C-07 Theme Poster - Aging, Mobility, and Neurobiology

Thursday, May 28, 2020, 9:30 AM - 11:30 AM
Room: CC-2000

1293 Chair: Todd Manini, FACSM. University of Florida, Gainesville, FL.
(No relevant relationships reported)

1294 Board #1 May 28 9:30 AM - 11:30 AM
EARLY AND LATE RAPID NEUROMUSCULAR PARAMETERS OF THE PLANTAR FLEXORS IN MIDDLE-AGED AND OLDER MALES

Benjamin E. Dalton, Alex A. Olmos, Matthew T. Stratton, Phuong L. Ha, Trisha A. VanDusseldorp, Alyssa R. Bailly, Yuri Feito, FACSM, Gerald T. Mangine, Tyler M. Smith, Garrett M. Hester. Kennesaw State University, Kennesaw, GA. (Sponsor: Dr. Yuri Feito, FACSM) (No relevant relationships reported)

Rapid torque production is important for physical function in older adults. Early and late rapid torque parameters are influenced by different physiological factors; therefore, they may be differentially affected by aging. Few comparisons exist between middle-aged and older adults for early and late rapid torque measures.

PURPOSE: To compare early and late rapid torque measures of the plantar flexors (PFs) in middle-aged (MM) and older males (OM).

METHODS: Twenty-nine MM (n=14; 45.3±2.6 yrs) and OM (n=15; 65.3±3.2 yrs) performed maximal voluntary isometric contractions of the PFs using a dynamometer. Peak torque (PT), as well as rate of torque development (RTD, Δtorque/Δtime) and impulse (area under the curve) during the early (0-50 ms; RTD_0_50, IMP_0_50) and late (100-200 ms; RTD_100_200, IMP_100_200) contraction phases were calculated. Torque at 50 (TTQ_50), 100 (TTQ_100), and 200 ms (TTQ_200) was also obtained. Additionally, RTD and TQ variables were normalized to PT. The onset was 2.5 Nm for all torque variables. Electromyography of the medial gastrocnemius was recorded in order to obtain rate of electromyography rise (RER). RER was calculated as the linear slope of the normalized electromyography signal at 30, 50, and 75 ms from the onset. Independent samples t-tests were used for group comparisons.

RESULTS: PT (p=0.05), early (p=0.16), and late (p=0.074) RTD were similar between groups. TTQ_50 (MM=69.7±11.68 vs. OM=55.9±18.54 Nm s⁻¹; p=0.046), TTQ_100 (MM=114.76±26.79 vs. OM=91.56±28.10 Nm s⁻¹; p=0.031), and IMP_100_200 (MM=4.79±1.11 vs. OM=3.83±1.17 Nm s⁻¹; p=0.032) were lower in OM. Normalized torque variables showed no differences (p>0.05). RER (p=0.037-0.072) was similar between groups.

CONCLUSIONS: Our data indicates that late rapid torque parameters of the PFs were preferentially influenced by age, yet PT appeared to mediate this result. Although not significant, the effect sizes for RER (d=0.69-0.74) may suggest that rapid muscle activation was influential as well.
### 1297  Board #4  May 28 9:30 AM - 11:30 AM
**Aerobic Exercise Protects Against Age-Related Cognitive Decline In A Population At Risk For Alzheimer’s Disease**

Ryan J. Dougherty, Clayton Vesperman, Brandon Mergen, Julian Gattán, Sarah Lose, Sterling Johnson, Ozioma Okonkwo, Dane B. Cook, FACSM. *University of Wisconsin - Madison, Madison, WI.* (Sponsor: Dane B. Cook, FACSM)

Email: rjdougherty@wisc.edu

(No relevant relationships reported)

**PURPOSE:** To determine whether mid-late life aerobic fitness prospectively predicts longitudinal cognitive trajectories in a sample of cognitively unimpaired older adults at risk for Alzheimer’s disease.

**METHODS:** One hundred and four adults (mean age at baseline 64.47 ± 6.1) from the Wisconsin Registry for Alzheimer’s Prevention underwent a graded treadmill exercise test and neurocognitive examinations at baseline assessment. Two additional biennial neurocognitive examinations were conducted between 3.54 ± 0.96 and 4.00 ± 0.41 years after baseline testing (follow-up range: 1.54 ± 4.80 years). Aerobic fitness was defined as the highest oxygen consumption (VO_{2max} mL/kg/min) value recorded during the final stage of the maximal exercise test when standardization criteria were met. The cognitive measure of interest was the preclinical Alzheimer’s cognitive composite (PACC) score which includes neurocognitive measures that have demonstrated to be sensitive to early age-related decline in preclinical Alzheimer’s disease, i.e., measures from the Rey Auditory Verbal Learning Test and the Wechsler Intelligence and Memory Scales. A linear mixed effects model was used to investigate whether longitudinal trajectories of cognition varied as a function of fitness while controlling for the variance explained by age, sex, and education.

**RESULTS:** On average, participants displayed a VO_{2max} of 26.57 ± 6.40 mL/kg/min. At baseline, age was negatively associated with fitness (r = -0.43, p < .001) and cognitive function (r = -0.27, p = .007). Longitudinal analysis revealed a significant time × VO_{2max} interaction (p = .032), indicating that greater aerobic fitness mitigated cognitive decline over a 2-4 year period.

**CONCLUSIONS:** Cognitive function declines with age and the progression of Alzheimer’s disease. These data indicate that aerobic fitness may preserve cognition in older adulthood, and suggest that engagement in activities aimed at improving fitness (e.g., exercise training) may mitigate age-related cognitive decline. Future studies that assess changes in fitness will be needed to better elucidate the causality of the observed relationship.

Ryan J. Dougherty was supported by a NIH NRSA grant: F31AG062009

### 1298  Board #5  May 28 9:30 AM - 11:30 AM
**Hippocampal Plasticity After Acute Exercise In Older Adults: A Diffusion Tensor Imaging Study**

Daniel Callow, Junyeon Won, Alfonso Alfiniti, Jeremy Purcell, Lauren Weiss, Wang Zhan, J. Carson Smith, FACSM. *University of Maryland, College Park, MD.*

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(No relevant relationships reported)

**PURPOSE:** The hippocampus is a critical region for many cognitive and memory processes that experience structural and functional decline with age. Exercise is beneficial for the aging brain and shows preferential benefits for hippocampal volume, activation, and memory-related cognitive processes. However, research thus far has primarily focused on the effects of exercise on long-term volumetric changes in the hippocampus using structural MRI. Critically, microstructural alterations within the hippocampus over short time intervals have been associated with neuroplasticity and cognitive changes that do not alter its volume but are still functionally relevant. It is not yet known, however, if microstructural neuroplasticity occurs in the hippocampus in response to a single session of exercise.

**METHODS:** We used a within-subject design to determine if a 30-minute bout of moderate-intensity aerobic exercise altered bilateral hippocampal diffusion tensor imaging (DTI) measures in healthy older adults (n=30) compared to a seated rest control condition.

**RESULTS:** Following exercise there was significantly lower fractional anisotropy (FA) relative to seated rest within the bilateral hippocampus, and this effect was driven by higher radial diffusivity (D_r). No significant differences in mean diffusivity (MD) or axial diffusivity (D_a) were observed. Additionally, cerebral blood flow (CBF) data were obtained in a subset of participants (n=13). Differences in D_r within the bilateral hippocampus were significantly associated with differences in bilateral hippocampal perfusion.

**CONCLUSIONS:** These findings suggest that a single session of exercise can lead to microstructural changes in the hippocampus of healthy older adults, and that these differences may be associated with changes in the extracellular space and glial, synaptic, and dendritic processes within the hippocampus. Repeated microstructural alterations from acute bouts of exercise may accumulate and precede larger volumetric and functional improvements in the hippocampus, a region that is often susceptible to age and pathological-related cognitive decline.

### 1299  Board #6  May 28 9:30 AM - 11:30 AM
**Late-life Physical Exercise, Cognition and Incidence of Incident Mild Cognitive Impairment**

Janina Krell-Roesch1, Jeremy A. Syrjanen2, Maria Vassilaki2, Alexander Woll1, Walter K. Kremers2, Mary M. Machulda2, Michelle M. Mielke3, David S. Knopman4, Ronald C. Petersen3, Yonas E. Geda4,5. *Karlsruhe Institute of Technology, Karlsruhe, Germany; 1Mayo Clinic, Rochester, MN; 2Mayo Clinic, Scottsdale, AZ.*

(No relevant relationships reported)

**PURPOSE:** Mild cognitive impairment (MCI) is the intermediate stage between normal cognitive aging and dementia. We examined the association between lack of engaging in physical exercise (PE) and presence of neuropsychiatric symptoms (NPS), both separately and combined, with the outcome of incident MCI.

**METHODS:** This prospective cohort study in the setting of the population-based Mayo Clinic Study of Aging in Olmsted County, MN, included 2306 cognitively unimpaired persons aged ≥ 50 years (1629 males; 835 APOE e4 carriers; 74 years median age). The outcome of interest in the Cox proportional hazard models was incident MCI, with age as the time scale. Predictors were lack of engaging in light, moderate and vigorous intensity PE within one year of baseline assessment; and presence of NPS (apathy, anxiety, apathy, appetite change, nighttime behavior, depression, and irritability) as measured by the Neuropsychiatric Inventory Questionnaire. We also compared the risk of incident MCI between four groups of participants: no NPS/ engaging in PE (reference group); NPS/ engaging in PE; no NPS/ not engaging in PE; and NPS/ not engaging in PE. Analyses were adjusted for sex, education, global cognition, medical comorbidities, and Apolipoprotein E (APOE) e4 status.

**RESULTS:** After a median follow-up of 5.3 years, 599 participants developed incident MCI. Individuals who did not engage in light (HR [95% CI]; 1.25 [1.00, 1.55]), moderate (1.19 [1.00, 1.41]) or vigorous intensity PE (1.36 [1.01, 1.83]) had an increased risk of incident MCI. Having anxiety (1.60 [1.09, 2.33]), apathy (1.91 [1.39, 2.62]) or depression (1.66 [1.30, 2.12]) was also associated with an increased risk of incident MCI. Participants who did not engage in PE (be it of light, moderate or vigorous intensity) in the presence of NPS had the highest risk of incident MCI. For example, not engaging in moderate intensity PE and having anxiety (1.94 [1.20, 3.15]), apathy (2.04 [1.34, 3.13]) or depression (1.93 [1.41, 2.66]) was associated with an increased risk of incident MCI as compared to the reference group.

**CONCLUSIONS:** Lack of engaging in late-life PE and NPS are independent risk factors of incident MCI. A combination of both factors is associated with an even more elevated risk of developing MCI, with NPS appearing to be a stronger driving force than lack of PE.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

THURSDAY, MAY 28, 2020

beetroot juice can increase salivary-pH. Therefore, the purpose of this investigation was to examine the effects of dietary inorganic nitrate supplementation on V̇\(_{\text{AT}}\) in patients with HF/EF.

METHODS: Sixteen patients with HF/EF (15 men, 63 ± 4 y, BMI: 31.8 ± 2.1 kg·m\(^{-2}\)) were randomized, double-blind, crossover design study. Participants consumed either beetroot juice (BRJ - 16mmol nitrate/day), or a nitrate-depleted placebo (PL) for five days prior to completing a cardiopulmonary exercise test (CPX).

RESULTS: Following BRJ supplementation plasma nitrite increased significantly compared to placebo (515.6 ± 461.0 mmol·l\(^{-1}\) vs. 195.0 ± 176.8 mmol·l\(^{-1}\); p=0.05). No differences were observed for the onset of VT (BRJ: 611.0 ± 119.7s, PL: 611.0 ± 142.3s; p=0.9) or V̇\(_{\text{AT}}\) (BRJ: 1159.7 ± 207.3ml·min\(^{-1}\) vs. 1132.4 ± 221.0ml·min\(^{-1}\); p=0.53).

CONCLUSIONS: Dietary nitrate supplementation, despite significant increase in circulating nitrate, produced no changes time to anaerobic threshold or sustainable sub-maximal oxygen uptake. Supported by Australian Heart Foundation Vanguard Award 103189 to Jason D. Allen

Board #3

May 28 9:30 AM - 11:30 AM

Nitrate-rich Beetroot Juice Offsets Salivary Acidity Following Carbohydrate Ingestion Before And After Endurance Exercise

Mia C. Burleigh, Nicholas Sculthorpe, Fiona L. Henriquez, Chris Easton. University of the West of Scotland, United Kingdom. (Sponsor: Jason David Allen, FACSM)

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(No relevant relationships reported)

Oral disease is prevalent in elite athletes and is associated with frequent carbohydrate ingestion which lowers salivary-pH. Conversely, ingestion of nitrate (NO\(_3\)-)-rich beetroot juice can increase salivary-pH. Purpose To determine the effect of nitrate (NO\(_3\)-) on salivary-pH following carbohydrate ingestion before and after exercise. Methods Eleven male endurance runners completed a double-blind randomised placebo-controlled study comprising four experimental trials. Participants ingested the following fluids one hour before each trial: (a) 140 ml of water (negative-control), (b) 140 ml of water (positive-control), (c) 140 ml of NO\(_3\)-rich beetroot juice (BRJ - 16mmol nitrate/day), (d) water (negative-control). During the negative-control trial, participants ingested 795 ml of water in three equal aliquots: before, during, and after 90 min of submaximal running. In the other trials they received 795 ml of carbohydrate supplements in the same fashion. One venous blood was collected before and after exercise. At the same time points, saliva was sampled before and repeatedly for 20 min following carbohydrate or water ingestion, area under the curve (AUC) was calculated. As expected, nitrate and NO\(_2\)- were highest in the NO\(_3\)-trial (all P<0.001). Salivary-pH followed a similar pattern (NO\(_3\)-trial - Pre-exercise 7.4 ± 0.4 Post-exercise 7.4 ± 0.4, negative-control - Pre-exercise 7.1 ± 0.3 Post-exercise 7.5 ± 0.2, placebo - Pre-exercise 7.3 ± 0.3 Post-exercise 7.2 ± 0.7, both P<0.05). Compared to negative-control, salivary-pH AUC was significantly reduced following carbohydrate in positive-control and placebo (Pre-exercise - positive-control 33 ± 2.9, placebo 33.2 ± 2.7, negative-control 36.3 ± 1.8. Post-exercise – positive-control 32.1 ± 3, placebo 32.7 ± 2.4, negative-control 36.2 ± 1.9, all P<0.05). Conversely, AUC was similar in negative-control and NO\(_3\)- despite ingestion of carbohydrate in the NO\(_3\)-trial (Pre-exercise 3.48 ± 2.5, Post-exercise 3.45 ± 2.5, both P=0.221). Conclusion Ingesting NO\(_3\)- rich beetroot juice attenuates the reduction in salivary-pH after carbohydrate supplements suggesting that NO\(_3\)- may protect athletes’ teeth from acid erosion caused by frequent carbohydrate ingestion.

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San Francisco, California

ACSM May 26 – May 30, 2020

1305 Board #5

May 28 9:30 AM - 11:30 AM

Twelve Weeks Of Nitrate, Beta-alanine, Or Combined Treatment In NCAA Division III Male Soccer Players

Javier Zaragoza1, Stacie Urbina2, Brian Brabham3, Camille Rey1, Vince Krepski3. University of Mary Hardin-Baylor, Belton, TX. 1Omnit Labs, Austin, TX. (Sponsor: Lemuel Taylor, FACSM)

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(No relevant relationships reported)

In a sport of long duration, such as soccer, with many high-intensity bouts interspersed within the match, enhancing performance to last the duration of the match and maintain high levels of intensity throughout. Thus, with provision of physical preparation, supplements such as beta-alanine (due to its intracellular buffering capacity) and nitrate (due to its vasodilatory and ergogenic effects in endurance exercise) may have value in this population.

Purpose: The purpose of this investigation was to examine the effects of chronic supplementation with nitrate, beta-alanine, or combined treatment in NCAA Division III male soccer players.

Methods: Twenty-two NCAA Division III male soccer players (age: 19 ± 1.1yrs; mass: 74.8 ± 8.0kg; body fat: 13.6 ± 4.0%) were randomly assigned into one of four treatments: (1) Nitrate (NO3-, 1.3g·day\(^{-1}\)) plus Beta-alanine (0.3g·day\(^{-1}\)), (2) Nitrate (NO3-, 1.3g·day\(^{-1}\)), (3) Beta-alanine (0.3g·day\(^{-1}\)), and (4) Control. The intervention period lasted 12 weeks with an initial 7-day washout period. Participants completed three 90-minute competition matches per week during the intervention period. Before each match, participants ingested their assigned supplement in a double-blind manner 60 minutes prior to kick-off. At the conclusion of the intervention period, participants underwent a maximum effort cycle ergometer (CE) test to exhaustion. Results: Both plasma NO3-, NO2- and NOx concentrations were significantly higher in the Nitrate (NO3-) plus Beta-alanine group compared to all other groups. No differences were observed between the Nitrate (NO3-) and Beta-alanine groups. Conclusion: Nitrate (NO3-) and Beta-alanine supplementation may have value in enhancing performance in NCAA Division III male soccer players.
Dietary nitrate (NO\textsubscript{3}) supplementation can improve exercise performance with this effect mediated by reduction of NO\textsubscript{2} to nitrite (NO\textsubscript{2}•) and then nitric oxide. The reduction of NO\textsubscript{2} to NO\textsubscript{2}• is catalyzed by oral NO\textsubscript{2}•, reducing bacteria. Chlorine is an antimicrobial agent that is commonly used to sterilize pool water, but it is presently unclear whether the lack of an improvement in swimming performance in trained swimmers following dietary NO\textsubscript{3}• supplementation can be ascribed to impaired oral NO\textsubscript{2}• reduction (ONR).

**PURPOSE:** To test the hypotheses that ONR would be greater: (1) in non-swimmers (NS) compared to elite swimmers (ES), and (2) before compared to after a pool training session in ES.

**METHODS:** Thirteen ES (8 males, 21 ± 2 yrs) and fourteen NS controls (9 males, 25 ± 4 yrs) participated in this study. In a randomized, double blind, crossover experimental design, ONR was assessed in ES before (AM-Pre and PM-Pre) and after (AM-Post and PM-Post) a morning and afternoon pool training session. In NS, ONR was only assessed in the morning. For assessment of residual oral NO\textsubscript{2}• concentration ([NO\textsubscript{2}•]), participants held 10 mL of water in their mouth for 3 min and subsequently expectorated the content of their oral cavity. Following a 3 min recovery, participants repeated this process with either 10 mL of water (PL) or 1 mM KNO\textsubscript{3} solution (NIT). Salivary [NO\textsubscript{2}•] was assessed using ozone-based chemiluminescence. In ES, ONR was assessed via a 2 × 2 repeated-measures ANOVA, while differences in ONR between ES and NS was assessed using an independent-samples t-test.

**RESULTS:** There was no significant difference in ONR between ES (10.0 ± 0.7 µmol·min\textsuperscript{-1}) and NS (10.2 ± 0.13 µmol·min\textsuperscript{-1}, P=0.05). There was a condition × time interaction effect for ONR in ES (P=0.05). Compared to PL, ONR in NIT was higher AM-Pre, AM-Post, PM-Pre and PM-Post (P=0.05); however, ONR in NIT was not different between the AM-Post (0.12 ± 0.11 µmol·min\textsuperscript{-1}) and AM-Pre (0.10 ± 0.07 µmol·min\textsuperscript{-1}) or PM-Post (0.17 ± 0.15 µmol·min\textsuperscript{-1}) and PM-Pre (0.16 ± 0.10 µmol·min\textsuperscript{-1}) conditions (P=0.05). Oral NO\textsubscript{3}•-reduction in NIT was higher in PM compared to AM-Pre (P=0.05).

**CONCLUSIONS:** Similar ONR was exhibited in ES and NS, and ONR was not acutely attenuated in ES following morning or afternoon pool training sessions. These observations suggest that exposure to chlorinated pool water does not interfere with ONR.

**PURPOSE:** In recent years, sports supplements have been of interest to athletes as a possible way to increase performance. Two supplements of high interest are beetroot (BR) and tart cherry (TC) juice. BR is known to have an ergogenic effect due to its high nitrate contents, helping to vasodilate blood vessels in times of low oxygen availability. TC is known for its anti-oxidative and anti-inflammatory properties, which is shown to benefit athletes as well. Therefore, this study aimed to investigate whether beetroot and tart cherry supplementation would improve repeated sprint performance in healthy individuals.

**METHODS:** Using a randomized cross-over, double-blind, placebo-controlled design, 12 healthy individuals (4 females and 8 males, 24.4 ± 2.7 years) were consumed BR, TC, and placebo capsules separately to determine the effects of these supplements on repeated sprint cycling performance. Participants completed a baseline sprint test, concluding a 5-minute warm-up, followed by six 10 second sprints (6x10) interspersed by a minute passive recovery. Participants received capsule contained 500mg of powder. In total, 2000mg of BR, TC, and placebo were separately consumed for four days prior to testing day. Peak power (W) and average power (W) were measured using Monark bike instrument data. Blood pressure was taken before and following the test. Lactate testing was done prior to the test, immediately after, as well as 10 minutes following the cycling sprint protocol.

**RESULTS:** Results showed that the average power was significantly higher in BR (491.5 ± 78 W) and TC (497 ± 82 W) against PL (477 ± 90 W), while no difference was found between BR and TC conditions. Furthermore, the lactate level at 10 minutes following the test was significantly lower in BR (10.3 ± 0.67 mmol/l) versus TC (11.08 ± 1.23 mmol/l) and PL (11.61 ± 1.12 mmol/l) conditions. There was no significant difference among TC, BR, and PL on peak power. CONCLUSIONS: Our results indicate that while BR and TC supplementation both improved performance at the 10-s repeated cycling sprint, this improvement was only accompanied by differences in lactate levels after the protocol in response to BR supplementation.

**Board #6 May 28 9:30 AM - 11:30 AM Influence Of Chlorinated Pool Water Exposure On Oral Nitrate Reduction In Healthy Adults**

Stephen J. Bailey, Loughborough University, Loughborough, United Kingdom.
Email: s.bailey2@lboro.ac.uk
(No relevant relationships reported)

**Board #7 May 28 9:30 AM - 11:30 AM Beetroot Supplementation Lowers Blood Pressure, But Does Not Improve Exercise Efficiency In Female Masters Swimmers**

Lisa Ferguson-Stiegall, FACSM, Owen Sloop, Alyssa Q. Eastman. Hamline University, St Paul, MN.
(No relevant relationships reported)
Yoga may elicit numerous benefits including weight loss. However, it is unclear if adults with obesity will lose more weight as frequency and amount of yoga increases within a behavioral weight loss intervention. **PURPOSE:** To compare the association between yoga participation and weight loss across two styles of yoga. **METHODS:** Fifty adults with obesity (BMI: 31.3±3.8 kg/m²; 45.8±9.5 years) participated in a 6-month group-based behavioral weight loss intervention. All participants were prescribed a calorie and fat-reduced diet (1200-1800 kcal/day, 20-30% fat intake). Randomization was to either a Restorative (RES) or Vinyasa (VIN) style of yoga, with one supervised session per week and 4 home-based sessions using videos developed and provided by the investigators on an electronic tablet. Yoga sessions increased from 20 to 40 to 60 minutes per session across the intervention. Weight was assessed at baseline and 6 months. Analysis of variance with repeated measures was used to assess weight loss. Linear regression analyzed the association between yoga participation with weight loss. **RESULTS:** Weight significantly and linearly related to weight loss in both RES and VIN styles ($\beta=0.088$, $p=0.018$; $\beta=0.089$, $p=0.001$, respectively). Total participation minutes in yoga was significantly and linearly related to weight loss in both RES and VIN styles ($\beta=0.002$, $p=0.034$; $\beta=0.003$, $p=0.001$, respectively). **CONCLUSIONS:** Findings indicate that the amount and frequency of participation in yoga is associated with weight loss within the context of a comprehensive behavioral intervention. Future study needs to examine strategies to enhance yoga participation in adults with overweight or obesity, and to understand the pathways by which yoga may influence body weight regulation.

**PURPOSE:** Reduced non-exercise physical activity (PA) may contribute to attenuated weight loss during behavioral interventions. Our objective was to compare PA and sedentary behavior (SB) before and after dietary restriction (DIET) versus aerobic exercise intervention (EX).

**METHODS:** Adults with overweight or obesity were randomized to undergo 12 weeks of DIET or EX, both aimed at 2000 kcal/week reduction in energy balance. Average steps and time spent sitting, standing, stepping, light activity, and moderate-to-vigorous activity (MVPA) were measured using ActiVital accelerometers at baseline and for approximately 7 days within the last 2 weeks of the intervention. PA and SB variables were assessed with and without removal of exercise sessions. Data were analyzed using mixed methods analysis of variance with time (baseline vs. follow-up) as the within-subjects factor and group (diet vs. exercise) as the between-subjects factor. In post-hoc analyses, dependent samples t-tests assessed changes within groups.

**RESULTS:** 26 individuals (n=15 DIET, n=11 EX) had valid accelerometry data at both time points (age: 36±8 years, body mass index: 30.3±3.0 kg/m², n=19 [73%] women). The DIET group trended towards greater weight loss (DIET -7.2±6.4 kg; EX: -3.5±6.3 kg, p=0.071). Without removing exercise sessions, MVPA increased within the EX group (baseline: 60±11, follow-up: 73±15 min, p=0.011), but not in the DIET group (baseline: 63±15, follow-up: 62±16 min, p=0.847). However, after removing exercise session data, no significant interactions, within-subject effects, or between-subject effects were observed for steps or time spent sitting, standing, stepping, light activity, or MVPA, **Table 1**.

**CONCLUSION:** PA and SB were not differentially affected by DIET and EX interventions, suggesting that these strategies may not result in compensatory reduction in PA.

Supported by the American Diabetes Association and NIH Grants: UL1 TR000154, T32 DK007658-29, K01 DK100445.
CONCLUSIONS

The desire to eat increased in both groups when compared with baseline, CG from 17 (10-25) mm at baseline to 70 (12-87) mm in Post-2h and to 47 (7-85) mm in Post-24h (Group: P=0.71, Time: P<0.01, GXT: P=0.06). Hunger feelings increased 2h and 24h-post HIIE compared between groups (OB: 234 ±90 kcal and CG: 254 ±72 kcal, P=0.8). No effect of HIIE: CG individuals achieved higher MVA (P<0.01) and VO2peak (P=0.04) than OBS.

RESULTS

Participants’ food intakes were measured using 24h dietary recalls at baseline and restriction (DIET) and aerobic exercise (EX) groups. Changes in non-exercise physical activity and sedentary behavior between dietary

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<tr>
<th>Measurement</th>
<th>Baseline</th>
<th>Follow-up</th>
<th>Change</th>
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<td>Within-group</td>
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<td>Steps, average number</td>
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<tr>
<td>DIET</td>
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<td>3936±854</td>
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<td>Sit, minutes</td>
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<td>DIET</td>
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<td>Stand, minutes</td>
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<td>Step, minutes</td>
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<td>DIET</td>
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<td>EX</td>
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PURPOSE: To determine if aerobic exercise (AEx) and resistance exercise (REx) differentially influence acute energy intake and appetite regulation. METHODS: Physically inactive adults with overweight/obesity (n=24, 53.1±7.3 years, BMI ≥25 kg/m²; 50% female) completed 2 conditions: 1) AEx (treadmill walking at 65-70% of age-predicted maximum heart rate for 45 minutes) and 2) REx (1-set to failure of 12 repetitions for each lower extremity exercise). All conditions were initiated in the postprandial state (35 minutes post breakfast). Appetite (visual analog scale for hunger, satiety and prospective food consumption [PFC]) and hormones (ghrelin, PYY, and GLP-1) were measured before consumption [PFC] and 2 hours after the standardized breakfast meal. Post exercise food cravings (following 90 min VAS and blood draw via food cravings Inventory [FCI] questionnaire) and ad libitum energy intake at the lunch meal were also measured. RESULTS: There was no difference in post-exercise ad libitum energy intake between conditions (AEx: 937±65 kcal vs. REx: 991±68 kcal). There were also no differences in post exercise food cravings, nor area under the curve (AUC) for hunger, satiety, or PFC. However, there was a trend for higher satiety scores 150 min post breakfast in the REx condition (AEx: 35±4 ±44 kcal vs. REx: 42±4 kcal, P=0.08). AUC for ghrelin (AEx: 143,952±7,464 pg/ml vs. REx: 130,737±4,928 pg/ml, P=0.002), PYY (AEx: 23,812±1,592 pg/ml vs. REx: 20,540±1,177 pg/ml, P=0.001), and GLP-1 (AEx: 1,615±110 pg/ml vs. REx: 1,314±93 pmol/L, P=0.001) were all greater in the AEx condition compared to REx. For ghrelin and PYY, the higher AUC for AEx was due to greater values for all of the post-exercise time points evaluated (all p<0.05). For GLP-1, the higher AUC for AEx was due to significantly higher levels at the 90 minute postprandial time point (p=0.001), and a trend for greater levels at the 120 minute time point (p=0.07). CONCLUSIONS: The data suggest that an acute bout of aerobic exercise appears to increase both ghrelin and PYY, two gastrointestinal gut peptides, as well as PYY and GLP-1, anorectic gut peptides, compared to an acute bout of resistance exercise. However, acute ad libitum energy intake was not different between conditions. Future work is needed to determine if exercise modality influences chronic energy intake and appetite regulation.
To determine the effects of high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) on energy compensation in response to 12-weeks of supervised aerobic exercise. After a 4 wk lead in period of 3x/wk of MICT, subjects (N = 24) were randomly assigned into: HIIT or MICT, for an additional 5 wks. HIIT included a 10x1 min protocol 3x/wk and MICT included 30 min of exercise 5x/wk. Subjects completed both stationary cycling and inclined treadmill exercise. 13 participants (1 M, 12 F) were randomized into the HIIT group (28.0 ± 9.7 yr; BMI = 23.9 ± 3.9 kg/m²; VO\textsubscript{2max} = 29.0 ± 6.0 ml/min/kg; VO\textsubscript{2max} = 29.0 ± 6.0 ml/kg/min). 11 participants (2 M, 9 F) were randomized into the MICT group (26.0 ± 6.9 yr; BMI = 27.4 ± 8.7 kg/m²; VO\textsubscript{2max} = 26.2 ± 7.3 ml/kg/min). Resting metabolic rate (RMR), body composition, and maximal oxygen uptake (VO\textsubscript{2max}) were measured at baseline and after 12 and 4 wks. Mean energy and macronutrient intake did not differ among all participants, by exercise intervention group, or by compensation status (P > 0.05). Both HIIT and MICT led to a similar percentage (~45%) of participants compensating for the exercise intervention. Despite the large difference in cumulative exercise training time (480 vs 1200 min, HIIT vs MICT), body fat and weight changes were similar between groups. Finally, our data suggests that HIIT may elicit weight loss that is close to that predicted by exercise energy expenditure when compared to MICT.
but less is known about age-related differences in ME during dynamic contractions. PURPOSE: To examine age-related differences in ME during maximal effort isometric, isotonic, and isokinetic contractions of the knee extensor muscles. We hypothesized that age-related differences in ME would be present only during dynamic contractions. METHODS: 10 young (Y; 27.5±1.2 yr, 6 men) and 10 older (O; 71±2.1±1.6, 5 men) healthy adults performed three 24-s bouts of maximal knee extensor contractions: 1) sustained isometric contraction (MVIC), 2) isokinetic contractions (120°·s−1, 0.5 Hz), and 3) isotonic contractions with a load of 20% MVIC (MVDC20%; 0.5Hz). Phosphorus magnetic resonance spectroscopy of the vastus lateralis was used to calculate ATP flux through the creatine kinase reaction, non-oxidative glycolysis, and oxidative phosphorylation. Quadriceps muscle contractile volume was measured using serial fat-water magnetic resonance images.

All spectroscopy and imaging data were acquired using a whole-body 3T magnetic resonance system. The torque-time integral (TTI) during the MVIC, and power-time integral (PTI) during MVDC20% and MVDC30%, were calculated. Total ATP flux was used to determine the ATP cost of each 24-s bout, and ME was calculated as specific TTI or PTI, divided by ATP cost. Differences between groups were evaluated using independent samples t-tests. RESULTS: ME was not different between young (0.12±0.01 Nm·cm·mM ATP−1) and older (0.11±0.01 Nm·cm·mM ATP−1; p=0.765) muscle during the MVIC. However, during both MVDC20% and MVDC30%, ME was greater in young than older muscle (MVDC20%: 0.011±0.001 vs. 0.007±0.001 W·s/cm3·mM ATP−1; p=0.002, respectively; and MVDC20%: 0.011±0.001 vs. 0.009±0.001 W·s/cm3·mM ATP−1; p=0.031, respectively). CONCLUSION: These results show an age-related deficit in ME that is evident only during dynamic contractions, potentially due to the higher energy demand of these contractions.

1321 Board #3
May 28 9:30 AM - 11:30 AM
Age-specific Resistance-type Exercise Training Improves Performance Without Altering Strain-injury Susceptibility
Brent A. Baker, Marshall A. Naimo, Erik P. Rader, James Ensey. CDC/NIOSH, Morgantown, WV. (Sponsor: Stephen E. Alway, PhD, FACSM)
Email: bwb3@cdc.gov
(No relevant relationships reported)

Purpose: Two tenets of exercise programming/training are injury prevention and performance enhancement. The purpose of this study was to determine whether a validated model of resistance-type exercise training (RTET) utilizing stretch-shortening contractions (SSCs) could alter susceptibility to the mechanical induction of skeletal muscle strain injury with aging. Methods: F344XBN rat dorsal flexor muscles were SSC RTET in vivo for 1 month on a custom-built isokinetic rod dynamometer utilizing age-specific RTET protocols. Performance for dorsiflexor muscles were analyzed temporally, and immediately following skeletal muscle strain injury. ANOVA was used for statistical analysis; n = 8 and p<0.05. Results: Rodents receiving no SSC RTET prior to injury had significantly (p<0.05) greater static (-48.6% and -54.5%) and dynamic (-40.9% and -49.8%, respectively) peak force deficits. Age-specific, SSC RTET improved muscle performance in young and old rodents by 15% and 18%, respectively (p<0.05). Interestingly, young and old rodents undergoing SSC RTET still incurred significant static (-48.8% and -55.7%, respectively) and dynamic (-47.5% and -48.7%, respectively) peak force deficits, which were similar deficits compared to untrained rodents. Conclusions: Although age-specific SSC RTET increases skeletal muscle adaptation, these results suggest that skeletal muscle strain induction susceptibility is unaltered following SSC RTET, irrespective of age.

1322 Board #4
May 28 9:30 AM - 11:30 AM
Impaired Recovery From Muscle Disuse In Early Life Compared To Young And Mature Adulthood
Emory Perlman¹, Abbas Doctor², Ziad Mahmassani², Alec McKenzie³, Jonathan Petrocelli², Naomi de Hart¹, Paul Reidy⁴, Micah Drummond⁵.¹ Miami University, Oxford, OH. ²University of Utah, Salt Lake City, UT. (Sponsor: Kyle Timmerman, FACSM)
(No relevant relationships reported)

Physical inactivity negatively influences health and wellness, which has been a particular concern with aging. Less is understood regarding the impact of muscle disuse during early stages of postnatal skeletal muscle development. PURPOSE: We propose that exposure to muscle disuse early in life will adversely impact muscle recovery compared to adulthood. METHODS: Postnatal day 30 (Young), mature 5 month (Adult) and aged ~25 month (Old) mice were studied as freely moving (Control) or experienced muscle disuse in the form of hindlimb unloading (HU) for two weeks followed by a 7 day recovery period where they were allowed to freely ambulate or "reload" (RL7). We assessed tissue composition, hindlimb and forelimb muscle size and myofiber diameter and cross-sectional area (CSA).

RESULTS: Muscle weight was not recovered in the Young and Old for soleus (absolute, normalized) or plantar (absolute) (P>0.05). In the soleus, the difference between Control and RL7 was 1.19±0.38, 0.21±0.32, 0.81±0.32 mg for Young, Adult and Old, respectively. There was a trend for the Young to have recovered injury vs adult (p=0.056). In the plantaris, the difference between Control and RL7 was 1.84±0.77, 0.37±0.65, 1.50±0.64 mg for Young, Adult and Old, respectively. The soleus myofiber CSAs were not recovered in any group and the MHC I myofiber were particularly affected in the Young. In the plantaris, myofibers were not recovered in the Young due to an impaired recovery in the MHC Ix+b myofibers.

CONCLUSIONS: Postnatal mice are particularly susceptible to muscle disuse as shown by impaired muscle recovery compared to young adult and old adult mice. Supported by NIA R01AG AG050781

1323 Board #5
May 28 9:30 AM - 11:30 AM
Muscle Density, Not Size, Is Inversely Associated With All-cause Mortality: The Multi-ethnic Study Of Atherosclerosis
Britta Larsen¹, John Belletiere¹, Matthew Allison¹, Robyn L. McClelland², Miljko Miljkovic¹, Chantal Vella, FACSM³, Pamela Ouyang², Michael Criqui¹, Jonathan Unkart¹.¹ UC San Diego, La Jolla, CA. ²University of Washington, Seattle, WA. ³University of Pittsburgh, Pittsburgh, PA. 4University of Idaho, Moscow, ID.
¹Johns Hopkins University School of Medicine, Baltimore, MD. (Sponsor: Chantal Vella, FACSM)
Email: blarsen@ucsd.edu
(No relevant relationships reported)

Purpose: Little is known about associations between lean muscle and mortality in healthy adults. The purpose of this study was to evaluate associations between abdominal muscle quantity (area) and quality (density) with risk of all-cause mortality in a diverse cohort. Methods: Abdominal muscle area and density were measured in men (n=946) and women (n=955) from the Multi-Ethnic Study of Atherosclerosis using computed tomography scans at the L2-L4 spinal column, with muscle density scored as attenuation in Hounsfield units. Sex-stratified Cox proportional hazard models were used to assess risk of all-cause mortality across sex-specific quartiles of muscle area and density adjusting for confounders, with area and density entered simultaneously. Results: Mean age for men and women at baseline was 64.2 and 65.1 and median follow-up time was 10.6 and 10.9 years, respectively. The mortality rate for men was higher than for women (19.9% vs. 12.5%). Hazard ratios of all-cause mortality by quartiles of muscle area and density are shown in Table 1. For muscle density there was an inverse dose response with mortality, such that men and women in the highest quartiles of muscle density had 73% and 57% lower risk of mortality, respectively, in fully adjusted models compared to those in the lowest quartiles. There was no association between muscle area and mortality. Conclusions: In a large, diverse cohort of men and women, greater abdominal muscle density, but not muscle size, was associated with a markedly lower risk of all-cause mortality with over a decade of follow up. These results highlight muscle density as a powerful predictor of mortality in relatively healthy community dwelling adults. Future studies are needed to investigate biological mechanisms linking skeletal muscle fat infiltration with mortality.

1324 Board #6
May 28 9:30 AM - 11:30 AM
Associations Of Skeletal Muscle Lipid Infiltration With Hypertrophy And Physical Performance Outcomes In Older Adults
Douglas E. Long¹, S. Craig Tuggle², Alejandro G. Villasante³, Marcos M. Bamman, FACSM⁴, Philip A. Kern⁵, Charlotte A. Peterson¹, R. Grace Walton¹.¹ University of Kentucky, Lexington, KY. ²University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Brian Noehren, FACSM)
(No relevant relationships reported)

Preserving muscle mass and quality is critical for long term health and longevity. Unfortunately, the hypertrophic potential of aged individuals is diminished, with some experiencing less than favorable outcomes from supervised resistance training programs. This has led investigators to explore the “poor” responder muscle

Abstracts were prepared by the authors and printed as submitted.
phenotype. PURPOSE: The purpose of this study was to determine whether muscle lipid infiltration plays a role in anabolic adaptation responses, such as muscle growth and physical performance.

METHODS: The effects of a 14-week progressive resistance training (PRT) program on muscle size and quality, strength, and physical function in 48 individuals aged 65 and older (mean age ± SD, 70.8 ± 4.5 yrs) was determined. Computed tomography (CT) imaging of cross-sectional mid-thigh regions was used to measure intermuscular adipose tissue (IMAT) and thigh muscle density (TMD) as measures of thigh muscle lipid content. Associations between these lipid depots and baseline function, as well as muscle adaptations to PRT, were made for muscle size (DXA muscle mass and CT muscle area) and physical function and performance (strength, power, SF-36, PROMIS) using multiple linear regression models adjusted for potential confounders such as sex, BMI, CT muscle area, and baseline muscle strength. The association of muscle lipid and physical activity were conducted as a secondary analysis.

RESULTS: At baseline, TMD (median Hounsfield unit ± SD, 42.4 ± 4.0 HU), but not IMAT (median ± SD, 12.5 ± 4.3 cm²), was significantly associated with all physical function and performance variables (R² range 0.45–0.75; p < 0.05) except leg extension strength and power. Neither IMAT nor TMD was related to physical activity. Following PRT, IMAT was not associated with any exercise adaptation, whereas TMD was negatively associated with percent change in isometric strength (R²=0.17) and muscle power (R²=0.28, p < 0.05).

CONCLUSIONS: Muscle fatty infiltration can impact strength and power gains following PRT in older persons. More work is needed to understand the dynamics of ectopic muscle fat accumulation and its influence on physical function and muscle metabolism/anabolism.

1326 Board #8 May 28 9:30 AM - 11:30 AM Aging Induces A Differential Muscle Transcriptome Profile Following Resistance Exercise Training Tatiana Moro, Ted G. Graber, Paul T. Reidy, Elena Volpi, Blake B. Rasmussen. University of Texas Medical Branch, Galveston, TX. Email: tatiana.moro.phd@gmail.com (No relevant relationships reported)

PURPOSE: Resistance exercise training (RET) in older adults produces a lesser muscle hypertrophy response as compared to young adults. We hypothesized that this anabolic resistance to exercise may be associated with a differential muscle transcriptome profile. We enrolled 10 young and 10 older men into a 12-week progressive RET program. Skeletal muscle biopsies were obtained from the vastus lateralis before and after RET.

