 0.24 mm).

The dissected dorsal and interosseous ligaments had consistent morphology, whereas the plantar ligament demonstrated a Y- and a fan-shaped variant. A connection between the interosseous and plantar ligaments was present in 64% of dissections.

CONCLUSION: The dorsal Lisfranc ligament is easily visualized on ultrasound with 23% of the ligament not clearly visible at the peripheral bony attachments. While visually underrepresented on ultrasound, measurements were consistent. Radiographic joint space measurement remains the diagnostic gold standard. Further research should focus on using ultrasound to measure both bony and ligament integrity.

Ligament echogenicity provides additional diagnostic information to assess more subtle joint injuries. Additionally, the plantar Lisfranc ligament variability may impact the stability of the joint in some patients.

F-64 Free Communication/Poster - Breast Cancer

Friday, May 31, 2019, 1:00 PM - 6:00 PM

Room: CC-Hall WA2

3166 Board #212 May 31 3:30 PM - 5:00 PM

Impact of Aerobic and Resistance Exercise on Global Shoulder Function in Breast Cancer Survivors

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(No relevant relationships reported)

Purpose: Treatment strategies for breast cancer including surgery, radiation, endocrine therapy and chemotherapy have contributed to improving survival rates. However, the implementation of surgical and radiation therapies precipitates adverse musculoskeletal effects in the upper extremity (UE), including decreased shoulder range of motion (ROM), weakness, and chronic pain, with 67% of breast cancer survivors (BCS) reporting upper extremity problems. The purpose of this exploratory analysis of a randomized, controlled trial was to investigate the effects of a 16-week aerobic and resistance exercise intervention on the functional mobility of the UE in BCS.

Methods: BCS were randomized to the Exercise (EX; N=50) or Control (CON; N=50) groups. The EX group underwent moderate-to-vigorous aerobic and resistance exercise sessions 3 times/week for 16 weeks. Functional mobility was assessed pre- and post-intervention by active ROM, maximal isometric voluntary strength, the Disabilities of Arm, Shoulder and Hand (DASH) questionnaire, and the Penn Shoulder Scale (PSS). Repeated-measures analyses of variance were used to compare pre- and post-intervention data in the two groups and assess between group differences.

Results: Included BCS were 53.5 ± 10.4 years old, Hispanic white (55%) with body mass index 33.5 ± 5.5 kg/m². Participants were treated with surgery (79% mastectomy) and both chemotherapy and radiation therapy (76%), including breast alone (55%) or breast + nodal radiation (45%). At baseline, EX and CON did not differ on functional mobility measures ($p > 0.05$). Post-intervention, the EX group experienced statistically significant improvements in active ROM (shoulder flexion, external rotation at 0°/90°), isometric strength (shoulder flexion, external rotation, internal rotation and horizontal adduction) and DASH/PSS scores when compared to their baseline measures ($p < 0.001$) and to the CON group ($p < 0.001$). The CON group did not experience any changes ($p > 0.05$).

Conclusions: A 16-week aerobic and resistance exercise program is associated with improved functional mobility of the UE. Clinical exercise programs should be incorporated into current rehabilitation oncology practice as a means of improving global shoulder function following breast cancer treatment.

3167 Board #213 May 31 3:30 PM - 5:00 PM
Body Composition, Strength And Physical Function In Short- And Long-term Breast Cancer Survivors

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(No relevant relationships reported)

Previous data have found that breast cancer survivors (BCS) have poorer body composition, strength, and physical function compared to age and weight matched controls. Whether these changes improve over time after treatment remains uncertain. **PURPOSE:** To compare body composition, strength, and physical function between short-term (ST; <4 years; n=17; age=57±9 yrs) and long-term (LT; >4 years; n=24; age=62±7 yrs) BCS. **METHODS:** Body composition [lean mass (LM), fat mass (FM)] was assessed using dual-energy X-ray absorptiometry. Lower body strength was assessed using the Biodex leg extension/flexion system at 60 ° isometric knee extension. Upper body strength was assessed using one repetition maximum chest press. Physical function was measured using the continuous-scale physical function performance test. Independent t-tests were used to compare ST and LT-BCS. Significance was accepted at $p \leq 0.05$. **RESULTS:** Time since treatment completion was 1.8±1.0 yrs for ST and 11.8±6.9 yrs for LT. There were no differences in body weight, LM, FM, and upper and lower body strength between groups. Total physical function (ST:64±14; LT:73±11 U) and the functional domains for endurance (ST:66±15; LT:75±12 U) and balance (ST:65±15; LT:75±12 U) were significantly lower in ST-BCS. **CONCLUSION:** Our findings indicate that without exercise, body composition and strength do not improve whereas physical function improves over time following treatment. Funding: ACSM Doctoral Student Grant; NSCA Doctoral Graduate Student Research Grant.

3168 Board #214 May 31 3:30 PM - 5:00 PM
Effects of High-Intensity Interval Training on Body Composition in Breast Cancer Patients Undergoing Anthracycline Chemotherapy

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(No relevant relationships reported)

Purpose: While widely used in breast cancer patients, anthracyclines induce multiple adverse side effects, including weight gain and muscle atrophy. High intensity interval training (HIIT) is a novel exercise method that improves glucose metabolism, cardiorespiratory fitness and body composition in less exercise time than traditional continuous aerobic exercise in the general population. However, the effects of HIIT on body composition when performed during chemotherapy are unknown. The purpose of this study was to examine the effects of HIIT on body composition in breast cancer patients undergoing anthracycline chemotherapy.

Methods: Thirty sedentary breast cancer patients diagnosed with stage I-III breast cancer were randomized to exercise (HIIT=15) or control (CON=15) groups. HIIT performed 3 exercise sessions per week on stationary bike for 8 weeks during anthracycline chemotherapy. Exercise intensity was individually prescribed based on peak power output (PPO) and each HIIT session included 7 alternating bouts of 90% of peak power output followed by 10% peak power output. CON was asked to maintain current levels of activity. Lean mass and fat mass were obtained at baseline (wk0) and post-treatment (wk9) from the InBody 770 bioelectrical impedance scale (Biospace, Cerritos, California). Paired t-test and repeated ANOVA were used to determine effects of HIIT on body composition within and between the two groups.

Results: At baseline, HIIT and CON groups did not differ by age (46.9±9.8yr) or BMI (31.0±7.5 kg/m²). Following 8 weeks, body composition did not significantly change in either group ($p > 0.05$). Fat mass slightly decreased in the HIIT (wk0: 37.8±13.8kg to wk9: 35.4±13.4kg, $p > 0.05$) and CON (wk0: 30.2 ± 12.6kg to wk9: 29.4±13.7kg, $p > 0.05$) groups. Lean mass slightly increased in the HIIT group (HIIT: wk0: 44.0±6.4kg to wk9: 44.7±6.4kg, $p > 0.05$) and did not change in the CON group (wk0: 44.3±8.8kg to wk9: 44.2±8.5kg, $p > 0.05$).

Conclusions: An 8-week HIIT intervention did not improve body composition in obese breast cancer patients undergoing anthracycline therapy. Longer duration interventions with a larger sample must be explored to elucidate the benefits of HIIT on body composition in this population.

3169 Board #215 May 31 3:30 PM - 5:00 PM
Relationship Between Accelerometer Output And Oxygen Consumption In Patients With Breast Cancer After Chemotherapy Treatment

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(No relevant relationships reported)

PURPOSE: Currently used accelerometer cut-points to identify different intensities of physical activity are validated in the healthy population. These cut-points may not be applicable to patients with cancer due to lower fitness levels or different energy expenditure in rest. We aimed to examine the relationship between oxygen consumption and accelerometer output during different controlled activities in women with breast cancer shortly after completion of chemotherapy treatment.

METHODS: Forty women aged 50.4 (SD 9.5) years who completed chemotherapy treatment for breast cancer two to four months ago participated in this laboratory study. A cardiopulmonary exercise test was conducted to assess peak oxygen consumption (peakVO₂). Oxygen consumption in rest was assessed while lying supine for 6 minutes. Subsequently, nine activities with different intensities were performed while wearing an accelerometer on the right hip, and during which oxygen consumption was assessed. The relationship between oxygen consumption (expressed as percentage of peakVO₂) and Metabolic Equivalent of Task (MET) value) and accelerometer output (in counts per minute (cpm)) was studied with linear regression analyses.

RESULTS: PeakVO₂ was 21.5 (SD 6.1) mL/kg/min. Oxygen consumption in rest was 3.1 (SD 0.6) mL/kg/min. The accelerometer output corresponding to the cut-points for low versus moderate (40% peakVO₂) and moderate versus vigorous (60% peakVO₂) intensity physical activity were 1100 and 1868 cpm, respectively. The analyses based on MET values resulted in a cut-point of 1172 cpm to distinguish between low and moderate intensity physical activity (3 MET) and a cut-point of 2689 cpm to distinguish between moderate and vigorous intensity physical activity (6 MET).

CONCLUSIONS: The accelerometer cut-points to distinguish different physical activity intensities were lower than cut-points validated in the general population (i.e. 1952 cpm for moderate and 5724 cpm for vigorous intensity). This finding was irrespective of the method used to express oxygen consumption (%peakVO₂ versus MET). This study demonstrates that the use of accelerometer cut-points validated in the general (healthy) population underestimates the physical activity intensities in patients with breast cancer after chemotherapy treatment.

3170 Board #216 May 31 3:30 PM - 5:00 PM
Community-Based Exercise Improves Cancer-Related Fatigue and Physical Fitness In Breast Cancer Survivors: A Preliminary Analysis

Chad W. Wagoner, Jordan T. Lee, Stephanie A. Sullivan, Erik D. Hanson, Brian C. Jensen, Lee Stoner, FACSM, Aaron Piepmeier, Kirsten A. Nyrop, Hyman B. Muss, Claudio L. Battaglini, FACSM. University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Claudio Battaglini, FACSM)
(No relevant relationships reported)

PURPOSE: A preliminary analysis was conducted to examine the potential impact of a community-based exercise program to improve cancer-related fatigue (CRF) and markers of physical fitness in breast cancer survivors (BCS) who were within a year of post primary treatment. **METHODS:** Ten early stage (I-III) BCS were included in the analysis (58 ± 11 years; 168.8 ± 7.5 cm; 74.7 ± 20.5 kg). Pre and post intervention assessments were completed for CRF via the PROMIS Fatigue 7a questionnaire, VO_{2peak}, lower and upper body strength, and subendocardial viability (SEVR). A 6-Minute Walk Test (6MWT) and Timed Up and Go (TUG) were completed to assess physical function. Participants aerobically trained on their choice of elliptical, treadmill, or stationary bike, progressively increasing intensity over the 16-weeks. Resistance training consisted of full-body circuits targeting major muscle groups. Training took place 3 days/week for 1 hour each day. **RESULTS:** CRF (-6.0 ± 3.5; $p < 0.001$), 6MWT (50.3 ± 46.5 m; $p < 0.01$), and SEVR (6.25 ± 8.3; $p < 0.05$) all significantly improved in response to the exercise intervention. VO_{2peak}, lower and upper body strength, and TUG showed small but nonsignificant improvements. Further analyses elicited inverse associations between changes in CRF and 6MWT ($r = -0.60$; $p = 0.05$) as well as CRF and SEVR ($r = -0.40$; $p = 0.25$). **CONCLUSIONS:** Preliminary analyses revealed that a community-based exercise program is effective in improving CRF while either maintaining or improving other markers of physical fitness. Community-based exercise programs have the potential to be viable alternatives for treating BCS who are presently experiencing CRF. Future studies are needed to explore relationships among CRF and markers of physical fitness as they could provide insight into potential underlying mechanisms driving CRF. Supported by funding from the Breast Cancer Research Foundation of New York.

3171 Board #217 May 31 3:30 PM - 5:00 PM

The 24-month Follow-up Of The Optitrain Exercise Rct For Women With Breast Cancer Undergoing ChemotherapyKate A. Bolam, Sara Mijwel, Natalie Holowko, Jonas Bergh, Helene Rundqvist, Yvonne Wengström. *Karolinska Institutet, Stockholm, Sweden.*

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(No relevant relationships reported)

In the earlier OptiTrain randomized controlled exercise trial, we found beneficial effects of two different exercise programs on health and treatment related outcomes. **PURPOSE:** The aim of this study was to report on cancer-related fatigue (CRF), quality of life (QoL), symptoms, muscle strength, cardiovascular fitness, body mass and physical activity levels of women with stage I-IIIa breast cancer who had been involved in the OptiTrain exercise RCT, 24 months from baseline. **METHODS:** The original 16-week, supervised exercise program was a three-armed, randomized controlled trial comparing the effects of a combined program of resistance training and high intensity interval aerobic training (RT-HIIT) or a combined program of moderate intensity and HIIT aerobic exercise (AT-HIIT) to usual care among 240 women with breast cancer undergoing chemotherapy. At 24 months, 117 and 155 participants participated in the in-clinic tests and completed the self-report questionnaires, respectively. We assessed CRF, QoL, symptoms, muscle strength, estimated cardiorespiratory fitness, body mass and objectively measured sedentary behaviour and physical activity. Analyses included mixed linear effects model analyses. **RESULTS:** RT-HIIT reported lower levels of total CRF (-1.37, 95% confidence interval (CI) -2.70, -0.04, effect size (ES) = -0.38), cognitive CRF (-1.47, 95% CI -2.75, -0.18, ES = -0.44), physical symptoms (-0.23, 95% CI -2.70, -0.00, ES = -0.29) but higher muscle strength (12.09, 95% CI 3.77, 20.40, ES = -0.51) than UC at 24 months. Whereas AT-HIIT reported lower total symptoms (-0.23, 95% CI -0.42, -0.03, ES = -0.29), symptom burden (-0.30, 95% CI -0.60, -0.01, ES = -0.08 (no effect)) and body mass (-2.15, 95% CI -3.71, -0.60, ES = -0.28) than UC at 24 months. **CONCLUSIONS:** The RT-HIIT group from the OptiTrain exercise RCT reported lower levels of total and cognitive CRF, and physical symptoms but higher muscle strength at 24 months, whereas, the AT-HIIT group reported lower total symptoms, and body mass at 24 months. The clinically relevant ES in muscle strength in the RT-HIIT is particularly encouraging given the importance of muscle strength as a predictor of many relevant health outcomes. While these results are promising, effect sizes range from small to medium and the results must therefore be interpreted with caution.

3172 Board #218 May 31 3:30 PM - 5:00 PM

Effects Of Exercise Training During Breast Cancer Chemotherapy On Fitness Outcomes At 1-year Follow-upAndria R. Morielli¹, Ki Yong An¹, Dong-Woo Kang¹, Christine M. Friedenreich², Donald C. McKenzie³, Karen Gelmon⁴, John R. Mackey⁵, Robert D. Reid⁶, Kerry S. Courneya¹. ¹University of Alberta, Edmonton, AB, Canada. ²Alberta Health Services, Calgary, AB, Canada. ³University of British Columbia, Vancouver, BC, Canada. ⁴University of British Columbia & British Columbia Cancer Agency, Vancouver, BC, Canada.⁵Cross Cancer Institute, Edmonton, AB, Canada. ⁶University of Ottawa Heart Institute, Ottawa, ON, Canada.

(No relevant relationships reported)

PURPOSE: To determine the effects of different doses and types of exercise during breast cancer chemotherapy on fitness outcomes at 1-year follow-up and to investigate the associations of physical activity during the follow-up period with fitness outcomes. **METHODS:** The Combined Aerobic and Resistance Exercise (CARE) Trial was a multicenter trial in Canada that randomized 301 breast cancer patients initiating chemotherapy to 3 days/week of supervised exercise consisting of either: (1) a standard dose of 25-30 minutes of aerobic exercise (STAN, n=96), (2) a higher dose of 50-60 minutes of aerobic exercise (HIGH, n=101), or (3) a combined dose of 50-60 minutes of aerobic and resistance exercise (COMB, n=104). At 1-year post-intervention, patients completed objective measures of aerobic fitness, muscular strength, and muscular endurance. Physical activity was collected via questionnaire at 1-year follow-up and patients were categorized as meeting (1) aerobic only, (2) strength only, (3) combined, and (4) neither exercise guideline. **RESULTS:** We obtained fitness data on 263 (87.4%) patients and self-report data on 284 (94.4%) patients at 1-year follow-up. Analyses of covariance showed that COMB was superior to HIGH for upper body muscular endurance (8.8 reps; $p = 0.020$); borderline superior to HIGH for lower body muscular strength (5.1 kg; $p = 0.05$); and borderline superior to STAN for upper body muscular endurance (6.4 reps; $p = 0.09$). Moreover, meeting the combined exercise guideline at follow-up was associated with: (1) better VO_2 peak (2.1 ml/kg/min; $p = 0.002$); upper body strength (2.8 kg; $p = 0.017$); and upper body endurance (13.4 reps; $p = 0.004$) compared to meeting neither guideline, (2) better upper body endurance (8.6 reps; $p = 0.026$); and lower

body endurance (15.2 reps; $p = 0.020$) compared to meeting the aerobic only guideline and (3) better VO_2 peak (1.7 ml/kg/min; $p = 0.041$); and lower body endurance (20.1 reps; $p = 0.036$) compared to meeting the strength only guideline. **CONCLUSIONS:** Performing combined aerobic and strength exercise during breast cancer chemotherapy resulted in longer-term improvements in muscular endurance and strength compared to aerobic exercise alone. Moreover, performing combined aerobic and strength exercise during follow-up was strongly associated with better fitness outcomes.

3173 Board #219 May 31 3:30 PM - 5:00 PM

Effects Of Exercise During Chemotherapy On Hospitalization And Chemotherapy Completion: The OptiTrain Breast Cancer TrialSara Mijwel, Kate A. Bolam, Yvonne Wengström, Helene Rundqvist. *Karolinska Institutet, Stockholm, Sweden.*

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(No relevant relationships reported)

PURPOSE: Prevention of chemotherapy adverse effects may aid in reducing the number of women being admitted to the hospital. Moreover, the importance of sustaining full dose chemotherapy-intensity has been demonstrated. We previously showed that a 16-week exercise program in patients with breast cancer undergoing chemotherapy was beneficial to prevent physiological and self-reported health-related deteriorations. Here, the aim was to examine the effects of exercise on hospitalization and chemotherapy completion rates.

METHODS: 240 women scheduled for chemotherapy were randomized to 16-weeks of resistance and high-intensity interval training (RT-HIIT), moderate-intensity aerobic and high-intensity interval training (AT-HIIT) or to usual care (UC). Chemotherapy completion rate is reported as the mean relative dose intensity (RDI; $\text{mg}\cdot\text{m}^{-2}\cdot\text{wk}^{-1}$), which represents the actual received dose intensity as a fraction of the dose intensity of the originally planned chemotherapy regimen. Lymphocyte and thrombocyte concentrations were measured prior to each chemotherapy session. All data were extracted from medical records.

RESULTS: A significantly lower proportion of participants in the RT-HIIT group (3%) were hospitalized compared to participants in the UC group (15%) over the course of chemotherapy ($p=0.049$). In total, 22% of the participants in RT-HIIT, 28% in AT-HIIT, and 20% in UC required a dose adjustment with no significant between group differences ($p=0.49$). Among those that required dose adjustment, median relative dose intensity was 80% (IQR=75-87) in the RT-HIIT group, 75% (IQR=75-80) in the AT-HIIT group, and 77% (IQR=73-82) in the UC group ($p=0.25$). No significant differences were found between groups for lymphocyte or thrombocyte concentrations. **CONCLUSIONS:** A 16-week exercise intervention consisting of resistance and high intensity interval training during chemotherapy may have significant implications for the cost of cancer care due to reduced hospitalization rates, but had no effect on chemotherapy completion rates.

F-65 Free Communication/Poster - Clinical Exercise Physiology - Other

Friday, May 31, 2019, 1:00 PM - 6:00 PM

Room: CC-Hall WA2

3174 Board #220 May 31 3:30 PM - 5:00 PM

Inflammatory and Affective Responses to Acute Resistance Exercise of Varying Loads in Postmenopausal Women.Ciaran M. Fairman¹, Maryam B. Lustberg², Marcy L. Haynam², Anna Kimborowicz², Josh Bartels², Michael Lantz², Sarah Johnson², Carl Maresh², William J. Kraemer, FACSM², Brian C. Focht, FACSM². ¹Edith Cowan University, West Perth, Australia. ²Ohio State University, Columbus, OH. (Sponsor: Brian C Focht, FACSM)

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(No relevant relationships reported)

Resistance exercise (RE) is increasingly recognized as a powerful behavioral intervention that can improve key metabolic and cardiovascular risk factors among aging women. The manipulation of RE variables, such as repetitions and load, may illicit differing physiological and psychological responses to acute bouts of RE. Although differential responses to acute RE may influence training adaptations and subsequent motivation for regular RE participation, the effects of acute RE upon these outcomes in postmenopausal (PMW) have yet to be evaluated. **PURPOSE:** To determine the effects of RE intensity on physiological, affective, and motivational outcomes in PMW.