METHODS: The transcriptome profiles of skeletal muscle from both young and older adults were obtained by utilizing next-generation RNA sequencing. RESULTS: We analyzed a total of 26,486 genes (i.e., RNA transcripts) in skeletal muscle and found that 11,262 genes in young subjects and 11,830 genes in the older adults were up-regulated after 12 weeks of RET. On the other hand, we observed a down-regulation of 11,079 and 11,214 genes in the young and old groups, respectively. In particular, we found that autophagy linked gene expression (e.g., ATG12, PIK3R4, ULK2, ULK3) and transcripts related to muscle hypertrophy (e.g., AKT, EIF2S2, GSK3b) were differentially expressed between young and older adults. Interestingly, we identified 21 genes (e.g., COL5A2, COL3A1, COL1A1) encoding extracellular matrix (ECM) and ECM-associated proteins that were significantly upregulated only in the elderly (P<0.05). CONCLUSIONS: Skeletal muscle gene expression is differentially regulated in older adults in response to RET which may contribute to anabolic resistance and reduced muscle hypertrophy with aging. Future studies will include mechanistic experiments to identify how aging alters gene expression and whether anabolic resistance can be reversed. Funding: NIH/NIA R56 AG051267

C-11 Thematic Poster - Walking with Knee Arthritis and Arthroplasty Thursday, May 28, 2020, 9:30 AM - 11:30 AM Room: CC-2010

1327 Chair: Julia Freedman Silvernail. University of Nevada, Las Vegas, Las Vegas, NV. (No relevant relationships reported)

1328 Board #1 May 28 9:30 AM - 11:30 AM Associations Between Ultrasonographic Measures Of Femoral Cartilage, Self-reported Function, And Walking Speed In Individuals With Medial Compartment Knee Osteoarthritis Steven J. Pfeiffer, Daniel Nissman, Deborah L. Givens, Rachel Sorensen, Brianna Cook, Erik A. Wikstrom, FACSM, Troy Blackburn, Brian Pietrosimone, FACSM. University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Brian Pietrosimone, FACSM) Email: stevenpj@email.unc.edu (No relevant relationships reported)

Ultrasound has been used to evaluate femoral cartilage cross-sectional area (CSA) and echo intensity (EI) in young individuals without knee pathology. Yet it remains unknown if ultrasound derived measures of CSA and EI are associated with patient reported outcomes (PRO) and physical performance (habitual walking speed) in individuals with knee osteoarthritis (KOA).

PURPOSE: To determine associations between ultrasonographic femoral cartilage CSA and EI, and PRO and habitual walking speed in individuals with medial compartment KOA.

METHODS: Twenty-one individuals with medial compartment KOA (76% female, age = 61 ± 8 yr, BMI = 29.3 ± 4.0 kg/m²) participated in this study. Habitual walking speed was assessed over a 6-meter walkway using infrared timed gates. PRO were measured using the Western Ontario and McMaster Universities Osteoarthritis Index function subscale (WOMAC-Function). Participants were seated with their knees extended on an examination table for 45 minutes in order to unload the femoral cartilage and acquire a resting ultrasound image. Three images were acquired on the involved limb and the derived measures (CSA and EI) from the medial femoral cartilage were averaged. Separate, stepwise linear regression models were used to
1329
Board #2
May 28 9:30 AM - 11:30 AM
Impact Of Pain Suppression On Three-dimensional Gait Kinematics In Knee Osteoarthritis Patients
Alix Cagnin1, Maria Celia Bazan1, Robert Pontbriand2, Manon Choinière1
1École de technologie supérieure, CRCHUM, Montreal, QC, Canada. 2Centre de médecine sportive de Laval, Laval, QC, Canada. 
Email: cagninal@gmail.com

PURPOSE: Knee osteoarthritis (KOA) is characterized by pain and adaptations in knee kinematics during gait. The study aimed at assessing the impact of pain suppression on three-dimensional (3D) knee kinematics during gait in KOA patients.

METHODS: Participants had 1) tibiofemoral KOA with or without patellofemoral KOA, 2) a pain intensity ≥ 3 on a 0-10 pain intensity scale, and 3) a radiographic grade ≥ 2. Each patient performed two gait trials: a pain trial and a pain-free trial. An intra-articular knee injection of 5ml of lidocaine (1%) was administered between heel strike and 40% of stance for 55% of them on their internal tibia rotation.

RESULTS: A limited flexion amplitude and an internal tibia rotation in regards to the femur (+2.3°; both p<0.001) between trials. The change was linked to KOA progression (paired T-test or Wilcoxon signed-rank test for non-normal distribution of delta values).

RESULTS: 7 women and 4 men participated. Their mean age was 60 years (95%CI: 55.63) and the mean BMI was 29.3 kg/m² (25.8;32.8). The mean pain decreased from 4.6 (3.2;6.0) to 0.5 (0.0;0.9) with the injection. The suppression of knee pain led to changes on 2 markers during the loading phase of the gait cycle (Table). Participants significantly improved their flexion amplitude (+9.7°) and reduced their internal tibia rotation in regards to the femur (+2.3°; both p<0.001) between trials. The change was clinically significant (more than 2.0°) for all of the patients on their flexion amplitude and for 55% of them on their internal tibia rotation.

CONCLUSION: Results suggest an association between pain and knee kinematics during the loading phase of the gait cycle. A limited flexion amplitude and an internal tibia rotation in regards to the femur could be corrected with pain suppression. Further studies are needed to have a better understanding of the impact that pain may have on gait adaptations in KOA patients.

1330
Board #3
May 28 9:30 AM - 11:30 AM
The Therapeutic Efficacy Of Platelet-Rich Plasma On Gait And Balance In Patients With Knee Osteoarthritis
Gu Eon Kang1, Prathap Jayaram1, Theodore S. Zhang1, Jay Deco1, Brian Xu1, Guillermo Beckman1, Bijan Najafi1. 1Baylor College of Medicine, Houston, TX. University of Houston, Houston, TX. 2Morehouse School of Medicine, Atlanta, GA. 3University of Texas at El Paso, El Paso, TX. 
Email: gueon.kang@bcm.edu

PURPOSE: To examine the therapeutic efficacy of LR-PRP on gait and balance in patients with KOA.

METHODS: Eight patients with unilateral and bilateral KOA (4 men; 55.3 ± 10.9 years; 31.22 ± 8.35 kg/m²) participated after signing a written informed consent. Participants visited the outpatient clinic in Baylor College of Medicine H. Ben Taub Department of Physical Medicine and Rehabilitation two times (baseline and follow-up; six to eight weeks apart). At baseline, the study physiatrist (PJ) provided a single intramuscular knee injection of 5ml of LR-PRP (NO. 1, 2, 3, 4, 5, 6, 7, 8) and the patient visited the outpatient clinic in Baylor College of Medicine H. Ben Taub Department of Physical Medicine and Rehabilitation two times (baseline and follow-up). At baseline, the study physiatrist (PJ) provided a single ultrasound guided intra-articular LR-PRP injection. Our primary endpoint was balance activity of daily life and quality of life using the 12-item Knee Injury and Osteoarthritis Score (KOOS-12), and gait speed. The beneficial effects of leukocyte-rich platelet-rich plasma (LR-PRP) on subjective functional outcomes in knee osteoarthritis (KOA) is limiting, to this end there is a paucity of data about its efficacy on objective functional outcomes.

RESULTS: Results for outcome parameters are shown in Table 1. Pain symptoms, activity of daily life and quality of life improved 31%, 33% and 46%, respectively, but the improvements did not reach statistical significance level (all p > 0.05). Gait speed was very similar between baseline and follow-up (p > 0.05). Some balance parameters tended to improve. Medial-lateral center-of-mass sway and center-of-mass sway area decreased 34% and 41%, respectively. Medio-lateral hip sway and hip sway area decreased 40% and 46%, respectively. However, the improvements in balance parameters did not reach statistical significance level (all p > 0.05).

CONCLUSIONS: Results suggest potential of LR-PRP on gait and balance. Based on the results, further study with a larger sample size is warranted.
Knee flexion deformity and gait impairments (GIs) are common clinical in the absence of flexion deformity.

Measurement to ensure that assessors do not miss the presence of gait alterations, even and also the value of completing clinical evaluation with a dynamic kinematic

Not have a flexion deformity. It supports that it remains essential to assess deformity likely to have sagittal GIs. However, the majority of patients who had sagittal GIs did not have a flexion deformity (77/148: 52.0%). Similar results were observed on the limited DROM was significantly higher in the group who had a flexion deformity of the participants showed a limited DROM (69.2%). The proportion of patients with each GI.

Fischer’s tests were used to assess between-group (presence or absence of flexion deformity) differences on the proportion of patients with each GI.

TKR population is generally understudied. Age-related differences have been younger knee osteoarthritic patients (<60 yrs) undergoing TKR, but this younger following successful total knee replacement (TKR); however, patients continue

PURPOSE: To determine the effect of cycling power output on external knee adduction moment in older adults with knee OA (66.0±8.6 years) and 13 controls (64.0±7.2 years) completed 3-minute cycling trials at power outputs of 75 Watts (W) and 100 W at a cadence of 60 revolutions per minute on a stationary cycle ergometer. Reflective markers (n=33) were attached bilaterally on participants’ pelvis, lower extremity, shoes, and force pedals. Three-dimensional marker positions and pedal reaction forces were sampled synchronously at 240 Hz. Using an inverse dynamics approach, external knee adduction moments were computed for both power output conditions. Peak external adduction moments were identified and averaged across 60 crank cycles for the more affected leg in the knee OA group and the dominant leg in the control group. A two-way mixed model ANOVA was used to examine the effects of power output (75 vs. 100 W) and group (knee OA vs. control) on peak external knee adduction moment. RESULTS: A group x power output interaction was observed (p=0.029; partial eta=0.183). Peak external knee adduction moment increased with power output in both groups, but the magnitude of increase was much greater for the knee OA group (1.5±1.3 v. 2.5±1.6 Nm, p=0.001) compared to the control group (1.6±1.5 v. 2.6±1.3 Nm, p=0.047). CONCLUSION: Increases in detrimental knee joint moment with power output are greater for older adults with knee OA compared to healthy controls. Older adults with knee OA should exercise caution when pedaling at higher power outputs during rehabilitation.

Introduction: Significant improvements in pain and function have been reported following successful total knee replacement (TKR); however, patients continue to demonstrate persistent balance impairments, increasing the risk of falls and injuries. National joint replacement registries have reported a substantial growth in younger knee osteoarthritic patients (<60 yrs) undergoing TKR, but this younger TKR population is generally understudied. Age-related differences have been previously reported for gait, balance recovery responses, and perceived knee function, distinguishing younger TKR patient from the typical, older TKR patients. Purpose: To investigate if age-related difference in perceived pain and health status exist following total knee replacement. Methods: Thirty-six unilateral TKR patients (18 younger TKR patients: 57.1±4.6 yrs; 32.5±4.1 kg/m² and 18 older TKR patients: 74.5±6.6 yrs; 31.8±3.5 kg/m²), following TKR surgery took part in the study. Each patient completed the following questionnaires: The Activities-Specific Balance Confidence (ABC), the Oxford Knee Score (OKS), and the Short Form-36 (SF-36). The Timed Up and Go (TUG) test and self-reported number of falls in the previous 12-months also collected. Results: The younger TKR patients reported higher balance confidence (88.4±11.2 v. 73.7±11.7) and functional mobility (9.2±2.1 v. 13.5±3.8 sec), as well as less falls (1.4±0.2 v. 4.2±1.7), compared to the older TKR patients (p<0.05). The

<table>
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<tr>
<th>PRIMARY AND SECONDARY ENDPOINTS</th>
<th>BASELINE</th>
<th>FOLLOW-UP</th>
<th>P-VALUE</th>
<th>EFFECT SIZE (COHEN’S D)</th>
</tr>
</thead>
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<tr>
<td>KOOS-12: Pain symptoms</td>
<td>50.0 ± 17.6</td>
<td>65.3 ± 18.3</td>
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<td>0.85, Large effect</td>
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<td>KOOS-12: Quality of life</td>
<td>34.2 ± 10.4</td>
<td>50.1 ± 20.8</td>
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<td>Gait speed, m/s</td>
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<td>0.94 ± 0.18</td>
<td>0.696</td>
<td>0.18, No effect</td>
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<tr>
<td>Balance: Medio-lateral center-of-mass sway (degree)</td>
<td>0.46 ± 0.31</td>
<td>0.30 ± 0.09</td>
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<td>0.64 ± 0.22</td>
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<td>Balance: Center-of-mass sway area (degree)</td>
<td>0.27 ± 0.27</td>
<td>0.16 ± 0.08</td>
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<td>0.55, Medium effect</td>
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<td>Balance: Medio-lateral ankle sway (Degree)</td>
<td>1.11 ± 0.75</td>
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<td>Balance: Anterior-posterior ankle sway (Degree)</td>
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<td>Balance: Medio-lateral hip sway (Degree)</td>
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<td>0.62, Medium effect</td>
</tr>
</tbody>
</table>

This was funded by the FPQIS (Quebec Government).
younger TKR patients also reported less perceived knee pain when completing tasks of daily living (18.2 ± 3.2, v. 12.7 ± 3.7; p < 0.05) than non-replaced limbs (9.7 ± 2.0). Similar findings were seen in peak push-off (p < 0.01) for both surgical groups. Peak landing-response KAbM were smaller in non-replaced limbs of BCS (-0.59 Nm/kg) and PS (-0.42 Nm/kg) patients compared to those in their non-replaced limbs (BCS: 0.42 ± 0.9 kg/m; PS: 0.23 ± 0.5 kg/m). Conclusion: The results from this study showed that during downhill walking, peak KEMs were lower in replaced limbs than non-replaced limbs for all TKR patients, suggesting a deficit in knee extensor strength regardless of TKA designs. Post-surgery rehabilitation should focus on eccentric strength training of quadriceps for their replaced knees to reduce the asymmetry in knee movement and loading. BCS and PS patients may need additional attention in strengthening of quadriceps and hamstrings of the replaced limbs.

The two-parameter critical power (CP2) model states that the tolerable duration (Tlim) of severe-intensity cycling is determined by critical power (CP) itself, and the finite energy store that may be expended at work rates above CP (W'). Notwithstanding its ability to provide useful predictions of Tlim across a variety of exercise modes, the two-parameter model (CP2) consistently overestimates Tlim for ramp incremental exercise. PURPOSE: To determine whether a three-parameter model of CP (CP3) provides more accurate predictions of Tlim compared with those made by the CP2 model. METHODS: Seventeen healthy, recreationally-active adults (1 female, age: 29 ± 4 yrs, BMI: 25 ± 3, peak O2 uptake: 50 ± 8 ml/kg/min) completed a ramp cycling protocol, and a series of exhaustive, constant work rate (CWR) trials across 5 separate visits (~70-100% peak work rate). The CWR trials were used to establish each participant’s power-Tlim relationship, from which the CP2 and CP3 models were fitted to data. Cross-validation (CV) was used to assess external model validity. Finally, the observed Tlim during the ramp incremental protocol was compared to that predicted by the CP2 and CP3 models. RESULTS: CP2 was higher than CP3 (239 ± 14 W v 233 ± 13 W, P < 0.05), whereas W' was smaller for the two- v three-parameter model (20.3 ± 1.3 kJ v 22.7 ± 2.9 kJ, P = 0.05). The CP3 model yielded a better fit to power-Tlim data than the CP2 model, as judged by the lower root-mean-square error (RMSE) computed from the CV procedure (128 ± 141 s). The predicted ramp Tlim obtained via the CP3 model was longer than the actual Tlim for ramp incremental cycling (21.9 s, P < 0.05); however, the ramp Tlim predicted by the CP3 model was not different from the actual ramp Tlim (21.7 s, P > 0.05). Furthermore, there was higher absolute agreement between actual and predicted ramp Tlim for the CP3 model, as evidenced by a higher concordance correlation coefficient (0.98 ± 0.04) and lower RMSE (16.4 ± 27.7 s). CONCLUSIONS: Our findings indicate that the CP3 model provides better predictions of ramp exercise performance than the CP2 model. These findings provide further support for the idea that Tlim for super-CP cycling is determined not only by the magnitude of W', but also by a maximal rate at which W' can be accessed, particularly at high work rates.

The University of Tennessee, Knoxville, TN. 2Tennessee Orthopaedic Research Center, Nashville, TN. 1University of Tennessee, Knoxville, TN. 2Tennessee Orthopaedic Research Center, Nashville, TN. (No relevant relationships reported)
Traditional theory has linked muscular size and muscular strength at baseline and following resistance training, though recent studies have challenged the independence of these traits, especially within the context of chronic resistance training. We previously completed a large study of strength and size changes with 12 weeks of progressive resistance training in previously untrained adults. **PURPOSE**: We examined the acute effects of progressive resistance training on the relationship between muscle volume (VOL) and muscle strength, measured as both dynamic (one repetition maximum; 1-RM) and isometric (maximal voluntary contraction; MVC) strength. We further tested for sex differences in these relationships. **METHODS**: 665 healthy young (18–age=40) and untrained individuals (254 men and 411 women) were tested. Muscle volume (by magnetic resonance imaging) and strength (1-RM and MVC) measures were taken before and after 12-weeks of resistance training of the non-dominant biceps/triceps. Subjects trained with progressively increasing weights twice per week using biceps preacher curl, biceps concentration curl, standing biceps curl, overhead triceps extension, and triceps kickback. We used Pearson correlations to test strength-size relationships in the entire cohort and within sex both at baseline and percent change following training. **RESULTS**: Weak to moderate correlations were seen at baseline: VOL-1-RM (r=0.43 in all, 0.32 in women and 0.14 in men, all p<0.01) and VOL-MVC (r=0.34 in all, 0.19 in women and 0.28 in men, all p<0.01). Following training, specific relationships between percent changes in strength and size were: VOL-1-RM (p=0.04 in all, p=0.03 in women, p=0.006; and 0.14 in men, p=0.03) and VOL-MVC (r=0.13 in all, p=0.01; 0.19 in women, p=0.01; and 0.12 in men, p=0.054). **CONCLUSION**: At baseline, significant but weak correlations exist between strength and size, regardless of sex. Following training, correlations became weaker, and even insignificant for change in volume to change in 1-RM in the whole cohort and change in volume to change in MVC in men. Together, these data provide evidence that isometric and dynamic strength are complex traits, especially following resistance training, that are affected by factors beyond size. **Hormonal, Psychological, And Muscle Damaging Effects Of An Acute Bout Of Farmers' Walk Resistance Exercise**

The Farmers’ Walk (FW) exercise may help to enhance resistance training programs by incorporating movements which supplement functional tasks such as lifting and carrying weight over various distances. Minimal information exists concerning the intramuscular responses associated with FW performance, which may negatively promote perception and application of this exercise in prescribed protocols. **PURPOSE**: To investigate the hormonal, psychological, and muscle damaging effects of an acute bout of the Farmers’ Walk Carry (FWC) when compared to an individual’s unloaded walking pattern (NWC). **METHODS**: Fifteen participants (mean ± SEM; age: 21.6 ± 0.5 yrs; height: 172.5 ± 2.4 cm; weight: 81.8 ± 4.0 kg) completed a series of testing sessions. In the initial session, participant’s demographic information, anthropometrics, body composition, lower body power, and strength were measured. Subsequently, participants completed two counter-balanced conditions during which they performed 10 repetitions of a 20 m walk while either carrying 70% of their 1-repetition maximum deadlift or non-weighted walk. Participants were allowed a 30 s rest period after odd-numbered repetitions, and 2 min of rest after even-numbered repetitions. Participants provided self-reported evaluations of muscle soreness (VPSM), blood sampling for myoglobin (Mb) and creatine kinase (CK-MB), and saliva samples for testosterone (T) which were collected prior to the exercise protocol, immediately after the exercise protocol, and 30- and 60-min after completion of the exercise. Post-exercise assessment consisted of blood sampling, saliva, countermovement jump (CMJ) height, and VPSM scores collected at 24 h, 48 h, and 72 h in both conditions. **RESULTS**: Increases were observed for overall (p<0.001) and upper body VPSM measurements (p<0.01) along with decreases in CK-MB (p=0.04) during the FWC. No significant differences were revealed for Mb, T, or CMJ height. **CONCLUSIONS**: The discrepancy found between upper- and lower-body muscle soreness (VPSM) during the FWC may be related to differences in primary muscle recruitment and their joint concentric, eccentric, and isometric muscle actions. These variances may be related to differences in muscle recruitment, and neuromuscular inhibitions of lower body performance. **High-velocity Resistance Training Improves Power Output Across The Entire 1RM Percentage Spectrum In Elderly Individuals**

Gustavo Z. Schaun, Stephanie S. Pinto, Luana S. Andrade, Mariana R. Silva, Gabriela B. David, Gabriela N. Nunes, Vitor L. Krüger, Eduardo F. Marins, Cristiane L. Alberton. Federal University of Pelotas, Pelotas, Brazil. Email: gustavoschaun@hotmail.com

The aging process is related to impairments in several biological systems, such as the neuromuscular system. Of concern, considerable reductions in strength and power output are observed after the sixth decade of life, which are strongly related to declines in functional capacity. High-velocity resistance training (HVRT) is an alternative to counteract these impairments in the elderly population. **PURPOSE**: To compare the mean and peak power output adaptations to twelve weeks of HVRT. **METHODS**: Thirteen older adults (69.4 ± 6.2 years; 71.5 ± 16.0 kg; 161.8 ± 8.9 cm) were recruited and, after giving their informed consent, completed two familiarization sessions and, on a separate day (baseline), were assessed for their legpress one repetition maximum (1RM) and mean and peak power output at loads corresponding to 30-90% 1RM using a linear encoder. Four weeks after baseline and prior to the intervention (pre-intervention) both 1RM and power tests were repeated and all participants underwent twelve weeks of HVRT twice per week. The exercise training protocol comprised of five exercises (legpress, knee extension, seated bench press, seated row and calf raise) and progressed from 1-3 sets of 10 repetitions per exercise at 40-60% 1RM. Tests were repeated post-intervention and mean and peak power comparisons were made using one-way ANOVAs with repeated measures and Bonferroni’s post hoc. **RESULTS**: Mean and peak power output results are shown in Figure 1. Peak power improved significantly at all loads when compared to both baseline and pre-intervention (all p<0.05), while mean power output improved from 30-70% 1RM (all p<0.05) but not at 80 and 90% 1RM. No differences were observed between baseline and pre-intervention measures (all p>0.05). **CONCLUSION**: HVRT is an effective alternative to counteract power output declines across a wide range of loads in older adults. This is relevant as different functional tasks seem more associated to muscle power at different percentages of 1RM.
similar to the demands of basketball. **PURPOSE**: Therefore, the purpose of the present study was to examine the effects of basketball practice on maximal isometric force and LFF.

**METHODS**: Eleven NCAA Division 1 basketball players (Males = 6 and Females = 5) performed a Maximal Voluntary Isometric Contraction (MVIC) and neuromuscular electrical stimulation of the knee extensors at a high and low frequency before (Pre), immediately after (Post) and 24-hours (24Post) following a basketball practice during the preseason. Athletes wore Inertial Measurement Units to capture the external training load (eTL) of the practice. The ratio of force produced during the low to high frequency muscle stimulation was used as an index of LFF. A one-way repeated measures analysis of variance was performed to determine differences in MVIC and LFF across time, with significance set at \( p < 0.05 \). Effects sizes (Cohen’s \( d \)) were calculated for pairwise comparisons and interpreted as trivial (0.00), small (0.20-0.49), medium (0.50-0.79), and large (0.80 and greater).

**RESULTS**: The average of the eTL parameters during practice were PlayerLoad = 636.5 ± 66.1 arbitrary units (au); PlayerLoad per minute = 4.76 ± 0.69au; Total Jumps = 143.8 ± 53.0 count (ct); Inertial Movement Analysis (IMA), High = 39 ± 20ct; IMA, Medium = 155 ± 53ct; IMA, Low = 582.8 ± 156ct. There was a significant time effect for MVIC (\( p = 0.031 \)), but post-hoc pairwise comparisons revealed no significant difference across time (\( p > 0.05 \)). There was a significant time main effect for LFF (Pre = 0.515 ± 0.025; Post = 0.483 ± 0.038; 24Post = 0.513 ± 0.033; \( p < 0.019 \)). There was a significant increase from Post-to-24Post (\( p = 0.039 \), \( d = 0.84 \)), and a significant decrease from Pre-to-Post-practice (\( p = 0.104 \)), but did exhibit a large negative effect (\( d = 1.0 \)). There was a significant increase from Post-to-24Post practice (\( p = 0.039 \), \( d = 0.84 \)). **CONCLUSIONS**: Based on these preliminary findings it appears basketball practice induces LFF in collegiate basketball athletes that recovers back to baseline within 24 hours of the bout. Although LFF was present, MVIC appeared unaffected.

### Table 1. Regression models for predicting performance fatigability

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Full-model regression</th>
<th>Stepwise regression</th>
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<tbody>
<tr>
<td></td>
<td>( R ) ( p )-value</td>
<td>Standardized Beta</td>
</tr>
<tr>
<td>Strength</td>
<td>0.64</td>
<td>0.01</td>
</tr>
<tr>
<td>mCSA</td>
<td>0.66</td>
<td>0.00</td>
</tr>
<tr>
<td>TS%</td>
<td>0.67</td>
<td>0.07</td>
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Previous work has shown greater declines in average concentric velocity (ACV) values during sets to fatigue for the bench press compared to the squat. The decline in ACV during sets of the overhead press (OHP) and deadlift (DL) has not yet been investigated. This information would be useful for those using ACV to prescribe training loads.

**PURPOSE**: To determine the effect of different loads on ACV during single sets of repetitions to failure with the OHP and DL.

**METHODS**: Thirty individuals (23 ±3 yrs) with current training experience with both the OHP and DL completed a 1RM protocol for the OHP and DL. Participants then returned to the lab on two separate occasions and completed one set of the OHP and DL to volitional fatigue at either 70% or 90% of their 1RM in a randomized order. The open barbell system measured ACV of all repetitions. The absolute and relative (%) decline in ACV was calculated for each condition and compared between loads (70% vs. 90%1RM) and between lifts (OHP vs. DL). Paired samples t-tests were used to compared ACV values between individual repetitions within each condition.

**RESULTS**: There were significant differences (\( p < 0.05 \)) in both absolute and relative ACV decline between lifts and between loads. The absolute and relative decline in ACV was greatest for the 70%OHP condition (0.36±0.12 m/s; 58.1±11%) followed by 90%OHP (0.70±0.10 m/s; 70.6±13%) and 70%DL (0.16±0.08 m/s; 31.1±14%). 90%DL (0.09±0.06 m/s; 26.1±17%). For the 70%OHP condition, ACV was significantly (\( p < 0.014 \)) greater for the third repetition (0.59±0.15 m/s) compared to all subsequent repetitions; for 90%OHP, ACV was significantly (\( p < 0.004 \)) greater for the first repetition (0.39±0.13 m/s) compared to the third and all subsequent repetitions. For the 70%DL condition, ACV was significantly (\( p < 0.014 \)) greater for the third repetition (0.49±0.08 m/s) compared to the first, fourth, sixth, and all subsequent repetitions; for 90%DL, ACV was significantly greater (\( p < 0.043 \)) for the second repetition (0.32±0.04 m/s) compared to all other repetitions.

**CONCLUSIONS**: These data suggest the velocity decline during sets to fatigue is influenced by both the load and the lift performed. Greater declines in velocity are apparent during the OHP compared to the DL and when lifting lower (70%1RM) compared to higher loads (90%1RM).
HISTORY: An 18-year-old senior high school football player sustained an avulsion fracture to the left 5th digit proximal phalanx on October 2018 during practice which was treated with an ulnar gutter cast for 6 weeks. He played through the remaining football season and baseball season, after which, he presented to the clinic with what he felt was instability in his left hand. He reported no new trauma. Upon examination, there was mild tenderness in the 5th digit and tenderness localized to the head of the 4th metacarpal. The patient denied numbness, weakness, swelling, or bruising to the site of pain, but endorsed clicking of the 4th digit when making a fist and opening his hand again.

PHYSICAL EXAMINATION: Mild Boutonniere’s deformity of 5th. Full ROM with all finger motions. Snapping sensation when going from fully flexed position in 4th digit to fully flexed position. Tenderness to palpation at 5th digitPIP and at 4th digit just proximal to MCP. Slightly more movement with anterior - posterior translation of the 4th metacarpal dorsally compared to the proximal phalanx. Sensation intact to light touch.


TEST AND RESULTS: X-rays: Interval healing of nondisplaced fracture of the fifth digit proximal phalanx. Cystic lesion of the head of the fourth metacarpal not evident on previous x ray study. MRI: Avascular necrosis of the 4th metacarpal head including articular surface flattening with adjacent subcortical marrow edema bordered by linear somewhat serpiginous hypointense signal, perhaps sclerosis, and with some tiny subchondral cystic foci as well. Small amount of T2 hyperintense marrow signal in the visualized distal shaft of the 4th metacarpal as well. Small 4th MCP joint effusion.

FINAL/WORKING DIAGNOSIS: Dieterich’s Disease (avascular necrosis of the metacarpal head)


CONCLUSIONS: After the completion of a given work at maximal exercise intensity, reduction in MVIC did not mirror the greater magnitude of knee extensors torque loss in CON than ECC. ECC and CON contractions elicited central fatigue and peripheral fatigue, respectively. Fatigue magnitude and etiology both depended on the amount of work performed.
FINAL DIAGNOSIS: AP, lateral, and oblique views of the right hand revealed a mildly displaced fracture of metacarpal bones.


TEST AND RESULTS: X-ray: Impression: Right minimally displaced Bennett fracture with near anatomic reduction. There is old sign of some ulnar collateral ligament injury noted at the MCP. CT: Showed an acute fracture at the base of his thumb with a large fracture fragment noted attached to the ulnar collateral ligament.

FINAL WORKING DIAGNOSIS: Recurrent Bennett’s fracture

TREATMENT AND OUTCOMES: 1. Surgical repair with 3 screws 2. Pain control with NSAIDs if needed 3. Started rehab 3 weeks after surgery and was cleared for competitive play 7 weeks out from surgery.

Author Comments: Images available

HISTORY: 22 y/o Collegiate quarterback present to clinic with thumb pain in his throwing hand which began that morning in practice. During practice he was throwing a ball, and it hit his thumb on a defensive player’s helmet which caused immediate pain and weakness. The athlete’s past medical history includes a Bennett fracture repair 17 months prior on the same hand.

PHYSICAL EXAMINATION: Examination in the clinic revealed tenderness on palpation over the thenar eminence and the anatomical snuff box. Sensation was intact. He had weakness with adduction of the thumb, and decreased ROM in all planes. Grip strength in the right hand was decreased.


TEST AND RESULTS: X-ray: Impression: Right minimally displaced Bennett fracture with near anatomic reduction. There is old sign of some ulnar collateral ligament injury noted at the MCP. CT: Showed an acute fracture at the base of his thumb with a large fracture fragment noted attached to the ulnar collateral ligament.

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Author Comments: Images available

HISTORY: An 18-year-old high school football player suffered a hand injury after tackling the quarterback and celebrating by punching the artificial turf. He continued playing, however during the second half, he noticed his hand was swollen. He reported no pain, full range of motion, and no numbness or tingling in his hand or fingers. He denied wrist or elbow pain.

PHYSICAL EXAMINATION: Sideline examination was performed remarkable for a mildly swollen right hand, no obvious deformity of the wrist, hand or fingers. There was mild tenderness to palpation along the ulnar aspect, with full active range of motion at the wrist and fingers. He had normal strength with flexion and extension at the wrist, MCP, PIP, and DIP, however wrist flexion and MCP flexion was painful. He was able to make a full fist and rotational alignment was not significant. Supportive tape was applied, and he continued to play without increase of swelling or pain.


FINAL DIAGNOSIS: Boxer’s Fracture (Fracture of the 5th metacarpal bone)

TREATMENT AND OUTCOMES: 1. Operative management with plate and screw fixation considered, however nonoperative care was ultimately decided on. Patient placed in an ulnar gutter prefabricated splint and immobilized for at least 8 weeks. 2. Pain control with NSAIDs if needed 3. He was allowed to continue football competition; splint wrapped in a partial club cast. He was not allowed to play offensive receiver; other positions he had no limitations 4. Repeat radiographs at 4 weeks showed no interval change in the fifth metacarpal shaft fracture and early callus formation noted on orthogonal views. Patient had full ROM and strength on exam. Continued ulnar gutter splint immobilization and partial club cast for competitions, with light physical therapy initiated.

5. Repeat radiographs at 6 weeks showed continued fracture healing, well aligned, normal strength on exam.

6. Nonoperative management with ulnar gutter splint immobilization allowed patient to complete the football season with successful preliminary stages of fracture healing.
Radicular Pain And Numbness To The Lower Extremity Not Always A Radiculopathy.

Richard A. Fontanez, Edwardo Ramos. University of Puerto Rico Medical Science Campus, San Juan, PR.

Email: fontanez.richard@gmail.com

(No relevant relationships reported)

**History:** A 47-year-old male scuba diver instructor complained of a few months history of progressive low back and right gluteal pain with associated bilateral lower extremity numbness, tingling and right leg limp. Past medical history remarkable for obesity and hypothyroidism. Denies recent illness, trauma, falls or use of any drug or steroid.

**Physical Exam:** Antalgic gait with right lower extremity limp and no muscle atrophy. Tenderness over lumbar paraspinal muscles, anterior groin and greater trochanteric area. Full passive range of motion (ROM) and limited active ROM on right hip flexion, extension and abduction due to pain. Negative straight leg raise test, positive roll over test. Skin creases over the right hip. MRI of right hip was performed to identify the likely cause of the symptoms.

**TEST AND RESULTS:**

1. MRI-arthrogram of right hip showed a 5.0 x 7.0 x 8.6 cm high density mass along the left iliac bone deep and within the psoas.
2. CT Pelvis without contrast: revealed 5.0 x 7.0 x 8.6 cm high density mass along the left iliac bone deep and within the psoas. CTA Abdomen/Pelvis with contrast: demonstrated a pelvic hematoma she was admitted to the PICU where she developed numbness and tingling in the affected leg with decreased strength of hip flexion and knee extension.

**Physical Exam:** The patient was wheel chair dependent but stood with support. Her lumbar spine was normal other than tenderness overlying the paraspinals and iliac crest of the left side. Her left lower extremity range of motion was pain-free with hip flexion past 120, external rotation to 55 degrees and internal rotation to 25 degrees. She was unable to fully extend the hip - maintaining approximately 5 to 10 degrees of hip flexion. She had decreased sensation to light touch of anterior, medial, and lateral thigh, medial shin and medial foot. Strength of hip flexion was 3+. DIFERENTIAL DIAGNOSIS:

- Femoral nerve strain
- Femoral neck fracture
- Labral tear
- Anterior inferior iliac spine avulsion

**TEST AND RESULTS:**

CT Pelvis without contrast:

- 5.0 x 7.0 x 8.6 cm high density mass along the left iliac bone deep and within the iliacus muscle anteriorly and into the iliacus with mass effect on the psoas.
- Hemorrhage extending along the posterior left psoas muscle superiorly into the abdomen and descending colon

CTA Abdomen/Pelvis with contrast:

- Small 4 mm blush of contrast in the inferior and posterior aspect of the left psoas hemotoma possibly a small area of active extravasation. No discrete connecting vessel identified.

**FINDING:** Femoral nerve neuropraxia

**DIFFERENTIAL DIAGNOSIS:**

- Iliopsoas hemotoma
- Femoral nerve neuropathia

**TREATMENT AND OUTCOMES:**

1. Refer to Neurology with follow up for monitoring of neuropathia
2. MRI to re-evaluate hemotoma size, evaluate muscle and nerve involvement
4. Referral to PT for mobilization
HISTORY: A 15 year-old right hand dominant male presented to sports medicine clinic due to left shoulder pain. The mechanism of injury was while playing football the day prior where he jumped to catch a pass, and landed directly on grass onto his left shoulder with arm by his side. Heard a “pop” when he landed, and was experiencing intermittent, generalized shoulder pain since the event. Denied prior injury of affected extremity as well as denied numbness or tingling. There was no swelling, discoloration, or bruising per the patient or the mother of the patient. There was no obvious reported deformity of the shoulder as well. The patient denied any neck or elbow pain. Symptoms were improved at rest and with arm at his side.

PHYSICAL EXAM: Left Shoulder: Pain with passive abduction, flexion on range of motion (ROM) testing. Active ROM is full in all directions. Tenderness to palpation (TTP) at the AC joint and scapular angle; no TTP at scapular body. Strength: 2/5 in extension due to pain. Passive ROM was 80 degrees in flexion and abduction, 30 degrees in extension.

DIFFERENTIAL DIAGNOSIS:
1. Acromioclavicular sprain
2. Rotator Cuff injury
3. Glenoid labrum injury
4. Distal clavicle contusion
5. Glenohumeral dislocation

TEST AND RESULTS:
1. X-ray Left Shoulder: no acute fracture, dislocation, or soft tissue abnormality
2. X-ray Left Scapula: no acute displaced fracture.
3. MRI (no IV contrast) Left Shoulder: Feathery edema in the rotator cuff musculature centered about the scapula. Low grade muscular strain vs underlying non-displaced scapular body fracture. 4. CT Shoulder Trauma w/ Joint (no IV contrast): Non-displaced hairline fracture in the mid scapular body perpendicular to the long axis. AC and GH joints are intact.

FINAL WORKING DIAGNOSIS:
Non-displaced extra-articular fracture in the mid scapular body
TREATMENT AND OUTCOMES:
1. Immobilization with sling for initial 4 weeks with pendulum swings twice daily
2. At week 4, no pain at rest with asymptomatic full strength. Physical Therapy intensified.
3. Cleared for non-contact and non-collision activities at week 8.
4. Returned to all activities without restriction at week 12.

1366 May 28 10:10 AM - 10:30 AM
Shoulder Pain-Wheelchair Basketball
Ryan P. Nussbaum, DO, Prakash Jayabalab, MD, PhD. Shirley Ryan AbilityLab/Northwestern University, Chicago, IL. (Sponsor: Dr. Joseph Ihm, MD, FACS) Email: nussbaum@srallab.org (No relevant relationships reported)

HISTORY
39 year old male wheelchair basketball player was referred for shoulder pain and need for potential glenohumeral joint injection. He had experienced one year of left-sided shoulder pain that began after colliding with an opponent at high velocity during a game. At the time of the trauma, he had sudden onset burning left sided neck pain that radiated down his arm to his left hand. He noticed that raising his left arm above his shoulder worsened the shoulder pain. Additionally, he noticed left-sided weakness with elbow flexion and shoulder abduction that made wheelchair transfers difficult.

PHYSICAL EXAMINATION
4/5 strength with left shoulder abduction and elbow flexion. Active left shoulder abduction and flexion was limited to 90 degrees, due to pain. Empty can, Hawklin’s, and Neer’s tests caused left anterior shoulder pain. Decreased sensation over the left lower arm in 4.5 sensory dermatome.

DIFFERENTIAL DIAGNOSIS
1. Cervical radiculopathy/myelopathy
2. Left supraspinatus tear
3. Left subacromial impingement
4. Left biceps tenosynovitis
5. Left brachial plexopathy

TESTS AND RESULTS
Left Shoulder MRI
- No supraspinatus tear
- Subtle superior-posterior infraspinatus tear
- Trace biceps tenosynovitis
Cervical Spine MRI
- Left paracondylar disc herniation causing moderate spinal canal stenosis with compression of spinal cord and myelomacia at C5-6 level.
- Moderate to severe foraminal stenosis, worse on the left at C5/6.
Left Brachial Plexus MRI
- No abnormality
Upper Extremities EMG/NCS
- Left primarily demyelinating median nerve mononeuropathy across the wrist.
- Observation and re-innervation at the level of the left triceps brachii muscle without abnormalities in other C6 or C7 innervated muscles or radial innervated muscles to assist with innervation suggestive of cervical radiculopathy

FINAL WORKING DIAGNOSIS
- Left cervical radiculopathy/myelopathic features
- Referral to Neurosurgery for potential surgical decompression in setting of cervical myelopathic findings.
- Initiated physical therapy focusing on McKenzie based program with spine stabilization.

1367 May 28 10:30 AM - 10:50 AM
Shoulder Injury - Wrestling
Alex K. Ngu, Benjamin Ma, Cindy J. Chang, FACSM. University of California San Francisco, San Francisco, CA. (Sponsor: Cindy J. Chang, FACSM) Email: alexngan93@gmail.com (No relevant relationships reported)

History:
A 14 year-old wrestler was injured during a match when he was thrown over his opponent’s shoulder, landing directly on his left shoulder. He reported immediate swelling of his shoulder and tingling of fingers; at the emergency department (ED) shoulder radiographs were negative. He was given a ketorolac injection; bruising appeared a few days later. He returned to the ED one week later with left sided chest and abdominal pain; chest radiographs were negative. Two months later, he presented to our sports medicine clinic with 7/10 “achy all over” shoulder pain that worsened with movement. He denied instability, weakness or radicular symptoms.

1368 May 28 9:30 AM - 9:40 AM
Chair: Thomas Andre. University of Mississippi, University, MS. (No relevant relationships reported)

1369 May 28 9:30 AM - 9:40 AM
Relationship Between A Burnout Syndrome Evaluation And Hopelessness In Mexican College Athletes.
Victo Hugo Montejano-Lambaren, Sara Ramirez-Hernandez, Alejandro Gaytan-Gonzalez, Juan Ricardo Lopez-Taylor. Universidad de Guadalajara, Guadalajara, Mexico. (No relevant relationships reported)

PURPOSE: To find the relationship between Burnout Syndrome and Hopelessness.

METHODS: 307 Mexican college athletes were evaluated by trained psychologists with a battery which included a Sport Burnout Syndrome Inventory (conformed by 18 items; divided in 3 factors: Emotional Exhaustion (EE), Depersonalization (D) and Reduced Personal Realization (RPR); qualified in 4 grades: “Low Risk”, “Moderated Risk”, “High Risk” and “With Burnout”) and Beck’s Hopelessness Scale (conformed by 20 items; qualified in 4 grades: “Normal”, “Slight”, “Moderated” and “Severe”). Multinomial logistic regression was performed to associate the components scores of burnout syndrome and the hopelessness results.

RESULTS: The association between “Moderated Risk” of Burnout Syndrome risk and “Slight Hopelessness” were statistically significant in EE Factor (p=0.02). Likewise, “High Risk” scores in RPR (p=0.002) and “With Burnout” punctuations in D (p=0.03) seem to be predictors of “Slight Hopelessness”. On the other hand, “High Risk” scores in EE was associated with “Moderated Hopelessness” (p=0.04). We did not obtain “Severe” evaluated athletes in our sample.

CONCLUSIONS: Beck’s Hopelessness Scale is an instrument that allows us to identify some indicators associable with the risk of committing suicide. Our results suggest that our college athletes do not show signs of suicide risk. Nonetheless, we see how higher Burnout Risk has an association with higher hopelessness scores. Both Burnout and suicide are public health issues, so we are convinced that more similar studies are necessary.
Table 1. Association between Burnout syndrome risk and Hopelessness levels.

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<tr>
<td>With BO</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High risk</td>
<td>1.87 (0.56 - 6.20)</td>
<td>15.96* (1.22 - 209.07)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>2.17* (1.15 - 4.11)</td>
<td>3.77 (0.35 - 40.32)</td>
</tr>
<tr>
<td>With BO</td>
<td>3.42* (1.13 - 10.36)</td>
<td>3.06 (0.26 - 36.70)</td>
</tr>
<tr>
<td>High risk</td>
<td>1.02 (0.37 - 2.79)</td>
<td>2.35 (0.33 - 16.72)</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>3.50 (0.48 - 2.30)</td>
<td>-</td>
</tr>
</tbody>
</table>
| Data expressed as OR (%). BHS: Beck Hopelessness Scale, BO: Burnout. D: Depersonalization. EE: Emotional Exhaustion. RPR: Reduced Personal Realization. *Sample size was too low to perform the analysis.}

Purpose: To explore the relationship among athletes’ self-evaluations of internal & external attentional focus, goal orientations, and injury experiences.