METHODS: Thirteen PMW (Age: 59.23±11.3; BMI 29.99±4.55) participated in the study. Each participant completed 3 experimental conditions in a randomly assigned order. The low-load condition involved 3 sets of 12-15 reps at 55%-64% 1 repetition maximum (RM), with 60 seconds of rest between sets. The moderate load involved 3 sets of 8-12 reps at 65%-75% 1RM, with 90 seconds of rest between sets. The heavy load involved 3 sets of 3-6 reps at 80-90% 1RM, with 120 seconds of rest between sets. Assessment of inflammatory markers (IL-6, TNF- α) were obtained prior to, immediately after, 15 minutes and 30 minutes after each condition. Affective and motivational outcomes were assessed prior to, during, and at multiple timepoints following each condition.

RESULTS: Results revealed no significant ($p > 0.05$) differences in inflammatory markers or affective responses as a function of RE load. Furthermore, there was no significant differences ($p > 0.05$) in intention or self-efficacy between experimental conditions.

CONCLUSIONS: CONCLUSION: Acute bouts of RE at 55-64% 1RM, 65-75% 1RM and 80-90% 1RM yielded comparable inflammatory and affective responses in PMW. The similar responses to the varying loads of acute RE observed in this investigation may have valuable practical implications for RE prescription among PMW.

**3175 Board #221 May 31 3:30 PM - 5:00 PM
Blood Pressure Abnormalities Among NCAA Athletes**

Hannah M. Wright¹, Michael C. Meyers, FACSM¹, Mark L. Niebyski², James C. Sterling³, Shad K. Robinson¹. ¹Idaho State University, Pocatello, ID. ²World Hypertension League, Corvallis, MT. ³Baylor, Scott & White, Dallas, TX.
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(No relevant relationships reported)

Although an athlete is routinely exposed to rigorous physical training programs leading to improved cardiorespiratory function, more recently, there has been concern with athletes presenting with hemodynamic abnormalities commonly associated with morbidity and mortality within the general population. **PURPOSE:** To quantify blood pressure (BP) abnormalities among NCAA Division I and II collegiate athletes. **METHODS:** Following written informed consent, 217 (131 male, 86 female) athletes (mean \pm SEM; age = 20.0 \pm 0.1 yr; ht = 178.7 \pm 1.1 cm; wt = 86.9 \pm 1.8 kg) underwent supine, hyperventilation, and standing BPs using a manual, hand-held sphygmomanometer as part of a preexercise evaluation prior to CPET. Supine BPs were subsequently evaluated using ACC/AHA criteria, with data analyzed by gender and race (50 African American, 167 White). **RESULTS:** MANOVAs (Wilks' λ) indicated a significant main effect across gender ($F_{2,214} = 14.987$; $P < 0.0001$), but not race ($F_{2,214} = 2.239$; $P = 0.101$). Post hoc analyses revealed that, overall, males exhibited a higher incidence of elevated BP ($BP_{sys} 121.2 \pm 0.9$ vs. 113.8 ± 1.1 ; $BP_{dias} 70.1 \pm 0.9$ vs. 74.4 ± 0.7 , $p < 0.0001$) than females, respectively. Among the 45.6% of total athletes diagnosed with elevated BP, 74.7% were males ($BP_{sys} 124.9 \pm 0.7$ / $BP_{dias} 77.8 \pm 0.7$) as compared to 25.3% of cases documented among females ($BP_{sys} 122.9 \pm 1.2$ / $BP_{dias} 76.9 \pm 1.2$). Of equal concern, was the hypertension indicated in 7.6% of male athletes ($BP_{sys} 142.8 \pm 1.9$ / $BP_{dias} 84.0 \pm 1.9$), with none reported among females. **CONCLUSION:** Findings indicated that 50.2% of NCAA Division I and II athletes in this study were diagnosed, based on ACC/AHA guidelines, with either elevated BP (BP_{sys} between 120-129 mm Hg and BP_{dias} less than 80 mm Hg) or Stage I or II hypertension (BP_{sys} greater than 129 mm Hg, and $BP_{dias} \geq 80$ mm Hg). These findings support the need for early detection, follow-up screening, and non-drug treatment of athletes to include identifying risk factors (i.e., stress) and knowledge assessment. Ongoing studies are underway to assess the breadth and long-term implications of elevated BP on the athletes' health, particularly with respect to potential cardiovascular risk.

**3176 Board #222 May 31 3:30 PM - 5:00 PM
Cardiac Etiology of Exercise Induced Hypoxemia within Elite Athletes**

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(No relevant relationships reported)

PURPOSE: Exercise induced hypoxemia (EIH) is common finding within a group of elite athletes. It is generally thought, that the causality lies in the pulmonary. We report a group of 8 elite athletes with severe EIH (SpO₂ below 92%) examined for the origin of the EIH. The task was to perform differential diagnoses to locate the shunt into the pulmonary circulation or cardiac shunts.

METHODS: Eight consecutive national level endurance athletes (cycling, running and rowing) with severe EIH (SpO₂ reproducibly below 92) has been examined with stress transthoracic echocardiography with injection of agitated saline. The saline was administered via cubital vein during the last two steps of the stress echo and the

presence of the hypoxemia. Differential diagnoses was based on previously published reports for evaluation of cardiac shunts - number of microbubbles and latency (number of cardiac cycles) between the injection and the appearance of the microbubbles in the left heart. Trans-esophageal echo has been performed in the follow up procedure to evaluate the anatomical etiology of the shunt.

RESULTS: Four athletes presented pulmonary etiology of the hypoxemia. Four athletes have presented cardiac origin with right to left shunt causing EIH. Concurrent transesophageal echocardiography discovered one atrial septal defect and three patent foramen ovale (PFO). One athlete with present PFO underwent successful catheterization closure of the PFO. Follow up exercise testing and stress echo confirmed no signs of shunt and no signs of presence of EIH in that patient. Also, performance measures of that athlete improved significantly. One athlete with present PFO/ASD underwent unsuccessful catheterization closure due to anatomical challenges.

CONCLUSIONS: Exercise induced hypoxemia is generally thought to be caused by anatomical or functional shunts within the pulmonary circulation. Our findings suggest possibly higher prevalence than originally thought of cardiac etiology. Successful treatment by catheter-based closure device improves performance and eliminate other clinical signs of the right to left cardiac shunt. Further evaluation of larger group of elite athletes with EIH is warranted to understand better the real prevalence and possible treatment of the cardiac origin of the EIH.

**3177 Board #223 May 31 3:30 PM - 5:00 PM
Metabolic And Cardiovascular Effects Of Body Weight Support Treadmill Walking In Healthy Older Adults.**

Robert S. Van Zant, Wick Colchagoff, Anya Cox, Benjamin Eggleston, Andrea Griffith, Linda Harrison, Amie Newberry, Blake Price. *The University of Findlay, Findlay, OH.*
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(No relevant relationships reported)

Purpose: Body weight supported treadmill training (BWSTT) has been proven to be effective for gait re-education for patients experiencing neurologic and musculoskeletal impairments. Recently our lab showed no significant difference in cardiovascular and metabolic effects of BWSTT in healthy young adults at clinically appropriate levels of body weight support (BWS). The purpose of this study was to determine the effects of BWSTT on cardiovascular and metabolic function in older (50-80 years) healthy adults. **Methods:** A total of 20 subjects (50% female, 58.3±7.3 yr; 172.6±9.0 cm; 84.2±22.4 kg; 28.1±5.4 kg/m²) provided their informed consent for study participation. Each subject completed 3, 5-minute treadmill walking trials at a self-selected pace, with 0%, 15%, and 30% BWS, performed in a single-blind randomized fashion. Subjects rested for a minimum of 5 minutes between each trial, and did not begin a subsequent trial until HR was verified to be < 5 bpm of HR rest. Heart rate using a Polar Beat HR monitor, blood pressure (BP) via auscultation, rate of perceived exertion (RPE) using the Borg ratio scale, and oxygen uptake (VO₂) using continuous indirect calorimetry, were measured at rest, and during the 3 walking trials. Mean data from minutes 3, 4, and 5 were then analyzed for difference by repeated measures ANOVA using SPSS statistical analysis (Version 24). **Results:** At rest, HR was 70.8±8.2 bpm and BP was 126.8±12.2 / 84.3±8.6 mmHg. Mean walking speed was 67.1 m/min. All tested parameters for all exercise trials were significantly ($p < 0.05$) different from rest. Among exercise trials, VO₂ and tidal volume at 30% BWS was significantly less than 0% BWS. **Conclusion:** In contrast to previous findings in younger adults, 30% BWSTT elicits a significant reduction in VO₂ and tidal volume in older adults at self-selected walking speeds.

**3178 Board #224 May 31 3:30 PM - 5:00 PM
The Combined Effects of Whey Protein and Aerobic Exercise on Glycemic Responses**

Todd Castleberry¹, Ryan Gordon², Matthew Sokoloski², Emily Zumbro², Christopher Irvine², Aubrien Henderson², Matthew Brisebois², Vic Ben-Ezra². ¹Texas Christian University, Fort Worth, TX. ²Texas Woman's University, Denton, TX.
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(No relevant relationships reported)

BACKGROUND: An acute bout of aerobic exercise has been shown to improve glycemic responses in both healthy people and those with type 2 diabetes. More recent literature has also suggested that consuming whey protein prior to a meal or glucose challenge may decrease postprandial glucose response. To the authors' knowledge, no studies have examined the combined effects of acute aerobic exercise and whey protein on glycemic responses.

PURPOSE: The purpose of this study was to evaluate the combined effect of acute aerobic exercise and whey protein on plasma glucose, insulin, gastric inhibitory polypeptide (GIP), glucagon like peptide-1 (GLP-1), and glucagon following glucose ingestion in healthy, sedentary men.

METHODS: Eleven males (mean \pm SD, age: 24.3 \pm 5.4 years; BMI: 26.0 \pm 5.3 kg/m²; HbA1c: 5.2 \pm 0.2 %; VO_{2 max}: 38.3 \pm 6.1 ml/kg/min) completed four randomized trials:

no exercise and no whey protein (R); acute treadmill exercise (EX; 70% $\dot{V}O_2$ max for 60 min) performed ~12-14 hrs prior to a 75 g oral glucose tolerance test (OGTT); 50 g of whey protein (W) administered as a 30 min preload prior to an OGTT; and EX combined with W (EXW). Plasma samples from the OGTTs were analyzed for insulin, glucagon, GIP and GLP-1 using multiplex kits. Glucose was measured using enzyme-electrode technology. All variables are represented as incremental area under the curve (iAUC).

RESULTS: Glucose and insulin responses are represented in Table 1. GIP, GLP-1, and glucagon increased for both W and EXW compared to R ($p < .01$) and EX ($p < .03$).

	R	EX	W	EXW
Glucose (mmol x 120 min)	116.8 ± 105.3	155.7 ± 92.9	-21.1** ± 103.6	16.2** ± 118.1
Insulin (pmol x 120 min)	40922 ± 32078	34176 ± 22624	78956* ± 36162	63182 ± 51780

* $p < .01$ vs R; * $p < .01$ vs EX

CONCLUSION: Postprandial glucose responses are reduced following the consumption of 50 g of whey protein prior to a 75 g glucose challenge. Additionally, 50 g of whey protein increased plasma GIP and GLP-1, which has been shown to stimulate insulin secretion. Based on these findings, the combination of acute aerobic exercise and whey protein provides the most benefit compared to exercise or whey alone.

3179 Board #225 May 31 3:30 PM - 5:00 PM
Associations Among Objectively and Subjectively Measured Physical Activity in Older Adults
 Gabrielle Volk, *Miami University, Oxford, OH.*
(No relevant relationships reported)

Less than thirty-percent of older adults (>55y) meet the physical activity requirements outlined by Centers for Disease Control and Prevention. Physical activity has been reported to reduce the risk of diseases/conditions such as hypertension, type II diabetes, coronary heart disease, depression, and cancer—highlighting its importance as a modifiable, health-related factor. Consequently, it may be clinically useful for physicians to be able to assess physical activity in their patients. Thus, the **PURPOSE** of this study was to evaluate the validity of the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire compared to a more objective measure of physical activity using accelerometry. **METHODS:** In 58 adults ($\geq 58y$) we assessed physical activity via questionnaire (CHAMPS) and 7-day accelerometry (Actical); and body composition (bioelectrical impedance). For accelerometry, subjects were advised to continue their habitual activity level. Pre-established cut-points for accelerometry interpretation were: sedentary (<100 counts/min); light physical activity (100-431 counts/min); moderate-to-vigorous physical activity (MVPA) (>431 counts/min). MVPA for CHAMPS included activities with MET values ≥ 3.0 METs). Associations were examined utilizing partial correlations (controlling for age and sex). **RESULTS:** Mean values for these subjects included: age = 69.0 ± 6.3y; BMI = 27.4 ± 7.3 kg/m²; body fat percentage (32.8 ± 11.6%); CHAMPS MVPA = 1843.5 ± 1477.2 kcal/wk. Mean values for accelerometry were: wear time: 890.8 ± 112.3 min/day; 14.8 ± 1.9 h/day; counts/min: 110.5 ± 59.3; accelerometer MVPA = 56.7 ± 29.1 min/day. CHAMPS MVPA was significantly correlated with accelerometer counts/min ($r = 0.40$, $p = 0.003$) and accelerometer MVPA ($r = 0.29$, $p = 0.035$). CHAMPS MVPA was inversely correlated with body fat percentage ($r = -0.33$, $p = 0.015$). **CONCLUSION:** These preliminary data suggest that the CHAMPS questionnaire may provide clinicians with a suitable estimation of their patients' habitual physical activity level.

F-66 Free Communication/Poster -
Musculoskeletal/Neuromuscular

Friday, May 31, 2019, 1:00 PM - 6:00 PM
 Room: CC-Hall WA2

3180 Board #226 May 31 3:30 PM - 5:00 PM
Assessment of Bilateral Asymmetry in Cycling Peak Torque in Multiple Sclerosis Patients vs. Controls
 Brian A. Pribble¹, John W. Farrell, III², Daniel J. Larson¹, Christopher D. Black, FACSM¹, Debra A. Bembem, FACSM¹, Rebecca D. Larson¹. ¹University of Oklahoma, Norman, OK. ²University of Ottawa, Ottawa, ON, Canada.
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(No relevant relationships reported)

Bilateral asymmetry (BA) is defined as any significant differences in functional or anthropometric measures between contralateral limbs. BA in muscle function has previously been observed in persons with multiple sclerosis (PwMS), with higher levels of asymmetry in lower limb strength having a negative impact on walking capacity and quality of life. Previous methods used with PwMS have not allowed for the assessment of BA during bipedal movements. **Purpose:** The aim of the current study was to assess the levels of BA in power output in PwMS during submaximal cycling compared to healthy controls. **Methods:** Eight PwMS and 6 controls completed a cycle ergometer graded exercise test (GXT) at a self-selected cadence. Peak torque (PT) produced by each leg was assessed at 50%, 60%, and 70% of peak power output (PPO) to determine level of BA. Subjects additionally completed a 25-ft walk test (25FWT), six-min walk test (6MWT), and maximal voluntary contractions (MVCs) of the knee extensors. Group comparisons were assessed at each %PPO using a mixed factorial ANOVA. Correlations between GXT outcomes and 25FWT, 6MWT, MVC, and Expanded Disability Status Scale (EDSS) scores were assessed using Pearson's r and Spearman's rho correlations. **Results:** Non-significant effects were found for the Group x %PPO interaction ($p = 0.28$) and %PPO ($p = 0.49$) variables. Compared to controls, PwMS did not show any significant differences in BA at any %PPO. When collapsed across groups, the % difference in peak torque was found to have a weak to strong correlation with the 25FWT ($r = 0.72$, 0.80, and 0.79, all $p \leq .01$), 6MWT ($r = -0.41$ $p = 0.14$, -0.63 $p = 0.02$ and -0.73 $p = .00$), MVC ($r = 0.27$ $p = 0.35$, 0.47 $p = 0.09$, and 0.80 $p = 0.00$) and EDSS ($\rho = 0.38$ $p = 0.18$, 0.27 $p = 0.35$, 0.02 $p = 0.94$) at 50, 60, and 70% of PPO respectively. **Conclusion:** No significant differences were found for cycling peak torque asymmetry between PwMS and controls. Despite non-significance, PwMS displayed a between limbs difference of $\geq 10\%$ for peak torque at all levels of %PPO whereas controls all had differences $< 10\%$. Furthermore peak torque asymmetry was found to correlate moderately well with MS outcome measurements when collapsed across groups. Future research is needed to determine the viability of assessing BA with cycling PT measures.

3181 Board #227 May 31 3:30 PM - 5:00 PM
The Effects of Fatigue on Peak Torque During Dorsiflexion Between Limbs in Multiple Sclerosis Patients
 David J. Lantis¹, Gregort S. Cantrell², John P. Hintz³, Cameron D. Owens³, Debra A. Bembem, FACSM³, Christopher D. Black, FACSM³, Daniel J. Larson³, Rebecca D. Larson³. ¹St. Ambrose University, Davenport, IA. ²Northern State University, Aberdeen, SD. ³University of Oklahoma, Norman, OK. (Sponsor: Christopher D. Black, FACSM)
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Multiple Sclerosis (MS) is a progressive immune-mediated disease that causes demyelination of the central nervous system. One of the most common symptoms in MS patients is fatigue. While strength asymmetries (SA) have been previously identified in MS patients, less is known of the impact fatigue has on SA. Fatigue of ankle dorsiflexion (AD) has the potential to limit walking function and activities of daily living (ADL) in MS patients. **PURPOSE:** To investigate the impact AD fatigue has on peak torque (PT) between limbs in MS patients compared to healthy individuals (Non-MS). **METHODS:** 26 individuals participated in the current study (MS: $n = 13$, Age = 50.3 ± 9.1 yrs, Expanded Disability Status Scale = 3.5 ± 1.8; Non-MS: $n = 13$, Age = 50.8 ± 8.5 yrs). Visit 1 & 2 consisted of test familiarization sessions. Visit 3 consisted of pre-exercise (PRE) maximal isometric contractions (MVC) of AD followed by fatiguing isometric exercise (FE) at 30% MVC until exhaustion. Immediately (POST) and 2 minutes (REC) after exercise subsequent MVCs were performed. Both limbs were tested with 15 minutes of rest between FE. Limbs were separated for analysis based on MVC PT (strong vs. weak). **RESULTS:** There was no group or limb difference in FE duration. When both limbs were collapsed for analysis,

FE duration was significantly lower in the MS group compared to the Non-MS group (161.14 ± 97.13 N vs. 226.24 ± 83.7 N, respectively; $p < 0.009$). PT significantly decreased PRE-POST, increased POST-REC, but still significantly less at REC from PRE for both limbs within each group ($p < 0.05$). The MS group showed a significant PT difference between limbs at PRE ($\Delta 4.34 \pm 5.88$ N; $p < 0.05$) and REC ($\Delta 3.94 \pm 7.14$ N; $p < 0.05$), while the Non-MS group showed no limb difference. PRE PT was significantly correlated to FE duration in the Non-MS group ($r = -0.55$; $p < 0.003$), but there were no significant correlations between PRE PT and FE duration in the MS group ($p > 0.11$). **CONCLUSION:** The MS group fatigued more quickly than the Non-MS group, however there was no fatigue asymmetries between limbs. The fatiguing exercise attenuated PT differences between limbs in the MS group but not in the Non-MS group. Strength was not related to FE duration in the MS group, but was so in the Non-MS group. The lack of a relationship between strength and fatigue in MS patients may help guide rehabilitation to improve ADLs.