Methods: 102 college students (Mage = 19.65) completed a survey that measured attentional focus and goal orientations and collected demographic information and injury experience. Reliability coefficients for attentional focus (internal = .67 & external = .75) and goal orientations (task = .81 & ego = .74) were acceptable. The sample was split into two groups according to their competitive level: Group 1 participated in recreational activity or local competition, and Group 2 participated in state level or more advanced competition. ANOVA was used to examine whether injury experience is a significant predictor for attentional focus and goal orientations in each group.

Results: Group 2 athletes reported significantly higher scores in task (Group 1: M = 3.89, SD = 0.56) compared to those who did not (M = 4.27, SD = 0.49). There was no other statistically significant difference in both groups between with and without injury experience.

Conclusions: Overall results revealed that participating in higher levels of competition was related to athletes’ heightened task and ego orientations. In addition, athletes who experienced major injury demonstrated lower task orientation. Reduced task orientation can be problematic because previous research has found that task orientation is linked to positive psychological characteristics such as adherence, lesser performance anxiety, and mindffulness. This study found that fostering athletes’ task orientation may be a key for injury prevention. Future research should observe longitudinally and recruit more participants to examine variables potentially relate to athletic injury.

Flow, Optimism and Hope: Psychological Correlates in Triathletes

Matthew Stenson. College of Saint Benedict/Saint John’s University, Saint Joseph, MN. Email: mstenson@csbsju.edu

Purpose: The purpose of the present study was to explore the relationships among Flow, Optimism and Hope, and determine whether Optimism and/or Hope were predictors of Flow. Methods: For the study, 640 triathletes (37.80 ± 10.35 yrs; 24.18 ± 34.30 total triathlons) completed an online survey consisting of a demographic questionnaire, and validated psychometric scales for Flow, Optimism and Hope. Correlations, step-wise regressions, Confirmatory Factor Analyses and Structural Equation modeling (SEM) were used to explore the data. SEM was employed to generate a number of different models consistent with hypotheses and theory. Results: Ultimately, SEM showed that the best model was one in which Hope was a moderately strong predictor of Flow, while the small predictive value that Optimism had on Flow was indirect and moderated through Hope. For this mediation model, the SEM fit statistics demonstrated that the data fit the baseline structural model modestly well. The scaled χ2 (x2) (1162, N = 640) = 2466.24, p < .001; TLI = .93, CFI = .95, GFI = .86, RMSEA (.09/CI) = .042 (.040 - .044) denoted that the data fit the structural model objectively well. In the mediation model, Hope, and Optimism through predicted Flow (42% explained variance). Conclusion: Hopeful triathletes are optimistic triathletes, and hopeful triathletes experience higher levels of Flow than less hopeful triathletes. Lastly, Hope moderates the influence of triathlete Optimism on Flow.

Previous research on NCAA Division II student-athletes (SAs) as it relates to multi-dimensional wellness is scarce. Purpose: To examine differences in wellness levels between SAs who completed a college wellness course and those who did not. Methods: Overall, 530 SAs (n = 355, n = 175) between 18 and 23 years of age (M = 19.40, SD = 1.33) from 21 teams voluntarily completed the paper-based Multi-Dimensional Wellness Inventory (Mayol, Schreiber & Scott, 2017) and a demographic questionnaire. The 45-item MDWI measures one’s perceived behavior with respect to personal wellness orientation within nine dimensions: physical wellness exercise (PWE), physical wellness nutrition (PWN), mental (MW), social (SW), spiritual (SPW), intellectual (IW), environmental (EW), occupational (OW) and financial (FW). A factorial MANOVA was performed to analyze the differences in wellness levels. An alpha level of p ≤ .05 was set for statistical significance. Results: There was a statistically significant multivariate effect in SAs, F(9, 451) = 4.72, p < .001; Wilk’s Λ = .91, partial η2 = .09 with seven significant univariate main effects seen for PWE, F(1, 459) = 8.60, p = .004; PWN, F(1, 459) = 21.35, p < .001; MW, F(1, 459) = 13.01, p < .001; SW, F(1, 459) = 12.32, p < .001; IW, F(1, 459) = 14.13, p < .001; OW, F(1, 459) = 14.66, p < .001; and FW, F(1, 459) = 10.58, p = .001. No statistically significant univariate effects were seen for SPW and EW (p > .05), SA wellness course completers demonstrated higher PWE, PWN and MW levels (M = 14.43, SD = 3.29; M = 13.66, SD = 3.40; M = 17.08, SD = 2.14) than SA non-completers (M = 13.36, SD = 3.40; M = 13.36, SD = 3.40; M = 16.18, SD = 3.32). Additionally, SA wellness course completers showed higher SPW, EW and OW levels (M = 15.44, SD = 1.83; M = 15.08, SD = 2.65; M = 16.34, SD = 2.30) than SA non-completers (M = 14.87, SD = 2.03; M = 14.24, SD = 2.70; M = 15.81, SD = 2.36). Conclusions: Results demonstrated higher scores in PWE, PWN, MW, SW, IW, OW and FW for SAs who completed the wellness course versus SAs who did not. Findings indicate a need for future research pertaining to holistic wellness programming for SAs as well as targeted programming and support for this population. A multi-dimensional wellness intervention may assist in identifying and improving wellness deficits to further facilitate overall well-being in SAs.
Characteristics Of Resting State Networks Of Elite Skating Athletes: An ICA Analysis

Keying Zhang1, Chunmei Cao2, Yih-Kuen Jan2. 1Tsinghua University, Beijing, China. 2University of Illinois at Urbana-Champaign, Champaign, IL.

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(No relevant relationships reported)

Long-term motor skill learning can lead neuroplasticity changes. Until now, this conclusion is mainly proved by task fMRI and spontaneous brain activity evidence. However, these methods heavily rely on prior knowledge and hypotheses, and exist algorithm limitations.

PURPOSE:
To investigate the differences of resting state networks (RSNs) between elite skating athletes and non-athlete controls by means of data-driven approach.

METHODS:
Resting state fMRI data were acquired by Philips Achieva 3.0T scanner with a standard 32 channel head coil from 15 Chinese national level skating athletes (all men, 20.87±1.78 years old, with an average training year of 9.67±3.50) and 15 demographically matched healthy controls (all men, 20.85±1.83 years old). Gift was used to perform ICA (independent component analysis) arithmetic calculations and identify RSNs, including default mode network, somatomotor network, dorsal attention network, left frontoparietal network and visual network. A two-sample t-test was then conducted using SPM12 to investigate whether there were significant differences between two groups. Results were reported when voxel significant at a level of p < 0.01. Cluster-level whole-brain family wise error (FWE) was applied for results reporting. The voxelwise level of p < 0.01. Clusters coordinates were given in Montreal Neurological Institute(MNI) space.

RESULTS:
1. Athletes showed higher spontaneous activity in precuneus (cluster size =337, peak coordinate= 6, -3,39, peak t =6.65) in somatomotor network.
2. Athletes showed higher spontaneous activity in precuneus (cluster size =167, peak coordinate =69, -12,18, peak t =11.88) and cingulate gyrus (cluster size =167, peak coordinate =69, -12,18, peak t =11.88) in dorsal attention network.

CONCLUSIONS:
Elite skating athletes showed better functional connectivity in somatomotor network and dorsal attention network, which may further indicate that long-term specialized motor training may promote functional network activation patterns.

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attributable to mindfulness was examined in a regression model. Mindfulness explained 32% of the variability beyond the 21% explained by MT for a total of 53%.

CONCLUSIONS: This is the first study to explore the relationship of MT and SC via mindfulness in the collegiate environment. Results suggest considerable overlap between MT and SC via mindfulness, supporting the hypothesis. Preliminary findings are in accordance with Wilson et al. (2019): mindfulness may be crucial to increasing and conserving both constructs in the sporting environment. Results may also support the notion that mindfulness be investigated as a possible component of MT, too. Suggestions for future research include larger-scale studies and triangulation through multi-rating. Possible limitations include convenience samples, unequal sample sizes, and self-reported data.

Wildland fire suppression presents a working environment that often exceeds an energy expenditure of 20 MJ/day. Despite high levels of chronic physical exertion, we have noted maladaptive alterations in adiposity and blood lipids in a small cohort of wildland firefighters (WLFF) over a short 3-month season. PURPOSE: To determine changes in clinical health metrics and serum lipids resulting from 5 months of Wildland Firefighter (WLFF) duty. METHODS: We recruited 79 WLFF (72 males and 7 females from six crews (5 Hotshot crews, 1 Initial Attack crew) based in MT and CA and conducted a pre- and post-season observational study. After an overnight fast, nude body mass, blood pressure (BP), grip strength, and a step test (~VO2=20.7 MJ/day) were collected and analyzed for serum total cholesterol (CHOL), high density lipoprotein (HDL), low density lipoprotein (LDL), very low-density lipoprotein (VLDL), and triglycerides (TRIG). A 2-tailed dependent t-test was used to compare pre- and post-season values. Statistical significance was established at p<0.05. RESULTS: Body mass was increased (pre 77.4±9.7 vs post 78.4±9.5 kg, p<0.001). Systolic and diastolic BP decreased (pre 133±13/76±10 vs post 128±14/73±9 mmHG, p<0.001 and 0.05, respectively). Grip strength remained unchanged (pre 56.3±10.7 vs post 56.3±11.4 kg, p=0.05). There was a decrease in the HR response during the step test (pre 102±13 vs post 96±13 BPM, p<0.001). Serum CHOL and LDL did not change over the season (p=0.05). In contrast, serum TRIG (pre 73±35 vs post 92±55 mg/dl, p=0.001) and VLDL (pre 14±7 vs post 18±11 mg/dl, p=0.0001) were significantly increased by the end of the season, p=0.001. Similarly, HDL was significantly reduced (pre 68±15 vs post 64±13 mg/dl), corresponding to an increase in the TC/HDL ratio (pre 1.2±0.8 vs post 1.4±0.7, p=0.0001). CONCLUSIONS: Despite favorable changes in BP and aerobic fitness, there were maladaptive changes in serum lipids that occurred over the season, p<0.05. In contrast, FFs who lost weight showed a significant decrease (p=0.05) in TC (8±5 mg/dl), LDL (8±5 mg/dl), and BP (systolic: -5.3±5 mmHg; diastolic: -4.2±4 mmHg) with a significant increase (p<0.05) in LDL (2.3±0.1 mg/dl). There were significant changes (p<0.001) among weight stable FFs (in BP (systolic: -3.3±3 mmHg; diastolic: -3.8±3 mmHg)), and BG (2.7±0.7 mg/dl). CONCLUSION: On average, FFs gained weight and CVRFs worsened over 5 years. However, a large proportion of FFs (12%) lost weight or maintained weight (38%), and weight loss was associated with improvements in CVD risk profiles. In contrast, FFs who gained weight (50%) had significant detrimental changes in several CVD RFs. These results support the importance of weight maintenance and weight loss for the prevention of CVD in the fire service.

Supported by AFG Grant EMW 2017-00445

Sudden cardiac death (SCD) is the leading cause of line of duty fatalities among U.S. firefighters. 32% of these SCDs occurred after the fire call in 2018, suggesting an inability of the autonomic nervous system (ANS) to recover after strenuous events. Heart rate recovery (HRR) has been previously utilized to characterize ANS recovery and has demonstrated an ability to predict future mortality and/or cardiovascular events. The National Fire Protection Association recommends that firefighters have a maximal aerobic capacity (VO2max) of 42 ml/kg/min. However, the impact of meeting this aerobic fitness standard on the ANS recovery of firefighters has yet to be examined. PURPOSE: To examine the influence of aerobic fitness on the HRR profiles of firefighters. METHODS: 37 male career active-duty firefighters (mean ± SD, 39.1 ± 8.9 yrs; 178.8 ± 5.4 cm; 87.9 ± 11.2 kg) participated in this study. All participants completed both a submaximal step test and a maximal graded exercise test on a treadmill. A mono-exponential curve (HR = HR∞ + HR_e−t/HRRτ) was fitted to the submaximal and maximal HRR data of each participant. Participants were placed into Low Fit (n = 13) and High Fit (n = 24) groups based on the VO2max criterion of < 42 ml/kg/min and > 42 ml/kg/min, respectively. Independent t-tests were utilized to identify group differences in the decay rate (HRRe), asympote (HR∞), and amplitude (HR_e−t/HRRτ) HRR profile parameters. RESULTS: High Fit firefighters demonstrated significantly faster (p = 0.001) HR recovery than Low Fit firefighters, but no difference in HR∞ (p = 0.812) HRR parameters, during recovery after the submaximal test. In contrast, although High Fit firefighters demonstrated significantly greater HR∞ (p = 0.001) HRR parameters than Low Fit firefighters, no differences in HR∞ (P = 0.096) or HR∞ (p = 0.205) HRR parameters were observed during recovery after the maximal test. CONCLUSION: Although High Fit firefighters demonstrated enhanced HRR profiles after submaximal exertion, a similar influence was not observed after maximal exertion. These results suggest that aerobic fitness may positively influence ANS recovery after submaximal tasks, but slow ANS recovery after maximal tasks may be a factor to consider when determining SCD risk among both High Fit and Low Fit firefighters.
In firefighters, hypertension is an important risk factor for cardiovascular mortality while little is known regarding HS in this population. It is not known if lower or higher strength levels could be associated to different BP levels. **Purpose:** To evaluate the association between HS and BP in Firefighters. **Methods:** We evaluated 176 male firefighters with mean age of 28 ± 5.7 yrs, BMI of 24.6 ± 2.8 kg/m², systolic blood pressure (SBP) of 123.1 ± 11.3 mmHg, diastolic blood pressure (DBP) of 72.5 ± 6.6 mmHg, and HS of 102.2 ± 17.1 kg. Isometric HS was measured using a hand-held Sahaen dynamometer (Model SH 5001) in standing position with the arm extended straight down. Two maximal contractions were performed separated by one minute. HS was calculated as the sum of the largest value recorded from each hand and expressed in kilogram. HS was evaluated according to age as: poor, fair, good, very good and excellent. Afterward, firefighters were classified as having higher HS (good, very good and excellent categories) or lower HS (poor and fair categories). BP was measured in sitting position by an automatic digital arm pressure device. We compared the SBP and DBP of volunteers according to the HS classification (higher vs lower). The independent t-test (p<0.05) was used for the analysis. Data are presented as mean ± SD. Results: SBP was not different between those with higher and lower HS (p>0.05); however, DBP was significantly different between both groups (p<0.01). **Conclusion:** This study demonstrated that there is an association between muscle strength and DBP in this sample.

### Table 1. Blood pressure comparison between higher and lower grip strength

<table>
<thead>
<tr>
<th>SBP</th>
<th>DBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher (n=119)</td>
<td>123.5 ± 12.9</td>
</tr>
<tr>
<td>Low (n=57)</td>
<td>122.3 ± 13.9</td>
</tr>
<tr>
<td>p value</td>
<td>0.56</td>
</tr>
</tbody>
</table>

* independent t-test; SBP: systolic blood pressure; DBP: diastolic blood pressure.

**1411 Board #5 May 28 9:30 AM - 11:00 AM**

**Effect Of Occupational Hyperthermia On Upper Body Motion While Wearing Firefighters’ Protective Clothing In Hot Environment**

Ali M. Aljaaroudi1, Amit Bhattacharya2, Tyler Quinn1, Warren J. Williams1. 1Sam Houston State University, Huntsville, TX. 2University of Cincinnati, Cincinnati, OH. National Institute for Occupational Safety and Health, Pittsburgh, PA.

Firefighters perform strenuous activities for unpredictable duration periods under high environmental heat conditions. In addition to the thermal load, the tasks associated with firefighting place high physical demands on the upper extremities of the human body and dynamic balance stability. **Purpose:** To investigate the effect of occupational hyperthermia [Core temperature (Tc) ≥ 38 °C], induced by exercise in a hot environment while wearing firefighters’ protective clothing (FPC), on upper body motion. **Methods:** Twelve healthy males (Age: 24 ± 3.20 years; VO2max: 56.33 ± 4.72 mL/kg/min) were recruited to complete a Timed Up and Go (TUG) test while wearing inertial sensors before and after exercising inside an environmental chamber (30°C, 70% relative humidity). The exercise protocol included 40-min of treadmill walking at 40 % VO2max while wearing FPC. For the TUG, participants were instructed to sit on a chair, stand up upon researcher’s command, walk 3-meters, turn around, walk back to the chair, and sit down. Pre- and post-exercise measurements were compared using paired-sample t-test with alpha level set at p<0.05. **Results:** Following the exercise session in a hot environment wearing FPC, subjects’ Tc significantly increased (36.92 ± 0.27 vs. 38.25 ± 0.36 °C, p<0.01), exceeding the lower threshold limit of occupational hyperthermia (Tc ≥ 38 °C). Following the exercise session, a significant increase was found in swing velocity of the torso (77.17 ± 27.05 vs. 85.17 ± 25.89 %, p=0.03), right arm (184.33 ± 79.09 vs. 230.50 ± 104.98 %, p<0.01), and left arm (228.92 ± 77.20 vs. 250.75 ± 74.48 %, p<0.01). A significant increase was also found in range of motion of the right arm (184.33 ± 79.09 vs. 230.50 ± 104.98 %, p<0.01), and the left arm (228.92 ± 77.20 vs. 250.75 ± 74.48 %, p<0.01). **Conclusions:** Occupational hyperthermia can result in significant alterations in upper body motion which may contribute in perturbing the dynamic balance associated with gait function. The significant increase in arms and torso motion suggests that exercise in a hot environment while wearing FPC may result in physically exerting the lower extremities and increasing energy demand to maintain the dynamic balance associated with locomotion.
The firefighting profession requires high levels of physical fitness. Specifically, cardiovascular fitness has shown a strong relationship with the ability to perform occupational tasks. Despite this, not all firefighters maintain ideal fitness levels. Sudden cardiac arrest is the leading cause of on-duty fatalities for firefighters. Recent data suggests the prevalence of obese and overweight firefighters exceeds that of the general US population. Obesity is often correlated with low fitness levels in the general population, however when aerobic fitness improves, favorable outcomes in health related quality of life (HRQoL) have been reported. The relationship between HRQoL, aerobic fitness levels and body composition has not been studied in the professional firefighter population. PURPOSE: To determine the relationship of HRQoL, aerobic fitness, and body composition measures in professional firefighters.

METHODS: 16 professional firefighters (14 male; 36±8 yrs; 178±10 cm; 87.0±20.0 kg; 27.1±3.7 kg/m2) completed baseline HRQoL survey, BodPod, and maximal oxygen uptake (VO2max). HRQoL was assessed using the SF-36, with the physical and mental composite scores used for analysis. Body fat percentage was estimated using BodPod. VO2max was assessed using a graded treadmill exercise test. Descriptive statistics (mean ± SD) were reported. Pearson correlation tests were used to assess association between variables.

RESULTS: Overall participant anthropometrics are as follows: body fat (23.5 ± 6.8 %), VO2max (44.9 ± 6.0 mL/kg/min), physical health composite score (56.5 ± 2.6), and mental health composite score (48.9 ± 6.1). According to BMI classifications 6 firefighters were obese (≥30 kg/m2) and 4 were overweight (25-29.9 kg/m2). There were statistically significant negative correlations between VO2max and body fat % (r = -0.88; p < 0.000), and fat mass (r = -0.86; p < 0.001). There was a positive correlation between physical health composite score and age (r = 0.57; p < 0.001). No other relationships were found to be statistically significant.

CONCLUSIONS: The observed inverse relationship between aerobic fitness and body fat percentage supports prior findings. The novel finding that HRQoL was not correlated with aerobic fitness or body composition measures in this sample may be because of the overall high fitness levels observed in the firefighter population.

Systolic blood pressure

<table>
<thead>
<tr>
<th>Group</th>
<th>Peripheral</th>
<th>Central</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=10)</td>
<td>120 (102 - 157)</td>
<td>120 (107 - 145)</td>
<td>0.61</td>
</tr>
<tr>
<td>After</td>
<td>123 (104 - 129)</td>
<td>125 (98 - 139)</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Group 2 (n=10)

| Before | 123 (112 - 149) | 123 (112 - 154) | 0.55 |
| After | 119 (109 - 133) | 126 (113 - 139) | 0.55 |

Wilcoxon test.

Approximately 20% of firefighter (FF) injuries are the result of falls, jumps, slips, or trips and poor balance may be a common mechanism. Research has suggested that the Lower Quarter Y Balance Test (LQ-YBT) may be predictive of lower extremity injury, but the LQ-YBT may also be influenced by BMI and movement efficiency. Recently, a Functional Balance Test (FBT) was introduced to better reflect job-specific balance demands in FFs. However, the relationship between the LQ-YBT and FBT as well as measures of fitness in FFs remains unclear. PURPOSE: To identify the relationship between LQ-YBT and FBT performance as well as measures of fitness in active-duty FFs. METHODS: 16 (14 male, 2 female) active-duty FFs (35.3 ± 8.0 yrs, 179.1 ± 6.2 cm, 91.1 ± 16.9 kg) volunteered for the study. BMI and percent body fat via skinfolds (%Fat) were determined and each participant performed a Fusionetics™ Movement Efficiency Screen (MES), LQ-YBT, FBT, counter movement jump (CMJ), and a maximal treadmill test (VO2max). A composite score (LQ-YBT + CMJ) was formed by averaging the reach distances (normalized to leg length) in each direction across both limbs. The FBT required participants to walk on a wooden beam (2.5 m x 0.09 m x 0.05 m) by walking forward to the center, turning 180°, and walking backwards to the end of the beam before stepping off and repeating the same pattern to the starting point. FBT performance was represented by the total completion time (FTBT), total count for stepping off the beam (FBTERROR), and MHR (181.5 ± 10.7 bpm; r = 0.064). Bivariate Pearson correlations determined the relationship between LQ-YBT, CMJ, FBT, and BMI, and all physical fitness factors. An alpha of 0.05 determined statistical significance.

RESULTS: Significant correlations were identified between LQ-YBT and %Fat (r = -0.586, P = 0.017), BMI (r = -0.695, P = 0.003) and VO2MAX (r = -0.594, P = 0.015). FBTERROR (15.5 ± 5.2 sec) and FBTEMHR (1.7 ± 1.1) were not related to any fitness measures or LQ-YBT + CMJ. CONCLUSIONS: The lack of relationship between LQ-YBT and FBT may suggest that the tests reflect different aspects of balance. Further, the FBT was not related to any other measure whereas the LQ-YBT was related to measures of fitness (i.e., %Fat, BMI, VO2MAX). Thus, the FBT may have greater generalizability in evaluating balance performance in active-duty FFs.

Heart rate variability (HRV) is a non-invasive marker of autonomic nervous system (ANS) function based on the beat to beat variation in heart rate measured by the R-waves and reflected as the mean RR for the 5-minute resting sample. Bivariate Pearson correlations determined the relationship between resting RR, MHR, and VO2max. An alpha of 0.05 determined statistical significance. RESULTS: Resting RR (86.4 ± 134.0 ms) had a moderate significant relationship with %Fat (r = 0.594, P = 0.017), BMI (5.9%) and %FAT (5.9%) and VO2MAX (P = 0.003), and MHR (181.5 ± 10.7 bpm; r = -0.360, P = 0.029), but VO2max was not related to MHR (r = 0.308, P = 0.064). CONCLUSION: Higher resting RR was associated with greater VO2max but lower MHR. The positive relationship between RR and VO2max is consistent with prior research suggesting that a higher resting HRV is related to higher fitness. The inverse relationship between HRV and MHR suggests that greater parasympathetic nervous system control at rest (i.e., higher HRV) may extend into maximal exercise tasks. Thus, for a firefighter, the benefit of a more favorable resting HRV may not only be cardioprotective, but also influence the relative intensity of a maximal task.
North Texas during a 6-month training program. METHODS: Twenty-five professional firefighters completed 6 months of high-intensity group training, consisting of 2 training sessions per week. These individuals underwent a pre- and post-fitness testing protocol that consisted of body composition, range-of-motion, anaerobic power, muscular endurance, and cardiorespiratory fitness. A repeated-measures MANOVA was used to determine any differences between testing periods. A significance level of 0.05 was used. Results: Improvements (p < 0.05) in flexibility, anaerobic performance, fatigue index, muscular endurance, and aerobic fitness were found following the 6-month training program. No differences in body composition or peak power were observed (p > 0.05). Conclusion: Six months of high-intensity group exercise may improve measures of physical fitness in firefighters.

Table 1: Health and Physical Fitness Measures Before and After 6 Months of Exercise Training in Firefighters

<table>
<thead>
<tr>
<th>Test</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Percent Change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass (kg)</td>
<td>96.0 ± 17.9</td>
<td>93.1 ± 20.1</td>
<td>-3.0%</td>
<td>0.597</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>30.5 ± 11.0</td>
<td>29.9 ± 7.2</td>
<td>-2.0%</td>
<td>0.113</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>29.2 ± 5.0</td>
<td>29.0 ± 5.0</td>
<td>-0.7%</td>
<td>0.597</td>
</tr>
<tr>
<td>Flexibility (cm)</td>
<td>24.9 ± 6.3</td>
<td>34.6 ± 7.0</td>
<td>+39.0%</td>
<td>0.001</td>
</tr>
<tr>
<td>Pushups</td>
<td>28.8 ± 14.9</td>
<td>36.4 ± 18.1</td>
<td>+26.4%</td>
<td>0.001</td>
</tr>
<tr>
<td>Curls</td>
<td>22.1 ± 15.8</td>
<td>53.4 ± 30.6</td>
<td>+141.6%</td>
<td>0.002</td>
</tr>
<tr>
<td>Peak Power (W)</td>
<td>1052.2 ± 275.5</td>
<td>1063.3 ± 287.9</td>
<td>+1.1%</td>
<td>0.815</td>
</tr>
<tr>
<td>Mean Power (W)</td>
<td>633.4 ± 150.4</td>
<td>672.4 ± 152.2</td>
<td>+6.2%</td>
<td>0.006</td>
</tr>
<tr>
<td>Fatigue Index (%)</td>
<td>60.5 ± 7.4</td>
<td>52.8 ± 9.3</td>
<td>-12.7%</td>
<td>0.001</td>
</tr>
<tr>
<td>VO₂max (ml/kg/min)</td>
<td>34.7 ± 4.9</td>
<td>38.4 ± 5.9</td>
<td>+10.7%</td>
<td>0.006</td>
</tr>
</tbody>
</table>

All values are mean ± s.d. *Significantly different than Pre-Test. BMI = body mass index; VO₂max = maximum oxygen consumption

Acute and chronic changes in pulmonary function have been previously reported in US firefighters. However, the majority of research on pulmonary function in US firefighters was conducted more than three decades ago. Due to the changes in the use of protective equipment and changes in materials that are burning in structure fires, it is important to examine pulmonary function in firefighters and to explore changes in pulmonary function over time.

PURPOSE: To examine pulmonary function and changes in pulmonary function over a 5-year period in US firefighters. METHODS: Occupational medical exams separated by 5 years (2009-2016) were examined from a cohort of US career firefighters in Virginia (males, n=603; females, n=69). The exam results were compared to the expected changes over time based on spirometric reference equations generated from NHANES III data. Paired t-tests were used to compare observed changes between Time 1 and Time 2. One-sample t-tests were used to compare the expected with the observed change. RESULTS: There were significant decreases (p<0.001) in FEV₁, FVC, and FEV₁/FVC over the 5-year period. There were significant differences (p<0.001) between observed changes in FEV₁, FVC, and FEV₁/FVC and the expected changes over a 5-year period (Table). Conclusion: Pulmonary function declined significantly over time. The observed decreases over the 5-year period in FEV₁, FVC, and FEV₁/FVC were two to four times greater than what would be expected in the general population. Increased efforts are needed to address respiratory protection for US firefighters in order to minimize their risk of pulmonary illnesses and occupational cancer. Supported by FEMA AFG Grant EMW 2017-FP-00045.

Table 5: Year Changes in Pulmonary Measurements Among US Firefighters

<table>
<thead>
<tr>
<th>Time</th>
<th>1</th>
<th>2</th>
<th>Change</th>
<th>Expected Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV₁ (L)</td>
<td>4.13 ± 0.03</td>
<td>3.67 ± 0.03</td>
<td>-0.46 ± 0.02***</td>
<td>-0.12***</td>
</tr>
<tr>
<td>FVC (L)</td>
<td>5.03 ± 0.04</td>
<td>4.59 ± 0.03</td>
<td>-0.44 ± 0.02***</td>
<td>-0.10***</td>
</tr>
<tr>
<td>FEV₁/FVC (%)</td>
<td>82.2 ± 0.2</td>
<td>80.1 ± 0.2</td>
<td>-2.1 ± 0.1***</td>
<td>-0.98***</td>
</tr>
</tbody>
</table>

Values are means ± SE

*Expected change based on NHANES III

**p<0.001
The combination of thermal extremes and metabolic demands associated with wildland firefighter (WLFF) job tasks may elicit acute impairment in work capacity. As heat injuries persist in WLFF and other tactical occupations, field evaluations can gather insight into characteristics of job tasks that may contribute to thermoregulatory challenges.

**PURPOSE**: To evaluate the activity and physical demands of wildland firefighting as they relate to the associated environmental conditions.

**METHODS**: Direct observation and real-time wireless physiological monitoring allowed for weather and physiological metrics, including heart rate (HR), percentage of HR max (%)HR(max), core temperature (Tc) and physiological strain index (PSI), of male (n=301) and female (n=33) WLFFs to be monitored during wildfire management activities. Activity levels (ACT; counts min⁻¹) were recorded using an ActiCal activity monitor (Mini Mitter) located in the left pectoral pocket. Heat Index estimations (HI) were calculated using temperature (TEMP) and relative humidity (HUM) inputs recorded using an OMEGA Temperature Data Logger. One-way ANOVAs were used to compare means of HI quartiles data using HR, ACT, and PSI as dependent variables.

**RESULTS**: TEMP and HUM values were computed to heat index (n = 3891 hours) and divided into quartiles (Q1: 13.3-25.1°C; Q2: 25.2-26.4°C; Q3: 26.5-28.9°C; Q4: 29.0-49.1°C). Average ACT displayed a negative, linear correlation with HI (Q1: 535 ± 731 counts min⁻¹; Q2: 423 ± 615 counts min⁻¹; Q3: 384 ± 571 counts min⁻¹; Q4: 309 ± 416 counts min⁻¹; p < 0.05). However, this reduction in activity level resulted in only a moderating effect on HR and PSI as average HI (Q1: 113 ± 27 bpm; Q2: 116 ± 26 bpm; Q3: 116 ± 26 bpm; Q4: 111 ± 25 bpm) and PSI values (Q1: 3.5 ± 1.6; Q2: 3.7 ± 1.6; Q3: 3.7 ± 1.5; Q4: 3.5 ± 1.5) were lowest in Q1 and Q4. Average Tc values increased only slightly with increasing HI (Q1: 37.49 ± 0.46°C; Q2: 37.59 ± 0.48°C; Q3: 37.60 ± 0.43°C; Q4: 37.59 ± 0.41°C). CONCLUSIONS: Although physical activity occurred for approximately half of a typical 12 to 16-hour work shift, physical exertion was the primary indicator of challenges to thermoregulation in this population. Reductions in activity levels with increasing heat index values suggest adequate regulation of body temperature in the majority of WLFF field operations.

**RESULTS**:

<table>
<thead>
<tr>
<th>Table 1 - Duty cycle (x100) by respirator and energy expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Expenditure</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Standing 1 L/min 2 L/min Max</td>
</tr>
<tr>
<td>Baseline (instrument mask only)</td>
</tr>
<tr>
<td>34.11 (8.46) 41.07 (6.44) 41.86 (4.69) 44.17 (5.65)</td>
</tr>
<tr>
<td>Small loose-fitting PAPR</td>
</tr>
<tr>
<td>34.99 (4.77) 42.10 (2.78) 44.06 (3.50) 46.97 (3.43)</td>
</tr>
<tr>
<td>Medium loose-fitting PAPR</td>
</tr>
<tr>
<td>43.53 (9.37)* 46.32 (5.53)* 46.02 (4.92) 47.41 (3.95)</td>
</tr>
<tr>
<td>Large loose-fitting PAPR</td>
</tr>
<tr>
<td>46.86 (11.09)* 47.27 (4.59)* 46.41 (3.90)* 48.74 (4.06)*</td>
</tr>
<tr>
<td>Tight-fitting PAPR</td>
</tr>
<tr>
<td>40.24 (8.66)* 42.30 (3.34) 45.54 (3.43) 44.77 (3.40)</td>
</tr>
</tbody>
</table>

All values are reported as mean (standard deviation). *significantly different than baseline within energy expenditure (p<0.05).

Significant main effects (p<0.01) included the respirator, energy expenditure, and respirator x energy expenditure interaction. CONCLUSION: Relative inspiratory time increased with energy expenditure and with both PAPR hood size and type. This evidence suggests dead space in PAPRs and low tidal volume affect respiratory responses by increasing the relative inspiratory time. Covariate effects by inhale carbon dioxide and breathing resistance would be useful for future research.

Uncompensable heat from wildland firefighter (WLFF) personal protective equipment decreases the physiological tolerance while exercising in the heat. Our previous work demonstrated that the WLFF helmet significantly increases both perceived and actual head heat. **PURPOSE**: This study compared heat accumulation under simulated working conditions while wearing standard non-vented WLFF helmets (H) versus a vented helmet (VH). **METHODS**: Ten male subjects with VO₂max of 59.8 ± 3.6 ml·kg⁻¹·min⁻¹ completed two trials. Following a 10-minute seated acclimation period, subjects walked 180 minutes (at 3.5 mph, 5% grade) in a heat chamber (35% and 30% relative humidity) with three intervals of 50 minutes of exercise and 10 minutes rest followed by a work capacity test to exhaustion. Subjects randomly completed opposing helmet trials separated by a two-week washout. Each trial measured physiological strain index (PSI), visual analog scale (VAS), helmet temperature and relative humidity (Th, Rh), rating of perceived exertion (RPE) and heart rate (HR). Data was analyzed using a 2X6 repeated measures ANOVA.

**RESULTS**: All subjects finished all trials. Work capacity was significantly greater in the VH trial (95.9±10.3 KJ vs. 109.3±8.5 KJ VH; p <0.001). At the end of the 3 hour trial HR (146.8±17.2 bpm H, 144.3±17.9 bpm VH), PSI (6.06±1.45 KJ, 5.89±1.24 VH), VAS (14.2±1.7 H, 13.3±1.7 VH), Th (35.52±0.47°C H, 35.75±0.50°C VH), and Rh (45.6±5.1% H, 41.0±5.9% VH) showed a significant effect of time (p<0.05) but were not significant between trials. End trial PSI and HR significantly related to work performed (r=−0.8, P<0.001).

**CONCLUSION**: Elevated work, trends for RPE, helmet microenvironment, and VAS suggest greater heat dissipation and comfort with the vented helmet. This suggests the standard unvented WLFF helmet may contribute to accumulated heat over time, which may affect work output and safety in the field. 

Supported by the USFS (18-CR-11138100-005).
169.5±4.2 cm) Type I Intergancy Hotshot (IHC) WLFF were studied during an 11-day critical training period. Daily body weight (BW), upper body (US), and lower body (LS) muscle soreness scales were collected. Venous blood was collected from the antecubital region on Days 1, 4, 8, and 11 to measure creatine kinase (CK) and lactate dehydrogenase (LDH). Skin fold measurements were taken on Day 1 and Day 11 to calculate body fat percentage (BF). One-way ANOVA were used to analyze mean differences in CK, LDH, US, and LS. Paired samples t-tests were used to identify differences in BF and CK. Data presented as mean ± SE. Frequency of sleep in body weight were observed between Day 1 and Day 11 (p=0.065) of CT. BF significantly decreased from Day 1 and Day 11 (15.3±1.4% vs. 14.1±1.3%, p<0.002). US and LS showed a main effect of time, elevated from baseline for subsequent days, with a peak on Day 3 (3.8±0.5 cm, p<0.001); LS: 4.3±0.3 cm, p<0.001) of CT. CK showed a significant effect of time, elevated from baseline, with a peak on Day 4 (p=0.001). LS showed a main effect of time, where Day 11 significantly increased from Day 1 (159.4±6.9 IU/L), p<0.040). CONCLUSION: These data suggest that WLFF undergo significant physiological stressors to induce muscle soreness and damage during CT. Although there have been previous case reports of rhabdomyolysis during CT, these IHC WLFF remained sub-clinical. Despite this, these data demonstrate that CT presents a stress that may jeopardize WLFF performance and safety in the field. Careful preparation and monitoring of the training stimulus is key to avoid clinical ramifications.

**Purpose:** Previous studies report that firefighters lacking an adequate level of physical fitness, even those classified as experts, can experience a severe physiological challenge in unpredictable environmental conditions. The purpose of this study was to assess and track the annual physical fitness performance of the members of a professional firefighting department.

**Methods:** As part of the annual health and fitness testing (data from 2002-2017) performed by the Bowling Green Fire Department (BGFDP) in Bowling Green, KY, 153 firefighters had their physical fitness evaluated using standardized and recommended tests published by the International Association of Fire Fighters. A mixed methods analysis was employed to examine differences over time for each of the dependent variables (push-ups, plank hold, handgrip strength, static arm pull, and static leg pull) using SPSS (v25).

**Results:** Handgrip strength performance significantly improved in the first 4 years after baseline (p < .05) followed by a steady, significant decline each following year (p < .05), with the exception of year 15 (p > .504). Push-up performance significantly declined from baseline (p < .05). The plank hold performance was maintained over the first 5 years of testing (p > .05) before showing marked improvement in the most recent year (p < .05). Although small, flexibility significantly improved from year 1 to year 2 (p < .05), but then was maintained over each subsequent year of testing (p > .05). Static arm pull and static leg pull both significantly improved for the first 4 years (p < .05), but then showed a steady decline thereafter (p < .05).

**Conclusions:** Based on these results, physical fitness showed a consistent improvement in the first several years tested; however, several of the muscular strength-related variables showed a consistent decline thereafter. It will be important to continue to monitor and adjust the physical training regimen to attempt to alleviate any physical fitness decline.

Firefighting, being one of the most dangerous jobs, requires specialized equipment and strategies to safely and effectively respond to fire emergencies. It is essential for this profession to wear firefighter protective clothing (FPC) to provide barrier protection from the dermal contact of hazardous materials such as heat, flame, and combusted product (Kim et al. 2017). However, the mobility, comfort and physiological responses among on-call volunteer FFs remains a paucity. PURPOSE: To quantify the impact of volunteer FFs` night time call response on sleep volume and stage-specific distribution. METHODS: Eight male volunteer FFs (34.76 ± 2.56 years) were validated wristband sleep monitors to track total, stage-specific, and percent distribution of sleep on nights without a call (CON), and on nights where there was a call response between 1900 and 0700 (CALL). Data was extracted via the device’s app to a tablet and recorded via spreadsheet. One firefighter experienced two nights with a call and only one without. Both sets of CALL data were compared to the CON resulting in 9 sets of CON/CALL data which were analyzed using a one-way ANOVA. RESULTS: Significant differences were found in total sleep (CON: 417.125 ± 52.044 mins; CALL: 261.111 ± 61.116 mins), time spent in rapid-eye movement (REM) (CON: 109.88 ± 28.47 mins; CALL: 51.44 ± 17.92 mins) and light sleep (CON:225.75 ± 26.20 mins; CALL: 157.89 ± 37.54 mins), and percentage of sleep spent in REM (CON: 22.25 ± 3.73%; CALL: 16.44 ± 3.17%). This was accompanied by respective effect sizes (f) of .570, .537, .429, and .511. Despite comprising 22.57% of total CON sleep, REM sleep decreased disproportionately, accounting for 37% of CALL sleep loss. CONCLUSIONS: Volunteer firefighters responding to overnight calls experience significant total sleep deprivation, even those classified as experts, can experience a severe physiological challenge in unpredictable environmental conditions. Significant and disproportionate decreases in total and percentage of REM sleep were also observed on nights with a call. Considering the impact of REM sleep on optimal executive function, this degree of sleep deprivation has the ability to impact critical decision-making events, not only on the fire ground, but at the firefighter’s day job, thereby increasing risk of injury/death.
Firefighters are at an increased risk for cardiovascular events (e.g., heart attack) due to increased incidence of physical inactivity and obesity. PURPOSE: To compare objectively measured physical activity and cardiorespiratory fitness between two independent fire departments. METHODS: Two independent fire departments from the Midwest participated in the study. Waist circumference (WC) and body mass index (BMI) were used to classify obesity status. Firefighters were classified as obese if BMI > 30.0 kg/m^2; WC: 96.8 ± 7.45 cm and fire department two (FD2) had 11 complete the study (age: 36.18 ± 4.29 years; BMI: 27.79 ± 4.00 kg/m^2; WC: 94.5 ± 6.41 cm). Six firefighters were classified as obese (five from FD1 and one from FD2). There were no significant differences between the two departments for sedentary (≤38 minutes/day) or active (≥38 minutes/day) physical activity (p > 0.05). The ACFT scores were significantly lower in FD1 compared to FD2 (38.9 ± 5.7 minutes/day vs. 42.5 ± 5.7 minutes/day, p = 0.002). CONCLUSION: The ACFT does not adequately measure fitness status of fire departments.
study examined the influence of age on recovery following an acute bout of workite resistance exercise.**METHODS:** Nineteen young and 19 older career firefighters (FFs) completed an acute bout of resistance exercise in addition to pre- and post-testing 24, 48, and 72 hours post-exercise. A work-related fatigue (WRF) survey was completed to assess daily fluctuations in work demands. Ultrasonography was used to assess cross-sectional area (CSA) and echo intensity (EI) of the vastus lateralis, in addition to muscle thickness (MT) and EI of the biceps brachii. To determine maximal jump height and associated movement patterns, participants completed back squats while standing on a jump mat with a linear transducer attached at the waist. Upper-body peak force (PF) was measured during an isometric upright row task, using a calibrated tension-compensation load cell. Lower body PF was examined with the participants seated in a custom-built, calibrated isometric dynamometer and their knees flexed at 60 degrees. Following 3 submaximal warm-up contractions, participants performed 3 maximal voluntary contractions for each strength assessment lasting 3–4 s. The FFs completed the circuit-style resistance exercise bout following pre-testing, which included 3 sets of 8–10 repetitions at 80% of their predicted 1-repetition maximum of the deadlift, shoulder press, and upright row. Linear mixed models, controlling for resistance exercise, were analyzed to assess all primary outcomes, with subject as the random effect and group and time as fixed effects. Alpha level was set at a priori at 0.05.**RESULTS:** There was a significant group by time interaction effect for WRF (P < 0.002) and was controlled for in subsequent analyses. There were no other significant group by time interactions (P > 0.171). Collapsed across time, young FFs showed lower body peak PF (P < 0.006), jump performance (P < 0.024), and local Vt. EI (P < 0.008) values compared to older FFs (P < 0.023) and jump performance (P > 0.092) decreased as muscle size increased (P = 0.006) for both groups.**CONCLUSION:** These results indicate that age may not influence the recovery from a bout of workite resistance exercise in FFs.**1435 Board #29 May 28 9:30 AM - 11:00 AM PHYSICAL FITNESS, PHASE ANGLE AND BODY FAT DISTRIBUTION OF YOUNG MALE ARMY CADETS Raquel D. Langer, Juliano H. Borges, Vagner X. Cirolini, Mauro A. Páscoa, Gil Guerra-Júnior, Ezequiel M. Gonçalves. University of Campinas, Campinas, Brazil. Email: raquel.langer@gmail.com (No relevant relationships reported)**

A military career demands a routine of physical training to induce adequate levels of physical fitness (PF) and body composition. Body fat distribution (i.e. android and gynoid fat) are related to increase metabolic risk also observed in military populations. Phase angle (PhA) is used to evaluate nutritional status and is an indicator of cellular health. However, it is unclear if PhA is influenced by changes in PF induced by physical training. PURPOSE:** To verify the association between PF and PhA, android and gynoid fat, and b) if PF changes have an association with changes in PhA, android and gynoid fat in the army cadets. METHODS: 385 young male army cadets (18.7±0.7 yrs) were evaluated before (M1) and after (M2) 6-mo of military training. PhA was calculated by bioelectrical impedance parameters. Dual-energy absorptiometry evaluated android fat (β=0.39) in %A, android fat in kg (G) and %G were assessed. Results were compared between M1 and M2. Linear regression analysis was used to verify if changes in %A (on independent variables influenced the PF changes among participants. RESULTS: In M1, PF was associated (p<0.001) with %PhA (r=-0.16), A% (r=-0.39), A (r=-0.41), G (r=0.45), and G% (r=0.46). In M2, PF was associated (p<0.001) with %A (r=0.36), A (r=0.37), G (r=0.41), and G% (r=0.40), but not with %PhA (r=0.10, p=0.25). The PhA (r=-0.23) and G% (r=0.26) increased (p=0.001), and A (r=0.35% decreased (p=0.05) compared to M1. In addition, male army cadets improved (p=0.001) the PF test (A=1.1min) compared to M1. The PF improvement was associated (p=0.001) with ∆A% (r=0.38), ∆A (r=0.36), ∆G (r=0.42), and ∆G% (r=0.40), but not with ∆PhA (r=0.06, p=0.209). Linear regression of the PF had an effect (p<0.001) of ∆A (β=0.39), ∆A (β=0.38), ∆G (β=0.41), and ∆G% (β=0.42), but not of ∆PhA (β=0.07, p=0.179). CONCLUSION: PF was associated with PhA, A and G. The improvement on PF seems to be more influenced by ∆A and ∆G, but not by ∆PhA in young male army cadets. Supported by CAPES (No.23001.000422/98-30)**

**1436 Board #30 May 28 9:30 AM - 11:00 AM Assessing Injury Susceptibility At Marine Corps Recruit Depot, San Diego, California**

Paul Y. S. Poh, Pinata H. Sessom, Daniel W. Trone.1, Leidos Inc., Naval Health Research Center, San Diego, CA. Naval Health Research Center, San Diego, CA. Email: paula.y.s.poh@gmail.com (No relevant relationships reported)**

Individuals enlisting at the Marine Corps Recruit Depot (MCRD) San Diego undergo a physically demanding training regimen. As such, musculoskeletal injury (MSKI) rates during training remain high and account for costly increases in attrition and delays in graduation, thereby impacting force readiness. Earlier injury detection is needed, and functional movement tests such as the functional movement screen (FMS), Y-balance test lower quarter (YBT-LQ) and ankle dorsiflexion range of motion (AD-ROM) can provide predictive value for MSKI incidence.
PURPOSE: To test the hypothesis that functional movement assessments are beneficial tools for movement analysis and injury prediction.