3182 Board #228 May 31 3:30 PM - 5:00 PM
Benefits Of Whole Body Vibration Exercise For Non-specific Chronic Low Back Pain: An Assessor-blind, Randomized Controlled Trial

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 (No relevant relationships reported)

PURPOSE: The purpose of this study was to confirm the benefits of whole body vibration (WBV) exercise for pain intensity and functional disability in patients with non-specific chronic low back pain (NSCLBP). **METHODS:** This was a 2-arm single-blind randomized controlled trial. Eighty-nine NSCLBP patients met the inclusion criteria, they were randomly allocated to either the WBV exercise group ($n=45$) or the control group ($n=44$). The WBV exercise group received WBV exercises three times a week for 12 weeks. The control group received general exercise protocol three times a week for 12 weeks. Primary outcome measures were pain intensity and functional disability measured by the visual analog scale (VAS) scores and Oswestry Disability Index (ODI). The secondary outcome measures included lumbar joint position sense, quality of life (Short Form Health Survey 36, SF-36) and overall treatment effect (Global Perceived Effect). **RESULTS:** A total of 84 NSCLBP patients completed the 12-week study program. After 12 weeks, compared with the control group, the mean VAS and ODI scores decreased by additional 1 point (95% CI, -1.22, -0.78; $P < 0.001$), 3.81 point (95% CI, -4.98, -2.63; $P < 0.001$) based on adjusted analysis in the WBV exercise group. And the WBV exercise group provided additional beneficial effects for in terms of lumbar joint position sense ($P < 0.05$), SF-36 ($P < 0.05$), and Global Perceived Effect ($P = 0.012$). **CONCLUSIONS:** The study demonstrated that WBV exercise could provide more benefits than general exercise for relieving pain and improving functional disability in patients with NSCLBP.

3183 Board #229 May 31 3:30 PM - 5:00 PM
The Synergic Impact of Sarcopenia and Dynapenia on Depressive Symptoms in Korean Older Adults

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 (No relevant relationships reported)

The Synergic Impact of Sarcopenia and Dynapenia on Depressive Symptoms in Korean Older Adults

Purpose: To examine the synergistic impact of low appendicular skeletal muscle mass (ASM) and low muscle function (MF) on the risk of depressive symptoms in community-dwellers of Korean older adults. **Methods:** Data obtained from a total of 446 participants aged 65 years or older (80% women) recruited from local communities were used in this analysis. ASM and MF were assessed with dual-energy X-ray absorptiometry (DEXA) and a 30-s chair stand test, respectively. Depressive symptoms were assessed with the center for epidemiologic studies depression Scale (CES-D). Logistic regression was used to estimate odds-ratios (ORs) and 95% confidence interval (CIs) for having depressive symptoms according to ASM and MF levels. Statistical significance was tested at $p=0.05$. **Results:** The overall prevalence of depressive symptoms in this study population was approximately 16.4%, with 3.6% of men and 12.8% women. With respect to depressive symptoms, individuals with low ASM alone or low MF alone had significantly higher ORs of 2.963 (95% CI=1.318-6.538, $p=0.019$) or 3.843 (95% CI=1.679-8.797, $p=0.002$), respectively, compared to individuals with normal ASM and MF (OR=1). In addition, individuals with low ASM and MF had a significantly higher risk of OR=7.907 (95% CI=3.354-18.640, $p < 0.001$) compared to individuals with normal ASM and MF (OR=1).

Conclusion: The current findings suggest that both sarcopenia and dynapenia are independently and additively associated with an increased risk of depressive symptoms in elderly Korean adults, implying an urgency of an intervention targeting at both muscle mass and function for a healthy aging. This study was supported by the National Research Foundation funded by the Korean Government (NRF-2018R1D1A1B07048210 and NRF-2017R1A2B4007357).

3184 Board #230 May 31 3:30 PM - 5:00 PM
Effect of Resistance Training on Muscular Function and Functional Mobility in Adults with Cerebral Palsy

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 (No relevant relationships reported)

Cerebral Palsy (CP) is a non-progressive neurological disorder due to damage in the brain leading to musculoskeletal dysfunction and immobility. Physical deconditioning of individuals with CP appears to accelerate muscle atrophy and osteoporosis; thus, adults with CP are more prone to fall and fracture. The lower state of balance and functional mobility is also related to the higher risk of fall in the general public, and resistance training is known to improve overall muscular strength and functional mobility. However, equivocal results were reported whether resistance training has a positive effect on muscular function and balance in CP population. **PURPOSE:** To determine the influence of resistance training to muscular strength and balance in adults with CP who already developed muscle atrophy and osteoporosis. **METHODS:** Twenty adults with and without CP were recruited. Seven CP participants completed post-exercise experiments after performing resistance training twice a week for three months. Muscular strength (torque, work, and power) at 90, 150, and 210 °/sec were assessed in the leg using the Humac Norm Isokinetic Dynamometer. Functional mobility was assessed from the Berg Balance Test, and limits of stability test using the Biodex balance system. **RESULTS:** CP group had significantly lower knee extensor peak torque (e.g., 11.8 ± 2.3 CP vs. 68 ± 12.5 control, ft-lbs, $P < 0.05$), and lower knee flexor peak torque (e.g., 6.3 ± 1.6 CP vs. 43.8 ± 7.9 control, ft-lbs, $P < 0.05$) compared to control. After 3 months of training, CP group did not show statistical differences in muscular strength [e.g., extensor peak torque (27.5 ± 17.0 pre vs. 31.5 ± 24.2 post, ft-lbs, $P > 0.05$), and flexor peak torque (9.3 ± 5.6 pre, vs. 15.0 ± 10.9 post, ft-lbs, $P > 0.05$), or balance [e.g. overall score (25.2 ± 16.1 pre vs. 24.3 ± 11.4 post $p > 0.05$) on limit of stability test, total score (18.0 ± 19.5 pre vs. 24.4 ± 21.6 $p > 0.05$) on Berg Balance test. However, individuals who improved peak torque in knee flexors and extensors also improved postural stability via the Berg balance test. **CONCLUSIONS:** These preliminary findings suggest that muscular strength influences functional mobility in adults with CP only after exercise training.

3185 Board #231 May 31 3:30 PM - 5:00 PM
Differential Effect of Obesity on Muscular Strength in Adults with Cerebral Palsy

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 (No relevant relationships reported)

Cerebral palsy (CP) is a non-progressive and permanent neurological disorder that is characterized by muscular deterioration and atrophy. The major clinical problem with CP is early development of cardiovascular disease with increased rates of mortality. Due to the inevitability of motor dysfunction adults with CP can develop health risk factors such as obesity at a higher rate compared to the general population. Limited information is available to identify levels of obesity and its relation to muscular function in adults with CP. **PURPOSE:** To determine whether severity of obesity may affect muscular function and strength in adults with CP. **METHODS:** We studied total of sixteen adults with and without CP. Muscular strength (i.e., torque, work, and power) during knee extension and flexion was measured at 90, 150, and 210 °/sec in the lower extremity using Humac Norm Isokinetic Dynamometer. Maximal isometric forearm muscular strength was measured using a handgrip dynamometer. Body mass index (BMI), waist to hip ratio, and whole-body scan from Dual Energy X-Ray Absorptiometry were used to identify the levels of obesity. **RESULTS:** Compared to control, individuals with CP had similar BMI (26.8 ± 3.0 CP vs. 22.9 ± 1.0 control kg/m²; $P > 0.05$), % body fat (35.2 ± 4.5 CP vs. 28.4 ± 3.7 control %; $P > 0.05$), and % leg fat (40.7 ± 4.3 CP vs. 30.5 ± 4.1 control %; $P > 0.05$). However, waist to hip ratio was significantly greater in CP (0.90 ± 0.02 CP vs. 0.80 ± 0.02 control; $P < 0.05$); muscular strength was significantly lower in CP compared to control (e.g., knee extensor peak torque at 90°/sec; 25.9 ± 8.1 CP vs. 72.5 ± 12.2 control ft-lb; $P < 0.05$). There was no relationship between BMI and extensor/flexor peak torque in both groups; however, there was a linear relationship between waist to hip ratio and extensor/flexor peak torque only in CP group ($R^2=0.34$). A strong inverse relationship between % leg fat and extensor/flexor peak torque was observed in both groups ($R^2=0.79$).

CONCLUSION: These findings suggest that central obesity rather than BMI appeared to influence muscular strength in CP adults. In addition, less fat in the legs rather than the total body may contribute for higher leg muscular strength in adults with CP. Supported by Central RSCA and Undergraduate Research Grant, SJSU

3186 Board #232 May 31 3:30 PM - 5:00 PM
Effects Of Fatigue On Isometric And Isokinetic Dorsiflexion Strength Asymmetry In Multiple Sclerosis

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Multiple Sclerosis (MS) is an autoimmune disease affecting the central nervous system. MS is characterized by a variety of symptoms, with fatigue being the most commonly reported symptom. Strength asymmetry (SA) of knee extensor/flexors has been documented in previous research in individuals with MS. However, SA of the dorsiflexors in MS patients has yet to be fully investigated in a fatigued state. **PURPOSE:** The aim of this study was to measure SA of the dorsiflexors during isometric/isokinetic maximal voluntary contractions (MVC/MVIC, respectively) before and after a fatigue test (FT). **METHODS:** Thirteen individuals with MS (8 Female (F), 5 Male (M), Age = 50.3 ± 9.1 yrs. and an expanded disability status scale (EDSS) score = 3.5 ± 1.8) and 13 Non-MS individuals (8 F and 5 M, Age = 50.8 ± 8.5 yrs.) participated in a three visit study. Visit 1 consisted of equipment and test procedure familiarization. The following two visits consisted of either a FT test at 30% of MVC or at 30% of MVIC. Prior to, and immediately following the FT, MVC or MVICs were performed. During each visit both legs were tested with a 15 minute break between assessments. The order of test (MVC or MVIC) and leg (left or right) was randomized. All MVIC's were performed at 60°/s. **RESULTS:** SA was calculated as the difference between limbs Pre and Post FT. Measurements of peak tension (PT), voluntary contraction time (VCT), and muscle tension maintaining capacity (MTMC) during MVC and MVIC between legs (within) and between groups were not statistically different (p>0.05). Although MVIC VCT and MVC PT between groups was not significantly different, notable effect sizes (ES) were shown between groups during MVIC for VCT (ES=0.67, MS vs. Non-MS= 0.12 ± 0.09 vs. 0.07 ± 0.06 sec, p= 0.12), and MVC for PT (ES=0.8, MS vs. Non-MS= 3.03 ± 2.67 vs. 1.35 ± 1.23 Nm, p=0.06). **CONCLUSION:** The moderate/large ES for MVC PT and MVIC VCT highlights the possibility of fatigue affecting SA and VCT differently between MS and Non-MS. In future studies, a larger sample size should be used to improve the statistical power of the analyses.