METHODS: A total of 38 police officers (N = 407; age: 20 ± 2 y; height: 174.5 ± 7.3 cm; weight: 76.1 ± 11.4 kg) underwent testing of FMS, YBT-LQ, and AD-ROM prior to beginning training. Injury incidence during training and graduation outcomes were tracked by instructors.

RESULTS: Twelve recruits (3%) were dropped from their class due to a lower body stress fracture or patellar dysfunction for eight, and separating four from enlistment. A one-way analysis of variance revealed statistical group differences (MSKI vs no MSKI) for the FMS hurdle step (F(1,400) = 4.314, p = 0.038) and trunk stability (TS; F(1,394) = 14.600, p = 0.000) assessments, with lower scores in the MSKI group (HS: 1.9 ± 0.5 vs 2.2 ± 0.5; TS: 1.3 ± 1.2 vs 2.4 ± 0.9). During the YBT-LQ anterior direction, the MSKI group showed a greater difference (F(1,394) = 6.536, p = 0.011) between legs (4.5 ± 7.7 cm vs 1.5 ± 5.8 cm). For both leg-ankle-foot complexes, the MSKI group demonstrated higher AD-ROM scores (right: 44.1 ± 4.7° vs 40.5 ± 6.5°; left: 43.3 ± 5.4° vs 41.6 ± 6.5°) with the right side trending toward significance (F(1, 399) = 3.692, p = 0.055).

CONCLUSIONS: MSKI recruits who incurred a lower body MSKI during training had a movement analysis of inferior lower body mobility and stability, weaker core stabilization, and poorer single limb stance and imbalance. The increase in ankle flexibility observed in the MSKI group may be a risk factor for overuse Achilles tendon injuries. Results not only apply to MCRD recruits, but could also apply to recruits in other military branches, athletic communities, and first responders seeking screening tools for movement analysis and injury prediction.

1343 Board #33 May 28 9:30 AM - 11:00 AM
The Physical Parameters Of Tactical Climbing And Performance Characteristics Of NSW Operators
Dallas Wood, David Swain, FACSM. Old Dominion University, Norfolk, VA. (Sponsor: David Swain, FACSM)
Email: dwodoo06@odu.edu

PURPOSE: In tactical settings vertical elevation is critical for advantage to Special Operation Forces. Climbing proficiency in various settings (alpine, urban, and maritime) requires strength, power, endurance, and technique. This research seeks to 1) study differences in physical performances and anthropometrics of US SEAL lead climbers from non-lead climbers, and 2) catalogue the types and weights of the various climbing systems to assess total system mass to lead climber’s body mass. Our hypothesis is that there would be no differences in physical performance on Combine tests or anthropometrics between lead climbers and non-lead climbers as they are the same Special Operations populations.

METHODS: Climbing surveys were collected from lead climbers. Retrospective Combine data (standing long jump, pro-agility test, 25-lb pull-up, body mass bench press, 1-RM deadlift, 300-yd shuttle, 3-mile run, and 800-m swim) were compared between 13 SEAL lead climbers (age: 30.9 ± 5.4 y; height: 180.3 ± 11.6 cm; mass: 89.6 ± 10.3 kg; body fat: 15.8 ± 4.4%); and 305 non-lead climbers (age: 28.4 ± 5.0 y; height: 178.4 ± 6.2 cm; mass: 86.0 ± 9.1 kg; body fat: 17.3 ± 4.5%).

RESULTS: Lead climbers performed significantly better than non-lead climbers in the Pro Agility, 1-RM dead lift and the 800-m swim. There were no significant differences between lead climbers and non-lead climbers in anthropometrics and the remaining Combine tests. The total mass reported for the climbing equipment for each tactical scenario was up to 5.8 kg for Urban climbing, up to 14.0 kg for Alpine climbing, and up to 8.0 kg for maritime climbing. With a typical combat load of 22 kg, adding this climbing equipment exceeds one-third of the lead climbers’ own body mass. This combined load is more than double that used in the weighted pull-up test.

CONCLUSIONS: Lead climbers were not significantly different than non-lead climbers in anthropometrics and the remaining Combine tests. The total mass reported for the climbing equipment for each tactical scenario was up to 5.8 kg for Urban climbing, up to 14.0 kg for Alpine climbing, and up to 8.0 kg for maritime climbing. With a typical combat load of 22 kg, adding this climbing equipment exceeds one-third of the lead climbers’ own body mass. This combined load is more than double that used in the weighted pull-up test.

1344 Board #34 May 28 9:30 AM - 11:00 AM
Assessing Value Of Physical Training For Tactical Athletes
Kimbo E. Yee1, Justin B. Moore, FACSM2, George Grieve3, Kasey Hucks4, Daniel Bornstein1. 1The Citadel, Charleston, SC, 2Wake Forest School of Medicine, Winston-Salem, NC.
Email: kyee@citadel.edu

PURPOSE: Population physical fitness (PF) levels have steadily declined over the past 20 yrs. PF is the strongest predictor of injuries among military personnel, after gender. Military and paramilitary organizations continue evaluating physical training (PT) methods to improve tactical athletes’ performance on physical fitness tests (PFT). Similarly, many tactical units are evaluating PFT standards to determine their ability to predict physical readiness for service. However, evidence on the efficacy and effectiveness of PT for passing a PFT and being fit for service remains equivocal. The purpose of the current study was to develop and test the psychometric properties of an objective instrument for assessing attitudes towards PT as it relates to current PF, lifelong PF, and ability to pass a military PFT.

METHODS: Data were collected on 892 cadets from a senior military college who participate in military PT at least two days a week. The sample was split into two sub samples for the purpose of establishing and confirming the psychometric properties of the scale. In sample one, coefficient alpha was calculated for six or prior subscales and a
confirmatory factor analysis was conducted using maximum likelihood estimation with missing variables. Modification indices were consulted following estimation. Analyses were repeated on subset samples. All analyses were conducted in Stata ( Version 16). RESULTS: In sample one, all six subscales indicated acceptable internal consistency (alpha = .69-.89) and the final measurement model was a good fit for the data (Chi-square=558.15 (215), RMSE=0.060, CFI=0.947, TLI=0.937). Modification indices suggested adding two additional covariances, which resulted in a superior fit to the data (Chi-square=445.63 (213), RMSE=0.050, CFI=0.964, TLI=0.957). In sample two, all subscales indicated acceptable internal consistency (alpha = .69-.86) and the final measurement model was a good fit for the data (Chi-square= 395.83 (213), RMSE=0.044, CFI=0.968, TLI=0.962). CONCLUSIONS: The current data provide support for the factorial validity and internal consistency of the instrument. Thus, this instrument can be employed as an objective assessment of PT programs within tactical settings and can be used to conduct impact evaluations in the presence or absence of formal military and paramilitary PFT.

1441 Board #35 May 28 9:30 AM - 11:00 AM Prevalence Of Hypohydration In Military Servicemembers Before A Multi-day Field Training Exercise

Jeffery L. Hileson, Les.Lee K. Funderburk. Baylor University, Waco, TX. (No relevant relationships reported)

It is well established that hypohydration negatively impacts physical and cognitive performance. Despite the importance of hydration, athletes frequently participate in training or competition hypohydrated. While data exists in athletes, there is a lack of data on Military servicemembers’ (SM) hydration status prior to field training exercises or combat. For our nation’s Warfighters, starting a mission hypohydrated can put their lives at risk. Performance decrements have been documented as consequences on mission readiness and decrease survivability and lethality on the battlefield. While the recently revalidated Military fluid replacement guidelines (TB MED 507) have been shown to effectively replenish known fluid losses without causing overhydration, they do not address hydration status before training events.

PURPOSE: To describe the hydration status of Military SMs prior to a physically rigorous, multi-day field training exercise.

METHODS: Data was collected from three training iterations from 2017-2019. In total, first morning void urine samples were collected from 93 Military SMs (2017, n=23; 2018, n=33; 2019, n=37). Hydration status was determined by urine specific gravity (USG) with cutoffs according to the American College of Sports Medicine (ACSM) and the National Athletic Trainers’ Association (NATA) guidelines: eugydration <1.010, minimal hypohydration 1.010-1.020, hypohydration 1.021-1.030, severe hypohydration >1.030. For each cohort, only USG data was collected.

RESULTS: The mean (SD) USG for the sample was 1.020 (0.009). Using the ACSM cutoffs (hypohydration >1.020), 50.5% of Military SMs were hypohydrated at the start of the field training exercise. Using the NATA cutoffs, 18.3% (n=17) were eugydurated; 31.2% (n=29) were mildly hypohyrated; 40.9% (n=38) were hypohydration; 9.7% (n=9) were severely hypohydration.

CONCLUSIONS: Despite the Military’s emphasis on appropriate hydration strategies, just over half of the SM cohort were hypohydration, while approximately 10% were severely hypohydration. For each cohort, only USG data was collected. Despite the importance of hydration, athletes frequently participate in training or competition hypohydrated. While data exists in athletes, there is a lack of data on Military servicemembers’ (SM) hydration status prior to field training exercises or combat. Performance decrements have been documented as consequences on mission readiness and decrease survivability and lethality on the battlefield. While the recently revalidated Military fluid replacement guidelines (TB MED 507) have been shown to effectively replenish known fluid losses without causing overhydration, they do not address hydration status before training events.

1442 Board #36 May 28 9:30 AM - 11:00 AM Differences In Fitness Between Law Enforcement Cadets And Officers: A Retrospective Study Of Two Agencies

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INTRODUCTION: Research suggests that police officers progressively become less fit during their careers which may impact their ability to perform job-specific physical tasks. However, as tasks may vary between different law enforcement agencies (LEAs), there may be differences in both fitness levels and changes in fitness between different LEAs. PURPOSE: To identify differences in fitness parameters between cadets and incumbent police officers across two independent LEAs. METHODS: Retrospective analysis of data from two separate LEAs were analyzed. The study cohort consisted of 388 male incumbent police officers (LEA 1 n = 72; mean age = 39.43 ± 8.28 yrs; mean weight = 87.47 ± 11.60 kg; LEA 2 n = 316; mean age = 37.92 ± 7.71 yrs; mean weight = 88.80 ± 12.93 kg) and 157 cadets (LEA 1 n = 66; mean age = 29.95 ± 5.73 yrs; mean weight = 85.65 ± 11.92 kg; LEA 2 n = 91; mean age = 30.14 ± 6.93 yrs; mean weight = 86.50 ± 12.23 kg). Fitness measures included 1 min maximum push-up repetitions (PU), and sit-up repetitions (SU), a vertical jump (VJ), and either a 1.5 mile run or a 20m multistage fitness test (20m MSFT), with the latter measures converted to VO2max. Independent samples t-tests were used to compare, both combined and individual, LEA cadet cohorts against incumbent officer cohorts. Alpha levels were set at p≤0.05. RESULTS: When combined, cadets were found to be significantly younger (p<0.01) and lighter (p<0.05) than incumbent police officers. However, the fitness of LEA cadets was divided into respective LEAs only differences in age remained between cadets and officers. When comparing fitness measures, cadets achieved higher PU, SU, VJ, and VO2max scores as a cohort (p<0.001 respectively) and as LEA 2 (p<0.01, p<0.001, p<0.01 and p<0.001, respectively). However, only PU, SU and VO2max (p<0.001 respectively) were significantly higher in LEA 1 with no differences in VJ between cadets and incumbent officers. CONCLUSIONS: Cadets generally were more fit than incumbent police officers, whose fitness may decrease over time due to job demands (e.g. shiftwork and stress), age-related declines, and changes in physical activity. Police officer fitness appears to peak during their time as cadets and decreases regardless of LEA. Maximizing fitness levels during cadet training and minimizing fitness loss after training is vital if incumbent officers are going to remain fit for duty.

1443 Board #37 May 28 9:30 AM - 11:00 AM Effects Of Non-mandated Physical Readiness Training On Fitness And Performance In Army Officers

Kate Early, Emily Garrett, Brian Tyo, Clayton Nickis. Columbia State University, Columbia, GA. (No relevant relationships reported)

PURPOSE: To provide military personnel for occupational operations, Army captains are responsible for implementing, participating and mandating physical readiness training (PRT) for their respective units. However, the fitness of captains was generally more fit than incumbent police officers, whose fitness may decrease over time due to job demands (e.g. shiftwork and stress), age-related declines, and changes in physical activity. Police officer fitness appears to peak during their time as cadets and decreases regardless of LEA. Maximizing fitness levels during cadet training and minimizing fitness loss after training is vital if incumbent officers are going to remain fit for duty.

1444 Board #38 May 28 9:30 AM - 11:00 AM Associations Between Physical Fitness Characteristics And The Candidate Physical Ability Test (CPAT)

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Firefighting is a physically demanding occupation, with significant physiological stresses well documented in the literature. The Candidate Physical Ability Test (CPAT) is a firefighting-task specific test designed to screen firefighter candidates. Previous research has correlated physical attributes with performance on individual tasks. However, few studies have examined the association between fitness characteristics and performance on a series of tasks designed to mimic the demands of firefighting, such as the CPAT. PURPOSE: To examine the associations between physical fitness characteristics and performance on the CPAT. METHODS: Ten healthy male firefighters (age= 31.8± 11.3; Body Mass Index (BMI)= 30.0 ± 4.3; percent body fat (%BF)= 20.4± 7.1; VO2max (ml·kg·min-1)= 42.1± 6.9) completed a fitness assessment which included: 1) a graded exercise test (stair climb, hose drag, equipment carry, ladder raise and extension, forcible entry, pushup test, curl up test, hand grip strength, and sit-ups), 2) VO2max ( VO2max=45.7±2.4 vs. 48.8±3.8 ml·kg·min-1 ); mean power output (566±47 vs. 542±91 W), sit-ups (72±5 vs. 77±11 reps) or push-ups (59±6 vs. 60±15 reps) (p<0.05). There was no time by group interaction in body fat percent (P=0.28), mean power output (P=0.17), or sit-ups (P=0.71). VO2max (p<0.001) and push-ups (p<0.01) increased across both groups after the intervention. CONCLUSIONS: Captains maintained cardiorespiratory fitness, body composition and anaerobic power after 5 months regardless of PRT being mandated or not. Participants may have had freedom to perform exercise they found enjoyable as opposed to being confined to PRT which focuses on strength and endurance, thus leading to increased aerobic capacity. Duties related to the rank and combat experience as well as pressure of rank may influence Captains to maintain their fitness.
activities of 20 full official matches were collected and analyzed using GPS Polar Team Pro System. In thus study were used five positional roles in soccer players (side-backs, full-backs, defensive midfielders, offensive midfielders, attackers) within the tactical scheme 4-4-2. The indicators of the intense actions were number of sprints, % of intense actions (speed of 14 to 25.1 km.h-1), amount of accelerations and decelerations, maximum speed in addition to the total distance of displacements. A repeated measures analysis of variance (Kruskal-Wallis) was performed for distances covered at different intensities between positions. RESULTS: Significant differences were found for the full-backs with side-backs, defensive, midfielders, offensive midfielders, attackers (H=5.35; p<0.01), referring to total distance traveled during a game. It was shown that the indicators of the intense actions between the side-backs and full-backs with defensive and offensive midfielders, and attackers, was relative to the % intense actions (H=7.15; p<0.01), speed (H=58.97; p<0.01), amount of decelerations (H=77.54; p<0.01) and accelerations (H=55.61; p<0.01). However, for the execution of the maximum speed were observed in side with full-backs and midfielders (p<0.01). Significant differences were found between intense actions between side-backs and full-backs with defensive and offensive midfielders and attackers, allowing to emphasize that the midfielders and attackers need to be more intense side-backs and full-backs, mainly in the tactical scheme 4x4x2. The main finding was that offensive, defensive midfielders and attackers had higher activity at all intensities, including intense sprinting, high-intensity actions, and in accelerations and decelerations. CONCLUSIONS: These results show that intense actions are highly dependent on positional role and relative tactical organization in a soccer team.

Field-based sports training traditionally revolves around the “art of coaching”, where coaches use experience and educated guesses as a primary means of conditioning players. With the advent of GPS technology, field sports have the capability to monitor external training loads more accurately thus allowing the coaching staff to design better conditioning programs in order to match sport-specific demands seen during practices and competitions, potentially improving performance. NCAA rule limitations for Division III pre-season training accentuates the need to determine the training loads of these practices.

PURPOSE: The purpose of this study was to determine if performance measures differed dependent on game outcomes and field position during a full NCAA collegiate.

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<th>Board #40</th>
<th>May 28 9:30 AM - 11:00 AM</th>
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The physiologic responses collegiate athletes experience during practice/competition are reasonably well understood; however, an important yet understudied group who also exerts substantial effort during sporting events are team mascots. Mascots typically wear heavy suits/uniforms that create an environment not conducive to effective temperature regulation, thus putting the wearer under high physiologic stress. Although physiologic responses experienced by collegiate athletes and mascots during athletic competitions have been studied previously, it is unknown how these responses compare with one another. PURPOSE: To compare in-game heart rate (HR) responses and accelerometer data of a collegiate mascot with those of collegiate soccer athletes. METHODS: A physiological tracking system was used to evaluate HR and movement from three groups: a mascot while “in suit” [N=7 (1 female)] during a football game, and players in the first half of a varsity men’s N=9) and women’s N=9) soccer game, separately. All games were played under similar ambient conditions (avg 21°C, 60% rh, 5 mph wind). Prior to the study, individuals’ HRmax values were determined during graded treadmill tests performed to volitional exhaustion or an on-field intermittent recovery test. Variables analyzed were time “in suit” on the field, distance traveled (meters/min), and percent of time in pre-established HR zones [HRzone1 (50-59%HRmax), HRzone2 (60-69%HRmax), HRzone3 (70-79%HRmax), HRzone4 (80-90%HRmax), and HRzone5 (>90%HRmax)]. Differences between groups were evaluated via a one-way ANOVA. RESULTS: There were no differences between groups for time spent “in suit” on the field (F=4.77; p<0.01); however there was a significant difference between groups for distance traveled (p=0.001), with the mascot traveling less distance (55±6 m/min) than the soccer players (men, 115±25 m/min, women, 107±4 m/min). All three groups spent over 90% of time “in suit” on the field in HRzones 3, 4 or 5, and 75% of time in HRzone 4 or 5. There were no significant differences between groups for time spent in various HRzones. CONCLUSION: The mascot suit environment created a physiological strain on the wearer similar to that of a varsity collegiate soccer athlete, despite much less movement performed per session. |
women’s soccer season.

METHODS: Average speed [km·h−1] was monitored in 89 female soccer athletes across 5 NCAA Division I teams (mean ± SD; age, 19.8 ± 1.1 y; body mass, 58.1 ± 3.23 kg; height, 172.4 ± 6.62 kg; height, 1.8 ± 0.34 cm) using GPS-enabled player tracking devices during the competitive season. Athletes were categorized into three groups, depending on field position (forwards (FWDs), midfielders (MIDs), and defenders (DEFs)). Within group comparison for wins, losses, and ties were determined using mean differences (MD) with 95% confidence interval (95% CI) and effect sizes (ES). All interval 4-minute assessments post-hoc with a Tukey HSD, with alpha set at 0.05 for all analyses. RESULTS: Average speed across all positions was 3.5 ± 1.17 km·h−1 in wins, 3.0 ± 1.05 km·h−1 in ties, and 3.5 ± 1.31 km·h−1 in losses. Within group, FWDS, MIDs, and DEFS achieved a significantly greater average speed in games that resulted in a loss versus a tie (MD[95%CI]; FWDS:0.69[0.20,1.18] km·h−1; ES; 0.63, p=0.001; MID: 1.18[0.62,1.74] km·h−1; ES; 0.82, p=0.001; DEF:0.62[0.38,1.26] km·h−1; ES; 0.65, p<0.001). There was also a significantly greater average speed achieved in games that resulted in a win versus a tie for all positions (MD[95%CI]; MIDS:0.50[0.03,0.98] km·h−1; ES; 0.45, p=0.034, MIDS:0.78[0.23,1.32] km·h−1; ES; 0.62, p=0.003, DEFS:0.58[0.16,1.00] km·h−1; ES; 0.53, p=0.004). For all positions, average speed was greater in games that resulted in a loss versus a win, however, this difference was only significant for MIDS:0.40[0.08,0.73] km·h−1; ES; 0.29, p=0.011 and not for FWDS (p=0.25) and DEFS (p=0.66). It should also be noted that the effect sizes between wins and losses were 0.17 (FWDS), 0.29 (MIDS), and 0.20 (DEFS).

RESULTS: Average speed across all positions were greatest in games that result in a loss. This novel data can provide insights to coaches on how game results impact physiological demands by position. Tailored recovery strategies may be derived from this type of data to create a positional specific plan.

Cardiorespiratory fitness (CRF) is important for soccer players who need to sustain the capacity to recover between high intensity intervals, an important aspect for optimal performance measurements across playing position could be due to team-based training methods selected by the coaches.

PURPOSE: Nutrition guidelines often call for restricting fat, fiber, and protein in pre-competition meals (mainly to limit gut distress), yet there is a lack of direct evidence to support these recommendations. This study compared the effects of pre-competition high-carbohydrate (HCHO) and mixed-macronutrient (MM) meals in division I soccer players during simulated competition. METHODS: Fifteen female players participated in this randomized, investigator-blinded, crossover study involving two ~1,000-kcal meals (HCHO and MM) consumed 4 hours prior to 70-minute simulated scrimmages. Assessments included global positioning system (GPS) tracking (total distance covered [TDC], high-speed running [HSR]), heart rate (HR), ratings of perceived exertion (RPE), ratings of fatigue (ROF), gut symptoms, and perceptions of satiety, hunger, and fullness. GPS data were available for a subset of 12 participants. Differences between conditions for HR, HRS, ROF, and gut symptom data were evaluated with Wilcoxon signed-rank tests. GPS data and data from hunger, satiety, and fullness scales were compared using within-subjects repeated measures ANOVAs. Significance was at the p < 0.05 level. RESULTS: During the first half, TDC was 3.44 ± 0.30 km for HCHO and 3.43 ± 0.22 km for MM. During the second half, TDC was 3.24 ± 0.18 km for HCHO and 3.18 ± 0.18 km for MM. A within-subjects ANOVA revealed a time effect (F = 27.3, p = 0.001) but no condition effect (F = 0.18; p = 0.684) or condition x time interaction (F = 0.34; p = 0.571) for TDC. Players did 433 ± 204 m of HSR during the first half for HCHO and 424 ± 211 m for MM. During the second half, TDC was 3.24 ± 0.25 km·hr−1 for HCHO and 3.09 ± 0.22 km·hr−1 for MM. Average speed across all positions was 3.35 ± 1.17 km·hr−1. Experimentally determined differences in performance measurements across playing position could be due to systematic variations in training methods selected by the coaches.

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Performance analysis creates a foundation for performance staff to display findings to coaches and aid in understanding how training loads impact the wellness of each player. Applying an appropriate training load and allowing sufficient recovery will improve an athlete’s performance, while reducing the risk of overtraining, injury, and illness. Monitoring individual load and recovery is a critical part of this process and not solely dependent on physical observations. Overtraining can manifest in an athlete’s mood, sleep, muscle soreness, and self-reported stress. PURPOSE: To examine the effects of different activities during a season on daily wellness dimensions. METHODS: 25 female soccer players (21±2y) completed daily morning self-administered questionnaires consisting of 5 dimensions of wellness (i.e. fatigue, sleep, muscle soreness, stress, and mood) on a 0 (feeling the worst) - 100 (feeling the best) scale on their computers or mobile devices. Activity on the previous day (i.e. off-day, game, practice, or double practice) was used as an independent variable in assessing wellness scores. RESULTS: Type of day did not have a significant effect on fatigue (p=0.842), sleep (p=0.395), or mood (p=0.499). Post hoc analyses revealed self-reported muscle soreness to be significantly worse (p=0.049) after practice days (n=11) than after off-days (n=19) (difference score = 7). In all dimensions, there was a trend for positive self-reports to be best after off-days and worst after days of practice (n=11) than after off-days (n=19) (difference score = 12). Moreover, off-days (i.e. no activity) are important parts of programming as they generally positively affect the physical and mental health recovery of athletes. Overtraining can manifest in an athlete’s mood, sleep, muscle soreness, and self-reported stress. PURPOSE: To examine the effects of different activities during a season on daily wellness dimensions. METHODS: A cross-sectional study was performed. The study participants consisted of 35 soccer players (age = 20.2 ± 0.9 years, height = 187.0 ± 6.5, body mass = 82.1 ± 3.3 kg) who play at top league at Czech professional male soccer league. The participants performed two trials of the agility 505 test, and each leg was used per trial. In addition to time to complete the agility 505 test, movement kinematics were also assessed using 2D kinematic analysis. Main outcome variables included: initial speed at which a player enters the measured section (v1), final speed at which a player leaves the measured section (v2), deceleration speed before the turn - speed in the third step before the turn (v3), in the second step before the turn (v2d) and the first step before the turn (v1d), and acceleration speed after the turn in the first step (v1a), second step (v2a) and the third step (v3). We used Pearson correlation coefficient for analysing the data. RESULTS: In turning off the right and left leg the subjects’ performance times revealed low correlation (r=.24 and p=.165). Total time to complete the agility 505 test had significant correlations with following parameters when turning with DL: v1 (r=.79, p<0.00), v2a (r=.38, p=.03), v3a (r=.42, p=.01), v2d (r=.40, p=.02), v3d (r=.50, p=.00) and v2 (r=.61, p<0.00). Conversely, no significant correlation was found for the remaining variables. However, we found significant correlations between va2 vs v2 (r=.69, p<0.00) and va3 vs v3d (r=.37, p=.03) when DL was used. Interestingly, higher correlations were detected on NL: va1 vs v1d (r=.60, p<0.00), va2 vs v2d (r=.69, p<0.00) and va3 vs v3d (r=.61, p<0.00) compared to DL. CONCLUSIONS: Findings of this study revealed low correlation between compared sides. The better deceleration phase before 180 degree turn is a key for improving the acceleration phase following the cut. Supported by GA4 19-11560S, UNCE HUM12

1453 Board #47
May 28 9:30 AM - 11:00 AM
Tracking Athlete Wellness And Its Relationship With Activities During A Season In Female Soccer Players
Sabrina Borg, Abby Hunt, Kevin J. Milne. University of Windsor, Windsor, ON, Canada.
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(No relevant relationships reported)

Identifying what constitutes performance in elite athletes is critical in developing a basis and understanding of what to strive for, for athletes and coaches. Next College Student Athlete (NCSA), a recruiting company, lists minimal height provisions for elite female soccer players of 165cm (5’4”) across positions. Claiming height, an inalterable characteristic, as a measure of performance, is detrimental to athletes and the sport. PURPOSE: The purpose of this study is to determine if differences in performance exist among players of different height, ≥165cm and <165cm.

METHODS: Age, height, position of number, and number of goals for 288 female soccer players from the 2019 World Cup were recorded. Players were only included if they played an average of ≥60 minutes when entered into a match. Independent t-tests were used to examine differences between players ≥165cm and <165cm. Data are reported as mean difference [95% confidence interval] (MD [95%CI]). Statistical significance was set at p<0.05. RESULTS: Of athletes <165cm, 31 of 109 (28.44%) were defenders, 18 of 66 (27.27%) were forwards, and 44 of 84 (52.38%) were midfielders. 20.34% of goals and 28.77% of assists were made by players <165cm. 31% of goals and 28.77% of assists were made by players ≥165cm. Among number of goals made by players <165cm, 52.38% were by forwards, 42.86% were by midfielders, and 28.77% by defenders. There were no significant differences between players ≥165 and players <165 in regard to the number of assists made between forwards and defenders (MD [95%CI]; forwards, 0.176 [0.01,0.34]); between forwards and midfielders (MD [95%CI]); midfielders, 0.44 [0.04,0.84]); between forwards and defenders (MD [95%CI]; 0.546 [0.23,0.85]). CONCLUSION: Height contributed to performance in number of goals scored by midfielders and forwards, but not in assists among forwards and defenders. 20.34% of goals and 28.77% of assists were made by players <165cm.

1454 Board #48
May 28 9:30 AM - 11:00 AM
DIFFERENCES IN HEIGHT AND PERFORMANCE AMONG PLAYERS IN THE 2019 FIFA WORLD CUP
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(No relevant relationships reported)

Performance analysis creates a foundation for performance staff to display findings to coaches and aid in understanding how training loads impact the wellness of each player. Applying an appropriate training load and allowing sufficient recovery will improve an athlete’s performance, while reducing the risk of overtraining, injury, and illness. Monitoring individual load and recovery is a critical part of this process and not solely dependent on physical observations. Overtraining can manifest in an athlete’s mood, sleep, muscle soreness, and self-reported stress. PURPOSE: To examine the effects of different activities during a season on daily wellness dimensions. METHODS: 25 female soccer players (21±2y) completed daily morning self-administered questionnaires consisting of 5 dimensions of wellness (i.e. fatigue, sleep, muscle soreness, stress, and mood) on a 0 (feeling the worst) - 100 (feeling the best) scale on their computers or mobile devices. Activity on the previous day (i.e. off-day, game, practice, or double practice) was used as an independent variable in assessing wellness scores. RESULTS: Type of day did not have a significant effect on fatigue (p=0.842), sleep (p=0.395), or mood (p=0.499). Post hoc analyses revealed self-reported muscle soreness to be significantly worse (p=0.029) after game days (n=8) than off-days (n=19) (difference score = 12) and self-reported stress to be significantly worse (p=0.049) after practice days (n=11) than after off-days (n=19) (difference score = 7). In all dimensions, there was a trend for positive self-reports to be best after off-days and worst after days of double practice. CONCLUSION: This study provides evidence that a quick self-administered questionnaire can provide important information about an athlete’s wellness. Moreover, off-days (i.e. no activity) are important parts of programming as they generally positively affect the physical and mental health recovery of athletes. Nonetheless, adherence to survey completion declined and value assigned to activities changed throughout the season. As such, future research is needed to further the understanding of how athlete wellness is impacted by and can impact performance during activities across a competitive athletic season.
played (MD=0.09, ES=0.05; p=0.59), minutes played (MD=−15.60, ES=0.09; p=0.29), average minutes per game entered (MD=−3.01, ES=0.06; p=0.53), nor average minutes per total team matches played (MD=2.86, ES=0.08; p=0.38) in those <165cm and those ≥165cm.

**CONCLUSIONS:** This work provides clear evidence that being <165cm in height does not preclude reaching elite World Cup status as a professional female soccer player nor does it impact whether or not a player on the roster serves as a starter, the matches played, or the average minutes played. The findings indicate that the 1.1cm minimum height standard is an ill-informed, biased criterion which has the potential to inhibit successful recruitment efforts for future female elite soccer players.

**REFERENCES**

(No relevant relationships reported)

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**Acute:**

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**ENERGY AVAILABILITY IN ASSOCIATION WITH BIOMARKERS DURING A DIVISION I SOCCER SEASON IN FEMALE ATHLETES**

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(No relevant relationships reported)

Low energy availability (EA) is related to adverse physiological effects including hormonal disruption. **PURPOSE:** To evaluate in-season changes in EA and to assess biomarkers related to EA, macronutrient intake, body composition (BC), and exercise energy expenditure (EEE). **METHODS:** Prior to preseason and weeks 2, 4, 8, 10, 14, 16, and 18 female collegiate soccer players (N=11) underwent blood draws to assess thyroid hormones, leptin (LEP), growth hormone (GH), IGF-1, total cortisol (Ct), and prolactin (PRL), and BC tests to determine fat free mass (FFM) and percent body fat (%BF). Heart rate monitoring was used to assess EEE/kg during all training. Energy intake (EI), protein (PRO), carbohydrate (CHO) and FAT per kg were tracked via 3-day diet logs. EA was calculated as EI/Av weight (kg)/EI. **RESULTS:** Area under the curve (AUC) was calculated for biomarkers, EA, macronutrients and BC. Pearson-product correlations assessed AUC relationships with significance set at P<.05. Trends were considered P<.01. **RESULTS:** Time main effects were seen for all macronutrients, EA, EI and EEE, with the highest values seen during pre-season (P<.05). Time main effects were seen with increases in FFM and declines in %BF (P<.05). EA correlated with FFM (r=−.67), GH (r=−.63), PRL (r=−.65) and FreeT4 (r=−.69), %BF correlated with TC (r=−.70) and LEP (r=−.71), with a trend for T4 (r=.55). FFM correlated with PRO (r=.65), with trends for FAT (r=.57), IGF-1 (r=.58), FreeT4 (r=.53) and CORT (r=.57). PRO correlated with GH (r=.73), PRL (r=.75) and FreeT4 (r=.61), with a trend for EEE (r=.53). FAT correlated with GH (r=.65), PRL (r=.76) and FreeT4 (r=.60), with a trend for IGF-1 (r=.57). CHO correlated with LEP (r=.60) and PRL (r=.62). EEE correlated with LEP (r=.63) and trended with PRL (r=.56). **CONCLUSIONS:** Total distance (TD), and number of sprints (SP), maximal accelerations (AC), and maximal decelerations (DC). Conditional growth models assessed the relations between match performance and ACWR at each lag and TACWR.

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**ACWR produced the most robust relations with physical performance. One SD above a given player’s mean ACWR, resulted in increased performance in the match relative to their mean within-match performance, with an additional 1.13% (95% CI = 0.04, 2.27) (p<0.01) additional SP, and 1.77 (p<0.01) more AC. TL<sub>1</sub> was independently and negatively associated with TD (p<0.01), SP (p<0.01), and AC (p<0.01). On average, players decreased training load by 17.80±6.40 units per day leading into a match. When applying this average, model results suggest players would complete 265.75±15.2 additional TD (p<0.01), 0.71 additional SP (p<0.01), and 0.53 additional AC (p<0.01) above their mean within match performance. CONCLUSIONS:** The ACWR appears to be associated with additional within-match external load. Greater decreases in TL prior to a match may allow improved recovery, leading to increased physical capacity within the match. This study was funded in part by the National Collegiate Athletics Association.
associated with peak power nor power drop for any of the analyzed sections (whole body, legs, and trunk). However, it was significantly associated with average power for all sections. This association was better described by the fat mass index at trunk than for the whole body and legs.

CONCLUSIONS: Higher fat mass index is associated with lower average anaerobic power in professional soccer players. Nonetheless, the trunk fat mass index appears to be more relevant to explain this association.

| Table 1. Association between fat mass index (kg/m²) and anaerobic power. |
|-----------------|----------|---------|--------|--------|
|                  | Slope    | Intercept | R²     | SEE    | p       |
| Whole body       | -0.81    | 15.3     | 0.09   | 2.23   | 0.15    |
| Average power    | -0.52    | 10.8     | 0.41   | 0.55   | <0.001  |
| Power drop       | 0.005    | 0.198    | 0.01   | 0.055  | 0.71    |
| Legs             | -2.32    | 15.5     | 0.11   | 2.21   | 0.12    |
| Average power    | -1.09    | 10.5     | 0.25   | 0.61   | 0.012   |
| Power drop       | 0.002    | 0.211    | 0.01   | 0.055  | 0.94    |
| Trunk            | -1.07    | 14.4     | 0.05   | 2.28   | 0.29    |
| Average power    | -0.96    | 10.7     | 0.44   | 0.23   | <0.001  |
| Power drop       | 0.016    | 0.189    | 0.02   | 0.055  | 0.051   |

Team heart rate monitors system is widely used in sport and fitness settings. Determining accurate HR_{max} parameters is essential for proper exercise prescription and evaluation of training sessions. PURPOSE: To examine the implications of accurate maximal heart rate assessment methods on training intensity determined by team heart rate monitoring system for a single soccer training session.

METHODS: Nineteen female college soccer players were monitored using heart rate team system during a 114-minute tactical technical training session. Heart rate was recorded in beats per minute (bpm) every 0.1 sec. Maximal heart rate (HR_{max}) was determined using three methods: age-predicted 220-age formula, during preseason and post-season graded treadmill maximal exercise protocols (GXT). Time spent in >90% of HR_{max} was calculated for each HR_{max} assessment value for the training session. Descriptive statistics were performed for all variables. Paired t-test was used to determine differences in peak heart rate values obtained from pre- and post-season GXT protocols. Time spent in >90% was 42.9 ± 10.6% for HR_{max} for from preseason, postseason and age predicted formula respectively and difference significantly between the groups (p<0.02). Mean time spent in ≥80% was 21.4 ± 11.8% vs 13.9 ± 10.6% vs 10.8 ± 11.8% bpm for HR_{max} for from preseason, postseason and age predicted formula respectively and difference significantly between the groups (p=0.02). Mean time spent in ≥80% was 42.9 ± 15.8% vs 36.6 ± 15.3% vs 36.4 ± 15.7% bpm for HR_{max} for from preseason, postseason and age predicted formula respectively with no significant differences between the groups.

CONCLUSIONS: Maximal GXT more useful than age-prediction formula for HR_{max} parameters when establishing player physiological parameters in preseason player profile when using team heart rate monitoring system. High intensity sessions above 90% of HR_{max} can be incorrectly evaluated impacting training and player recovery.
across various competition levels. PURPOSE: To examine the demand on hockey officials across competition levels, officiating systems, and officiating roles.

METHODS: Ice hockey officials (n = 17, 37.7 ± 9.3 yr, 175.6 ± 4.9 cm, 86.1 ± 9.1 kg) were monitored during USA Hockey youth games, and collegiate hockey games. Chest-worn heart rate monitors with built-in accelerometry were recorded heart rate (HR), caloric expenditure (CE), speed, and distance during hockey games. Lower age classifications utilize a two-official system, while higher-level games utilize three officials (one REF, two LIN). The collegiate games in this study utilized a four-official system (two REF, two LIN). Analyses of variance and t-tests were used to detect significant differences across competition levels, systems, and roles. Alpha of 0.05, 2-sided was set a priori as a significance level. RESULTS: Significant differences were detected across competition levels for distance, training load, and CE (p ≤ 0.001). Mean values for each variable increased as competition level increased. Across officiating systems, distance, training load, and CE significantly increased (p ≤ 0.010) from two- to three-official systems. However, the four-official system had significantly lower values for average HR and CE (p ≤ 0.030). CONCLUSION: Hockey officiating is physiologically demanding and impacted by competition level and systems. Across competition levels, no significant differences were found for calories/hour (p = 0.498), indicating a similar rate of demand on officials in all levels of play. Demands on REF are greater in three-official systems compared to four-official systems, where demands are similar between REF and LIN, justifying its use in higher-level games.

1464 Board #58 May 28 9:30 AM - 11:00 AM Practice And Game Internal Demands Of Men And Women Varsity Ice Hockey Players

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Purpose: The purpose of this study was to quantify and compare internal load, using training impulse (TRIMP) and sessional rating of perceived exertion (sRPE), of men and women varsity ice hockey players during a practice and game. Methods: Data (mean ± SD) were collected for 26 male (22.1 ± 1.1 yr, 85.9 ± 5.4 kg, 183.1 ± 5.1 cm) and 24 female (19.8 ± 1.4 yr, 68.0 ± 6.9 kg, 168.1 ± 5.9 cm) varsity ice hockey players. On-ice internal load was reported TRIMP (Arbitrary Units, AU), measured using HR monitors worn on the upper arm, and sessional rating of perceived exertion (sRPE, AU), using the Borg 10 RPE scale with time on-ice during one practice and one home game of the regular season. Results: During the 75 min practices, the mean HRmax values for males and females were 183 ± 8 and 177 ± 14 bpm, indicating a high intensity for both with no significant difference between sexes (p=0.124). During the games (15-min warm-up and 3 X 20-min periods), the mean HRmax values for males and females were 178 ± 24 and 190 ± 5 bpm, with the females significantly higher than the males (p=0.044). The TRIMP scores for the males were 109 ± 49 and 91 ± 57 AU for the game and practice and not significantly different (p=0.263) and the sRPE scores were significantly (p=0.044) higher during the game (457 ± 234) vs. practice (346 ± 222 AU). The TRIMP scores for the females were 79 ± 25 and 94 ± 56 AU for the practice and game and not significantly different (p=0.261) and the sRPE were also not significantly different (p=0.445) between the practice (348 ± 152 AU) and game (390 ± 225 AU). Males had a significantly greater TRIMP (p=0.012) and sRPE (p=0.029) compared to females during the practices but there were no significant differences in TRIMP (p=0.875) or sRPE (p=0.487) between males and females during the game. Overall, there was a significant positive correlation between TRIMP and sRPE (p=0.029) but when separated into males and females, there was a significant correlation for the males (p=0.032) but no significant correlation for the females (p=0.770). Conclusion: Preliminary data suggests no differences in internal loads between practices and games for females, but game loads exceeded training loads for males. Furthermore, training loads were higher for males compared to females, however game loads were similar. Supported by a grant from Mitacs and PepsiCo.

1465 Board #59 May 28 9:30 AM - 11:00 AM External Loads Of Men'S And Women'S Varsity Ice Hockey Players During A Practice And Game

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Purpose: To quantify and compare the external load demands of men’s and women’s varsity ice hockey players during one practice and game using a local positioning system (LPS). Methods: Female (n = 24, 19.8 ± 1.4 yr, 68.0 ± 6.9 kg, 168.1 ± 5.9 cm) and male (n = 26, 22.1 ± 1.1 yr, 85.9 ± 5.4 kg, 183.1 ± 5.1 cm) varsity ice hockey players consented to wear a player-tracking sensor (accelerometer, gyroscope, and magnetometer) during one practice (P) and one game (G) in an arena outfitted with an
LPS. On-ice measures (mean ± SD) included accelerations, decelerations, accumulated acceleration load, distance travelled, and skating speed. Results: The average number of accelerations per skater were not different for females (P: 30.7 ± 12.6 vs. G: 26.6 ± 10.3; p=0.259) but were significantly greater in P than G for males (71.6 ± 26.7 vs. 48.0 ± 23.2; p=0.004). The average number of decelerations followed a similar trend and P and G for females (38.9 ± 14.7 vs. 47.5 ± 18.6; p=0.101) and males (79.6 ± 27.8 vs. 56.0 ± 24.8; p=0.006). Average peak acceleration did not differ between P and G for females (3.7 ± 0.5 vs. 3.6 ± 0.5 m/s²; p=0.586) or males (4.2 ± 0.5 vs. 4.3 ± 0.8 m/s²; p=0.591), while accumulated acceleration load was higher for P vs. G only for females (138.4 ± 23.1 vs. 165.0 ± 40.5; p=0.012). There was no difference in P or G distance travelled for females (4577.7 ± 1217.7 vs. 5332.6 ± 1614.5 m; p=0.084) or males (6398.4 ± 1456.0 vs. 7485.3 ± 2492.2 m; p=0.096). Although P and G peak skating speed was similar for females (29.3 ± 5.0 vs. 27.7 ± 3.9 m/s; p=0.236) and males (3.6 ± 0.7 vs. 3.6 ± 0.5 m/s; p=0.502), skating speed was lower than G for both females (3.7 ± 0.9 vs. 7.0 ± 2.0 m/s; p=0.001) and males (5.4 ± 1.5 vs. 6.7 ± 1.9 m/s; p=0.005). Males had significantly greater accelerations (count and peak), accumulated acceleration load, distance travelled, and peak skating speed in P and G compared to females (p=0.019). Peak decelerations and average speed in P and G did not differ between females and males (p=0.05). Conclusion: Preliminary data captured using an LPS suggests that several components of external load are different between P and G for female and male ice hockey players. Furthermore, the external load of ice hockey appears to be greater in males than females. This research was funded by a grant from Mitacs and PepsiCo.

Ice hockey is a high-intensity sport that requires optimally performing energy systems to compete at an elite level. Typically, off-ice performance tests are used to evaluate player fitness, but little is known about their relationships to on-ice tests.

Purpose: To compare performance, blood lactate (LAC), and heart rate (HR) obtained during off- and on-ice fitness tests in collegiate ice hockey players.

Methods: Nineteen male, collegiate ice hockey players, (age=18-24 yr; ht=1.81±0.03 m; wt=79.4±7.4 kg) were assessed off-ice using a discontinuous, incremental treadmill (TM) protocol separated by 90-sec rest, until players reached volitional exhaustion. The on-ice test, in full gear, was a repeated shift ability (RSA) test consisting of eight, 22-sec stages of maximal effort skating with 90-sec rest between stages. Fatigue decrement index (FDI) was calculated by subtracting fastest from slowest RSA stage times. During both tests, fingerstick LAC was obtained during rest intervals and HR was measured continuously. Spearman correlations were used to assess the relationship between TM completion time and FDI, as well as the relationships in Stage4 LAC and HRrecovery between off- and on-ice tests.

Results: TM times to exhaustion averaged 19.8±1.1 min, and RSA times averaged 22.0±0.4 sec. Correlations revealed no relationship between TM time and FDI (r=0.30, ns). Average FHR during the TM was the highest achieved HR of 175±9 bpm (91% of TM HRmax) during the RSA tests. For the TM tests, Stage4 LAC and HRrecovery averaged 10.2±2.8mmol and reduction to 76±8% HRmax, respectively. For the RSA tests, Stage5 LAC and HRrecovery averaged 13.3±1.9mmol and reduction to 74±4%HRrecovery. Stage5 TM and RSA LAC values were significantly related (r=0.52, p<0.05); however no significant relationship existed between Stage4 TM and RSA values for HRrecovery (r=0.34, ns).

Conclusion: The lack of relationship between TM time and FDI was expected given the two tests’ emphases on different energy systems and the homogeneity of the athletes’ overall fitness. Moderately to high correlation found between LAC measures, regardless of test modality, supports previous research from our lab indicating the predictive value of LAC measures on ice hockey player performance.

Purpose: To determine if the skate boot plays a role in ankle range of motion, balance or lower extremity power, all three of which may be linked to ankle injuries. Methods: 20 members of the Merrimack Men’s Hockey Team participated in the study. Testing was conducted with skates on followed by skates off. Odd numbered participants started with their dominant leg, even numbered participants started with their non-dominant leg. Weight bearing dorsiflexion (DF), Y-balance test (YB), and single leg hop for distance (SL) were performed and measured bilaterally. Results: No significant interaction was found for DF, YB, or SL between skate type (no skate vs. skate) and leg dominance (dominant vs. non-dominant), (p>0.05). DF, YB, and SL were significantly higher when subjects were in no skates (MDF-NOSK = 28.8; MYB-NOSK = 93.61; MLS-NOSK = 123.45) compared to when in skates (MDF-SK = 11.15; MYB-SK = 85.89; MLS-SK = 101.51), (p<0.05). SL was also higher for the dominant leg (MDFDOM = 141.21) compared to the non-dominant leg (MDFNONDOM =110.73), (p<0.01). DF and YB were not statistically different between the dominant and non-dominant leg. Conclusion: The results suggest with lower extremity power testing in collegiate figure skaters leg dominance does not impact ankle range of motion or balance. However, with lower extremity power, leg dominance does play a role. The findings that range of motion, balance, and power are greater without skates than with the skates, is plausible to conclude that the skate boot does in fact play a role in these three measurements. Further research is needed in order to examine the specifics of how the skate boot affects each of these measurements.

Purpose: Use player worn sensors (PWS) to measure and compare absolute and relative training load metrics for U17 and U18 Junior national ice hockey teams. Methods: 90 total members of two teams (U17: n=45 and U18: n=45) of the National Team Development Program (16.6±2.1 y, 17.5±2.7 y) consented to procedures approved by the EMU-HSRC. Zephyr BH-3 (Zephyr, MD) PWS measured triaxial accelerations (g’s) for all on ice practices (P) and games (G). Dynamic Accelerations (DYNAs) were generated from exponentially weighted accelerations and Dynamic Functional Threshold (DFT) from peak 30 min DYNAs within a 2 week moving window. Intensity Factor (IF) and Individual Hustle Score (IHS) were derived from session and 30 min DYNAs relative to DFT, respectively. Dynamic Training Load (MTL) for a single session was derived from the IF and the session duration. MTL was used as the input for a model to calculate Chronic Training Load (CTL), Acute Training Load (ATL) over a given amount of time. MANOVA was used to compare metrics by session type, (G) vs (P), and between teams for main effects (p<0.05). Results: For G, duration was not different between teams. However, 30 minute and session DYNAs, as well as MTL and IHS, were lower for U18 (0.360±0.056, 0.293±0.052, 176.2±55.2, 0.904±0.131) than U17 (0.372±0.044, 0.307±0.038, 187.3±44.3, 0.924±0.062, p<0.05). In P, duration was higher for U18 (1.353±0.53) than U17 (1.74±0.50; p<0.05). 30 minute and session DYNAs were not different between teams, but IHS and IF were lower for U18 (0.894±0.112, 0.768±0.098) than U17 (0.897±0.101, 0.790±0.096; p<0.05). Despite lower IHS and IF, ATL was higher for U18 (174.2±59.5) than U17 (109.8±26.0; p<0.05). Overall, for P and G, duration was longer for U18 than U17 (1.35±0.79, 2.21±0.83; p<0.05). IF and IHS were lower for U18 (0.757±0.111, 0.895±0.109) than U17 (0.783±0.094, 0.907±0.100; p<0.05). CTL and ATL were higher for U18 (69.9±24.8, 85.4±24.4) than U17 (63.5±17.3, 77.2±25.3). Conclusion: Relative intensity measures, such as IHS and IF, were more sensitive in determining load than absolute, unnormalized measures such as DYNAs. Duration of training sessions were longer for U18, leading to higher CTL even with lower intensity. This may be of importance as higher CTL has been associated with higher fitness and resilience to injury.

Purpose: Evaluate pre season, off-ice combination assessments in major junior hockey players.
ice hockey athletes. METHODS: During 2018 and 2019 pre-season training camps, prospective athletes participated in NHL combine style assessments. Tests included vertical jump via Vertec, broad jump via meter tape, box 90 s box jump test on a foam plyo station, 9-12 s countermovement jump (CMJ) height was estimated with a Bosco mat. Stationary agility run, timed 300 m shuttle, timed 2-mile run, hand-grip dynamometer, pull-up repetitions, and 135 lbs bench press repetitions. Height and weight were measured via stadiometer and scale, respectively, with values used to calculate body mass index. For data analysis, athletes were categorized into defense and offense with goalies removed due to position specificity. Descriptive statistics and comparative analysis, mixed methods regressions, were performed using SPSS (version 24.0) with significance at p ≤ 0.05. RESULTS: Athletes selected (n=48) had higher bench press repetitions (19:6 f = 26:023, P = 0.000), pull-up repetitions (11:4 f = 11.810, P = 0.001), faster pro-agility values (4.78 f = 0.23 sec. right; 4.75 f = 0.23 sec. left; only left was significantly different (F = 5.471, P = 0.022), and had greater grip strength values (59.10 kg right, 61.19 kg left; only left was significantly different; F = 5.489, P = 0.022) than athletes dismissed (n=26; 11:71 rep, 8.33 rep, 4.89 f = 0.22 sec. right, 4.88 f = 0.25 sec. left, 55.19 kg right, 56.11 kg left). Further, athletes selected were older (17:8 f = 1.4 yrs.; F = 13.904, P = 0.000), and achieved greater broad jump values (103:26 f = 7.1 ins., F = 26.099, P = 0.000) than athletes dismissed (16:610 yrs., 96:45 f = 1.1 ins.). Defensive athletes were taller (73:22 f = 2.2 in.; F = 28.23, P = 0.040) and had greater height (67:6 f = 3.3 kg, F = 13.915, P = 0.001) and right (67:68 kg, F = 16.027, P = 0.000) grip strength values than offensive athletes (70:9; 2.7 in., 58:8 kg left, 55:10 kg right). Conclusion: Selected athletes were older and exhibited superior power output, muscular endurance, and muscular strength. Defensive athletes were taller, and excelled in areas of muscular strength, endurance, and power.

The lack of ice hockey-specific lactic anaerobic assessment tools limits the ability of coaches to better track and develop their players. PURPOSE: Establish two predictive equations for assessing indirectly 1) the O2 energy expenditure, and 2) the fatigue index.

METHODS: Twenty male ice hockey players participated in this study (age=18.5±1.0 year). The maximal anaerobic skating test (MAST) consisted of skating back and forth on an 18.2 m course at maximal speed with abrupt stops at each end for a total of 12 shuttles (average time=52.0±2.06 s). The O2 energy cost was measured using a portable metabolic analyzer (Cosmed K4+,) and the maximum post-exercise lactate concentration (at 6th shuttle). RESULTS: Correlations between lactate concentrations were r=0.87 and standard error of estimate (SEE) were 6.2% and 6.8% respectively for O2 uptake and lactate production, indicating that validity of the regression algorithms were excellent. Particularly for the estimation of the lactate level, the removal of variables in relation to the skating efficiency reduces the correlation to 0.49 and increases the SEE to 10.5% indicating the importance of considering an index of skating efficiency during this type of evaluation. CONCLUSIONS: To our knowledge, there is no specific ice hockey field test allowing the indirect estimation of O2 cost and lactate concentration in a purely anaerobic test. Thus, using simple and easy-to-use variables, coaches will be able to monitor more effectively their players’ progress in an effort to optimize their individual on-ice anaerobic performance.

Although ice hockey is mainly considered as an anaerobic sport, oxygen consumption is a key aspect in hockey performance. In fact, several studies have shown a relationship between maximal oxygen consumption and repeated sprint ability for hockey players. PURPOSE: The purpose of the present study was to assess the relationship between peak oxygen consumption, skating speed and fatigue while performing on-ice repeated shifts. METHODS: Ten male elite ice hockey players [age: 20.2±1.81 years, height: 176.70±6.75 cm; weight: 76.20±11.48 kg] completed an on-ice repeated shift test (Peterson et al., 2015). The latter consisted of 5 maximal skating bouts including accelerations, crossovers and change-of-direction manoeuvres. Skating bouts occurred at 120 seconds intervals, which represented approximately 90 seconds of passive recovery between each bout. Total shift time and split durations were measured using four photocell timing gates (FusionSport, SmartSpeed Pro Timing System, Colorado, USA). Skating speed was then computed. Breath-by-breathe analysis was performed in order to measure peak oxygen consumption (VO2 peak) and heart rate was monitored (K4BZ, Cosmed, Italy). RESULTS: In average, VO2 peak varied from 35.76±5.00 ml/kg/min on the first shift to 32.04±4.49 ml/kg/min on the last shift whereas skating speed varied respectively from 5.98±0.31 m/s to 5.53±0.33 m/s. The average time to complete the skating bouts was 23.70±1.22 seconds for the first sprint to 25.67±1.59 seconds for the last sprint. The average performance decrement (i.e. fatigue index) was of 4.81±2.47 percent. The coefficient of determination (r2) was 0.204 (r=0.451, p=0.001) for VO2 peak as a function of skating speed and r2=0.196 (r=-0.442, p=0.200) for VO2 peak versus the fatigue index. CONCLUSION: The aerobic capacity partially explains the players’ repeated sprint ability and shows that it is a fitness component that cannot be neglected in ice hockey. Our results are consistent with other studies that have investigated the link between aerobic capacity and linear repeated sprints, whereas, the approach herein used repeated sprints with direction changes.

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Practitioners have utilized sport specific alpine ski racing field tests for lower limb power assessment for many years. PURPOSE: The purpose of this study was to validate the alpine ski racing 90 s box jump field test with the 90 s Wingate.

METHODS: Elite alpine ski racers (n=15) were tested during their annual post-season physical testing combine. The box 90 s box jump test was conducted on a foam plyo
Cerebral blood flow (CBF) is sensitive to changes in the arterial partial pressure of carbon dioxide (CO2) with cerebrovascular reactivity an established risk factor for stroke and neurodegenerative disease. However, its interpretation can be complicated given subtle differences in cerebrovascular and central respiratory chemoreflex response transients.

**PURPOSE:** To examine to what extent exposure time to CO2 influences CBF response.

**METHOD:** We measured CBF response to hypercapnia (FICO2 = 5%) in five healthy participants for 10 min in the supine position. End-tidal partial pressures of CO2 (PETO2, CO2), minute ventilation (Ve), and middle cerebral artery blood velocity (MCAv) were assessed during both the early (3~4 min) and late phases (9~10 min) of exposure.

**RESULT:** We observed elevated Ve during the late compared to the early phase of exposure (from 11 ± 2 to 29 ± 8 vs. 23 ± 4 L/min, P < 0.047) despite no differences in PETO2 (P = 0.304). The corresponding increase in MCAv during the late phase was suppressed compared to the early phase (from 48 ± 11 to 58 ± 14 vs. 63 ± 13 cm/sec, P = 0.029). Thus, the response of CBF to change in PETO2, at late phase was lower than that of early phase (1.1 ± 0.5%/minmg vs. 1.7 ± 1.3%/minmg, P < 0.07).

**CONCLUSION:** These findings highlight the importance of considering the central respiratory chemoreflex transient during the clinical assessment of cerebrovascular reactivity.
Peripheral vascular dysfunction has been documented to progress with advancing age, and age itself is the greatest risk factor for developing dementia. However, the likely link between peripheral and cerebral vascular function with aging has yet to be clearly investigated. PURPOSE: Therefore, the purpose of this study was to assess peripheral and cerebral vascular function in both young and old healthy adults and examine the relationship between the responsiveness of these vascular beds. METHODS: Peripheral vascular function was assessed with passive leg movement (PLM: blood flow Δ peak and AUC), and cerebral vascular function was assessed by the breath hold acceleration index (BHIΔ) in 11 healthy adult males (7 old: 68±3 yr; 4 young: 23±3 yr). Doppler ultrasound was used to measure both common femoral artery blood flow and middle cerebral artery velocity. RESULTS: Peripheral vascular function was significantly attenuated in the old adults compared to the young (PLM AUC: 116±63 vs. 424±14 ml/min; p<0.001; PLM Δ peak: 378±124 vs. 950±64 ml/min; p<0.001). Cerebral vascular function decreased in the elderly compared to the young with a large effect size (BHIΔ: 1.36 ±0.76 vs. 2.41±1.4; p<0.05, p=0.132). However, even with a relatively limited sample size, there was a significant positive relationship between PLM AUC and BHIΔ (r=0.65, p=0.03). CONCLUSIONS: The identification of a relationship between the function of the peripheral and cerebral vascular beds (leg and brain) is an important step forward toward a better understanding of the global mechanisms of aging on the vasculature and likely age-related dementia.

The response of posterior cerebral blood flow (CBF) to exercise is different from that of anterior cerebral circulation; however, its physiological mechanisms remains poorly understood. Regarding this unresolved question, we hypothesized that the cerebrovascular response to carbon dioxide (CO2), which is one of CBF regulatory parameters, is different from that of the anterior cerebral circulation during exercise. PURPOSE: To test our hypothesis, we examined the cerebrovascular response to CO2 in the posterior and anterior circulation during isometric handgrip (IHG) exercise. METHODS: The cerebrovascular response to CO2 was evaluated in seven young healthy males via the two levels of hypercapnic stimulus (target end-tidal partial pressure of CO2 = 5 and +10 mmHg from individual baseline values) at rest and during a 2-min IHG exercise at 30% of maximum voluntary contractions. Middle and posterior cerebral blood velocities (MCAv and PCav) were measured using a transcranial Doppler continuously throughout the experiment. RESULTS: During IHG exercise, MCAv increased (10.3 ± 9.0 %, P = 0.023) but MCAv remained unchanged (6.9 ± 4.5 %, P = 0.18). Interestingly, the cerebrovascular response to CO2 in both cerebral arteries increased during IHG exercise (P = 0.06) but there was no significant difference in the group response of MCAv and PCA (P = 0.733). CONCLUSIONS: These findings suggest that cerebrovascular response to CO2 may not contribute to the heterogeneous CBF response to exercise between anterior and posterior circulation.

Impact of 6-month Exercise Training on Cerebrovascular Function in Persons With Spinal Cord Injury

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Purpose: Persons with spinal cord injury (SCI) have a four-fold greater risk for cerebrovascular disease, suggesting that they cannot maintain stable cerebral perfusion. While disruption in autonomic control after SCI may impact cerebral vascular function, chronic physical deconditioning may also play a substantial role. If so, full-body aerobic exercise may improve cerebrovascular function in persons with SCI. PURPOSE: To assess the impact of injury and habitual, whole-body functional electric stimulation (FES)-assisted aerobic exercise training on cerebrovascular function in persons with SCI. METHODS: Baseline hemodynamic (heart rate, blood pressure, CO2 and cerebral blood flow (CBF) responses to oscillations in arterial blood pressure via low-resistance breathing (i.e. autoregulation) and progressive increases in arterial CO2 via rebreathing (i.e. vasoreactivity) were measured in 16 able-bodied control and 30 participants with SCI (n=15 cervical and n=15 thoracic). Nineteen participants with SCI (n=9 cervical and n=10 thoracic) completed 6-months of a FES-assisted rowing exercise training program. Changes in autoregulatory function, vasoreactivity, and VO2max were compared before and after aerobic exercise training via linear mixed effect model. RESULTS: Individuals with higher level SCI had slightly lower hemodynamic variables in comparison to able-bodied and those with lower level SCI and able-bodied. Greater VO2max was related to increased vasoreactivity (R^2=0.45, p<0.01) at baseline. Overall, VO2max increased significantly after training (p<0.01). Vasoreactivity also tended to increase with training, but the change was not statistically significant due to high variability. Given this, we assessed the relation between the change in VO2max and vasoreactivity in exercise “responders,” defined as those with >10% change in VO2max, n=8. In responders, an increase in VO2max was strongly associated with an increase in vasoreactivity (R^2=0.72, p<0.01) regardless of the level of SCI. CONCLUSION: Cerebral vasoreactivity is impaired in individuals with SCI. This impairment is primarily due to physical deconditioning, and can be improved by habitual aerobic exercise.
task (cognitive task) before, immediately after, and 30 min after each exercise bout. Middle cerebral artery blood flow velocity (Transcranial doppler ultrasoundography) and arterial pressure (Finapres photoplethysmography) were continuously measured to determine dCA using transfer function analysis, and dCA was estimated at rest and during each cognitive task. RESULTS: Before exercise, transfer function phase in the very low-frequency (VLF) was decreased during cognitive task compared to the resting measurement ($P < 0.01$), indicating that there was brain activation-induced dCA impairment. Transfer function phase during each cognitive task immediately after exercise was higher than before ($P < 0.01$) and 30 min ($P < 0.01$) after exercise regardless of exercise protocol, indicating that dCA impairment during the cognitive task was blunted immediately after exercise. CONCLUSIONS: The brain activation-induced dCA impairment is attenuated immediately after exercise. This result implies that aerobic exercise improves dynamic CBF regulation in response to brain activation during a cognitive task.

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**Board #76 May 28 10:30 AM - 12:00 PM**
Cardiorespiratory Fitness And The Cerebrovascular Response To A Metabolic Stimulus Following Cyclooxegenase Inhibition

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Cardiorespiratory fitness (CRF) is positively associated with cerebrovascular function and cognition. We have previously shown that prostaglandins play an important role in regulating the cerebral vasodilator response to hypercapnia, and that the magnitude of change in cerebral vasodilator responses during cyclooxygenase (COX) inhibition is associated with CRF in older adults. However, it is unknown if CRF also influences the cerebrovascular response to a metabolic stimulus in older adults. PURPOSE: To determine the effects of CRF on the cerebrovascular response to a metabolic stimulus before and during COX inhibition in older adults. METHODS: Thirty-five participants completed a maximal exercise test on a cycle ergometer. Participants were split into two groups: high CRF (10 men, 8 women, age = 62 ± 5y) or Low CRF (7 men, 10 women, age = 66 ± 7y), based on the median VO2 max (ml/kg/min). All participants completed two levels of the Stroop Color Word Test. Beat-to-beat mean arterial pressure (MAP) and middle cerebral artery velocity (MCAv) were measured at baseline and in response to each level of the Stroop test before and after administration of the COX inhibitor Indomethacin (INDO). The maximum MAP, MCAv, and cerebral pulsatility index (Pl) responses were calculated as the highest 3-beat average during each cognitive challenge. RESULTS: There were no differences between high and low CRF groups in MCAv at rest or in response to the metabolic stimulus. There was a trend for lower Pl at rest ($p = 0.09$) and in response to the Stroop test ($p = 0.09$) in the high CRF group compared with the low CRF group. During INDO, MCAv decreased (Low CRF: -29 ± 4%, High CRF: -27 ± 3%; $p < 0.01$) and Pl increased (Low CRF: 22 ± 3%, High CRF: 17 ± 3%; $p < 0.01$). During INDO, MCAv at rest was not different between groups; however, Pl was lower in the high CRF compared to low CRF group (Low CRF: 0.98 ± 0.05, High CRF: 0.87 ± 0.03; p < 0.05). Lastly, the change in MCAv and Pl in response to the metabolic stimulus did not differ between groups. CONCLUSION: In older adults, elevated levels of CRF may lead to a lower Pl at rest and in response to a metabolic stimulus. Additionally, COX inhibition did not alter the cerebrovascular response to a metabolic stimulus. Supported by NIH Grant HL118154.

1483

**Board #77 May 28 10:30 AM - 12:00 PM**
**The Acute Effects of Prolonged Sitting With or Without a High Glycemic Index Meal on Cerebral Blood Flow in Healthy Adults**

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**Purpose:** Exposure to acute prolonged sitting reportedly leads to decreased cerebral blood flow. However, it is unclear whether or not a high glycemic index meal will exacerbate the detrimental effects of prolonged sitting on cerebral blood flow. The study purpose was to determine if prolonged (3-hr) sitting resulted in a decreased total brain blood flow (QBF) and whether this decrease is exacerbated by a high glycemic index meal (HGI). METHODS: Twenty participants (22.6 [3.1] yrs; 73% P, 24.3 [3.7] kg/m2) were recruited to participate in an HGI and low glycemic index (LGI) condition. Using Doppler Ultrasound, total brain blood flow (QBF, ml/min) was calculated using the equation: (internal carotid artery [ICA] blood flow + vertebral artery [VA] blood flow) x 2. RESULTS: For QBF, there was no interaction effect ($P = 0.189$) or time effect ($P = 0.340$), however, there was a significant, small condition effect ($P = 0.04$, ES: -0.06). For LGI, QBF decreased by ~2203.2 ml/min (95% CI: -5136 to 730), and for HGI, QBF increased by 74 ml/min (95% CI: -2571 to 2719). Most of this change was driven by the internal carotid artery BF, where there was no interaction effect or time effect, however, there was a significant, small condition effect ($P = 0.043$, ES: -0.11). CONCLUSIONS: Prolonged sitting does decrease total brain blood flow, but contrary to expected, an HGI meal results in an increase in total brain blood flow.

**1484**

**Board #78 May 28 10:30 AM - 12:00 PM**
**Effect Of Exercise Training On Cerebrovascular Impedance In Amnestic Mild Cognitive Impairment Patients**

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Cerebrovascular hyperperfusion is associated with cognitive impairment in older adults. PURPOSE: To test the hypotheses that 1) patients with amnestic mild cognitive impairment (aMCI), a prodromal stage of Alzheimer’s disease, have higher cerebrovascular impedance than age-matched cognitively normal individuals; 2) 1-year endurance exercise training reduces cerebrovascular impedance in aMCI patients. METHODS: In the cross-sectional study arm, cerebrovascular impedance was estimated in 58 patients with aMCI (67±7 years) and 25 normal control subjects (65±6 years) with cross-spectral analysis between dynamic changes in cerebral blood flow velocity (CBFV) in the middle cerebral artery (via transcranial Doppler) and carotid arterial blood pressure (via applanation tonometry). In the longitudinal arm study, cerebrovascular impedance was estimated in randomly-assigned 37 aMCI patients who completed 1-year endurance exercise ($r=17$) or stretching exercise ($r=20$). RESULTS: After adjustment for age and sex, aMCI patients exhibited higher impedance modulus in the range of the first harmonic oscillations (0.78-1.56 Hz) than NC (1.18±0.34 vs. 1.01±0.35 mmHg/cm/s, $P = 0.037$). There was an inverse correlation between Z$_1$ and mean CBFV ($r = -0.673, P < 0.0001$). Linear mixed model analysis of exercise training revealed that Z$_1$ was significantly decreased after 1-year exercise intervention irrespective of exercise modes (time effect: $P = 0.001$; interaction between time and exercise modes: $P = 0.410$). CONCLUSION: Our findings suggest that aMCI is associated with higher cerebrovascular impedance when compared to cognitively normal older adults, and that regular physical activity ameliorates cerebrovascular impedance in patients with aMCI. Supported by the NIH (5R01AG033106-01, RZ) and JSPS (16K0011, JS).

**1485**

**Board #79 May 28 10:30 AM - 12:00 PM**
**The Relation Between Cardiorespiratory Fitness And Cerebral Blood Flow Regulation**

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Contradictory relationships have been reported between cardiorespiratory fitness levels and cerebral blood flow regulation. Some studies report an inverse relationship between cardiorespiratory fitness and cerebrovascular reactivity to carbon dioxide (CO$_2$) and an inverse relationship between cardiorespiratory fitness and dynamic cerebral autoregulation. Other studies have found a positive relationship. PURPOSE: The purpose of this study was to assess the relation between objectively measured cardiorespiratory fitness and cerebral blood flow regulation in patients with cognitive impairment (aMCI), a prodromal stage of Alzheimer’s disease, have higher cerebrovascular impedance than age-matched cognitively normal individuals; 2) 1-year endurance exercise training reduces cerebrovascular impedance in aMCI patients. METHODS: In the cross-sectional study arm, cerebrovascular impedance was estimated in 58 patients with aMCI (67±7 years) and 25 normal control subjects (65±6 years) with cross-spectral analysis between dynamic changes in cerebral blood flow velocity (CBFV) in the middle cerebral artery (via transcranial Doppler) and carotid arterial blood pressure (via applanation tonometry). In the longitudinal arm study, cerebrovascular impedance was estimated in randomly-assigned 37 aMCI patients who completed 1-year endurance exercise ($r=17$) or stretching exercise ($r=20$). RESULTS: After adjustment for age and sex, aMCI patients exhibited higher impedance modulus in the range of the first harmonic oscillations (0.78-1.56 Hz) than NC (1.18±0.34 vs. 1.01±0.35 mmHg/cm/s, $P = 0.037$). There was an inverse correlation between Z$_1$ and mean CBFV ($r = -0.673, P < 0.0001$). Linear mixed model analysis of exercise training revealed that Z$_1$ was significantly decreased after 1-year exercise intervention irrespective of exercise modes (time effect: $P = 0.001$; interaction between time and exercise modes: $P = 0.410$). CONCLUSION: Our findings suggest that aMCI is associated with higher cerebrovascular impedance when compared to cognitively normal older adults, and that regular physical activity ameliorates cerebrovascular impedance in patients with aMCI. Supported by the NIH (5R01AG033106-01, RZ) and JSPS (16K0011, JS).
was no correlation with cardiorespiratory fitness in very low frequency gain (r = -0.22, P = 0.92) or phase (r = -0.03, P = 0.87). There was no correlation with cardiorespiratory fitness and low frequency gain (r = -0.3, P = 0.13). Interestingly, low frequency phase was inversely correlated with cardiorespiratory fitness (r = -0.4, P = 0.04). CONCLUSION: These preliminary data suggest that cardiorespiratory fitness may not impact cerebrovascular reactivity to hypercapnia. However, a relation may exist between cardiorespiratory fitness and dynamic cerebral autoregulation.

**4186** Board #80 May 28 10:30 AM - 12:00 PM

**Effect Of Different Exercise Modes On Cerebrovascular Shear In Humans**  
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*No relevant relationships reported*

**PURPOSE:** To what extent exercise impacts the cerebrovasculature is dependent on exercise mode. This difference may be attributable to shear stress in the cerebral vasculature that effects improvements in vascular endothelial function. For the first time, we determined if an acute bout of isovolume interval exercise compounds cerebrovascular shear rate. **METHODS:** Eleven young men were randomly assigned to perform continuous exercise (Continuous Ex) or interval exercise (Interval Ex) of semi-recumbent cycling. During the Continuous Ex, subjects performed continuous cycling at 80W for 12 mins. During the Interval Ex, subjects performed 3 bouts of interval cycling (2 mins at 60W and 2 mins at 100W) that was volume matched with Continuous Ex. Shear rate in the internal carotid artery (ICA) was determined using Doppler ultrasound. **RESULTS:** Time averaged ICA shear rate was higher during Int Ex compared to Continuous Ex (351±57 vs. 330±61 /s, P = 0.038) and the elevation was superior neuroprotective benefits. These data are the first to highlight that a single acute bout of interval exercise compounds cerebrovascular shear, providing a mechanistic basis underlying its superior neuroprotective benefits.

**1487** Board #81 May 28 10:30 AM - 12:00 PM

**The Association Between Ambulatory Blood Pressure Monitoring, Cerebrovascular Pulsatility, And Cognitive Performance In Young Adults**  
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*No relevant relationships reported*

Ambulatory blood pressure monitoring (ABPM) is the gold standard for blood pressure (BP) assessment. In older adults, ambulatory pulse pressure (PP), mean pressure (MP), and BP dipping have been associated with altered cerebrovascular blood flow, increased cerebrovascular disease, and cognitive decline. Moderate-to-vigorous physical activity (MVPA) has favorable effects on BP and reduces cognitive decline in older adults. As hypertension rates increase in young adults, cerebrovascular pulsatility may damage white matter and accelerate cerebrovascular aging. MPVA may combat these effects. **PURPOSE:** Determine if ABPM is associated with middle cerebral artery (MCA) pulsatility and cognitive performance in a group of young adults. **METHODS:** 68 adults (21±4 yrs; 26.6±8.0% fat; 55.6±10.8% female; 21.3±4.3 yrs of education); Time averaged MCA pulsatility was assessed over 9 days via accelerometry. Pearson correlations were run for PP, MP, BP dipping, BP variability ratio (BPVR = standard deviation of systolic/standard deviation of diastolic pressure), and the ambulatory arterial stiffness index (AASI = 1 - regression slope of systolic and diastolic BP) with MCA pulsatility and cognitive performance (accuracy) controlling for MPVA. **RESULTS:** The change in MAP from rest to exercise was larger in BH compared with that in control (P < 0.05), whereas the relative response of VA blood flow to exercise did not differ between both BH (3.1 ± 14.6%) and control (0.9 ± 10.9%, P > 0.05). CONCLUSION: These results indicated that during isometric exercise, breath holding enhances exercise-induced increase in arterial blood pressure and CBF. Therefore, it should be considered mode of respiration during isometric exercise, especially in rehabilitation for elderly and patients with hypertension.

**1489** Board #83 May 28 10:30 AM - 12:00 PM

**Impact Of Work Of Breathing On Cardiac Output In Patients With Incomplete Spinal Cord Injury**  
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*No relevant relationships reported*

**PURPOSE:** The influence of alterations in the ventilatory response and work of breathing (WOB) on cardiac output (CO) during upper extremity exercise, resulting from Spinal Cord Injury (SCI) are not well understood. This study characterized the response of Qt and WOB during a maximal exercise arm-ergometer test in people with incomplete cervical SCI in contrast to able-bodied controls. **METHODS:** A 2-group convenience sample was used to compare respiratory muscle strength, WOB, and Qt during an incremental arm ergometer exercise test to volitional exhaustion. Subjects were 8 males with incomplete cervical SCI (isSCI: age 39±14yrs) and 8 able-bodied males (CON: age 38±13yrs). Maximal expiratory pressure (MEP) and maximal inspiratory pressure (MIP) were measured using a respiratory pressure meter, while breathing patterns were captured using breath-by-breath ventilatory gas exchange system. Qt was measured during exercise by bioimpedance cardiography. Data were analyzed using t tests to determine differences between group mean values. Linear regression analysis and Pearson’s correlation coefficient were used to examine the relationships among variables. **RESULTS:** All the variables were compared between groups at the average peak workload achieved by isSCI (30 watts). Both MIP (69.0±17.8mmHg/O vs. 89.7±15.4mmHg/O, P = 0.020) and MEP (59.9±16.4mmHg/O vs. 83.4±14.8mmHg/O, P < 0.008) were significantly lower in isSCI compared to CON. Minute ventilation (32.3±3.4L/min vs. 23.1±5.8L/min, p = 0.001) and WOB (2.8±0.5 vs. 1.6±0.8kg/m/min, p = 0.001) were significantly higher in isSCIcompared to CON, respectively. A significant difference in tidal volume (isSCI: 1.03±0.3L vs. CON:1.13±0.3L, P = 0.800) was not observed. Qwars lower in those with isSCI compared to CON (85±3L/min vs. 11±1L/min, p = 0.003), and correlated significantly with WOB in isSCI (r² = 0.73, p = 0.006).

CONCLUSIONS: A concurrent decrease in respiratory muscle strength and an increase in WOB relative to metabolic demand may be reflective of impaired respiratory performance. In people with iSCI, a potential moderating effect of WOB may partially explain the decline in Qt during arm exercise.
Adult survivors of preterm birth (PRE) have arrested lung development resulting in lower pulmonary function compared to their counterparts born at full term (CON). PRE have normal lung volumes, but lower expiratory airflow, which could be caused, in part, by a lesser driving (alveolar) pressure. During forced expiration alveolar pressure is the sum of pleural pressure, a function of respiratory muscle effort/strength, and lung recoil pressure. Whether or not PRE have normal respiratory muscle strength and/or lung compliance (CL) has not yet been explored. **Purpose:** The purpose of this study was to quantify respiratory muscle strength and CL in PRE and CON. Based upon the existing literature, we hypothesized that PRE and CON will have equivalent respiratory muscle strength and CL. **Methods:** To date, n = 8 PRE and n = 5 CON, visited the lab on two occasions. First, subjects performed standard spirometry (e.g. fast and slow vital capacity maneuvers). Next, to assess respiratory muscle strength, subjects performed maximal inspiratory and maximal expiratory pressure maneuvers (MIP and MEP, respectively). For MIP, subjects inhaled maximally against an occluded mouthpiece at residual volume. For MEP, subjects exhale exhaled maximally against an occluded mouthpiece at total lung capacity. Each maneuver was performed 3-5 times. On the second visit, CL was measured. To do so, subjects were instrumented with an esophageal balloon catheter and performed quasi-static expiratory deflation curves (i.e., very slow exhalations from total lung capacity to residual volume). To test for differences in MIP, MEP, and CL between groups we computed multiple independent samples t-tests with significance set to p ≤ 0.05. **Results:** We found no difference in MIP (1494 ± 36.5 vs. -106.5 ± 36.0 cm H2O, p = 0.24) or MEP (165.7 ± 42.9 vs. 121.0 ± 51.6 cm H2O, p = 0.14) between CON and PRE, respectively. Likewise, CL was comparable between CON (0.29 ± 0.11 L/cm H2O) and PRE (0.33 ± 0.10 L/cm H2O; p = 0.53). **Conclusion:** Our data suggests that adult PRE have normal respiratory muscle strength and CL, but instead may be the result of excessive airflow resistance. Support: Hooper Undergraduate Research Award from NAU.
Purpose: Exercise-induced bronchoconstriction (EIB) has been associated with BMI in asthmatic children, while increased body fat contributes to a reduction in post-exercise pulmonary function in non-asthmatic children. Obesity-related adipocytokines such as leptin and adiponectin correlate with EIB severity in asthma; however, the role of these hormones on EIB in non-asthmatic children remains unclear. The purpose of this study is to investigate the relationship between leptin and adiponectin and EIB in non-asthmatic children.

Methods: Twenty-five non-asthmatic prepubescent children (9-10 year) completed pulmonary function tests (FEV1, FVC, FEF25-75%) pre- and post-exercise. Each participant completed an incremental, cycle-ergometer exercise test to exhaustion (VO2max). The maximum percentage fall in FEV1 and FEF25-75% from pre- to post-exercise was calculated, participants were subsequently classified as EIB positive (EIB+) with drop in FEV1 ≥ 10%. The change in airway function from pre- to post-exercise was assessed as the area under the curve of the percentage fall in post-exercise FEV1 and FEF25-75% plotted against time for 15 min (AUCt), using trapezoidal integration. Serum leptin and adiponectin levels were determined from a fingerprick capillary blood sample taken before exercise. Results: BMI was significantly correlated with leptin (r = 0.473, p<0.05), but not adiponectin (r = -0.021). There was also no significant correlation between leptin or adiponectin and pulmonary function. Conclusion: There was a significant correlation between leptin and adiponectin and decreased airway function in EIB+, but not EIB- non-asthmatic children. The causality of this relationship warrants further investigation, but could provide insight into potential intervention strategies for the management of EIB.

Scientific Abstract: (ACSM World Congress 2020)

Swimming and Respiratory System: Impact Of Exercise On Pro-oxidants Production And Lung Function
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Purpose: To assess the impact of a high-intensity and prolonged-time exercise on the production of [H2O2], [NO2\textsuperscript{-}], hydrogen peroxide [H2O2], and lung function in swimmers. The exhaled breath condensate (EBC) is a non-invasive method used to assess the pro-oxidants species (EBC) is a non-invasive method used to assess the pH and pro-oxidants in the respiratory tract. A significant correlation between [NO2\textsuperscript{-}] and lung function was found.

Methods: Longitudinal quasi-experimental study. 18 competitive swimmers (8 female) aged 12-16 years completed 3.500-m of swim in indoor pool treated by chlorine (intensity of 80.2±3.1% of HR	extsubscript{max}) with no exposure to respiratory irritants by 5-days previous to tests. The spirometry test and EBC collection were done at rest, 20-minutes and 24-hours post-exercise and were analyzed using one-way RM-ANOVA test by the GraphPad-Prism software (v.6.0).

Conclusion: A high-intensity and prolonged-time swimming session decreased the pro-oxidants production with no changes in lung function in swimmers exposed chronically to exercise and respiratory irritants. More studies are necessary to identify and isolate the plausible factors involved in the formation of respiratory pro-oxidants during exercise in athletes chronically exposed to respiratory irritants.
RESULTS: HFREF patients, compared to CTL had greater % BF (HFREF: 36.7 ± 7% vs. CTL: 29.7 ± 5%) and body mass index (HFREF: 31.4 ± 4 vs. CTL: 26.4 ± 4.9 kg/m²) and lower VO₂peak (HFREF: 21.6 ± 6 vs. CTL: 27.6 ± 6 mL/kg/min) (all, p < 0.01). There were no differences between HFREF and CTL in forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV₁), forced expiratory flow rates between 25 and 75% of FVC (FEF25-75), residual volume (RV), or total lung capacity (TLC) (all, p > 0.05); however, HFREF had smaller expiratory reserve volume (ERV) than CTL (HFREF: 4.8 ± 0.8 vs. CTL: 1.1 ± 0.6 L; p < 0.05). In HFREF, % BF was significantly related to FVC (r = -0.60, FEV₁ (r = -0.59), ERV (r = -0.72), and TLC (r = -0.54) (all, p < 0.05). In CTL, % BF was significantly related to FEV₁ (r = -0.45) and FEF25-75 (r = -0.45) (both, p < 0.05). Lastly, % BF was significantly related to VO₂peak in HFREF (r = -0.78, p < 0.05), but not CTL (p > 0.05).