3187 Board #233 May 31 3:30 PM - 5:00 PM
Safety And Feasibility Of Strength Training In Patients With Duchenne Muscular Dystrophy

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Duchenne muscular dystrophy (DMD) is a rapidly progressive and currently incurable neuromuscular disease. Understanding the role of exercise is important for these patients as high-intensity or eccentric actions can be damaging in DMD yet a lack of loading may exacerbate muscle dysfunction. While a few studies show submaximal exercise may be safe and potentially delay the loss of muscle function in DMD, no study has systematically examined the potential of strengthening exercise to improve muscle function or attenuate disease progression. **PURPOSE:** To examine the safety and feasibility of a pilot, in-home strengthening intervention consisting of knee extensor (KE) and flexor (KF) exercise in DMD. **METHODS:** Eight ambulatory boys with DMD [9.3 (0.8) yrs, BMI 19.0 (4.6) kg/m²] on corticosteroid therapy were recruited to undergo 12 weeks of isometric exercise training of the bilateral KE and KF. Exercise prescription consisted of 4 sets x 6 reps, 3x/week at a target intensity of 50% maximal volitional contraction (MVC). At baseline (BL), MVC testing and training familiarization were done for one week on site. The exercise equipment (custom built chair, laptop, and load cell) was subsequently shipped allowing for in-home training and supervision via live video conferencing for each session. Safety outcome measures to assess muscle damage included magnetic resonance proton transverse relaxation time (T₂) of KE and KF, pain assessment, and creatine kinase levels at BL, 1, 6, and 12wks. Peak strength (KE and KF MVC) and time to ascend/descend 4 steps were also assessed at BL and 12wks. **RESULTS:** The 7 boys who completed the strength training program had a compliance of 84.9 (9.0)% for the exercise sessions. The safety measures did not indicate signs of muscle damage [non-

significant change in mean T₂: KE=2.3 (3.6)% and KF= 0.4 (4.6)%]. Peak torque increased by 20.6% for KE (p<0.01) and 14.3% for KF (p<0.05), and the time to ascend (13.5%, p<0.05) and descend (22.7%, p<0.05) steps improved after exercise training. **CONCLUSION:** This in-home, 12-week supervised strength training program was safe, feasible, and improved strength and function in boys with DMD. Future research is required to optimize the strengthening protocol and further explore its potential efficacy and clinical application.

3188 Board #234 May 31 3:30 PM - 5:00 PM
The Characteristics of Muscle Tone and Stiffness in Young Adults with Chronic Low Back Pain

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The prevalence of chronic low back pain (CLBP) in young adults is increasing; however, the biological mechanism of CLBP in this population remains unknown. **PURPOSE:** To observe the characteristics of muscle tone and stiffness (MTS) of relevant muscle groups in young adults with CLBP, in order to provide reference for rehabilitation and prevention of CLBP. **METHODS:** Twenty six subjects with CLBP (age: 22±2 years, 14 males and 12 females) were recruited as the experimental (E) group, while 29 healthy subjects (age: 25±2 years, 16 males and 13 females) were recruited as the control (C) group. The degree of pain (Visual Analogue Scale/Score, VAS) was recorded, and the MTS (indicators including F-Frequency, D-Logarithmic Decrement and S-Stiffness) of three muscle groups (para-spinal, hamstring and tensor fascia lata muscles) was assessed using the Myoton-3 equipment. Group differences were determined by using independent-sample t-tests; within the E group, MTS was compared between gender and degree of pain (VAS) using ANOVA. **RESULTS:** Compared with C group, the E group's MTS of all three muscles were significantly higher (p<0.05), and the differences were 11.4%, 10.0% and 14.9% respectively; E group showed bilateral imbalance in all three muscles, while C group did not show imbalance. With the E group, compared with female subjects, male subjects had higher MTS of tensor fascia lata and para-spinal muscles (p<0.05), and the differences were 12.8% and 20.0%, respectively; in addition, the MTS values of tensor fascia lata, hamstring and para-spinal muscles in the subjects with moderate pain (VAS 4-7) were higher than those with mild pain (VAS 1-3) (p<0.05), and the differences were 12.7%, 14.9% and 22.2% respectively. **CONCLUSIONS:** MTS is associated with considerable increase of hamstring, para-spinal muscle and tensor fascia lata in young patients with CLBP; Young CLBP patients had significant bilateral MTS imbalance of all these muscles; Young male CLBP patients had higher MTS in para-spinal muscle and tensor fascia lata than female patients; The more painful, the higher of the MTS in young CLBP patients.

3189 Board #235 May 31 3:30 PM - 5:00 PM
Differential Effect of Resistance Training on Musculoskeletal Architecture and Strength in Adults with Cerebral Palsy

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 (No relevant relationships reported)

Cerebral Palsy (CP) is a neurological disorder caused by lesions in the brain and is characterized by impaired motor function, musculoskeletal deformity, and atrophy. Individuals with CP appear to develop osteoporosis at an earlier age compared to general population. Bone weakness has adverse effects on the muscular system, which causes CP population to be more prone to fractures and further immobility. Bone mineral density (BMD) improves in the general population via resistance training. However, it is still uncertain whether resistance training alters skeletal strength in the CP population and whether it influences musculoskeletal architecture and strength. **PURPOSE:** To determine the effect of resistance training on BMD, skeletal architecture, and muscular strength in adults with CP. **METHODS:** We studied 14 adults with and without CP. CP participants went through 3 months of resistance training twice per week. Dual-energy X-ray absorptiometry was used to measure local BMD at the lumbar spine (L1-L4), proximal femur, and radial/ulnar regions. Architectural differences were identified by measuring various angles and lengths on the proximal femur. Leg muscular strength was measured during knee extension and flexion using the Humac Norm Isokinetic Dynamometer. **RESULTS:** There was a significant increase in BMD at femur in CP group after 3 month exercise (0.6±0.1 CPpre vs. 0.9±0.1 CPpost g/cm²; P<0.05). BMD at lumbar and forearm regions in CP group was similar to control group even though BMD in CP group seemed to improve after training (P>0.05). Skeletal architecture and muscular strength were significantly lower in CP compared to control, but it did not change after resistance

training (architectural angle; 64±5 CPpre vs. 70±2 CPpost degree; $P>0.05$). While control group showed a strong linear relationship between femoral neck BMD and knee extensor peak torque ($R^2=0.83$), CPpre showed no relationship ($R^2=0.01$). After 3 months of training, CP participants who exhibited higher BMD appeared to develop greater muscular strength ($R^2=0.26$). **CONCLUSION:** These findings suggest that short term resistance training improved skeletal strength in CP adults without alterations in skeletal architecture. Skeletal strength appeared to play a role in enhanced muscular strength in adults with CP only after exercise training.

3190 Board #236 May 31 3:30 PM - 5:00 PM

Effects Of Eccentric Training Combined To Neuromuscular Electrical Stimulation On Electromechanical Delay Of Peroneal Muscles In Individuals With Functional Ankle Instability

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(No relevant relationships reported)

The electromechanical delay (EMD) represents the time required by the muscles to provide a protective response to an injurious mechanism. Individuals with functional ankle instability (FAI) have showed longer EMD times for the peroneal muscles (EMD-P) than ankles of healthy individuals; which is thought to increase the risk of the recurrence of ankle sprains. However, there's currently no noninvasive treatment to shorten EMD-P. **PURPOSE:** The aim of this study was to investigate the effects of eccentric training combined with neuromuscular electrical stimulation (NMES) on the EMD time of peroneal muscles during eccentric muscle action in individuals with FAI. **METHODS:** This was a three-arm, single-blinded, randomized controlled trial. Thirty-nine volunteers (21 ± 3ys) with FAI were randomly assigned to control (CON; n = 13), eccentric training (ECC; n = 13), or eccentric training combined with neuromuscular electrical stimulation groups (ECC+NMES; n = 13). The control group received conventional rehabilitation therapy (CRT), involving strength and balance training. The ECC group performed isokinetic concentric and eccentric training of the peroneal muscles based on CRT. The ECC+NMES group received NMES simultaneous to the isokinetic training. Both groups trained 3 days/week for eight weeks. The EMD-P was calculated when peroneal muscles contracted eccentrically at 90/s using the isokinetic system before and after training. A one-way ANOVA was used to look at the differences in EMD-P between three groups. **RESULTS:** No significant differences existed for EMD-P among the groups before training ($F = 0.295, P > 0.05$). Compared with pre-training, the EMD-P was significantly shorter in the ECC group (133 ± 8 vs. 127 ± 8 ms, $P < 0.05$) and ECC+NMES groups (135 ± 11 vs. 119 ± 9 ms, $P < 0.05$). However, no change occurred in CON (134 ± 7 vs. 135 ± 10 ms, $P > 0.05$). The ECC group showed a significant lower EMD-P compared with CON after training (127 ± 8 vs. 135 ± 10 ms, $P = 0.027$), whilst EMD-P was shorter after training in ECC+NMES compared with ECC (119 ± 9 vs. 127 ± 8 ms, $P = 0.03$). **CONCLUSION:** Eccentric training effectively shortened the EMD-P in individuals with FAI compared with conventional treatment. However, ECC combined with NMES further enhanced the reduction in EMD-P. Therefore, ECC+NMES could be an effective treatment for FAI.

3191 Board #237 May 31 3:30 PM - 5:00 PM

Passive Hallux Adduction Decreases Lateral Plantar Artery Blood Flow in Low Arch Feet

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(No relevant relationships reported)

PURPOSE: Due to the vital role that blood flow (BF) plays in maintaining tissue health, compromised BF can affect tissue healing. An adducted hallux, as often seen inside a narrow shoe, may put passive tension on the abductor hallucis, consequently compressing the lateral plantar artery (LPA) into the calcaneus and restrict BF. This may negatively affect the health of tissues within the foot such as the plantar fascia and may contribute to plantar fasciopathy. The purpose of this study was to compare BF within the LPA before and after passive hallux adduction (PHA). **METHODS:** Forty-five healthy volunteers (20 female, 25 male; age = 24.8 ± 6.8 yr; height = 1.7 ± 0.1 m; body mass = 73.4 ± 13.5 kg) participated in this study. Blood velocity and vessel diameter measurements were obtained using ultrasound imaging (L8-18i transducer, GE Logiq S8). The LPA was imaged deep to abductor hallucis for 120 seconds: 60 seconds at rest followed by 60 seconds of PHA. Maximal PHA was performed by applying pressure to the medial side of the proximal phalanx of the hallux. BF was then calculated in mL/min, and measurements before and during PHA were compared. Arch height index (AHI) was assessed for all volunteers.