CONCLUSIONS: These data demonstrate that static lung volumes (i.e. FVC, ERV, and TLC) and FEV₁ are negatively related to % body fat in patients with HFREF. Future studies are necessary to determine the impact of body composition on ventilatory constraints during exercise in HFREF.

Respiratory muscle work exerts an influence on the distribution of blood flow during exercise. Most studies have focused on blood flow to the locomotor musculature rather than respiratory muscle owing to their complex anatomical arrangement. Purpose: To examine changes to accessory respiratory muscle blood flow in response to increasing ventilation (V̇E) during whole-body exercise. Methods: Blood-flow index (BFI) of the vastus lateralis (VL), sternocleidomastoid (SCM), and 2nd intercostal space (7IC) was measured during five-minute bouts of cycle exercise at 30, 60 and 90% peak-power output (EX). Participants then mimicked the hyperpnea of exercise (HY) achieved during each exercise bout. BFI was measured using near-infrared spectroscopy optodes and indocyanine green. Results: Six healthy males completed this study (age: 26 ± 3 years, V̇Epeak: 56 ± 9 mL·kg⁻¹·min⁻¹). V̇E was matched well between EX and HY (EX-30%: 53 ± 10 vs. HY-30%: 56 ± 14; EX-60%: 86 ± 14 vs. HY-60%: 87 ± 18; EX-90%: 159 ± 31 vs. HY-90%: 142 ± 40 L·min⁻¹; all, p < 0.05). BFI-VL increased from 0.15 ± 0.09 μM·sec⁻¹ at rest to 2.57 ± 1.10 μM·sec⁻¹ during the EX-30% trial and 0.44 ± 0.23 μM·sec⁻¹ during the HY-30% trial and did not significantly increase thereafter in either condition. No interaction effect was observed between condition and intensity, however, BFI-VL was significantly greater in the EX trials compared to the HY trials (p < 0.05). BFI-SCM increased slightly from 0.87 ± 0.48 μM·sec⁻¹ to 1.01 ± 0.54 and 1.67 ± 1.54 μM·sec⁻¹ in the EX-30% and HY-30% trials respectively. We observed no effects of condition or intensity when measuring BFI-7IC (p = 0.11). At rest BFI-7IC was 0.84±0.59 μM·sec⁻¹ and in the EX-30% and HY-30% trials increased to 1.20 ± 0.75 and 1.26 ± 0.60 μM·sec⁻¹, respectively. No differences in BFI-7IC were observed between condition or intensity (p > 0.05). Conclusion: Previous studies have shown that during heavy whole-body exercise there exists a competition for blood flow between the locomotor and respiratory muscles during heavy, whole-body exercise. In this study, BFI-SCM was similar between exercise and hyperpnea mimicking trials across a range of ventilations, suggesting blood flow to accessory respiratory muscles is preserved during exercise.

Funding: NSERC
Purpose: Aging related loss in muscle mass (sarcopenia) is major contributor to functional disability and all-cause mortality. Resistance exercise training (RT) is an established treatment for age-related losses in muscle mass, strength, and power. However, we have previously found that 3 d/wk of heavy RT in older adults may blunt the hypertrophic response to progressive resistance training. We postulate that this effect is mediated by skeletal muscle inflammation, indicated by heightened expression of TNFα and TWEAK-R. Typically, acute exercise induced inflammation is beneficial to muscle hypertrophy, and this regimen has been shown to be well tolerated by young adults. However, impaired exercise tolerance and adaptability sometimes demonstrated in older adults may be mediated by increased basal muscle inflammatory burden, coupled with an exaggerated inflammatory response to muscle loading. We hypothesize that this phenomenon in the aging cohort may impair hypertrophic responses to RT if intensive loading occurs too frequently (i.e. 3 d/wk).

Methods: This study builds on a previous clinical trial conducted by our lab (NCT02442479), analyzing muscle hypertrophy in a four-arm, randomized dose-response trial to determine optimal exercise treatment for aging individuals (60-75 y). For this follow-up molecular analysis, we analyzed two of the groups of interest that underwent either 3 d/wk mixed model consisting of two days high-intensity training days separated by 3 d of low-intensity training regimen (HHH, n = 18). Skeletal muscle biopsies were collected before and after 35 weeks of training in either HHL or HHH. Muscle and serum-derived miRNA-Seq is underway to identify potentially novel regulators of muscle hypertrophy and inflammation, accompanied by targeted muscle analysis of key inflammatory pathways (e.g., TNF/TWEAK/NFκB, IL-6/STAT3).

Results and Conclusion: We expect that results from this study will advance our understanding of the role of inflammation in blunting muscle hypertrophy in aging adults, including a better understanding of both dose optimization and inter-individual response heterogeneity. Supported by T32HD071866 and UAB Center for Exercise Medicine.

Few studies have concurrently examined multiple rapid neuromuscular characteristics of the plantar flexors (PFs) in middle-aged (MM) and older (OM) males. Further, it is important to determine the association between these measures and physical function.

Purpose: To compare rapid neuromuscular parameters of the PFs in MM and OM males. Few studies have concurrently examined multiple rapid neuromuscular characteristics of the plantar flexors (PFs) in middle-aged (MM) and older (OM) males. Further, it is important to determine the association between these measures and physical function.

Methods: Twenty-nine healthy, MM (n=14; 45.3±2.6 yrs) and OM (n=15; 65.3±3.2 yrs) performed fast, isotonic contractions of the PFs using a dynamometer. Participants were instructed to push with the ball of their foot “as hard and fast as possible” prior to each contraction. Peak velocity (PV), rate of velocity development (RVD), and rate of electromyography rise (RER) were obtained from IT trials. During the IK trials, time to peak torque (TPT) and rate of velocity development (RVD) were acquired. RVD was obtained from the linear slope of the velocity-time curve (Δvelocity/Δtime) as the highest rolling 20 ms value. RER of the medial gastrocnemius was derived from the linear slope of the normalized electromyography signal as the highest rolling 50 ms value. Maximal walking velocity (MWV) and time to complete 5 chair rises (5CR) were also recorded. Group comparisons were made with independent samples t-tests, while Pearson correlation coefficients were calculated to examine select relationships.

Results: RVD was lower (MM=5202.83±510.23 vs. OM=4630.29±854.23; p=0.037), and 5CR time greater (16%; p=0.022) in OM. RER was only correlated (r=0.431; p=0.026) with RVD., Only PV (r=0.396; p=0.033) and RVD., (r=0.480; p=0.008) were correlated with MWV, while only TPT was correlated with 5CR time (r=0.451; p=0.014).

Conclusion: Our findings suggest that rapid neuromuscular measures may be differentially influenced by age, and only particular parameters are associated with physical function.

Falls are the leading cause of fatal and nonfatal injuries among older people, although its association with handgrip strength is less characterized. Purpose: To prospectively assess the association between poor handgrip strength and incidence of falls in older women.

Methods: The cohort included 204 women (68.1 ± 6.2 years) who were assessed for handgrip strength (Jamar Dynamometer) at baseline and followed up for 18 months. FNIH Sarcopenia threshold of handgrip strength adjusted for body mass index (BMI) (<50.6) was used for clinical determination of muscle weakness. Multivariable Cox hazard models were analyzed in the total cohort and stratified by postural balance (near tandem stand test cutoff: 10 s) status.

Results: During the follow-up, 56 (27%) women experienced at least one event of falls. Compared to women with normal handgrip strength, women who had poor handgrip strength adjusted for BMI exhibited significantly higher risk for falls [Hazard Ratio (HR): 2.2, 95% Confidence Interval (CI) (1.1 - 4.6), p=0.031]. The risk was even greater in a stratified analysis among women with impaired balance [HR: 3.2, 95% CI: (1.3 - 7.7), p=0.011] but not significant (p=0.440) in women with normal balance.

Conclusion: Poor handgrip strength adjusted for BMI is associated with higher risk of falls in older women and particularly in those with impaired postural balance. These results suggest potential prognostic value of handgrip strength testing in risk stratification for falls.

Myostatin (growth and differentiation factor (GDF) 8) inhibits skeletal muscle growth, whereas follistatin (FST) can inhibit GDF8 to promote skeletal muscle growth. GDF15 may be a biomarker of stress, and also impact skeletal muscle growth. The purpose of this project was to determine if an acute bout of exercise in older women could positively influence these three circulating biomarkers.

Methods: Overweight, older women (64.0±1.3 years; BMI=32.8±1.0 kg•m⁻²; n=18) participated in an acute bout of cardiorespiratory and resistance exercise before and after a 12-week training intervention. The training intervention consisted of 3 d/wk of progressive supervised treadmill walking and resistance exercise at a moderate to vigorous intensity. Blood was collected before acute exercise (PRE), immediately after (POST), 1 hour recovery (1HR), and 2 hour recovery (2HR). Serum GDF8, FST, and GDF-15 were measured with commercially available ELISA kits.

Results: GDF8 did not change (p=0.05) at PRE, 1HR, and 2HR before the exercise training intervention. Both before and after the training intervention, an acute bout of exercise increased (p=0.05) GDF8 at POST, 1HR, 2HR compared to PRE. FST increased (p=0.05) from PRE to 1HR and 2HR both before and after the intervention. GDF15 increased (p=0.05) from PRE to POST before the intervention, but PRE to POST, 1HR, and 2HR after the intervention.

Conclusion: Regular exercise training can reduce the acute exercise effect on circulating GDF8. Further, acute exercise will increase FST before and after an exercise training intervention. These results were independent of a change in BMI. Together, this may be a potential mechanism for exercise to help maintain skeletal muscle mass during aging.
Sarcopenia is characterized by age-related loss of skeletal muscle mass and function, and is associated with increased risk of falls, fractures, and mortality. Physical inactivity and inadequate protein intake are lifestyle factors that may contribute to the development and progression of sarcopenia. Weight-adjusted skeletal muscle index (sMMI), grip-strength (GRIP) and gait-speed (GAIT) are utilized clinically to diagnose sarcopenia. Phase-angle (PhA), obtained via bioelectrical impedance, is predictive of muscular strength and may also be predictive of sarcopenia. The PURPOSE of the study was to evaluate the relationships among indicators of sarcopenia, habitual physical activity, protein intake, and PhA in older adults. METHODS: In 96 subjects (68W/28 M, 68±6yrs) gait speed, grip strength (dynamometer), body composition (bioelectrical impedance), and habitual physical activity (7-day accelerometer) were measured. sMMI [skeletal muscle mass (SMM)/body mass (BMI)] was also calculated. In a subset of 34 subjects, habitual dietary intake was determined (3-day diet recall). Partial correlations (controlling for age and sex) were utilized to examine the relationships among variables of interest. Significance was set to \( \alpha = 0.05 \). RESULTS: Mean values were: SM: 28.6 kg; BMI: 26.0 ± 1.0; GAIT: 1.5 ± 0.4 m/s; PhA: 4.9 ± 0.7°; moderate-intensity PA (MOD PA): 58±31 min/day; sedentary time (SED): 707±82 min/day; relative protein intake (RPI): 0.8±0.2 g/kg body mass. MOD PA was significantly \( (p<0.05) \) correlated with sMMI \( (r=0.28) \), GRIP \( (r=-0.25) \), and RPI \( (r=0.42) \). RPI was additionally correlated with PhA \( (r=0.37) \) and body mass \( (r=-0.44) \). There was a trend towards a significant correlation between RPI and sMMI \( (r=0.29, p=0.11) \). GAIT was significantly correlated with activity counts per minute \( (r=-0.23) \), GRIP \( (r=-0.47) \), sMMI \( (r=0.45) \). GRIP was significantly correlated with sMMI \( (r=0.40) \). CONCLUSIONS: These data show that greater PA and RPI are associated with better scores for some of the clinical indicators of sarcopenia. Thus, increased PA and RPI intake may represent effective strategies for decreasing the risk of sarcopenia.

Muscle power is critical for older people to independently and safely perform the activities of daily living. Physical activity in general and resistance training, in particular, are essential for the prevention of muscle power loss with ageing. PURPOSE: To analyze the associations between moderate-vigorous intensity physical activity (MVPA) and functional fitness in older women, including the role of muscle power in mediating these associations. METHODS: Participants were 54 older women with a mean age 73±6.8yrs. MVPA (min day−1) was measured by accelerometry. Lower limb peak muscle power (W/kg) was assessed using a mechanography ground reaction force platform. Functional fitness (lower body strength, agility/dynamic balance, and aerobic endurance) was objectively assessed through physical fitness tests from the Senior Fitness Battery, respectively: 30s chair stand (repetitions), 8-foot up-and-go (s), and 6-minute walk test (m). Functional fitness was also subjectively evaluated via the 12-item Composite Physical Function Scale Questionnaire which gives a global score of physical function (points). Direct and indirect mediation model effects were estimated using the PROCESS macro developed by Preacher and Hayes, and 95% bootstrap confidence intervals were constructed to test the hypothesis that muscle power mediated associations. Age was examined as a covariate. RESULTS: A significant portion (40-78%) of the total effect of MVPA on functional fitness in older women was explained by muscle power. The indirect effects were observed on physical function global score \( (β=0.040 \text{95% CI}[0.010, 0.099]) \) and in each of the functional fitness parameters: lower body strength \( (β=0.048 \text{95% CI}[0.013, 0.117]) \), agility/dynamic \( (β=0.009, \text{95% CI}[0.000, 0.009]) \), and aerobic endurance \( (β=0.065, \text{95% CI}[0.146, 0.694]) \). There were no direct effects of MVPA on functional fitness. CONCLUSION: To improve functional fitness in older women, physical activity interventions should consider the mediating role of muscle power and include activities that require force to be rapidly generated.

Skeletal muscle fiber type distribution was 31% I, 4% I/IIa, 23% IIa, 27% IIa/IIx, 3% I/IIa/IIx, and 4% I/IIx fibers. Identified MyHC I/IIx fibers were found in two MHD patients. MyHC fiber typing via SDS-PAGE. Seven subjects (6 males and 1 female) receiving MHD treatment (age: 68W/28 M, 68±6yrs) were included in this study. PURPOSE: To investigate the role of hybrid fibers in older adults receiving MHD. METHODS: Nine hybrid fibers characterization via SDS-PAGE was performed. The number of hybrid fibers was calculated as the number of fibers identified as having a combination of MyHC isoforms. RESULTS: Three hybrid fibers were identified in two MHD patients. CONCLUSIONS: The presence of hybrid fibers in MHD patients suggests a potential role in disease and inactivity. Further studies are needed to determine the functional and metabolic properties associated with disease and inactivity.

| Board #102 May 28 9:30 AM - 11:00 AM Associations Among Physical Activity, Protein Intake, And Clinical Indicators Of Sarcopenia | 1508 | N. Chan2, Donny F. Gregg, Steven B. Machek1, Jonathan N. Myers2, Ralph Rabkin2, Khin Aye1, Abbas 1, Diego M. Perez1, Khin 1, Verity Zymbal1, Luis Carrasco2, Borja Sañudo2, Diana Luís1, Filomena Cardin1, Fátima Baptista1. 1University of Lisbon, Lisbon, Portugal. 2University of Seville, Seville, Spain. Email: verazymbal@fmh.unlisboa.pt (No relevant relationships reported) |
| Board #104 May 28 9:30 AM - 11:00 AM Muscle Power Mediates The Relationship Between Physical Activity And Functional Fitness In Older Women | 1510 | Vera Zymbal1, Luis Carrasco2, Borja Sañudo2, Diana Luís1, Filomena Cardin1, Fátima Baptista1. 1University of Lisbon, Lisbon, Portugal. 2University of Seville, Seville, Spain. Email: verazymbal@fmh.unlisboa.pt (No relevant relationships reported) |

**Board #103 May 28 9:30 AM - 11:00 AM**

**Skeletal Muscle Fiber Type In Older Patients Receiving Maintenance Hemodialysis Treatment**

Donny F. Gregg1, James R. Bagley1, Steven B. Machek1, Khin N. Chan2, Yiming Liu2, Yu Chen2, Irene Tobías3, Andrew J. Galpin1, Jonathan N. Myers2, Ralph Rabkin2, San Francisco State University, San Francisco, CA.1. VA Palo Alto Health Care System/Stanford University, Palo Alto, CA. 2. California State University Fullerton, Fullerton, CA.

Email: dgregg@sfsu.edu (No relevant relationships reported)

**PURPOSE:** Metabolic abnormalities and increased sedentary time in maintenance hemodialysis (MHD) patients lead to unfavorable skeletal muscle adaptations and reduced exercise tolerance. Muscle function is affected by the proportion of “pure” myosin heavy chain (MyHC) fiber type isoforms (Type I, IIa, and IIx) and prevalence of co-expressing “hybrid” fibers (Type I/IIa, I/IIx, I/IIx, and I/IIx) which display unique functional/metabolic properties associated with disease and inactivity. Previous investigations have utilized APase fiber typing methods in MHD patients, but this technique lacks fidelity to identify hybrid fibers. The purpose of this study was to 1) more accurately measure MyHC fiber type distribution in older men undergoing MHD and 2) compare the MyHC fiber type profile of these MHD patients to the literature. METHODS: Seven subjects (6 males and 1 female) receiving maintenance hemodialysis treatment (age: 63.6 ± 4.4y; MHD duration range: 0.8 - 10y) underwent resting vastus lateralis muscle biopsies. Individual muscle fibers were mechanically isolated (696 total fibers) for MyHC fiber typing via SDS-PAGE. RESULTS: MyHC fiber type distribution was 31% I, 4% I/IIa, 23% IIa, 27% IIa/IIx, 3% IIx/IIa, 2% IIx, and 11% IIx. Rarely identified MyHC I/IIx fibers were found in two MHD patients. CONCLUSIONS: MyHC fiber type distribution was 31% I, 4% I/IIa, 23% IIa, 27% IIa/IIx, 3% IIx/IIa, 2% IIx, and 11% IIx. Rarely identified MyHC I/IIx fibers were found in two MHD patients.

**Board #105 May 28 9:30 AM - 11:00 AM**

**Early Life Muscle Disuse Causes Premature Dynapenia In Adulthood**

Paul T. Reidy1, Emory Perlman1, Ryan Schmidt1, Abbas Doctor1, Jackie Monni2, Ziad Mahmassani3, Dennis Fix1, Alec McKenzie1, Jonathan Petrocelli1, Naomi de Hart2, Micah Drummond2. 1Miami University, Oxford, OH. 2University of Utah, Salt Lake City, UT. (Sponsor: Kyle Timmerman, FACSM) Email: reidypt@miamioh.edu (No relevant relationships reported)

Physical activity (PA) is a vital behavior to maximize health and wellness. Less is understood regarding the impact of muscle disuse on children, specifically during key stages of muscle development. PURPOSE: We propose that, similar to malnutrition, exposure to muscle disuse early in life will impact function in adulthood. METHODS: We exposed postnatal mice (1 month old) to physical inactivity in the form of muscle disuse (hindlimb unloading, HU) shortly after weaning, and then let them age to adulthood (5 months of age). They were then tested for physical function (grip strength) and muscle size. RESULTS: Compared to similar aged controls, no notable effects of early life physical inactivity (HU) on skeletal muscle size were observed. POI muscle mass was 339.4±8.8 mg for Early Control and 332.2±6.2 mg for Early HU. However, a clear and robust reduction in grip strength was experienced in those exposed to HU early in life. Max Grip Strength was 0.398±0.008 kg for Early Control and 0.362±0.007 kg for Early HU (P<0.05). Additional analyses will be presented at the meeting. CONCLUSIONS: Since grip strength is a strong predictor of health status, reduced functionality, and early mortality these findings of premature dynapenia (muscle weakness) as a result of early life muscle disuse are concerning. Supported by NIA R01AG050781.
INTRODUCTION: Statin medications are widely used to reduce major cardiovascular risk factors and events, but have also been reported to reduce cardiopulmonary and mitochondrial adaptations expected with aerobic exercise training. The current study evaluated the influence of statin therapy on aerobic exercise training adaptations in older adults. METHODS: Twenty-eight healthy, sedentary older adults (67±5 yrs old, BMI=30±5, mean±SD, 5 males) participated in a 12-week graded treadmill walking intervention (EX) with roughly half the group on statin therapy (+statin). 3P MRS was used to quantify oxidative capacity of the plantar flexor muscles (3T MRI, 51.7MHz, TR=3s); a monoexponential model was used to fit the time constant of phosphocreatine recovery following acute plantar flexion. Peak oxygen consumption (VO2 peak) was measured during a modified Balke exercise stress test. Repeated measures ANOVA was used to assess changes in muscle oxidative capacity and VO2 peak between groups with significance at P<0.05. RESULTS: Prior to the exercise intervention, PCr time constant (tau, s) was significantly prolonged in statin users (+statin 42.2±10.5s, -statin –34.1±9.9s, P<0.039). Following exercise training, the time constant was reduced by 27% (+statin 30.3±9.6s, Post: 29.6±10.4s) for EX compared to CON (Pre: 35.6±6.3s to 36.4±9.0s, P<0.001, n=27. There was no significant effect of statin therapy with a 28.0% improvement for EX+statin compared to -statin 25.3% for EX-statin. VO2 peak increased 11% following EX (Pre:18.8±2.8 ml/kg/min, Post: 20.1±3.5 ml/kg/min) compared to CON (Pre: 21.8±3.7, Post: 20.8±3.6 ml/kg/min), P=0.001, n=21 with no effect of statin therapy. CONCLUSION: Moderate exercise training in older adults on a low dose statin resulted in typical increases in aerobic fitness. These results are encouraging for the majority of older adults as 50% or more are likely to be prescribed a statin for reduction in cardiovascular event risk or prevention of metabolic syndrome. Supported by NIH AG042041.

Carnosine Content Of Trained Men And Women

Eimear Dolan1, Paul A. Swinton2, Luana Farias de Oliveira1, Nathalia Saffiotti Reczende1, Brunana Caruso Mazzolani1, Giulia Cazzetta Bestetti1, Fabiana Infante Smaira1, Alina Dumas2, Pedro Perim1, Luiz Riani1, Bruno Gualano1, Bryan Saunders2.
1University of Sao Paulo, Sao Paulo, Brazil. 2Robert Gordon University, Aberdeen, United Kingdom.

Beta GAMM ASES Scores

Carnosine is a dipeptide formed from the amino acids β-alanine and L-histidine, which contributes toward a number of essential processes in skeletal muscle metabolism. A number of modifiable (e.g., sex and age) and non-modifiable factors (e.g., training status) purportedly influence muscle carnosine content (MCarn), but little is known about the relative contribution of these factors. PURPOSE: To investigate the influence of modifiable and non-modifiable determinants of MCarn in a group of cycling-trained men and women. METHODS: 73 trained cyclists (54 men and 19 women, age 18 - 60) participated. Whole muscle MCarn was determined using high-performance liquid tomography, from a biopsy taken from m. vastus lateralis. All participants completed a self-report questionnaire of their current and previous training habits, and an exercise test battery (aerobic capacity testing, wingate test and a 4km time-trial). Body composition was assessed using the sum of 7 skinfolds. To describe relationships between MCarn and a range of demographic, performance and training-related factors, penalized regression in the form of LASSO (least absolute shrinkage and selection operator) analysis was completed. Models were generated using the glmnet package in R with associations described by regression coefficients and a monotonous model was used to estimate women to have a median reduction of ~two percentage inclusion in 10000 bootstrap samples. Model's predictive quality was assessed via four-fold interactions into the model. The model's predictive quality was assessed via four-fold cross-validations evaluating the following metrics between predicted vs true data: 1) Pearson correlation coefficients, 2) linear regression R2 values, and 3) root mean square error (RMSE).

RESULTS: The GAMM predictive model (Figure 1) had the following characteristics: Pearson coefficient = 0.74-0.76, R2 = 0.55-0.58, and RMSE = 13.4-14.2. CONCLUSIONS: Nonlinear CATs can be used to predict ASES measures, and the model provides a proxy for exercise-induced changes in function. The model can be used by clinicians to quickly identify patients who are likely to benefit from additional interventions.
**Board #109** May 28 10:30 AM - 12:00 PM
**Comparison Of Parent Self-reported Physical Activity And Accelerometer Readings Among Racially/ethnically Diverse Young Children**

Junia N. de Brito 1, Allison Tate 1, Katie A. Loth 1, Jerica M. Berge 1, 1University of Minnesota, Minneapolis, MN. 2University of Georgia, Athens, GA. (Sponsor: Matthew Buman, FACSM)

No relevant relationships reported

**PURPOSE:** To compare parent-reported child physical activity (PA) with accelerometer-measured in a sample of racially/ethnically diverse families and examine whether self-reported and objective measures differed by sex.

**METHODS:** 146 parent-child dyads, with children (5-7 years old; 47% girls) represented by six racial/ethnic groups (n=23 African American, n=25 American Indian, n=25 Hispanic/Latino, n=25 Hmong, n=24 Somali, and n=24 White) were included in this analytic sample. Parents reported average weekly hours of child light (LPA), moderate (MPA), and vigorous PA (VPA) using a validated self-report measure. Child LPA, MPA, and VPA were objectively measured by accelerometer (ActiGraph GT2M) for 8 days. Correlation analyses were used to compare self-reported and accelerometer-measured PA variables. Multiple linear regression assessed the association between parent self-reported child LPA, MPA and VPA and accelerometer-measured PA. Child and whether child sex moderated these associations. All models were adjusted for child age, sex, BMI, race/ethnicity, and household income.

**RESULTS:** The average weekly hours of LPA, MPA, and VPA measured by parent self-report and accelerometer were 3.2, 2.8, and 30.6±6.6, 3.9±1.5, 1.6±1.1 hours per week, respectively. Pearson correlations between self-reported and accelerometer-measured LPA, MPA, and VPA were 0.3, 0.25, and 0.22, respectively.

**CONCLUSION:** Overall, self-reported and objective measures of PA were poorly correlated in this racially/ethnically diverse sample of parent-child dyads. Misunderstanding of what constitutes different levels of child PA by parents, the sporadic nature of PA behaviors in young children might explain these findings. When accelerometer is not available, future studies should incorporate descriptive measures of different types of PA and choose a different survey tool, such as Ecological Momentary Assessment to have better estimates of parent-reported PA.

**Board #110** May 28 10:30 AM - 12:00 PM
**Activity Monitor Step And Heart Rate Accuracy During Overground Walking And Stair Climbing**

John D. Smith. 1Texas A&M University-San Antonio, San Antonio, TX.

(No relevant relationships reported)

Wrist-worn activity monitors incorporate various inputs, most notably movement counts and heart rate, to provide an aggregate of daily physical activity. **PURPOSE:** To assess the accuracy of wrist-worn activity monitors during over-ground walking, and ascending and descending stairs. **METHODS:** Forty-seven students (age = 26.7±5.9 yrs, ht = 169.9±10.4 cm, wt = 77.0±17.8 kg) were filmed as they walked for 200m across a level surface, up four flights of stairs, and down four flights, with full recovery between each. After each of the three trials, HR from CS, GV, FH, and MF were recorded. Video was later reviewed for actual counts (AC) to be compared with the monitors. Repeated measures ANOVA was used to determine significant differences between the counts (Alpha set at .05). Pedometer error was calculated as [(monitor counts - AC)/AC] * 100. **RESULTS:** 200m walk: MF (282.8±27.7 counts), PL (265.1±44.1 counts), and AL (254.7±52.4 counts) were significantly lower than AC (294.0±22.4), p<0.05, with error greatest in the PL (34%) and AL (13%). Descending counts: MF (282.8±27.1 counts), PL (265.1±41.4 counts), and AL (254.7±52.4 counts) were significantly lower than AC (314.0±22.4), p<0.05, with error greatest in the PL (34%) and AL (13%). Ascending counts: MF (97±5.0 counts), AC (106.2±5.0 counts), p<0.05, with error greatest in the PL (34%) and AL (13%). The strength of the relationships between self-reported and objective PA was similar between girls and boys (all r ≥0.64, p<0.01). Accelerometer-measured MPA revealed 23.8% of children met the U.S. PA guidelines.

**CONCLUSION:** Overall, self-reported and objective measures of PA were well correlated in this racially/ethnically diverse sample of parent-child dyads. Misunderstanding of what constitutes different levels of child PA by parents, the sporadic nature of PA behaviors in young children might explain these findings. When accelerometer is not available, future studies should incorporate descriptive measures of different types of PA and choose a different survey tool, such as Ecological Momentary Assessment to have better estimates of parent-reported child PA throughout the day. Interventions for PA promotion among racially/ethnically diverse children are needed given the low levels of MVPA in this sample.

**Board #111** May 28 10:30 AM - 12:00 PM
**Analysis Of Runners With Medial Tibial Stress Syndrome**

Ronald Bispo Barreto da Silva 1, Lucas Nogueira Oliveira 1, Hannah Sophia Vasconcelos Bezerra Silva 1, Allana Mendonca Martins Santos 1, Marcos Antonio Almeida-Santos 1, 1Triradentes University, Aracaju, Brazil. 2Federal University of Sergipe, Aracaju, Brazil.

No relevant relationships reported

**PURPOSE:** To describe the kinematics and strength analysis of running athletes diagnosed with MTSS and to evaluate its effect on the athletes’ performances. **METHODS:** Twenty-seven runners with MTSS and 29 runners without MTSS (control group) were evaluated. The participants answered the sociodemographic, Baecke’s Usual Physical activity and International Physical Activity questionnaires. Videos of the participants while running were recorded from the rear and the side. Kinové® software was used to analyze the videos. An FPX25 digital algometer (Greenwich, USA) was used to measure the pre- and post-race pain. The data gathered were entered in the software and were compared with runners with MTSS. **CONCLUSION:** The average speed of the runners with MTSS was lesser than that of the healthy runners. The strength of the quadriceps femoris and hip extensors was reduced in runners with this syndrome, suggesting that focused treatment of the weakened muscles could be one way of accelerating recovery.

<table>
<thead>
<tr>
<th>Speed</th>
<th>Std. Error</th>
<th>t</th>
<th>p-Value</th>
<th>95% conf. interval</th>
</tr>
</thead>
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<tr>
<td>v*</td>
<td>20.4 Km/h</td>
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</tr>
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<td>5.91 Km/h</td>
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<td>±0.33 Kmh</td>
<td>±0.27</td>
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</tr>
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</table>

* reference: v; † reference: Control Group; ‡ reference: Female.

**Board #112** May 28 10:30 AM - 12:00 PM
**Factors Associated With Daily Physical Activity In Children**

Julie A. Young 1, James Onate 1, Amy Valasek 2, 1The Ohio State University, Columbus, OH. 2Nationwide Children's Hospital, Columbus, OH.

(No relevant relationships reported)

**Purpose:** The purpose of this study was to examine which factors were related the number of days per week of physical activity in children. **Methods:** Patients presenting to sports medicine clinics between the ages of 5-18 were asked “On average, how many days per week did you participate in MVP?” and “On average, how many minutes per day did you participate in MVP?”. Age, sex, BMI percentile, as well as the history of asthma, attention deficit hyperactivity disorder, depression, and diabetes were recorded. A linear regression was utilized to determine which factors were associated with increased days of physical activity. **RESULTS:** Data were recorded on 14,440 subjects. Average age was 13.9±1.249 years, average BMI percentile was 65.5±27.4%, and 54.1% were female. A total of 2340 (16.2%) reported asthma, 818 (5.7%) reported ADHD, 308 (2.1%) reported depression, and 92 (.6%) reported diabetes. Average days per week of MVP was 4.3±1.68. Approximately 5% of patients reported 0 days of MVP/week, whereas only 6% of patients reported daily MVP. Females reported .48 less days of MVP per week than males (p<0.001). Those with a history of ADHD reported .23 days less of MVP when compared to those without ADHD (p<0.001). Older children completed more days of MVP (p<0.001). **Discussion:** The current MVP recommendations require 60 minutes of daily MVP for all school aged children. The vast majority of children in our study were not participating in MVP 7 days per week. All children should be screened for MVP to identify and counsel those who are not active daily
Wearable fitness devices have risen in popularity for athletes and the general population, and are increasingly integrated into smartwatch technology. Optical heart rate measurement by photoplethysmography provides data to monitor and track training intensities and progress. **Purpose:** To determine the validity of optical HR measurement in 3 fitness devices while resting, walking, and running. **Methods:** Ten subjects (5 male, 5 female) completed 4 testing protocols based on the ANSI/CTI standards for sedentary (Sed), and treadmill walking (Walk), running (Run), and dynamic running/walking (Dyn). Subjects wore 3 optical heart rate devices: Polar OH1 on the right forearm (OH1), Garmin Forerunner 945 (FR945) on the left wrist, and Apple Watch 4 (AW4) on the right wrist. The Polar H10 (H10), a chest strap device, was the criterion HR measurement device. Sed, Walk, and Run were all 7-minute protocols with 1 minute of standing, 5 minutes of prescribed intensity, and 1 final minute of standing. Raw HR data was extracted from each device and temporally aligned with the H10 for data analysis. **Results:** Mean descriptive statistics for the subjects were: age = 26.8 ± 7.6 years, height = 1.70 ± 0.12 m, weight = 73.0 ± 14.3 kg, BMI = 25.1 ± 2.8 kg/m², and body fat = 22.6 ± 11.2%. Mean Absolute Deviation (MAD), and Mean Absolute Percentage Deviation (MAPDE) were calculated for each device for each protocol (Table 1). **Conclusions:** At rest and during both steady-state and variable-speed treadmill walking and running, the Polar OH1, Garmin Forerunner 945, and Apple Watch 4 optical HR monitors demonstrated a level of accuracy well within that required by the ANSI/CTA Standard (2018) for physical activity monitoring devices for heart rate measurement (<10% Mean Absolute Percent Error). Supported by the Dr. David E. Martin Sport Science Research Fund and The Atlanta Track Club.

### Table 1: Mean Absolute Deviation (Means Per Hour) and Mean Absolute Percentage Error (%)

<table>
<thead>
<tr>
<th>Device</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Running</th>
<th>Dynamic</th>
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<td>2.39</td>
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</table>

**Examples:**

1. To assess the convergent validity of a novel image annotation schema for determining posture from wearable camera still-images (IMGs) and activPAL (AP) posture classifications. **Methods:** Participants (n=5, mean age 45y, range 21-81y, 3F) were seated in a chair and were asked to perform a sequence of 3 IMGs denoted a postural “event”. Sequences of fewer than 3 IMGs and when IMGs could not be accurately classified were annotated as “transitions”. For analyses, IMGs and AP output were converted to one-sec epochs and matched sec-by-sec. Total visit time and event time is reported in min. Overall and event percent agreement between AP and IMGs were calculated. Within events, statistical bias and CIs for posture times from IMGs to AP posture times were calculated to determine accuracy and precision with mean posture times from AP stated as reference. Confusion matrices were computed to determine misclassification. **Results:** 13 visits were analyzed with a total visit time of 1546 min and total event time of 1546 min. Mean overall percent agreement including events and transitions was 72%, while mean event percent agreement was 80%. **Conclusion:** Within events, IMGs do not currently provide adjusted MET energy expenditure values. Notably, activity intensity is categorized as moderate if MET values range from 3.0-5.9; activities with 6.0+ METs are categorized as vigorous-intensity. Recently, the Youth Compendium of Physical Activities was released by an NCCOR workgroup in response to concerns that adult MET energy expenditure values may not accurately account for age differences in basal metabolic rates. However, the Youth Compendium does not currently provide adjusted MET, moderate-vigorous activity (MVPA) cut-points for youth, resulting in potential research errors such as over-reporting of a child’s MVPA. **Purpose:** To determine if average MVPA energy expenditure values would significantly differ when two youth scoring protocols (the traditional Three-Day Physical Activity Recall (3DPAR) vs. new NCCOR Youth Compendium) were compared across repeated measures in a sample of pre-adolescent girls. **Methods:** Study participants completed detailed 7-day PA logs at study baseline (BL), 1-week follow-up (FU1), and 3-month follow-up (FU2). All self-reported activities were coded with MET (3DPAR) or MET (NCCOR Youth Compendium) energy expenditure (EE) values from each protocol’s respective activity repository. Conservatively, if multiple EE values were available per activity, the lowest value was selected. Activities were considered MVPA if MET/METY exceeded 3.0. **Results:** At all data collection times, mean volume of MVPA was greatest when utilizing the NCCOR protocol. Group differences between the scoring protocols were significant when examining both weekday (BL/FU1/FU2: p < .001) and weekend activity (BL/FU1/FU2: p < .001). **Conclusion:** To our knowledge, this is the first study which provides comparisons of two qualitative MVPA scoring protocols utilizing repeated measures analyses of EE values in youth. Thus, findings may be important to future research using self-report activity data. In the current study, adult cut-points for MVPA were applied to the Youth Compendium scoring protocol, although literature suggests that EE of similar activities is higher for children than adults. Consequently, we urge that higher MVPA cut-points for the Youth Compendium be explored to more accurately capture measures of PA epidemiology in youth.
Purpose: To cross-validate PPAQ, a validated physical activity (PA) recall questionnaire, for the Chinese college students.

Methods: 166 (99 males & 67 females; Age = 18.6 ± 1.1 yr., Height = 170.6 ± 8.4 cm, Weight = 63.3 ± 12.4 kg, BMI = 21.6 ± 3.1) Chinese college students7-day energy expenditure (EE) data were estimated using ActiGraph wGT3X-BT accelerometers. They were also asked to recall their PA using PPAQ before and after the accelerometer data collection. Total EE, walking steps, light, moderate, vigorous, very vigorous and moderate-to-vigorous PA (MVPA) time, estimated by ActiGraph were compared with EE derived from PPAQ and test-retest reliability was computed also for PPAQ.

Results: All subjects wore the accelerometer for at least 10 hr. a day and over 4 days in one week. The correlation between the accelerometer total EE and that reported by PPAQ is 0.308 (p = 0.001), accelerometer walking and that reported by PPAQ is 0.361 (p = 0.001), which were low, but consistent with the validity reported for the questionnaire method. The test-retest reliability coefficient of PPAQ is 0.761. In average, the Chinese college student’s PA are: Weekly Total EE =1778.41 ± 1003.76 (kcals), Daily EE =142.93 ± 85.85 (kcals),Weekly walking Steps = 38730.02 ± 15506.72 (steps), Weekly total MVPA = 347.2 ± 144.4 (minutes), Daily MVPA 28.06 ± 14.71 (minutes), Weekly Average PA intensity METs = 1.14 ± 0.07 (METs), according to the ActiGraph.

Conclusion: Similar validity and reliability of PPAQ were confirmed for the Chinese college student sample and they met the PA guideline.

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not differ between those with "good" or "poor" sleep quality, highlighting that sleep is a multidimensional physiological construct. To ensure coherent translation in sleep studies, there is a need to develop standardized methods that will produce comparable estimates of sleep across device and self-report data.

Sedentary behaviors are persuasive in all societies. According to the 2018 American Time Use Survey, nearly 96% of adults spend 4-5 hours/day in sedentary behaviors that include watching TV, reading, computer use, relaxing and thinking. Since sedentary behaviors increase chronic disease risks, interest is high in knowing the energy costs of sedentary behaviors to help populations to reduce time spent in sedentary behaviors. PURPOSE: To update the energy costs of sedentary behaviors in the 2011 Adult Compendium of Physical Activities. METHODS: Energy cost in ml.kg⁻¹.min⁻¹ and heart rate in bpm were measured by Cosmed K4b² portable indirect calorimetry system in 10 males and 9 females (20-59y), mean age (31.6 ± 7.5 y), weight (63.4 ± 8.9 kg), and height (167.1 ± 5.8 cm). The subjects completed 17 randomly assigned behaviors in lying, reclining, sitting, and standing postures at 4.2 METs. The energy cost of sitting with a min rest between behaviors. Mean ± SD were computed with data presented as mean METs computed as VO₂ (ml.kg⁻¹.min⁻¹) and 3.5 ml.kg⁻¹.min⁻¹. Terminal digits for MET values were rounded to 0.5, 3, 5, or 8 to comply with format of the Compendium. RESULTS: Mean MET values were presented by behaviors and postures performed. Doing nothing (lie: 1.3; sit: 1.3; stand: 1.0); Watching TV (lie: 1.3; sit: 1.3; Reading (recline: 1.5; sit: 1.5; study: 1.3); Texting (recline: 1.5; sit: 1.5; stand: 1.5); Fidgeting (sit hands only: 1.5; sit feet only: 1.8; stand hands & feet: 2.0); Typing (stand: 1.3). The measured MET values, seven were the same as the Compendium, four were lower (on the order of 0.3 - <1.0 METs), and one was higher by 0.3 METs (Recline: read). Heart rates during the behaviors ranged from 62 to 80 beats.min⁻¹. CONCLUSIONS: The measured mean MET values ranged from 1.0 to 2.0 METs, classified as inactive (1.0-1.49 METs) and light activity (1.5-2.9 METs). Duplication of measured MET values to those in the Compendium confirm the energy cost of common sedentary behaviors. Of the four behaviors with lower measured MET values, three had been estimated in the Compendium (Sit: read, text; Stand: text). Four behaviors not in the 2011 Compendium were measured (Recline: write, text; Sit: write, text). Supported by the Shanghai University of Sport.