RESULTS: Log transformed data was used to run a paired t-test between BF measured before and during PHA. The overall volume of BF over the 60 seconds during PHA was 22% lower compared to before (-0.250 ± 0.063 mL/min, $p < 0.001$), with an initial decrease of 60%. As AHI decreased, there was a greater negative Δ BF. As baseline BF increased, there was also a greater negative Δ BF.

CONCLUSIONS: Our preliminary findings of decreased BF through PHA indicate conditions that elicit PHA (e.g. wearing narrow-toed shoes) may affect BF and tissue health.

3192 Board #238 May 31 3:30 PM - 5:00 PM

A Randomized Controlled Trial Comparing Physiotherapy And Extracorporeal Shockwave Therapy In Treatment Of Plantar Fasciitis

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(No relevant relationships reported)

PurposePlantar fasciitis is postulated to arise from chronic overload. First line treatment includes non-steroidal anti-inflammatory drugs, orthotics, physical therapy and stretching exercises. Patients who do not respond to the above after a 6-month period can be considered for extracorporeal shock wave therapy (ESWT). In this study, we evaluated the outcomes of conventional physiotherapy alone versus physiotherapy together with ESWT over a 6-month period for patients diagnosed with plantar fasciitis.

MethodsPatients with heel pain who presented to the Specialist Orthopaedic Clinic from April 2017 to Apr 2018 were assessed for eligibility criteria. Enrolled patients were randomized into 2 arms: physiotherapy alone, or physiotherapy together with ESWT. Clinical and functional outcomes were evaluated using the SF 36 score, the American Orthopaedic Foot-Ankle Society (AOFAS) hindfoot score, as well as the Visual Analogue Scale (VAS) at baseline, 3 months, and 6 months. **Results**A total of 26 subjects were recruited. 1 dropped out of the study, and 5 defaulted follow-up. Results from the remaining 20 subjects were analysed. No significant difference in SF 36 score was found at 3-month follow-up (physical functioning $p=0.806$, physical limitations $p=0.624$, body pain $p=0.075$, general health $p=0.879$, vitality $p=0.119$, social functioning $p=0.419$, emotional limitations $p=0.958$, mental health $p=0.770$). The differences in AOFAS and VAS at 3-month follow-up were not statistically significant ($p=0.222$ for AOFAS, $p=0.329$ for VAS).

There was also no significant difference in SF 36 score after 6 months (physical functioning $p=0.814$, physical limitations $p=0.481$, body pain $p=0.091$, general health $p=0.427$, vitality $p=0.839$, social functioning $p=0.680$, emotional limitations $p=0.299$, mental health $p=0.416$). 6-month post-intervention AOFAS and VAS were not significantly different ($p=0.978$ for AOFAS, $p=0.372$ for VAS).

ConclusionOur study showed no significant differences in SF 36 score, AOFAS, and VAS after a 6-month period between participants who underwent physiotherapy alone as compared with those who received ESWT in addition to physiotherapy. No serious adverse events were noted at the 6-month follow-up visit. Further studies need to be undertaken with a larger sample size, and a longer follow-up period.

3193 Board #239 May 31 3:30 PM - 5:00 PM

Effect Of A Virtual-exercise Program On Physical Function And Activity: Findings From The VERITAS Trial

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Reported Relationships: J.P. Bettger: Industry contracted research; Reflexion Health.

PURPOSE: To determine the effect of a virtual exercise program versus usual care on physical function and activity 6 and 12 weeks after total knee arthroplasty (TKA). **METHODS:** We conducted a multicenter, randomized controlled trial with adults undergoing unilateral TKA. At least 10 days before surgery, participants were randomized 1:1 to the virtual exercise program with an avatar coach, in-home 3D biometrics and weekly telehealth clinician support versus usual care (referral to home health or outpatient physical therapy as determined by the surgeon and clinical team). Intention-to-treat analysis was used for the following 6- and 12-week secondary patient-reported outcomes: physical function (in five domains of the Knee injury and Osteoarthritis Outcome Score [KOOS], higher score is better function) and minutes per week of moderate-to-vigorous physical activity (MVPA). Patient satisfaction with the virtual exercise program was assessed of intervention group patients 12-weeks after surgery. **RESULTS:** From November 2016-December 2017, 306 patients were randomized (mean age, 65 years; 62.5% women); 287 completed the trial (143 virtual, 144 usual care). At 6 weeks, there was no difference between groups in pain, symptoms, quality of life, difficulty with daily activities, and with function needed for sports and recreation ($p>0.05$). Patients in the virtual exercise group reported a mean of 119.9 (SD 197.4) min/week of MVPA at 6 weeks compared with 68.9 (SD 112.0) min/week for usual care patients ($p=0.089$). At 12 weeks, physical activity, pain, symptoms, quality of life and daily activities were not significantly different between groups but

patients in the virtual exercise group reported less difficulty with function related to sports and recreation than usual care patients (intervention 75.6 [SD 19.2] vs usual care 61.5 [28.3], $p=0.006$). Patients in the virtual exercise group reported high likelihood of recommending the program to others (mean score 9.1 ± 2.1) on a scale of 0-10.

CONCLUSIONS: Among patients receiving TKA, the virtual exercise program increased MVPA in the first 6-weeks after surgery and resulted in measurable gains to physical function for sports and recreation activities at 12-weeks.

F-67 Basic Science World Congress/Poster - Sleep and Cardiometabolic Effect

Friday, May 31, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

3194 Board #240 May 31 3:30 PM - 5:00 PM Impact Of Anxiety-state On Moderate Continuous And 3-km Time-trial Exercise After 36h Of Sleep Deprivation

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Several evidences suggest that aerobic exercise performance decrease after sleep deprivation (SD) and psychobiology aspects could explain these effects, however, the role of anxiety on this way is poorer explored. **Purpose:** Investigate the role of anxiety-state on moderate continuous and 3-km time-trial exercise in subjects sleep deprived. **Methods:** Eleven healthy male subjects (32.72 ± 6.73 yrs; 70.93 ± 7.79 kg; 1.74 ± 0.05 m; 23.37 ± 2.74 kg/m²), were submitted to 30 min of moderate continuous exercise followed a 3-km Time-Trial test in treadmill in two conditions separated by 15 days: Normal Sleep (7-8 hours of sleep) and SD (36 consecutive hours). The subjects answered an anxiety state questionnaire (Idate Trait-State) before (B), immediately after aerobic moderate continuous exercise (AM), immediately after 3-Km time-trial (AT-T) and 30 minutes recovery (R). The time to finish the time-trial was used as performance index, and the time to partial distances was accompanied to observed strategy performance. The time-course and groups differences were compared by ANOVA repeated measures with post-hoc Duncan test, with significance $P \leq 0.05$. The protocol was approved by Unifesp Ethics Committed (#2.00.369). **Results:** The mean score of anxiety were higher in SD condition in B (34.9 vs 38.18 ; $P=0.03$), AM (31.8 vs 38.6 ; $P=0.006$) and R (30.90 vs 37.23 ; $P=0.01$) time-courses. No differences were found in the total and partial time to complete the 3-km test. The initial velocity of the time-trial test was higher in the normal sleep condition (15.45 vs 13.95 ; $p=0.005$). **Conclusion:** We observe that although the SD is not able to affect the total time to complete the 3-Km test, the score of anxiety in different time-courses (before, during and after exercise) was higher in the SD condition. In addition, the strategy used were different, demonstrated by the lower initial velocity chosen by the volunteers sleep deprived. These findings suggest that the level of anxiety associated with SD can alter strategies by underestimating the performance.

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3195 Board #241 May 31 3:30 PM - 5:00 PM Effects Of Bariatric Surgery On Cardiac Autonomic Parameters During Sleep

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PURPOSE: To analyze the effects of bariatric surgery on cardiac autonomic modulation in morbid obese patients. **METHODS:** The study included 14 morbid obese patients that were submitted to bariatric surgery. Before and after surgery subjects were submitted to body mass index (BMI) assessment, answered, and were submitted to polysomnography. During polysomnography, AHI and cardiac autonomic modulation were assessed during sleep. **RESULTS:** After surgery BMI and AHI reduced significantly ($p < 0.05$) from 48.7 ± 5.6 kg/m² to 41.9 ± 5.7 kg/m² and from 34 ± 29 events/h to 18 ± 16 events/h, respectively. Standard deviation were used as a measure of variability in pre and postoperative period and values were calculated with pre 829.20 ± 82.84 and post 972.24 ± 146.20 with $p \leq 0.001$ demonstrating gains in HRV in all patients. [1] Additional information with the application of the spectral wavelet analysis in the frequency decomposition provided values pre 2.8775×10^5 and post 2.3440×10^5 ($p < 0.05$). **CONCLUSIONS:** Morbid obese submitted to bariatric surgery presents improvement in cardiac autonomic modulation during sleep.

3196 Board #242 May 31 3:30 PM - 5:00 PM Oxygen Desaturation in Sleep Apnea is Inversely Associated with Vascular Changes Following Exercise Training

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PURPOSE: Obstructive sleep apnea (OSA) is characterized by reductions in nocturnal mean O₂ saturation (meanSpO₂) that may increase cardiovascular disease morbidity. The extent to which exercise confers cardioprotection in overweight adults with different meanSpO₂ profiles is not known. The purpose of this study was to examine the association of meanSpO₂ with vascular function changes following exercise training in adults with and without OSA. **METHODS:** At baseline, participants underwent overnight polysomnography to determine the presence and severity of OSA. Tertile-based cut-off points were used to categorize meanSpO₂ and apnea hypopnea index (AHI). Body fat was analyzed using dual energy X-ray absorptiometry. Vasoreactivity of the brachial artery was measured using flow-mediated dilation (FMD), while microcirculatory function was assessed via the total shear stress area under the curve (SSAUC) response during FMD. Body fat and vascular measures were repeated upon completion of a 6 week (3 sessions/wk; 1 hr/session) exercise training program. **RESULTS:** Thirty (age: 49 ± 9 years; BMI: 32.0 ± 3.8 kg/m²; 18 men: 12 women) adults with and without OSA completed the study. At baseline, adults in the highest tertile of meanSpO₂ were younger than those in the lowest tertile (43 ± 9 yrs vs. 53 ± 7 yrs, $p=0.017$), yet no differences in vascular measures, AHI or total body fat percentage were observed across the tertiles. No changes in brachial artery diameter or FMD were observed across tertiles following exercise. However, the change in SSAUC in the highest tertile of meanSpO₂ was greater, compared to the lowest tertile ($13,636 \pm 15,898$ A.U. vs. $-186 \pm 10,879$ A.U., $p=0.041$). Forward stepwise linear regression revealed that the highest tertile of meanSpO₂ was a significant ($F=5.15$, $p=0.036$) determinant of the increased SSAUC with exercise, independent of age and baseline SSAUC. **CONCLUSIONS:** Severe oxygen desaturation during sleep was inversely associated with improvements in microcirculatory function following exercise training.