### Table 1: Energy Costs of Sedentary Behaviors

<table>
<thead>
<tr>
<th>Behavior</th>
<th>METs</th>
<th>Heart Rate (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing nothing</td>
<td>1.3</td>
<td>62</td>
</tr>
<tr>
<td>Watching TV</td>
<td>1.0</td>
<td>65</td>
</tr>
<tr>
<td>Reading (recline)</td>
<td>1.5</td>
<td>70</td>
</tr>
<tr>
<td>Reading (sit)</td>
<td>1.3</td>
<td>70</td>
</tr>
<tr>
<td>Typing (stand)</td>
<td>1.3</td>
<td>70</td>
</tr>
<tr>
<td>Fidgeting (sit)</td>
<td>1.5</td>
<td>70</td>
</tr>
<tr>
<td>Fidgeting (sit)</td>
<td>1.8</td>
<td>70</td>
</tr>
<tr>
<td>Typing (stand)</td>
<td>1.3</td>
<td>70</td>
</tr>
</tbody>
</table>

### Table 2: Comparison of Energy Costs of Sedentary Behaviors Across Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>METs</th>
<th>Heart Rate (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist-Worn</td>
<td>1.3</td>
<td>62</td>
</tr>
<tr>
<td>Chest-Worn</td>
<td>1.3</td>
<td>65</td>
</tr>
<tr>
<td>Smartphone</td>
<td>1.3</td>
<td>70</td>
</tr>
</tbody>
</table>

Wrist-worn accelerometers have replaced hip-worn devices as the wear-site of choice when measuring physical activity (PA) in many large-scale studies. Data suggesting superior compliance with study protocols has largely driven this transition due to the potential for a more accurate view of habitual PA. Similarly, activity classification utilizing raw acceleration data has gained popularity relative to epoch-based activity count methods, owing to open source analytical packages, higher classification accuracy, and the potential for greater comparability among devices. As activity classification methods for wrist-worn accelerometer data are derived from PA performed in controlled settings, their accuracy in quantifying free-living PA is unknown. PURPOSE: The purpose of this study was to examine the classification accuracy of common PA quantification methods against a free-living, participant-specific intensity classification, heart rate reserve (HRR). METHODS: Healthy young adults (n=33; 18.6 ± 0.7 years, 69.6% female) wore a triaxial accelerometer on their non-dominant wrist and a heart rate monitor around their chest for 24 hours. Free-living intensity was quantified using traditional HRR ranges (e.g. MVPA≥40%), calculated using resting heart rate during sleep and age-predicted maximum heart rate. Two commonly used data classification methods were applied, 1) Euclidean norm minus one (ENMO) values calculated from raw triaxial data using mili gravitational (mg) cut points of light ≤100.6, moderate 100.6 - ≤428.8, vigorous ≥428.8, and MVPA ≥40%; 2) activity count across counts 1-15, ≥16 and ≥4721, and MVPA≥2199. RESULTS: ENMO-based classification underestimated average MVPA by 31.9 ± 106.6% (19.4 ± 105.3 mins). In contrast, activity count-based classification overestimated average MVPA by 368.4 ± 396.2% (178.3 ± 105.1 mins).
According to the 2018 American Time Use Survey, nearly 78% of US adults spend from 2.0-2.5 hours/day in housework activities that include cleaning, laundry, straightening up, cooking, washing dishes and other activities. Another 11% of adults spend nearly 1.0 hour/day caring for older household adults. As many adults do household activities, there is interest in knowing the energy costs of such activities. PURPOSE: To update the MET values in the 2011 Adult Compendium of Physical Activities (Compendium) with measured oxygen uptake MET values for selected household physical activities (PHAs) in adults. METHODS: The energy costs of six meal-related, five household cleaning, and two other care PHAs were measured in 20 adults ages 20-59 (10 males, 10 females). Each simulated PA was performed in a laboratory setting for 8-min with a 4-min rest between PAs. Submaximal VO2 (ml/kg/min) and heart rate (beats/min) were measured with a Cosmed K4b2 portable indirect calorimetry system. METs were computed as VO2 in ml/kg/min divided by 3.5 ml/kg/min. Subjects self-rated their PA and physical fitness level as low, middle or high. RESULTS: Subject characteristics were averaged for age (33.7 ± 11.2 yrs.), weight (67.9 ± 12.0 kg), and height (166.1 ± 7.4 cm). MET values were averaged upward or down to reflect terminal digit values as presented in the 2011 Compendium (0, 3, 5, 8, 10). MET values: carrying groceries on level surface (3.5), putting away groceries (2.5), food prep and cooking while standing (1.8), food prep and cooking while sitting (1.8), setting the table (1.7), putting away laundry (2.0), putting away household items (3.0), major cleaning (3.0), sweeping sidewalk (3.0), water plants (1.8), other care feeding/grooming (1.8), other care bathing/dressing (2.8). Heart rates ranged from 74 to 92 beats/min across all PAs. PA and fitness levels were rated as middle. CONCLUSIONS: MET values were generally lower (on the order of 0.3 to 1.2 METs) than estimated MET values presented in the 2011 Compendium. Measured MET values were the same as the 2011 Compendium for putting away groceries and putting away household items. Overall, measured MET values for frequently performed household activities are rated as low- to moderate intensity. Supported by the Shanghai University of Sport
Adults with Down syndrome (DS) have altered movement patterns. Especially during school-aged children, there is a need to understand the nature of movement and its impact on physical health. The purpose of this study was to examine the relationship between physical activity levels and body mass index (BMI) in adults with DS.

METHODS: A total of 16 adults with DS (10 men, age 31 ± 15 years) performed 12 tasks: sitting; playing app; drawing; folding clothes; sweeping; fitness circuit; moving box; basketball; standing; and walking at the preferred speed and at 0.8 and 1.4 m/s. We measured VO2 with a spirochrom (k4b2, Cosmed) and VA and VM with an accelerometer (wGT3X-BT, Actigraph) on the non-dominant hip. We used two separate multi-level regression models to predict VO2max and VO2peak with an accelerometer (SenseWear Armband) for 7 days while maintaining their regular activity prior to initiating the intervention. Data were considered valid if the activity monitor was worn for ≥10 hours per day on at least 4 days. These data from the activity monitor were used to identify total minutes of MVPA that met the criteria of ≥3 METs regardless of bout length and total minutes of MVPA that was accumulated in bouts ≥10 minutes. Methods: Baseline data from 377 adults with obesity (age=45.5±8.0 years; BMI=32.2±3.8 kg/m²) who enrolled in a behavioral weight loss program were included in this analysis. Subjects completed a seven-day monitoring period that included wearing a thigh worn activPAL (AP) accelerometer during all waking hours and completing a wear-time log. At the end of the monitoring phase individuals completed the PASIPD. Accelerometer data was processed with PAStudio (v8.9.1.24) and raw data was manipulated using the activPAL processing package in RStudio (1.2.1335) to calculate hours in stepping, light (1.5-2.99 METs) PA (LPA), and moderate-vigorous (>3.0 METs) PA (MVPA). Items were taken from the PASIPD to calculate hours of LPA and MVPA, and to derive a total activity score. Spearman correlations comparing AP stepping and total PASIPD, AP LPA and PASIPD LPA, and AP MVPA and PASIPD MVPA were computed. Wilcoxon Signed Rank tests were computed for differences between AP and PASIPD LPA and AP and PASIPD MVPA.

RESULTS: Twenty-seven subjects (16 male, 7 female) (mean±SD) age 75.8±6.2 yrs; height 168.4±9.5 cm; mass 83.8±17.6 kg) were analyzed. AP Stepping was significantly correlated with total PASIPD score with a Spearman’s rho of 425; p=0.14. AP LPA and PASIPD LPA, and AP MVPA and PASIPD MVPA were significantly correlated, Spearman’s rho of 436; p=0.12, and 435; p=0.12, respectively. On average, PASIPD underestimated AP LPA by 1.38 hours (p=0.024) and overestimated AP MVPA by 1.34 hours (p=0.001). Conclusion: Differences between PASIPD and AP measures of LPA and MVPA were apparent, but the PASIPD was moderately correlated to PA levels in this sample of arthritis individuals. Future work on examining the precision and accuracy of PA surveys in heterogeneous populations with varying disease and disability is warranted. This work was partially supported by NIH R11HD080828 and NIH IR01CA215518.

INTRODUCTION: The 2008 Physical Activity Guidelines for Americans recommended adults engage in ≥150 min/week of moderate-to-vigorous intensity physical activity (MVPA) in bouts of ≥10 minutes to elicit numerous health benefits. However, the 2018 Physical Activity Guidelines recommends that all MVPA, regardless of bout length, contribute to the desired MVPA goal as this also elicits health benefits.

PURPOSE: This study examined whether the number of adults meeting the public health recommendation of 150 min/week of MVPA differed based on the criteria that considered all minutes or minutes that were only accumulated in bouts ≥10 minutes.

METHODS: Baseline data from 377 adults with obesity (age=45.5±8.0 years; BMI=32.2±3.8 kg/m²) who enrolled in a behavioral weight loss program were analyzed. Participants reported not engaging in regular structured exercise that exceeded 60 min/week. Participants were instructed to wear an activity monitor (SenseWear Armband) for 7 days while maintaining their regular activity pattern. VO2max was predicted using the Godin questionnaire. A significant method-by-task interaction in within-subject ANOVA and follow-up t-tests indicated that absolute error was lower for the VM than the VA model for sitting, playing an app, drawing, and standing (p ≤0.004), but did not differ for other tasks. Bland-Altman plots indicated zero mean error for both models; however, the limits of agreement were narrower for the VM than the VA model (−6.44 to 6.44 and −5.57 to 5.57 ml/kg/min, respectively). Conclusion: Both VA and VM counts predict VO2max in adults with DS; however, prediction is more accurate for a VM than a VA model during sedentary behaviors. VM counts should be used in developing accelerometer-based prediction of physical activity and sedentary behavior in adults with DS. Supported by NIH Grant R15HD089660

Conclusions: Although there is a negative trend between air pollution and PA, there is a need for additional research to understand the factors that influence physical activity levels in urban areas.
Physical activity compensation (PAC) has been studied in a populations ranging from children to older adults participating across a range of mixed exercise interventions yielding equivocal results. Although physical activity is the highest predictor of weight loss success in post-bariatric (PB) individuals, it has not been reported if compensatory physical activity is also exhibited in PB individuals during exercise intervention. PURPOSE: To determine if PAC occurs on days following different types supervised exercise sessions in obese and post-bariatric individuals as measured by step count. METHODS: Ten obese individual (7 female, 3 male; BMI = 38.99 ± 6.3) and 8 PB individuals (7 female, 1 male; Body Mass Index (BMI) = 34.95 ± 7.6) participated in a supervised 12 week three days per week treadmill exercise training program. 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. 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. Both exercise interventions included a 2-week run-in to avoid injuries. Total weekly and daily steps were measured using micro-ActiPals for the pre-exercise week and weeks 3, 9 and 12.

RESULTS: Paired post hoc t tests (P > .05) found both obese and PB groups average daily steps were lower on days following supervised sessions. Average steps on days for exercise in week 3 for the Obese and PB groups were 9,840 and 10,797 respectively. For week 9, the average step count on days following supervised exercise was 7,567 for the obese group and 7,731 for the PB group. In both groups regardless of exercise mode, daily step counts increased and plateaued for weeks 3 through 9 and approached pre-study levels in week 12.

CONCLUSIONS: Despite different types of exercise intervention methods and near matching step volume, both obese and PB groups demonstrated lower levels of physical activity on the following day. The step count on those days was closely aligned with counts measured prior to exercise training and reflects a habitual and familiar activity pattern.
CONCLUSION: There was limited evidence for the validity and accuracy of proxy-measured PA and sedentary time using the IPAQ-SF in adults with ID. This suggests that device-based measurement may be a preferred method in studies of PA in adults with ID.

1542 Board #136 May 28 10:30 AM - 12:00 PM Physical Activity And Sedentary Time In Adults With Down Syndrome Estimated By Different Cut Points
Natalie L. King, Amber G. Cook, Supreeta Ghosh, Poram Choi, Stamatis Agiovlasitis, FACSM, Mississippi State University, Mississippi State, MS. ( Sponsor: Dr. Stamatis Agiovlasitis, FACSM)
Email: nk304@msstate.edu
(No relevant relationships reported)

Physical activity (PA) and sedentary time in persons with Down syndrome (DS) have been previously examined with accelerometry using intensity cut points developed for the general population. These cut-points may not be valid for persons with DS due to altered biomechanical and physiological responses to PA. PURPOSE: To examine if DS-specific cut-points and cut-points developed for the general population differ in estimating sedentary time and PA levels in persons with DS. METHODS: Eleven adults with DS (4 women & 7 men; age 37 ± 14 years) wore for 7 days an accelerometer (wGT3X-BT, Actigraph) on their right hip. Times sedentary and in light, moderate, and vigorous PA were assessed with three cut-point sets: (a) Troiano; (b) Freedson; and (c) DS-specific. The first two sets of cut-points were developed for the general population based on vertical axis counts. The third was developed by our group based on vector magnitude counts in 16 adults with DS. We compared sedentary time and PA variables between methods using 3×4 (method-by-intensity) within-group ANOVA. A significant interaction was analyzed with follow-up within-group ANOVA at each intensity level and post-hoc tests between methods if needed. RESULTS: A significant method-by-intensity interaction (p = 0.002) indicated that the estimates of times in sedentary and light, moderate, and vigorous PA generally differed between methods. Follow-up analysis showed that: (a) sedentary time was lower by our DS-specific cut points than the Troiano and Freedson (457 ± 131, 505 ± 149, and 517 ± 111 min/day, respectively; p ≤0.04); (b) light PA did not differ between methods (345 ± 37, 336 ± 85, and 346 ± 73 min/day, respectively; p = 0.782); moderate PA was higher by our cut points than the Troiano and Freedson (85 ± 44, 28 ± 24, and 25 ± 23 min/day, respectively; p < 0.001); and (d) vigorous PA was higher by our cut points than the Troiano and Freedson (9.9 ± 9.2, 0.3 ± 0.8, and 0.1 ± 0.2 min/day, respectively; p ≤0.007). There were no differences between the Troiano and Freedson.

CONCLUSIONS: Compared to cut-points for the general population, DS-specific cut-points estimate lower levels of sedentary time and higher levels of moderate and vigorous PA. Supported by NIH Grant R15HD098660

1543 Board #137 May 28 10:30 AM - 12:00 PM Accelerometer Cut Points For Adults With Down Syndrome
Amber G. Cook1, Natalie L. King1, Poram Choi1, Supreeta Ghosh1, Fabio Bertapelli2, Stamatis Agiovlasitis, FACSM,1 Mississippi State University, Mississippi State, MS. 2University of Campinas, Sao Paulo, Brazil. ( Sponsor: Dr. Stamatis Agiovlasitis, FACSM)
Email: age315@msstate.edu
(No relevant relationships reported)

Past research has indicated that the relationship between energy expenditure and accelerometer output is different between adults with and without Down syndrome (DS). This suggests a need for DS-specific cut-points for determining levels of sedentary behavior and physical activity from accelerometer output for adults with DS.

PURPOSE: To develop accelerometer output cut points for sedentary behavior and moderate and vigorous intensity physical activity for adults with DS.

METHODS: Sixteen adults with DS (10 men & 6 women; age 31 ± 15 years) performed 12 tasks at each intensity level and post-hoc tests between methods if needed.

RESULTS: A significant interaction was analyzed with follow-up within-group ANOVA. A significant interaction was analyzed with follow-up within-group ANOVA: Total SSB assessed by PDR was associated with activPAL-determined total sedentary time, percent of wear time spent sedentary, number and duration of sedentary bouts, and breaks in sedentary time. We examined sedentary bouts with thresholds of ≥1, ≥10, ≥30, ≥60 and ≥90 min and breaks for bouts ≥10 min. We used t-tests and 2×2 (sex by day) ANOVA to evaluate the effects of sex and day of the week. The sample included 52 adults with DS (25 men; age 45 ± 14 years) who wore an accelerometer (wGT3X-BT, Actigraph) on the hip for 7 days. Using valid days, we determined total sedentary time, percent of wear time spent sedentary, number and duration of sedentary bouts, and breaks in sedentary time.

CONCLUSION: Sedentary behavior in young male adults

1544 Board #138 May 28 10:30 AM - 12:00 PM Sedentary Behavior Levels And Patterns In Men And Women With Intellectual Disability
Supreeta Ghosh1, Poram Choi1, Stanley P. Brown1, Robert W. Motl1, Stamatis Agiovlasitis, FACSM,1 Mississippi State University, Mississippi State, MS. 2University of Alabama at Birmingham, Birmingham, AL. ( Sponsor: Dr. Stamatis Agiovlasitis, FACSM)
Email: sg2023@msstate.edu
(No relevant relationships reported)

Adults with Intellectual Disability (ID) experience health disparities that may be attributable to high levels of sedentary behavior. The levels and weekly patterns of sedentary behavior among U.S. adults with ID have received little attention.

PURPOSE: To examine levels and patterns of sedentary behavior and how these differ between sexes and weekdays and weekend days in adults with ID.

METHODS: The sample included 52 adults with ID (25 men; age 45 ± 14 years) who wore an accelerometer (wGT3X-BT, Actigraph) on the hip for 7 days. Using valid days, we determined total sedentary time, percent of wear time spent sedentary, number and duration of sedentary bouts, and breaks in sedentary time. The sample included 52 adults with ID (25 men; age 45 ± 14 years) who wore an accelerometer (wGT3X-BT, Actigraph) on the hip for 7 days. Using valid days, we determined total sedentary time, percent of wear time spent sedentary, number and duration of sedentary bouts, and breaks in sedentary time.

CONCLUSION: Sedentary behavior and intensity of physical activity in adults with DS. Overall classification accuracy was excellent. Supported by NIH Grant R15HD098660

1545 Board #139 May 28 10:30 AM - 12:00 PM Validation Of Previous-day Recalls Of Screen-based Sedentary Behavior In Young Male Adults
Stephen H.S. Wong, FACSM1, Chen Zheng2, Wendy Y. Huang1, The Chinese University of Hong Kong, Hong Kong, China. 1Hong Kong Baptist University, Hong Kong, China.
Email: hswong@cuhk.edu.hk
(No relevant relationships reported)

PURPOSE: Previous-day recall (PDR) has been suggested as a valid measurement of type, purpose and amount of sedentary behaviors in youth and adults. However, no studies have explored the feasibility and validity of using PDR to estimate sedentary behaviors in various bouts. This study examined the validity of a self-administered PDR in evaluating the total screen-based sedentary behaviors (SSB) and SSB by types and bouts using the activPAL as a criterion measure.

METHODS: One hundred young male adults aged 18–35 years volunteered to participate in the validation study. They completed a web-based PDR over 7 consecutive days, in which three categories of SSB (computer work & surf internet, computer games video, and other video games) were recorded to the nearest 15 minutes. Participants were advised to recall on the 7 days to determine the daily sedentary time and the sedentary time during each 15-min segment. The activPAL-based SSB were calculated based on the start point and endpoint of sedentary behavior from PDR. Total SSB, SSB by type of activities and by duration of bouts were drawn from PDR. Bivariate correlations between PDR- and activPAL-assessed outcomes were conducted. Bland-Altman Plots were performed to determine the agreement between two methods by type of activities and by the duration of bouts.

RESULTS: Total SSB assessed by PDR was associated with activPAL-determined sedentary time (r = 0.37). The absolute mean difference between PDR and activPAL

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was <1.38 h/day (95% confidence interval [CI]: -3.64, 0.88) for total SSB, -1.07 h/day (95% CI: -3.11, 0.96) for computer work & surf internet, -0.20 h/day (95% CI: -1.17, 0.76) for watching TV/video, and -0.15 h/day (95% CI: -0.95, 0.65) for playing computer games. The mean difference between two methods was smaller for sedentary bouts of ≥ 4 h (0.20 h/day, 95% CI: -0.69, 0.29) than for the sedentary bout shorter than 1 h (-0.42 h/day, 95% CI: -1.42, 0.57).

CONCLUSIONS: The online PDR could be used as an easy and valid tool to identify SSB, in particular the type and bouts of SSB in young male adults.

Traditionally, device non-wear time is determined by examining periods of consecutive zero counts, however, zero counts may also indicate periods of non-movement or sleep. In infants, evaluating non-wear is challenging due to their sporadic nature of movement and sleep frequency. These unique behavior characteristics make a zero counts approach prone to misclassification of non-movement and sleep as non-wear. Thus, an infant-specific method to identify device non-wear time is necessary. PURPOSE: To compare a novel method for identifying device non-wear to consecutive zero counts in infants. METHODS: Fifteen infants (mean±SD; age: 8.7±1.7 wk; 5.1±0.8 kg, 56.2±2.1 cm) wore an Actigraph wGT3X-BT on the hip and ankle. Criterion data (minutes of wear and non-wear) were collected during two, 2-hour periods of direct observation during which infants spent time in an infant bouncer, including sleeping and waking time. A vector magnitude and the inclination angle of each individual axis were calculated from raw 30 Hz acceleration data before being averaged into 1-min epochs. Using the 1-min data, a 4-min rolling coefficient of variation (CV) of each axis was calculated for each minute. Three decision tree models were developed using data from the 1) hip, 2) ankle, and 3) hip and ankle combined. For the consecutive zero counts method, two or more minutes of consecutive zero counts were considered non-wear; this was examined for the hip, ankle, and hip and ankle combined (i.e. if one site indicated “wear” the combined label was “wear”). RESULTS: There were 3,506 total minutes of observation with 1,987 min of sleep and 1,519 min of waking time with zero criterion non-wear minutes during the observation period. The decision tree approach resulted in lower misclassification of wear as non-wear (5.1-6.0%; 178-212 min) compared to the zero counts method (43.8-51.7%; 1,534-1,813 min). Of the misclassified minutes for the decision tree, 5.3-8.8% (106-175 min) was sleep time compared to 66.8-77.3% (1,328-1,535 min) for the consecutive zero counts method. CONCLUSIONS: Overall, using movement variability (i.e. CV) and device position (i.e. inclination angle), device non-wear can be more robustly identified when worn during periods of non-movement and sleep compared to a consecutive zero counts approach. Supported by NIH P30DK072476-10.

CONSUMER LEVEL ACTIVITY MONITORS

Consumer level activity monitors offer individuals the ability to self-monitor their physical activity throughout the day. However, examination of the accuracy between brands and comparison to gold standard measures is needed. PURPOSE: To compare two consumer-level activity trackers in assessing steps, energy expenditure and heart rate to gold standard assessments. METHODS: A total of 19 individuals who met ACSM guidelines for physical activity volunteered for the study (11 males, 8 females, age: 23 ± 7.6y). Subjects completed 2 sessions performing the Rockport 1-mile Walk test while wearing a Garmin Vivosport (GV) or Polar A370 (A370) activity monitor.

RESULTS: There were no significant differences between the GV and A370 for HR. The two monitors were significantly different for steps. GV measured a higher step count. The two monitors were deemed significantly different for steps. GV and A370 estimated higher energy expenditure than the GV. CONCLUSION: This study presents preliminary findings on the accuracy of two popular consumer level physical activity monitors, showing a strong relationship for step counts and HR compared to gold standard measures. Differences exist between these two brands in their estimation of kcals and steps.

In recent years, Fitbit has been increasingly used as a measurement or intervention tool in physical activity research. However, Fitbit’s shorter lifespan of model generation than research-based accelerometers may limit its utilization in the longitudinal study if measurement properties vary across model generations. To date, no information is available whether the estimates of sedentary behavior (SED) and physical activity (PA) differ between predecessor and newer models of Fitbit. PURPOSE: To determine the inter-model comparability between FF2 and Fitbit in assessing SED and PA during free-living conditions. METHODS: 38 healthy adults (Female: 65.8%, Age: 23.8 ± 0.8 yrs, BMI: 25.0 ± 2.46 kg/m²) wore the FF2 and FF on dominant wrist for seven consecutive days. Raw data of FF and FF2 were converted to activity counts summarized into minutes of SED and moderate-to-vigorous PA (MVPA) using a proprietary algorithm. Spearman’s correlation was used to assess the relationship between the estimates from FF and FF2. Paired t-test and mean absolute percent error (MAPE) were used to examine differences between FF and FF2. Bland-Altman (BA) plots were used to examine bias for agreement and variance between two devices. Results: The correlation showed a strong relationship (r = 0.81, P = 0.01) between FF and FF2 for estimating in total daily activities. FF2 yielded almost identical MVPA estimate (mean difference = 0.04 min/day, P = 0.94), but 8.8 min/day higher sedentary estimate (P < 0.01) when compared with FF. MAPEs were relatively lower for both SED (0.5 ± 0.8%) and MVPA (9.1 ± 9.9%). BA plots showed no apparent bias for the agreement and variance between FF2 and FF. SED (limits of agreement = 9.9 ± 27.1 min/day, Pitman’s test: r = 0.14, P = 1.51) and MVPA (r = 5.7 – 5.8 min/day, r = 0.36, P = 1.94) estimates. Conclusion: From this study, the estimates of SED and MVPA were similar between FF and FF2. Therefore, Fitbit Flex models can provide comparable estimates in SED and PA between models. Further, we suggest that researchers can choose FF2 as a measurement of PA when FF is not available in the market during the longitudinal PA research.

PURPOSE: To investigate the association between self-reported 60 minutes of moderate-to-vigorous physical activity (MVPA)/day and motor skill competence in children.

METHODS: Children 6-11 years participating in an after school or summer local YMCA program were enrolled. Study participants completed the Play the Study: Perception Is Everything, Physical Literacy And Reported MVPA In Children. Eric Noehly1, Dai Sugimoto1, Rebecca Zwicker2, Gregory Kobelski1, Edie Weller1, Laura Bertbet1, Avery Faigenbaum1, Gregory Myer3, Andrea Stracciolini1, 1Boston Children’s Hospital, Boston, MA. 2The College of New Jersey, Ewing, NJ. 3Cincinnati Children’s Hospital, Cincinnati, OH. (No relevant relationships reported)
MVPA/day?!” while 29% (N=26) answered no. Only 51% (N=85) of study participants were deemed physically literate. Correlation analysis revealed no statistical difference in physical literacy scores between children who report 60 minutes of MVPA/day and children who report otherwise (p = 0.816). More importantly, of children who perceived they spent 60 minutes/day in MVPA/day, only 52% could be considered physically literate. Of children who perceived they did not get 60 minutes of MVPA/day, 54% were considered not physically literate.

CONCLUSIONS: Simply asking about daily MVPA will not suffice as a screening tool for childhood physical inactivity and motor skill competency. These results emphasize the need for a clinically useful sensitive and specific screening tool that predicts motor skill competence in children required for sustained PA.

MotionSense HRV (MS-HRV) is a wrist-worn accelerometer-based sensor that is paired with a smartphone to examine health behaviors such as stress response, heart rate, and physical activity (PA). However, little information is available on the validity of MS-HRV in estimating PA.

PURPOSE: To evaluate the accuracy of MS-HRV for assessing PA and sedentary behavior (SED) in adults, using the most widely used accelerometer-based activity monitor, ActiGraph GT9X (GT9X), as a criterion measure, during free-living conditions.

METHODS: 19 adults (Female: 58%; Age: 30.9 ± 13.7 yrs; BMI: 30.3 ± 4.1 kg/m²) wore the MS-HRV on non-dominant wrist and AG on dominant hip simultaneously for seven consecutive days. The MS-HRV is composed of a smartphone and wristband that is accelerometer and LED biometric sensor to measure PA unobtrusively. Raw acceleration data from both MS-HRV and GT9X were processed using GGRIP package that summarizes multiday raw acceleration data to the amount of time (min/day) spent in SED and moderate-to-vigorous PA (MVPA) using Euclidean Norm Minus One (aka. ENMO). Pearson correlations and Bland-Altman (BA) plots were used to examine the relationship between MS-HRV and GT9X. Equivalence test was used to compare the 90% confidence intervals (CI) of the estimates from the MS-HRV with the respective equivalence zone (EZ ± 10% of the mean estimates) from the GT9X.

RESULTS: The correlations between MS-HRV and AG were high for both SED (r = 0.95, P < .01) and MVPA (r = 0.89, P < .01). BA plots illustrated no variance difference in SED estimates (Pimman’s test: r = 0.16, P = 0.95), but significantly different variance in MVPA (r = 0.91, P = 0.02) from two devices. The estimates of SED and MVPA from the MS-HRV (SED Mean (90% CI)): 237.6 min/day (198.5 - 276.8)); MVPA: 21.5 min/day (16.4 - 26.6) were not significantly equivalent to those from the GT9X (SED Mean (EZ)); 257.6 min/day (231.8 - 283.4); MVPA: 8.7 min/day (7.8 - 9.5)).

CONCLUSIONS: The MS-HRV accelerometer yielded comparable estimates of SED, but significantly higher estimate of MVPA when compared with the GT9X accelerometer. The observed difference in MVPA estimate could be due to the difference in device placement location (wrist vs. hip). Therefore, subsequent research that compares the estimates from two devices worn at the same location is warranted.

Weearable fitness devices have become widely accessible for athletes and the general population and are increasingly integrated into smartwatch technology. They are used to track daily physical activity and exercise behavior such as steps and provide data to training and health applications to track and evaluate health and fitness.

PURPOSE: To determine the validity of step counting in two wearable fitness devices during steady-state walking and running and during dynamic changes in walking and running speed.

METHODS: Ten subjects (5 females, 5 males) completed 3 treadmill test protocols based upon the ANSI/CTA standards for walking (WK), running (RUN), and dynamic walking and running (DYN) activities. Subjects wore a Garmin Forerunner 945 (FR945) on the left wrist and an Apple Watch Series 4 (AW4) on the right wrist during the Wik, Run, and Dyn protocols, which involved 5 minutes of steady-state walking, 5 minutes of steady-state running, and 3 different running speeds, respectively. Each protocol began and ended with 1 minute of standing. Footsteps were video recorded and counted by 2 observers to determine criterion step counts for each trial. Step counts from the FR945 and the AW4 were determined for each trial for comparison to the criterion step counts.

RESULTS: Mean (± SD) subject characteristics: age = 26.8 ± 7.6 y, height = 1.70 ± 0.12 m, weight = 73.0 ± 14.3 kg, BMI = 25.1 ± 2.8 kg/m², bodyfat = 22.6 ± 11.2 %. Mean Absolute Deviation (MAD) for Wik, Run, and Dyn for the FR945 was 3.5, 4.8, and 6.6 steps respectively, MAD for Wik, Run, and Dyn for the AP4 was 4.6, 4.4, and 14.0 steps, respectively. The Mean Absolute Percent Error (MAPE) for Wik, Run, and Dyn for the FR945 was 0.66 %, 0.59 %, and 0.45 %, respectively. MAPE for Wik, Run, and Dyn for the AP4 was 0.86 %, 0.56 %, and 0.98 %, respectively. CONCLUSIONS: During both steady-state and variable-speed treadmill walking and running, the Garmin Forerunner 945 and the Apple Watch Series 4 demonstrated less than 1% Mean Absolute Percent Error in step counting, a level of accuracy well within that required by the ANSC/CTA Standard (2016) for physical activity monitoring devices. Supported by the Dr. David E. Martin Sport Science Research Fund and the Atlanta Track Club.

PURPOSE: Comparison of body composition and physical activity level according to self-perception health in schoolchildren. The balance between health and well-being in children and adolescents can be understood through the physical, social, mental and spiritual environment. Methods: The sample consisted of 90 schoolchildren, 40 boys and 50 girls aged 9 to 11 years old, who are part of the Ilha Bela Mixed-Longitudinal Growth, Development and Physical Fitness Project coordinated by Center of studies physical fitness research laboratory from Sao Caetano do Sul (CELAFISCS), Sao Caetano do Sul, Brazil. Email: marcosbarbosampc@gmail.com.

Conclusion: According to self-perception health, differences in body composition were found when compared to self-rated health, and body composition values were lower in students who reported a positive score.

PURPOSE: Snowboarding is a recreational activity with large popularity and is also a sport in the Winter Olympics. Despite its popularity and inclusion in the Olympic program, relatively little remains known about the physiological characteristics of a snowboard session, particularly in field settings. The purpose of this study was to classify physiological responses to recreational snowboarding relative to ACSM daily activity guidelines. METHODS: To date, twenty-one men and women who were experienced snowboarders were recruited from a university community and while snowboarding wore a heart-rate monitor and GPS device. Data were collected at 1-second intervals and analyzed for time spent in moderate and vigorous intensities based on percentage of heart rate maximum (HRmax) (light ≤ 64% HRmax; moderate 64–76% HRmax, vigorous ≥76% HRmax). Based on this information, the amount of time spent in vigorous intensity exercise of at least 30 minutes a day.
The Movement and Activity in Physical Space (MAPS) System is a unique assessment combining data from accelerometers and the global positioning system (GPS) to provide patient-centered data from 13 activity-environment-related variables. Processing MAPS data is time-consuming and requires the use of multiple raters to ensure data are analyzed in a timely process and reduce potential risk of bias; however, it is unknown how the scores obtained from multiple raters are consistent which could significantly influence results. PURPOSE: Evaluate the interrater reliability of MAPS system variables obtained from 2 independent raters. METHODS: Twenty days of data from 3 participants were processed by 2 independent raters. Participants were instructed to wear an Actigraph GT3X Link accelerometer on their dominant hip and a LandAirSea Flashback 2 GPS for 7 days during waking hours. Outcome variables included: physical activity counts (PAC), physical activity counts at home (PAH), physical activity counts at locations other than home (PAL), step counts (SC), step counts at home (SH), step counts at locations other than home (SL), time at home (TH), time at locations other than home (TL), travel time (TT), number of locations visited (NL), number of instrumental trips (NIT), number of discretionary trips (NDT), MAPS intensity (MAPSi), and MAPS volume (MAPSv). To determine the interrater reliability of MAPS system variables obtained from separate raters intraclass correlation coefficients (ICC) were calculated for each MAPS system outcome. An ICC of .7 was considered acceptable and an ICC of .8 or greater considered good. RESULTS: The ICCs for most of the MAPS variables were considered good with PAC=.92; PAH=.75; PAL=.25; SC=.99; SH=.80; SL=.26; TH=.96; TL=.97; TT=.94; NL=.92; NIT=.78; NDT=.72; MAPSi=.49; MAPSv=.61. CONCLUSIONS: Overall, interrater reliability between raters was good for 7 MAPS variables with acceptable ICCs for 3 variables. Evaluation of GPS data can be challenging particularly when trying to determine departure and arrival times which are necessary for calculation of MAPS scores and activity counts at locations. Using a team of raters, rather than a single rater, would help to reduce potential bias from evaluation of GPS data; which is consistent with the currently recommended MAPS protocols.

### C-41 Free Communication/Poster - Intervention Strategies

**Thursday, May 28, 2020, 9:30 AM - 12:00 PM**

**Room: CC-Exhibit Hall**

**Board #149 May 28 10:30 AM - 12:00 PM**

**Participation In A Seven-Day Health Education Camp Improved Health Parameters In Overweight Children**

Carmen Silvia Grubert Campbell1, Alisson Luiz Aquino da Silva1, Jessica Myayelle da Silva Barbosa2, Suliane Beatriz Rauhle3, Catholic University of Brasilia, Taguatinga, Brazil, 1UFD University Center, Brasilia, Brazil. Email: campbellcsg@gmail.com

(No relevant relationships reported)

Childhood obesity affects millions of children worldwide. Multidisciplinary interventions are more effective in treating and controlling obesity since it has a multifactorial origin. Health education camps have shown positive contributions to both obesity prevention and treatment. PURPOSE: To investigate the effects of participating in the camp how fun can be healthy (KIDS) on health parameters in overweight children. METHODS: Twenty children of both genders (7-11 years old; BMI >85th) attended the KIDS for seven days. Educational, social and recreational activities were carried out by KIDS by a multidisciplinary team (physical education, nutrition, psychology, and pedagogy). Anthropometric parameters (Body weight - BW; Body mass index - BMI), skinfold thickness (tricipital + subscapular - ƩST), % body fat (%BF), resting metabolic rate (RMR), triglycerides (TG), LDL, basal insulin (BI), HOMA IR, HOMA B, and VO2max were measured before and after KIDS. Parental control of children’s eating habits and sleep patterns was also assessed before KIDS. The paired Student’s t-test was used to compare the effect of intervention.

RESULTS: Children improved all health parameters after KIDS respectively (52.52±10.28 vs 41.66±6.71%BF; 1,579.22±347.23 vs 1,805.11±312.23kcal; 1555.47±83.22 vs 1,555.32±0.58µUI/mL; 327.09±197.84 vs 312.39±155.03mm Hg). Maternal concern for the child’s overweight and modulation were the items of greatest concern while the perception of maternal overweight and the pressure to children’s eat were the least concern of the parents. It was also observed a high incidence of excessive daytime sleepiness, sleep breathing disorders and sleep onset and maintenance disorder in these children. CONCLUSIONS: Participation in KIDS for seven days induced significant improvement in health parameters, but not in aerobic fitness in overweight children. Supported by CNPq, CAPES, and Sabin.

### 1554 Board #148 May 28 10:30 AM - 12:00 PM**

**Interrer Reliability Of Movement And Activity In Physical Space (maps) Scores**

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(No relevant relationships reported)

An increasing number of physical activity (PA) interventions have been implemented to tackle the child obesity epidemic, yet many have shown limited effectiveness. This is possibly due to a lack of in-depth understanding of the intrinsic motivators and demotivators to PA for children. PURPOSE: A main aim of this study was to explore the intrinsic facilitators and barriers to PA participation through the lived experience of UK children (Study 1). Utilising the latter findings, our second aim was to develop and validate the PA-specific Rummination Scale for Children (PARSC) to assess children’s tendencies to engage in repeated negative thoughts about PA, which may hinder participation (Study 2). METHODS: For Study 1, 21 focus groups were formed based on participants’ year group (aged 6-10 years), and gender-and-assessed PA. Focus group discussions were thematically analysed. For Study 2, the themes identified for the intrinsic barriers were used to develop PARSC, which were completed twice by 15 participants. RESULTS: Children reported that the most significant facilitators were: PA as enjoyable, fun, and having friends to do it with. In contrast, the most significant PA demotivators were: the least concern of the parents. It was also observed a high incidence of excessive daytime sleepiness, sleep breathing disorders and sleep onset and maintenance disorder in these children. CONCLUSIONS: Participation in KIDS for seven days induced significant improvement in health parameters, but not in aerobic fitness in overweight children. Supported by CNPq, CAPES, and Sabin.

**Board #150 May 28 10:30 AM - 12:00 PM**

**A Better Approach To Improve Cardiovascular Function In Middle-aged, Inactive Human**

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(No relevant relationships reported)

PURPOSE: Investigate whether different aquatic aerobic exercise intensity modalities yield differential effects on vascular and endothelial function in middle-aged, inactive men.

METHODS: A randomized, controlled trial of middle-aged with inactive recipients 6 weeks of sprint interval training (SIT) or 6 weeks of moderate-intensity continuous training (MICT). Outcomes included arterial stiffness, endothelial function, lipid metabolism, body composition and aerobic capacity.

RESULTS: Twenty-six middle-aged with inactive human (mean age 41 years, 73% male) completed the study. The decrease (P<0.05) of AIXaq75 (augmentation index at HR of 75 beat/min) in SIT group was greater than MICT group. On the contrary, subendocardial viability ratio (SEVR) was elevated in the MICT (P<0.01) groups but not after SIT. Brachial artery BP decreased (P<0.01) by -8.1±1.5 mmHg after MICT exercise with no change in SIT. Both groups could significantly reduce fasting blood glucose (P<0.001), but only the decrease of total cholesterol was found in SIT (P<0.01). Brachial artery Flow-mediated vasodilation (FMD) was improved in both group, MICT only showed marginal significance(P=0.07) compared with SIT (P<0.05). SIT’s relative VO2max and O2 pulse increased (P<0.05) by 8.4% and 8.6%, respectively, with no change in MICT. Both groups of interventions could reduce BMI (P<0.05), but SIT was mainly by increasing lean body mass (P<0.01) and decreasing fat mass (P<0.001), while the lean body mass of MICT did not change. CONCLUSIONS: The results of the present study demonstrate that short-term low-volume aquatic SIT is a time-efficient strategy to induce changes in arterial vascular stiffness, endothelial function, lipid metabolism and body composition during exercise that are comparable to changes induced by water-based traditional high-volume MICT.
382 children (aged 6-11 years). RESULTS: For Study 1, four overarching themes were identified for the intrinsic facilitators - sense of competence/accomplishments, cognitive motivation, sensations and socialisation/social facilitation. Four main themes for the intrinsic barriers were lack of competence, fear of negative experiences, external constraints and lacking a sense of purpose. For Study 2, results from Rasch analysis demonstrated that PARSC possessed sound internal validity and consistency, and test-retest reliability. Self-perceived PA (p = 0.004) and avoidant coping (p = 0.01) were predictive of PA-specific rumination tendencies with 15% of variance explained.

CONCLUSION: The themes identified from the current study can inform future PA interventions and PE curriculum for UK children. Also, PARSC can be a useful tool to assess children’s PA-specific rumination tendencies and to advance our understanding of the role of rumination in PA behaviour.

1558 Board #152 May 28 10:30 AM - 12:00 PM An IT-based Health Behaviour Change Program To Increase Physical Activity: Evaluation Of Successes And Challenges
Gregory S. Kolt, FACSM1, Mitch J. Duncan2, Corneel Vandelaer3, Richard R. Rosenkranz4, FACSM4, Anthony J. Maeder4, Trevor N. Savage5, Rhys Tague6, Anetta van Italie1, W Kerry Mummery1, Cristina M. Caprionchon7, 1. Western Sydney University, Sydney, Australia. 2.University of Newcastle, Newcastle, Australia. 3.Central Queensland University, Rockhampton, Australia. 4.Kansas State University, Manhattan, KS. 5.Flinders University, Adelaide, Australia. 6.Griffith University, Gold Coast, Australia. 7.University of Alberta, Edmonton, AB, Canada. 8.University of Technology Sydney, Sydney, Australia.
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(No relevant relationships reported)

IT interventions initially used to promote health used static platforms, often only as a repository of health-based educational material. Such Web 1.0 technologies failed to promote longer-term user engagement, and rarely allowed the interaction required for more effective health promotion impact. With more interactive Web 2.0 technologies, greater engagement and retention is often evident, with the participation architecture encouraging interactive user-focused tools and interfaces that allow individuals to determine how information is generated, modified, and shared collaboratively.

PURPOSE: To identify successes and challenges of an RCT and real-world trial of an IT-based physical activity (PA) promotion intervention.

METHODS: The WALK 2.0 study used a Web 2.0-based platform to engage and retain participants in health behaviour change in order to increase PA. The program included 2 trials: (1) an RCT comparing a Web 2.0 intervention with a less interactive Web 1.0 intervention, and (2) a real-world randomised ecological trial (RET) comparing a Web 2.0 and Web 1.0 intervention.

RESULTS: The RCT showed that, compared to the Web 1.0 group, the Web 2.0 group improved PA in the short-term (p<0.02), but that the effect diminished over time, despite higher engagement of the Web 2.0 group. The RET showed that a Web 2.0 intervention was more effective in improving PA (p=0.005), and that while the Web 2.0 website was visited significantly more (p=0.002), both groups displayed high non-usage attrition and low intervention engagement. Whilst the RCT and RET showed that using a more interactive Web 2.0-based approach was more effective in improving PA, several challenges were identified in designing, implementing, and evaluating such interventions. These include IT-based intervention development in a research context, the ability to establish a self-sustaining online community, the rapid pace of change in web-based technology and implications for trial design, the selection of best outcome measures for ecological trials, and managing engagement, non-usage and study attrition in real-world trials.

CONCLUSIONS: Future research must look to broader research designs that allow for the ever changing IT-user landscape and behaviour, and greater reliance on development and testing in real-world settings.

1559 Board #153 May 28 10:30 AM - 12:00 PM Satisfaction And Participant Adherence In A Family Healthy Lifestyle Intervention For Children With ADHD
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(No relevant relationships reported)

Consistent evidence demonstrates that healthy lifestyle behaviors (i.e., sleep, nutrition, physical activity, and recreational screen time) are related to neurocognitive development and daily functioning of children with Attention-Deficit/Hyperactivity Disorder (ADHD). However, adopting and sustaining healthy home routines can be difficult for families. Interventions that effectively alter healthy home routines have potential to influence physical and mental health among children with ADHD.

PURPOSE: To develop and beta-test the Building Unstoppable families through Intergenerational Lifestyle Transformation (BUILT) program, and assess fidelity, adherence, and satisfaction via attendance rates and post-intervention semi-structured interviews.

METHODS: BUILT was offered at the University of Illinois at Chicago campus for six consecutive Saturdays. Two families from a Comprehensive ADHD Clinic, three children with ADHD, were enrolled and participated in sleep, physical activity, and nutrition activities during Family Fun Days and were also provided weekly home challenges related to cooking, physical activity, sleep, and screen time. Children earned tickets for completing home challenges, and these were redeemable for prizes. Attendance was taken at each session and semi-structured interviews were conducted with parents at post-intervention. Interviews were audio-recorded, transcribed, and coded using a thematic analysis approach.