3197 Board #243 May 31 3:30 PM - 5:00 PM Shorter Sleep Duration Is Associated With Increased Sedentary Duration In Lean, But Not Overweight Or Obese, Individuals

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PURPOSE: Sedentary behavior and insufficient sleep both can independently increase the risk for chronic diseases such as obesity and cardiovascular disease. However, whether or not prior nocturnal sleep duration influences daytime sedentary behavior is not well understood. We hypothesized that total sleep duration at night will be inversely associated with the subsequent day's total sedentary time. We also explored if this relationship is different in lean compared to non-lean individuals. **METHODS:** 27 adults (10 lean, 50 ± 2 years) chose a self-selected 8-h sleep opportunity for 5-14 days ($\mu = 11$). Adherence to the self-selected sleep period was verified using a sleep diary and phone calls to a time stamped mailbox at bedtime and upon awakening. Sleep duration was manually scored from wrist actigraphy (wGT3X-BT); and activity levels and sedentary duration were scored using 'Freudon Adult' algorithm'. To test whether total sleep duration (TSD) influenced subsequent sedentary duration (SD), a mixed model analysis was conducted with TSD as the independent variable, and subject as random factor. We further tested the associations between TSD and SD separately in lean and non-lean individuals. Finally, independent sample t-tests were used to determine whether TSD and SD differed between lean and non-lean individuals. **RESULTS:** TSD was negatively associated with the subsequent day's SD [$F(1, 289) = 4.8$; $p=0.03$]. SD was significantly higher in non-lean as compared to lean individuals [mean 386 minutes vs 302 minutes per day; $t(25) = 2.9$; $p = 0.02$]. TSD was not different between groups; $p = 0.64$. When lean and non-lean groups were analyzed separately, there was a significant inverse relationship between TSD and subsequent ST in lean [$F(1, 117) = 9.69$, $p = 0.002$] but not in non-lean individuals ($p > 0.05$). **CONCLUSIONS:** We discovered that shorter sleep duration during an 8h scheduled sleep opportunity is associated with increased SD during the subsequent day. This relationship was only found in lean individuals, possibly due to the higher ST in non-lean compared to lean individuals. Experimental studies investigating the bidirectional effects of sedentary behavior and sleep and the subsequent effect on cardiometabolic physiology are recommended to better understand the effect of these behaviors on the risk for chronic disease.

3198 Board #244 May 31 3:30 PM - 5:00 PM
Associations Of Sleep Metrics, Body Composition, And Cardiorespiratory Fitness In Older Women

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Sleep duration and quality have been associated with obesity risk. Most previous studies used body mass index (BMI) as a proxy of obesity and subjectively evaluated sleep. Older adults often suffer from poor sleep quality, high body fat, and low cardiorespiratory fitness (CRF), especially women after menopause. **PURPOSE:** To investigate if sleep duration and quality are associated with BMI, body composition, and CRF in older women. **METHODS:** Older women (n= 115; age: 65.61±4.32) wore an actigraph monitor for 7 days to measure sleep metrics. Total sleep time and sleep quality, which included wake after sleep onset, activity counts during sleep, sleep onset latency, and number of awakenings, were determined using manufacturer provided software. BMI was calculated, and a dual x-ray absorptiometry scan was performed to assess body composition. A graded exercise test was used to measure CRF. Data was collected in two locations (n=89 and 26, respectively). Pearson product correlations were used to determine associations and study location was controlled for. **RESULTS:** Total sleep time negatively associated with lean mass and fat free mass (r= -0.28, p=0.012; r= -0.28, p=0.012), but positively associated with percent body fat (r=0.26, p=0.025). There were no associations between sleep metrics and CRF. **CONCLUSIONS:** Our data indicates longer total sleep time was associated with less lean mass but greater body fat in older women. This suggests in older women longer total sleep time may be linked with less physical function and worse health condition. Further examination of the association between sleep with physical function and biomarkers in this population is recommended.

3199 Board #245 May 31 3:30 PM - 5:00 PM
Sleep Restriction during 8-Week Calorie Restriction on Physical Activity and Lipoprotein Particle Concentrations and Sizes

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Overweight and obesity and having an abnormal lipoprotein profile are associated with increased risk of cardiovascular disease (CVD). Increased sedentary time, decreased physical activity (PA), and restricted sleep are risk factors for obesity and CVD. Calorie restriction is often used to induce weight loss. However, little information exists concerning how caloric restriction, sleep restriction, and PA interact, and their overall impact on CVD risk.

PURPOSE: To examine changes in body weight, PA, and lipoprotein particle concentrations and sizes following caloric restriction (CR) and sleep restriction (SR) intervention (CR+SR) compared to CR alone in overweight or obese adults.

METHODS: 28 adults (age=44.5±5.8 years) were randomized into an 8-week CR or CR+SR group. Both groups consumed a diet equivalent to 95% of the individual's resting metabolic rate. Participants in the CR+SR were instructed to restrict time-in-bed up to 90 minutes 5 days per week. Sedentary and PA time was measured utilizing a Sensewear Mini Armband. Fasting serum samples were collected for analysis of lipoprotein particle concentrations and sizes by nuclear magnetic resonance spectroscopy. Repeated measure analyses included a group×time interaction to compare changes in weight, sedentary and PA time, and lipoprotein particle concentrations and sizes between groups.

RESULTS: Body weight significantly decreased in both groups with no difference between groups (p=0.748; weight loss: 2.5±0.2 kg in CR and 2.2±0.5 kg in CR+SR). A significant difference in the change in total PA time between CR and CR+SR (p=0.044) was found. Total PA time significantly increased in CR (256.7±87.6 to 320.1±122.7 minutes, p=0.025) only. No differences in the changes in lipoprotein particle concentrations or sizes between CR and CR+SR were found. Large HDL particle concentration decreased in the entire sample (7.5±3.4 to 6.6±3.4 μmol/L, p=0.004). **CONCLUSIONS:** The CR+SR did not result in increased PA as in the CR; however, weight loss and lipoprotein particle concentration or size changes for the two groups were similar. These results suggest that moderate SR on 5 days a week may not significantly alter lipoprotein metabolism during weight loss, which may partly be due to compensated sleep on the other 2 days of the week. Supported by AHA Grant 14BGIA20380706

3200 Board #246 May 31 3:30 PM - 5:00 PM
Relationships Among BMI, Estradiol, And Sleep-wake Behavior In Women

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PURPOSE: It has been estimated that women are at 40% increased risk for developing clinically significant sleep disturbances (such as insomnia) compared to men. Reproductive-related hormones, such as estradiol (E2), have been shown to play a key role in sleep-wake behavior in women, and pharmacological interventions which target the regulation of E2 have been shown to improve sleep in women. Importantly, body mass index (BMI) has been shown to be inversely associated with E2 levels in premenopausal women, and previous studies have also suggested that women who are overweight or obese are significantly more likely to report clinically-significant sleep disturbances. Thus, this study aimed to examine associations between BMI, E2, and sleep disturbances in premenopausal women in order to identify a non-pharmacological, physical activity (PA) related modifiable target for the prevention of clinically significant sleep problems in women. **METHODS:** Following a two-tiered screening process, 28 healthy women (18-45y, mean age: 24.6y) who were medication-free and had regular menstrual cycles completed: (1) enrollment visit, (including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) saliva collection for the assessment of salivary E2 levels. Saliva collection occurred during the follicular phase of the menstrual cycle to control for ovarian cycle E2 fluctuations. **RESULTS:** Higher BMI was significantly associated with lower E2 levels (r = -.38, p = 0.04), and also longer objectively-measured sleep onset latency (SOL) duration (r = .51, p = 0.004). Consequently, lower E2 levels were significantly associated with increased objectively-measured wake after sleep onset (WASO) duration (r = -.43, p = 0.03) and increased number of awakenings during the sleep period (r = -.48, p = 0.01). **CONCLUSIONS:** Results suggest that, in premenopausal women, higher BMI may be associated with increased sleep disturbances, and that this relationship may be mediated by E2 levels. It is therefore possible that regular PA, which has been shown to be inversely associated with BMI, may improve sleep via its positive effects on adiposity and associated regulation of E2.

3201 Board #247 May 31 3:30 PM - 5:00 PM
Associations Among Sedentary Time, Feeding Duration, And Sleep Duration In Adults With Overweight And Obesity

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PURPOSE: Reducing daily sedentary time, decreasing daily feeding duration, and increasing total sleep duration are important lifestyle targets for improving the metabolic health of adults undergoing weight loss. However, objective methods for simultaneous measurement of sedentary time, meal timing, and sleep in free-living adults are lacking and it is unclear how these variables are related in overweight adults or change in response to weight loss.

METHODS: Thirty-two overweight and obese adults were recruited to participate in an ongoing weight loss study (90% female, Age= 36.4±6.4 yr, BMI= 33.4±5.5 kg/m²). Participants simultaneously wore an activPAL accelerometer on the thigh and an Actiwatch on the non-dominant wrist for 7 days in a free-living environment to assess waking sedentary behavior and nighttime sleep, respectively. A cell phone application (MealLogger) was used to photograph and timestamp all caloric events during the 7-day period to determine daily feeding duration which was verified using a continuous glucose monitor. Assessments were performed at baseline and will be repeated at 12 weeks following completion of the weight loss intervention. Correlation analyses were performed on baseline data to determine associations among sitting time during waking hours, daily feeding duration, sleep duration, and sleep timing.

RESULTS: On average participants were sedentary for 67.5±8.5 % of waking hours, consumed energy over 11.0±1.9 hours during the day and slept for 7.2±0.7 hours at night. Sedentary time (as a percent of the waking day) was negatively correlated with sleep duration (Spearman rho=-0.48, P=0.006) but was not related to later sleep timing (sleep midpoint), longer feeding duration, or timing of the last meal.

CONCLUSIONS: Using a novel set of methods, we show that higher levels of sedentary time during waking hours are associated with shorter total sleep duration in adults beginning a weight loss intervention, however cause and effect cannot be

established in this analysis. Our future studies are aimed at understanding whether reducing sedentary time leads to increased sleep duration (or vice versa) and measuring how sleep, activity, and meal timing change with weight loss.