RESULTS: Participating families each attended 5 out of the 6 total sessions (83.3%). Thematic analysis of interviews showed positive aspects of the program included: improving routine structure, showing children their ability, keeping kids active, pursuing goals, relating accelerometer measures to activity, and associating nutrition with being strong and sports performance.

CONCLUSION: Providing equipment, between session goals, and/or self-regulated physical activity between sessions were beneficial to participant adherence. These findings will inform refinement of the intervention in a second iteration.

1560 Board #154 May 28 10:30 AM - 12:00 PM Impact Of A Dog Walking Course On College Students’ Physical Activity
Melanie Sartore-Baldwin, Bhibha Das, FACSM, Kelsey Bryan. 1.Dallas County Community College District, Dallas, TX. 2.University of Illinois at Chicago, Chicago, IL. 3.East Carolina University, Greenville, NC. (Sponsor: Bhibha Das, FACSM)
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(No relevant relationships reported)

The increase in sedentary behaviors, poor dietary choices, and academic time demands during college or university is well documented. Physical activity-related service-learning curricula offers a way to circumvent the negative effects of these increases by providing students with physical activity, as well as the opportunity to learn responsibility, life skills, and values associated with larger social issues.

PURPOSE: The purpose of this study was to compare physical activity (PA) levels of students enrolled in a standard PA course and students enrolled in a service-learning PA course where shelter dogs were walked by students.

METHODS: College students enrolled in a standard fitness walking course (N = 46; 74% females) and a fitness dog walking course (N = 19; 68% females) wore NL-1000 accelerometers 2 times/week during their 50 minute class session. Data was collected across 30 and 32 course sessions, respectively. Means and stand deviations were calculated and an independent t-test was performed.

RESULTS: Students in the standard fitness walking course acquired approximately 1760.9 steps ± 640.9, walked an average of .83 miles ± .3 and acquired approximately 7.6 minutes ± 4.2 of moderate to vigorous PA. Students enrolled in the fitness dog walking course acquired approximately 4406.0 steps ± 317.9, walked an average of 2.1 miles ± 1.6 and acquired approximately 26.2 minutes ± 3.2 of moderate to vigorous PA. There was a significant difference in steps (t(60) = 20.8, p < .000, d = 5.2), distance (t(60) = 20.9, p < .000, d = 5.3), and minutes (t(60) = 19.7, p < .000, d = 5.0) of moderate to vigorous PA between courses.

CONCLUSION: Students enrolled in a service-learning PA course walked significantly more steps, distance, and minutes than students enrolled in a traditional PA course. Notably, students in the dog walking course reached approximately 40% of their recommended step requirements during class time. The local shelter dogs also benefitted from being physically active demonstrating the utility of community engagement when seeking innovative ways to promote PA among college students.
Utilizing a multi-faceted recruitment approach to enlist potential research volunteers can help overcome financial, staffing and time burdens. Recently, our Duke Health and Exercise Research Trials team created an online registry to connect with individuals interested in clinical research participation.

**Purpose** To examine our registry’s ability to engage a diverse pool of volunteers in the greater Durham, NC area.

**Methods** We developed our IRB-approved registry in REDCap, a secure tracking database. Our registry allows us to recruit volunteers without cold-calling in one of two ways. First, we can contact individuals who are current or former participants from one of our research studies. Second, we can recruit from the general public by directing individuals to our registry’s web link via flyers, social media posts, and word-of-mouth. By volunteers consenting to join the registry, we are able to collect basic contact, demographic, and health-related information. Then, we screen for initial qualification by study-specific inclusion/exclusion criteria. For those who appear to be qualified for a particular study, we contact them to provide study-specific overviews and conduct the full screening process.

**Results** Since our registry launch in July 2018 to October 2019, 357 volunteers consented to join the registry. Because personal health information entry is optional, our registry includes 289 subjects who provided their birth year (1938 to 2001), 306 reported their gender (62% females), and 312 reported their race/ethnicity (77% Caucasian, 14% Black or African American, 93% not Hispanic/Latino). We have self-reported height/weight on 306 subjects. In addition, 29% reported having a chronic disease (n=8 disease categories).

**Conclusion** To date, as the majority are non-Hispanic Caucasian females, there appears to be a racial and gender disparity amongst our registry sample. However, our registry includes a significant proportion of volunteers who self-reported a chronic disease diagnosis. Based on initial implementation, our registry has successfully linked volunteers with 5 ongoing studies, ranging from healthy to diseased populations. Importantly, our findings highlight the need to improve our recruitment strategies to appeal to a more diverse population of future registry volunteers.

**Compliance Rate Of Device-based Intensity Prescriptions And Individual Preference For The Methods**

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Compliance with physical activity (PA) prescription is a key component to maximizing desired health outcomes. For instance, health improvement may be diminished or may not even occur without prescription compliance. Due to the practical limitations of prescribing activity intensity in a free-living setting, a precise and practical prescription method is necessary, and using a wearable device could be the gateway to address the issue. Several methods using wearable technologies are already available for this purpose, but few have determined the extent of prescription compliance when using the devices. **Purpose:** To determine the compliance rate of the device-based intensity prescriptions and to identify individual preference for the methods. **Methods:** Forty healthy adults (age 18-65 years; 20 females) participated in this study. The participants were prescribed to perform an aerobic activity (walking and/or running) at moderate- and vigorous-intensity using both (1) heart rate (HR) and (2) real-time cadence (RC) and continued to perform the activity for 2 minutes. For HR and RC prescriptions, a chest heart rate monitor and a cadence sensor that were paired with participants were prescribed to perform an aerobic activity (walking and/or running) for seven consecutive days to estimate SBT. Parents answered a question on their perceptions (PP) of their child’s physical activity: “days that my child participate in active physical exercise for at least 20 to 30 minutes”. To answer the following categorical variables were used: “6-7 days each week,” “5-5 days each week,” and “1-2 days each week or less”. Parent’s intentions (PI) to modify PA and SBT were assessed by answering two questions; “During the next month, I intend to get 30 minutes of physical exercise at least 5 days per week,” and “During the next month, I intend to limit my child’s daily TV viewing to 2 hours per day (or less)” answers categorized into “I will probably will try”, “I probably will not try”, and “I already do this”. Frequency distributions and descriptive statistics were performed for ordinal and continuous variables respectively. Due to the non-normality of the data, Mann-Whitney U-tests were used to explore differences in SBT by gender. To calculate minutes in SBT an Actigraph vector two-regression model (VM/RM) that has been validated for use in children was used (Crouter, Horton, & Bassett, 2012).

**Results** Significant differences were found between boys and girls for total SBT (239.3±74.6 min/days vs. 296.2±128.4 min/days, respectively, p=0.024). Also, a significant difference in SBT by gender was observed. Boys whose parents expressed that they already limit their child’s TV time spend less SBT than girls (241.3±65.3 vs. 291.5±127.4, respectively, p=0.002). No significant differences in daily SBT was reported when considering PP. **Conclusions:** Boys whose parents already limit their TV time spent significant less time on SBT than girls. Findings support the inclusion of goals related to PA in PA and/or SBT interventions, particularly when minimizing sedentary time among children.

**Lifestyle-induced reduction in health risk is thought to be the result of improvement in both exercise and eating behaviour. Whether increasing exercise is associated with a corresponding improvement in eating behaviour is unclear.**

**Purpose:** To determine if the adoption of exercise consistent with consensus recommendations increases diet quality in previously sedentary adults. **Methods:** Participants were 129 obese (BMI: 33.0 ± 4.5 kg/m2), middle-aged (51.5 ± 7.9 years), sedentary adults (81 females [62.8%]) who were randomly assigned to one of the following 4 groups: i) no-exercise control (n=32), ii) low-amount, low-intensity exercise (LAL) (180 and 360 kcal/c) for women and men, respectively, at 50% of VO2peak (n=36), iii) high-amount, low-intensity exercise (HAL) (360 and 600 kcal/c) for women and men, respectively, at 50% of VO2peak (n=40), iv) high-amount, high-intensity exercise (HAIH) (360 and 600 kcal/c) for women and men, respectively, at 75% of VO2peak (n=21). All exercise sessions were supervised. Self-reported daily diet records were assessed using an automated web-based program. The Canadian Healthy Eating Index (C-HEI) was averaged from 3-day diet records obtained at baseline, 8, 16 and 24 weeks. C-HEI is calculated using 8 adequacy (total vegetables and fruit, whole fruit, dark green and orange vegetables, total grain products, whole grains, milk and alternatives, meat and alternatives) and 3 moderation (saturated fats, sodium, other food) components. The components were summed to produce a single score between 0 and 100, with higher scores reflecting greater adherence to 2007 Canada’s Food Guide, and hence better diet quality. **Results:** Mean ± (standard deviation) C-HEI in all participants at baseline was 58.4 ± 13.4, with no difference between groups (P=0.40). There was no change in C-HEI at 24 weeks vs baseline in any of the groups assigned to increased amounts of exercise or
The lack of time for physical activity is a position that prevails in sedentary people. The low level of physical activity, coupled with factors such as poor diet has been related to the development of metabolic syndrome. HIIT is a modality that increases the level of physical activity with positive effects on cardiorespiratory variables, however, there is insufficient evidence of the effect on body composition. PURPOSE: to analyze the effect of a HIIT on body composition in sedentary adults. METHODS: twelve sedentary adults (50% women) 31.5 ± 5.4 years old, participated in 16 sessions (three per week) treadmill HIIT. Height (168.3 ± 8.6cm), body weight (BW) (80.8 ± 18.0kg), muscle mass (MM) (301.1 ± 69.4kg), body fat percentage (BF%) (33.2 ± 4.3%) and visceral fat area (VFA) (126.3 ± 39.5mm²) were measured. An initial measurement (M1), after session eight (M2) and (M3) were made. HIIT consisted of three minutes warmup at 40% of your maximal aerobic speed (MAS), five one-minute intervals (80% MAS) with one-minute breaks (50% MAS), followed by a five-minute recovery (40% MAS). MAS was estimated with the 30-15 Intermitent Fitness Test. RESULTS: a mixed two-way ANOVA without significant variation between sex, and measurements (p = .942) was applied. In the same way, with a one-way ANOVA of related samples, no differences were found in BW (%Δ = -0.4; p = .237; n = .123), MM (%Δ = 1.3; p = .142; n = 162) BF% (%Δ = 1.2; p = .444; n = .071) among the three measurements. Differences in VFA (126.3 ± 39.5cm² and 117.0 ± 40.5cm², p = .002; n = .472) were found between M1 and M2, respectively. CONCLUSIONS: these results indicate that 16 sessions of high intensity interval training, lasting 17 minutes per session, decrease the visceral fat of sedentary people.

Toddler children (18 months-2.8 years) spend a significant portion of their day at childcare settings, where they spend most of their time engaged in sedentary activity. Toddler classroom teachers have a considerable influence on toddlers’ physical activity (PA) levels. Due to the toddler classroom environment, teachers may encounter unique age and ability related barriers to the implementation of PA programs. PURPOSE: The purpose of this qualitative study was to determine the perceived barriers that toddler classroom teachers may face in implementing PA programs to toddlers. METHODS: Toddler classroom teachers from 3 environmentally matched childcare centers from the Springfield MA area participated in this qualitative study. Focus group meetings (n=3) were conducted separately at each center. At each meeting, a semi-structured focus group format and questionnaire were used to guide the sessions. All focus groups were audio-recorded and later transcribed by a primary, secondary, and tertiary trained researchers. Researchers used open coding to identify themes. Representative quotes were selected for each theme to demonstrate saturation of ideas. RESULTS: A total of 15 teachers participated in this study (age = 38.4 ± 12.5; BMI (self-reported) = 26.1 ± 4.3 kg/m²). Teachers had an average of 9.5 ± 8.7 years of experience as toddler classroom teachers (ranging between 1 to 28 years). Teachers perceived barriers to PA were categorized into 3 main themes. The three main themes were 1) essential childcare needs (e.g., regular diaper changes of the toddlers, child supervision), 2) wide variation in cognitive and motor skill abilities of toddlers (e.g., differences in children that just learned to walk versus those that have been walking for an extended period, short attention span) and 3) limited resources and physical space (e.g., limited activity options, small classroom design to hold 9 toddlers). CONCLUSION: This qualitative study provides preliminary evidence that classroom teachers face unique perceived barriers in implementing PA to toddlers. Future research should examine how these perceived barriers can be incorporated into the design and implementation of PA programs designed for toddlers within the childcare center.
Academy of Sports Medicine

Cognitively normal older carriers of the Apolipoprotein E-ɛ4 (ApoE-4) allele have a greater rate of memory decline over time than do noncarriers of this allele. However, the potential neurophysiological mechanisms and the role of physical fitness have not been examined in the elderly with a family history of Alzheimer’s disease (ADFH) and ApoE-4 genotype. PURPOSE: To investigate the brain event-related potential (ERP) performance and the interactive effects on physical fitness in the ADFH individuals with the ApoE-4 heterozygotes. METHODS: Forty-four older adults with ADFH were recruited and divided into an ApoE-4 group (n=22; 71.68±5.84 yrs) and a non-ApoE-4 group (n=22; 72.09±7.50 yrs) according to the ApoE genotype. They performed a senior functional physical fitness (SFPF) test and completed a visuospatial working memory task with low and high cognitive load while simultaneously recording electroencephalographic signals. RESULTS: Although there were no significant between-group differences with regard to reaction time and ERP P3 latency across conditions, the ApoE-4 relative to non-ApoE-4 group showed significantly lower accuracy rates (ARs) (72.15±11.39% vs. 78.72±16.60%, p=0.01) and smaller ERP P3 amplitudes (4.02±1.50mV vs. 6.41±2.70mV, p<0.001) only in the high working-memory load condition. Cardiorespiratory fitness was significantly correlated with the potential neurophysiological mechanism and the role of physical fitness have not been examined in the elderly with a family history of Alzheimer’s disease in ADFH individuals with the ApoE-4 genotype. Supported by the Minister of Science and Technology in Taiwan under grant numbers MOST 105-2410-H-006-050-MY3.

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(No relevant relationships reported)

1571
Board #165
May 28 10:30 AM - 12:00 PM
Feasibility Of Self-paced Intermittent Hypoxic Exercise As An Exercise Intervention In Obese Populations
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Background. We have previously shown for a healthy population, that in hypoxic conditions equivalent to 3500 m, self-paced intermittent best effort walking results in ~32 % greater oxygen cost (VO₂) compared to matched work steady-state walking. By combining a self-paced intermittent protocol with recumbent cycling, suggested to be a more comfortable exercise mode for obese populations, some perceived barriers to exercise (e.g. lack of time, discomfort) could be mitigated against, whilst increasing the exercise stimulus. Purpose. To determine if self-paced intermittent recumbent cycling performed in normobaric hypoxia increases oxygen cost and energy expenditure (EE) compared to matched work and duration steady-state exercise, and is a tolerable exercise mode for obese populations. Method. Fourteen tier 2 obese participants (4 men; 39 ± 13 yr; 165.1 ± 8.1 cm; 95.2 ± 16.1 kg; BMI: 34.9 ± 5.0 kg/m²) completed 3 exercise trials separated by 7 days. Trials were performed on a recumbent cycle ergometer and in a normobaric hypoxic chamber (F0, 0.135). After determination of the hypoxic ventilatory response, participants performed 90 % of their personal best work rate (washed-out, Wmax), participants completed one 30 minute steady state (SS) cycle at 90 % VT, and one self-paced intermittent (INT) cycle. During INT, participants performed periods of maximal work at Wmax and could stop and rest as many times as necessary before completing the distance covered during SS. Breath-by-breath data were collected from a metabolic cart, and heart rate and arterial oxygen saturation were monitored throughout. Time to complete SS and INT were compared by Wilcoxon signed-rank test, and physiological data were compared by paired t-test. Results. Time to complete the exercise bouts was similar (SS: 1200 ± 60 s vs INT: 1421 ± 441 s, p = 0.14). INT elicited a 30% higher VO₂, (SS: 1799.46 ± 320.19 L; INT: 2553.77 ± 1097.65 L) and EE than SS (0.89 ± 0.38 MJ vs. 1218.81 ± 91.47 kcal vs. 0.62 ± 0.11 MJ (148.29 ± 26.68 kcal), p = 0.03). Conclusion. The self-paced INT protocol was completed by all obese participants without incident or complaint, and induced a 30% increase in EE compared to a comparable duration of work performed at 90% VT. Further work is required to compare long-term adherence and weight loss/metabolic responses to this mode of exercise completed in both normoxic and hypoxic conditions.

1572
Board #166
May 28 10:30 AM - 12:00 PM
Evaluation Of The Painless Stretching Program On Range Of Motion And Pain
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(No relevant relationships reported)

PURPOSE: About 80% of Americans develop a lower back problem in their lifetime. This varies from a relatively mild, but persistent back ache to herniated, or ruptured discs between vertebrae of the lower back. This can be alleviated by restoring mobility, particularly in the lower back area. The Painless Flexibility™ system is an effective treatment for the typical lower back pain and other related symptoms such as sciatica. The Painless Flexibility™ system utilizes exercises and techniques that are focused on the fascia rather than the muscles, bones or joints. The purpose was to determine if the Painless Flexibility™ system group program increases the range of mobility and decreases reported pain level. The study duration was six months to collect data for evaluation of an impact study.METHODS: Nine participants underwent a series of questionnaires & physical evaluation of ability to stretch and level of back pain felt. Flexibility and pain were measured twice (pre-intervention and post-intervention) and a paired t-test was used to test for change and Cohen’s reported as an effect size. RESULTS: There was a statistically significant improvement in scapular retraction (d=1.25, p<0.001) and reach (d=1.26, p<0.005), spine rotation (d=1.39, p<0.003), and modified Thompson test (d=1.58, p<0.001). Reported pain decreased (d=0.74, p<0.015). CONCLUSIONS: The Painless Flexibility is an effective program to increase flexiblity and reduce lower back pain.

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(No relevant relationships reported)
### 1574 Board #168 May 28 10:30 AM - 12:00 PM
Randomized Face-to-face Vs. Remote Exercise Interventions in Overweight And Obese Subjects
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**PURPOSE:** To compare the effect of face-to-face exercise intervention and wearable activity tracker-based remote intervention on anthropometry and metabolism in overweight and obese subjects. **METHODS:** All 50 overweight and obese subjects were selected (age: [43.8±19.75] yrs, body mass index: [27.29±2.61] kg/cm², 30 males). CRF was measured with a graded exercise test by cycle ergometer. Body composition was measured by bioelectrical impedance analysis (BIA). Other indicators include anthropometric and biochemical characteristics (FBG, TC, TG, LDL-C, HDL-C). Exercise intervention program: 3 times/week, 60 min per session at 45%-65%VO₂max, 12 weeks. Two supervision modes: a traditional face-to-face group intervention, and an wearable activity tracker-based remote intervention with social networking platform(WeChat). **RESULTS:** After 12 weeks exercise training, BMI, fat%, neck circumference, waist circumference, FBG and TG were significantly improved in both face-to-face and remote groups. However, LDL-C and HDL-C changed insignificantly in the face-to-face group intervention. **CONCLUSIONS:** 12 weeks of face-to-face and wearable activity tracker-based remote intervention can improve body composition and glycolipid metabolism of overweight and obese subjects, but face-to-face intervention may have more significant effect on improving the circumference, LDL-C and TC. Supported by Social Science Foundation of Jiangsu Province (No. 20187872). Science and Technology Support Plan (Social Development of Changzhou)(CE20195046).

### 1575 Board #169 May 28 10:30 AM - 12:00 PM
Act-Belong-Commit Framework For A Mentally Healthy College Campus: Campus Recreation And Exercise Science Partnership
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A growing concern for universities is the state of mental health with a clear need for positive mental health campaigns and strategies to shift the culture surrounding mental well-being. Our campus has adopted a holistic framework, Act-Belong-Commit, to improve mental health through positive intentional engagement in activities. **PURPOSE:** The purpose of this study was to examine the mental health climate and well-being of current students on a primarily residential collegiate campus before the implementation of Act-Belong-Commit campaign. **METHODS:** 176 students (21±2.2 years; 162 female, 19 male, 2 gender non-binary) participated in the campus-wide survey. There was equal representation of the students across years in school with little ethnic/racial diversity: (Caucasian=93%; African American=2%; Hispanic/Latinx=3%; Asian=2%) and some diversity in sexual orientation (heterosexual=87%; homosexual=2%; bisexual=8%, or other=2%). Measures included: Satisfaction With Life (SWL), Multidimensional Scale of Perceived Social Support (MSPSS), Self-Stigma of Seeking Help Scale (SSSHS), Depression Anxiety Stress Scale (DASS), Resilience and the Meaning of Life Questionnaire (MLQ). A small subset (n=55) completed an ABC self-assessment. **RESULTS:** Social Support was significantly correlated (r=0.05) with many positive mental health outcomes: SWL (r=0.25); Resilience (r=0.41); Meaning of Life (r=0.34); Depression Subscale (r=0.36); Anxiety Subscale (r=0.34); Stress (r=0.35). High perceived social support and positive mental health were also seen in people high on ACT (Social Support r=0.31; Resilience r=0.37, Depression r=0.32, anxiety r=0.26, and stress r=0.36) and BE longing (SWL r=0.33, Resilience r=0.39, Depression r=0.29, stress r=0.28). **CONCLUSION:** Social support and a sense of belonging was integrally tied to measures of positive mental health and improved satisfaction with life measures. Belonging comes from being engaged in an active life with people and activities that bring meaning and purpose. Campus recreation and exercise science programs will lead the implementation of the ABC campaign, promoting physical activity, mindfulness/mediation, and play as activities to engage in a various levels as part of this positive mental health campaign.

### 1577 Board #171 May 28 10:30 AM - 12:00 PM
Using Fruits And Vegetables To Motivate Adherence To Walk With Ease, An Arthritis Focused Walking Program, In Low-income African American Women
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**PURPOSE:** To explore whether fruits and vegetables prescriptions were associated with increasing physical activity engagement in low income African American populations. Arthritis can be an obstacle to physical activity, and inactivity is often associated with chronic conditions such as cardiovascular disease, diabetes, and obesity. African American women are less likely to engage in recommended amounts of physical activity, and experience higher levels of chronic disease than other ethnicities.

**METHODS:** Individuals from low income areas, and who are African American, are less likely to engage in physical activity, and often lack access to fresh fruits & vegetables (F&V). To motivate adherence to Walk with Ease (WWE), an Arthritis Foundation evidence-based walking program, we paired weekly walks with a F&V prescription called "veggie scripts". A total of 277 adults (mean age 64 years, 86% female, and 75% African American) participated in WWE. Currently, the program is implemented in 17 sites in the Dallas area, 7 sites have completed WWE (N = 132) and 10 sites are currently active. Participants from two sites received $15 veggie script vouchers redeemable at community farm stands. WWE consisted of a weekly walking group and self-directed learning module for 6 weeks. A community health worker (CHW) leads the weekly walking groups at each site. Participants complete a pre- and post-survey that collects demographics, comorbid conditions, and walking habits. Weekly minutes of walking are self-reported each week.

**RESULTS:** On average, participants reported a total of 112.7 minutes of walking per week. The majority of the participants (54%) attended three or more weekly group walks and 22.3% attended all six walks. Participants who received veggie prescriptions (n = 25) were slightly more active than those who did not (122.2 minutes vs. 110.8 minutes per week). Additionally, veggie script recipients were more likely to attend three or more weekly walking sessions than their counterparts (64% vs. 52%).

**CONCLUSION:** The data offers a novel approach to community health: that possibly offering fruits and vegetables incentives may increase physical activity.
Walking is a popular choice of exercise in many populations. It is especially utilized in older populations and those recovering from cardiovascular injuries. The ACSM equations are a resource for clinicians to use as a way to estimate intensity levels using VO2 or MET as the outcome measure. The accuracy of these calculations are important to ensure those individuals are working at the prescribed intensity level. The equations allow for a more rapid and cost effective way to measure intensity level than expensive and cumbersome equipment. Purpose: The purpose of this study was to compare the predicted and measured VO2 of a population of untrained college age individuals. Methods: 21 healthy untrained college age individuals with an average BMI of 29.1 kg/m², completed 3 x 3 minute treadmill walking tasks. These consisted of walking at 1.5 m/s at both a level and a 5% incline and then an incline of 5% at an iso efficient pace compared to the level 1.5 m/s. Iso efficient pace was calculated using the ACSM equations and individual correction factors. Results: During level walking, the measured VO2 (14.4±1.1 mL/kg/min) was 15.4% greater (p<0.001) than predicted (12.5 mL/kg/min) from the ACSM walking equation. All 21 of the participants measured values were greater than predicted by the equation. During the 5% incline at iso efficient pace, participants walked at an average velocity of 1.1±0.025 m/s, and the measured VO2 (15.3±1.2 mL/kg/min) was 7% different (p<0.001) than predicted (16.1±0.3 mL/kg/min) from the ACSM equation. Of the 21 participants, 16 of them had measured VO2 values that were smaller than predicted. During the 5% incline at the pace of 1.5 m/s, measured VO2 (19.9±1.2 mL/kg/min) was 5.7% different (p<0.01) than predicted (20.6 mL/kg/min). Seventeen of the participants had measured values that were less than the predicted value. Conclusion: For a group of untrained college age individuals with BMI on the edge of the overweight/obese range, the ACSM equations fail to capture the measured values of oxygen consumption. Clinicians and researchers who are using this equation as a prescription for exercise should be cautious when using these equations to calculate exercise intensity.

Differences Between Predicted And Measured VO2 During Level And Uphill Walking

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Purposes: The purpose of this study was to compare the predicted and measured VO2 of a population of untrained college age individuals. Methods: 21 healthy untrained college age individuals with an average BMI of 29.1 kg/m², completed 3 x 3 minute treadmill walking tasks. These consisted of walking at 1.5 m/s at both a level and a 5% incline and then an incline of 5% at an iso efficient pace compared to the level 1.5 m/s. Iso efficient pace was calculated using the ACSM equations and individual correction factors. Results: During level walking, the measured VO2 (14.4±1.1 mL/kg/min) was 15.4% greater (p<0.001) than predicted (12.5 mL/kg/min) from the ACSM walking equation. All 21 of the participants measured values were greater than predicted by the equation. During the 5% incline at iso efficient pace, participants walked at an average velocity of 1.1±0.025 m/s, and the measured VO2 (15.3±1.2 mL/kg/min) was 7% different (p<0.001) than predicted (16.1±0.3 mL/kg/min) from the ACSM equation. Of the 21 participants, 16 of them had measured VO2 values that were smaller than predicted. During the 5% incline at the pace of 1.5 m/s, measured VO2 (19.9±1.2 mL/kg/min) was 5.7% different (p<0.01) than predicted (20.6 mL/kg/min). Seventeen of the participants had measured values that were less than the predicted value. Conclusion: For a group of untrained college age individuals with BMI on the edge of the overweight/obese range, the ACSM equations fail to capture the measured values of oxygen consumption. Clinicians and researchers who are using this equation as a prescription for exercise should be cautious when using these equations to calculate exercise intensity.

Regular physical activity (PA) can reduce the incidence of many chronic diseases. Rural-dwelling Canadians are at a higher risk of developing chronic diseases than their urban counterparts – potentially due to higher rates of inactivity. There is a scarcity of literature describing PA in these high-risk groups. Smartphones and mHealth apps such as Carrot Rewards (reward-based app downloaded by 1.3+ million Canadians) provide a unique opportunity to measure free-living PA amongst Canadians living with chronic disease. PURPOSE: To determine (1) daily step count averages (data collected by Carrot Rewards) for participants who self-report at least one chronic disease vs. those self-reporting none, and (2) whether these averages vary with living environment. METHODS: In this retrospective cohort study, 12,327 Ontarians (age: M=34.72, SD=13.63, gender: female 62.9%, male 35.3%, other 1.8%) completed a ‘chronic disease’ Carrot Rewards survey adapted from the Canadian Community Health Survey. In this study, participants could self-report chronic disease diagnoses including: diabetes, cardiovascular disease, chronic obstructive pulmonary disease, cancer and mood/anxiety disorders. Smartphone accelerometers, (HealthKit (iOS), Google Fit (Android) or FitBit) collected step count data which was retrieved by the Carrot Rewards app. Self-reported demographic information indicated participant rural/urban status. RESULTS: 37.7% of survey respondents reported being diagnosed with at least one chronic disease and 33% identified as rural-dwelling. Participants with at least one chronic disease had a significantly lower (p<.001) daily step count average (M=5136.29, SD=3732.83) than those with no diagnosis (M=5724.24, SD=3960.47). Rural-dwelling persons (M=5422.40, SD=3943.49) had lower mean daily step count averages than their urban counterparts (M=5542.61, SD=3588.32), though not statistically significant (p=.123). CONCLUSIONS: This study provides an objective lens into the PA behaviours of understudied Canadian populations. Individuals living with chronic disease had significantly lower daily step counts when compared to their ‘healthy’ counterparts. A fundamental understanding of PA behaviours for at-risk Canadians may help inform the design of targeted PA interventions in the future.

The Independent And Joint Associations Of Fitness And Fatness With Incident Prediabetes In Women: A Cohort Study

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PURPOSE: The purpose of this study was to examine the associations of cardiorespiratory fitness (CRF), general adiposity (i.e., body mass index; BMI) and central adiposity (i.e., waist-to-hip ratio, WHR) with risks of incident prediabetes in women. METHODS: A prospective cohort of 1534 women aged 20-79 years old who had an annual health check-up aged baseline between 1979 and 2005 were observed in the Cooper Clinic, TX, USA. Cox proportional hazards models were established to assess the association between fitness and fatness and incident prediabetes defined as fasting glucose 100-125 mg/dL. Independent and joint analyses were conducted for CRF (fit - upper 75% vs. unfit - lower 25%), BMI (<25 kg/m² vs. ≥25 kg/m²), and WHR (<0.50 vs. ≥0.50), while adjusting for confounding variables. RESULTS: Overall, 18.1% of the women developed prediabetes during an average follow-up of 5.06 years. CRF, BMI, and WHR were significantly associated with incident prediabetes in age-adjusted Cox proportional hazard models. When explanatory and confounding variables were considered simultaneously in fully adjusted multivariable models, only those who were unfit remained at risk (HR = 1.39, 95% CI = 1.02, 1.90). Joint analysis revealed a

Metabolic syndrome (MetS) is a clustering of cardiometabolic factors increasing risk of morbidity and mortality. Traditionally, MetS is assessed dichotomously; however, new techniques allow for consideration of the severity of MetS using gender- and race-specific, continuous z-scores. PURPOSE: This study aimed to identify how self-reported daily minutes of physical activity (PA) by intensity (sedentary, moderate, and vigorous) predicted degree of severity of MetS among MetS positive individuals (12 to 80-years-old). METHODS: Using 2015-2016 National Health and Nutritional Examination Surveys data, individuals with no missing cardiometabolic data were classified as MetS positive using ATP III criteria (obesity, dyslipidemia, dysglycemia, and hypertension). Subsequently, MetS z-scores were derived for each individual (n=708). Due to limited variability of the MetS z-score, tertiles (Lower: -1.95 to 0.76, Middle: 0.77 to 1.38, and Upper: 1.39 to 7.32) were created to increase predictive ability of PA. Differences in daily minutes of PA between MetS tertiles were determined with an ANOVA and linear regression was utilized to predict the severity of MetS with PA. RESULTS: The middle tertile (n=234) reported the most sedentary time (381.4±212.18 minutes; p=0.287) and vigorous PA (11.04±35.03 minutes; p=0.784). The lower tertile (n=237) reported the largest amounts of moderate PA (26.71±52.69 minutes; p=0.128). However, no significant differences between tertiles were observed. The linear regression revealed PA intensity was not a significant predictor of MetS z-score tertile. CONCLUSIONS: Overall, PA, as reported in total daily minutes, did not differ between MetS z-score tertiles nor did MetS severity levels of MetS. This may be due to PA being self-reported and/or the exclusion of non-MetS individuals. Future research may be able to elucidate a relation using a more sensitive, objective measure of PA to better understand its relation with MetS.
higher risk for those in the unfit/BMI < 25 (HR = 1.54 CI =1.07, 2.20) and unfit/BMI ≥ 25kg/m2) and waist circumference (WC; Male: WC ≥ 90cm, Female: WC ≥ 85cm). A total of 591 individuals with prediabetes and type 2 diabetes was diagnosed by the criteria 1) diagnosed as type 2 diabetes, 2) using diabetes medication, 3) abnormal fasting glucose level (fasting glucose ≥ 100mg/dL), 3 strong grip strength models were employed, which were 1) normal grip strength (GS), 2) divided by weight (GSW), and 3) divided by BMI (GSB), respectively, to examine the effect of different relative grip strengths on prediabetes. Multilayer perceptron (MLP) and traditional logistic regression (LR) algorithms employing RSNS package in R, were applied to classify the prediabetes based on hand-grip adjusted by age, income, education, occupation, marital status, binge drinking, smoking, daily calories intake, sedentary time, strengthening exercise adherence, aerobic exercise adherence variables, separately by gender. To evaluate the accuracy (ACC), sensitivity (SEN), and specificity (SPE) of the confusion matrix of ML, the participants were separated into a train for deriving equations and a test group for holdout cross-validation.

RESULTS: To classify prediabetes in obese males, GSB adjusted by co-variates was revealed the highest ACC for both ML classifiers (train group: MLP: 71.5%, LR=67.6%; test group: MLP: 63.9%, LR=66.1%), and GSB showed the lowest ACC (MLP: train=67.6%, test=61.6%). Moreover, GSW and GSB of MLP showed higher SEN than SPE in test group (SEN, SPE: GSW=76.8%, 44.1%; GSB=74.4%, 52.5%, respectively). In obese females, however, both ML classifiers did not show any consistent accuracy levels.

CONCLUSIONS: It was revealed that GSB showed a strong relationship with prediabetes in obese male adults in Korea. Moreover, MLP and LR classifiers present fair accuracy in the cross-validation to classify prediabetes predicted by GSB.
relationship between the length of residence and obesity based on Baron and Kenny's (1986) approach. All statistical analyses were conducted using SURVEY procedures in SAS version 9.4. A significance level of p < .05 was set for all analyses assuming the complex survey design of the NHANES.

RESULTS: Participants with living in the US for more than 10 years were significantly more likely to be at high risk of obesity (c; \(\beta = -0.7, p < .001\)) and to spend time participating in PA (a; \(\beta = -0.6, p < .001\)), and less likely to spend time participating in PA (a; \(\beta = -0.5, p < .05\)), compared to those who living in the US for less than 10 years. Also, the relationship between PA and obesity was significant (c; \(\beta = -0.7, p < .001\)). Length of residence indirectly affected obesity (ab; \(\beta = 0.47, p < .05\)), further supporting partial mediation effect of PA (c; \(\beta = 2.54, p < .001\)).

CONCLUSIONS: These findings may encourage long-term immigrants to participate in PA for lowering the risk of obesity.

1587 Board #181 May 28 10:30 AM - 12:00 PM
Physical Activity In The Early Postpartum Period In Primiparous Women
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Purpose: Little is known about physical activity (PA) during the early (≤ 6 weeks) postpartum period. Therefore, the purpose of this study was: 1) to describe the amount and types of PA done during early postpartum, and 2) to compare minutes/day of moderate-vigorous PA (MVPA) at 12-25 days (T1) and 33-46 days (T2) postpartum.

Methods: Participants were primiparous women that delivered vaginally. The amount and types of PA women did was measured using wrist-accelerometry (≥ 4 days) and at T1 and T2. PA data reflect total minutes and 5- and 10-minute bouts. The Wilcoxon Signed Rank test was used to compare daily minutes of MVPA in women at T1 and T2. PA data reflect total minutes and 5- and 10-minute bouts. The Wilcoxon Signed Rank test was used to compare daily minutes of MVPA in women at T1 and T2. PA data reflect total minutes and 5- and 10-minute bouts. The Wilcoxon Signed Rank test was used to compare daily minutes of MVPA in women at T1 and T2. PA data reflect total minutes and 5- and 10-minute bouts. The Wilcoxon Signed Rank test was used to compare daily minutes of MVPA in women at T1 and T2.

RESULTS: Of 577 of 645 eligible women after delivery (age: 28.3 (SD: 5.1)) with valid accelerometry at both T1 and T2 provided comparison data. Median (IQR) daily total minutes for light, moderate, vigorous and MVPA at T1 were 295.6 (247.1-348.2), 57.7 (34-79.6), 0.6 (0.3-1.3), and 64.4 (45.7-83.7), respectively, and at T2, were 327.3 (287.6-368.7), 63.1 (45.4-81.9), 0.6 (0.3-1.3), and 64.4 (45.7-83.7), respectively. Median (IQR) minutes/day of MVPA in 5- and 10-minute bouts were 1.6 (0.9-2.5) vs 1.6 (0.9-2.5) minutes; 5-minute bouts: median (IQR) = 64.7 (47-84.6) vs 56.5 (41-75) minutes; 10-minute bouts: median (IQR) = 26.9 (18-38) vs 26.3 (14-40) minutes.

Conclusion: Early postpartum women are active based upon total minutes of MVPA, but sustaining higher levels of MVPA requires significant increases in MVPA from T1 to T2 were small and few postpartum women reported doing activities with cardiovascular disease (CVD) risk, subjects with well controlled LDL-C are still at considerable residual risk for CVD. Alternative measures such as particle concentration of LDL (LDL-P) may be clinically useful for fully characterizing LDL discordant levels of LDL-C versus LDL-P concentration in the HERITAGE Family Study.

METHODS: Standard lip panel and lipoprotein subclass profiles via nuclear magnetic resonance (NMR) spectroscopy were measured among 715 participants (34% Black, 55% Female). LDL-C and LDL-P values ≥ the median value were considered high and values ≤ median were considered low. Four exclusive LDL-C/LDL-P groups were identified for LDL from these base categories: 1) low/low (< median for both LDL-C and LDL-P), 2) low/high (< median for LDL-C, ≥ median for LDL-P), 3) high, low, and 4) high/high. Cross-sectional associations between baseline LDL discordance group and CVD risk factors were assessed via multivariable linear regression. All models were adjusted for age, race, and sex.

RESULTS: Sixty four (9.0%) participants were discordant with high LDL-C/ low LDL-P, while 61 (8.5%) were discordant with low LDL-C/high LDL-P. Both concordant groups (low/LDL-C/low-LDL-P, high/LDL-C/high-LDL-P) were composed of 295 participants each (41.3%). Main effects (p<0.05) of LDL discordant group were found for the following outcomes: triglycerides, HDL-C, HDL-P size and small and large HDL-P concentration, percent body fat, maximal oxygen uptake, fasting insulin, lipoprotein lipase activity, testosterone, GlycA, and C-reactive protein. In general, groups with lower LDL-P had more favorable CVD risk factor profiles relative to high LDL-P groups. CONCLUSIONS: In low, low LDL-P levels were associated with favorable CVD risk factor profiles regardless of LDL-C levels.

1589 Board #183 May 28 10:30 AM - 12:00 PM
Changes In Health Behaviors And Anxiety Prevalence Among College Students: 2012-2017
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(No relevant relationships reported)

College presents unique challenges, including independent development and control of health behaviors (physical activity, dietary habits, substance use, sleep patterns, etc.). PURPOSE: To evaluate relationships among these variables and changes in these variables over the course of two repeated administrations of the National College Health Association (NCHA) survey at a mid-sized Southern university.

METHODS: Data were combined from two administration of the NCHA campus survey (2012 (n = 795) and 2017 (n = 404)). No individual student identifiers were collected. It is unlikely that any student participated in both years given the five year time span between administrations. Moderate (Mod), vigorous (Vig), and strength training exercise (ST); fruit and vegetable (F&V) consumption; and anxiety within the past year were self-reported. From the exercise questions, students were classified as meeting the PA guidelines or not. Descriptive statistics, Chi-Square analyses and Odds Ratios with 95% Confidence Intervals (CI) were calculated for changes from 2012 to 2017.

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RESULTS: Students were at lesser odds of reporting 3+ servings of F&V per day in 2017 (20.1%) than in 2012 (23.1%) (OR: 0.53, CI: 0.41-0.72). Days of Mod PA (past 7 days, 30 minutes) did not change significantly, but there were decreases in Vig PA (past 7 days, 20 minutes) and ST. Students were at lesser odds of reporting 3+ days of Vig PA in 2017 (23.8%) than in 2012 (35.1%) (OR: 0.58, CI: 0.44 - 0.76). Students were at lesser odds of reporting 3+ days of ST in 2017 (20.8%) than in 2012 (29.8%) (OR: 0.62, CI: 0.47-0.82). Students were also at lesser odds of meeting the PA guidelines as a whole in 2017 (39.8%) than in 2012 (28.9%) (OR: 0.82, CI: 0.64-1.08). Students were at greater odds to report “overwhelming anxiety” in the last month in 2017 (50.4%) than in 2012 (39.4%) (OR: 0.56, CI: 1.2-2.0). In both surveys, there were significantly lower odds of Anxiety in the last month for students who met the PA recommendations compared to those who did not. This protective effect was stronger in 2017 (OR: 0.50, CI: 0.33 - 0.74) than in 2012 (OR: 0.71, CI: 0.53 - 0.96).

CONCLUSIONS: Decreases in PA and increases in Anxiety are concerning. Future work is needed to determine whether there is a causal relationship between these variables.

1590 Board #184 May 28 10:30 AM - 12:00 PM Associations Of Objectively-measured Floor Climbing With Type 2 Diabetes

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No relevant relationships reported

Purpose: Self-reported floor climbing (FC) significantly predicts major health outcomes, including mortality. There are no data on objectively-measured FC, independent of total physical activity, with health outcomes in older adults. We examined the associations between FC and the prevalence of type 2 diabetes mellitus (DM) in older adults. Methods: This cross-sectional study included 488 older adults (56% women; mean age 72 years) who were without heart attack, stroke, or cancer in the past 5 years. FC was assessed with an accelerometer (FitBit Charge 2) worn on the non-dominant wrist for seven days. Average daily steps were assessed using a pedometer (Omron HJ-321). Participants were categorized into tertiles of FC or steps. For a joint analysis, participants were dichotomized into low (lower FC tertile) or high FC tertile (upper FC tertile) or high climbers (middle-upper FC tertile) and inactive (lower step tertile) or active (middle-upper step tertiles). DM was defined by self-report, fasting glucose ≥ 126 mg/dL, or taking insulin. Logistic regression was used to calculate the odds ratios (ORs) and 95% confidence intervals (CIs) of DM while adjusting for sex, age, smoking, heavy alcohol consumption, percent body fat, hypertension, hypercholesterolemia, and FC or steps in respective analyses.

Results: Of the 488 adults, there were 47 (10%) DM cases. Compared with the lower FC tertile, the ORs (95% CIs) of having DM were 0.42 (0.18-0.94) and 0.31 (0.11-0.87) for the middle and upper FC tertiles, respectively, after adjusting for the full model including steps/day. Compared with the lower step tertile, the ORs (95% CIs) of having DM were 0.45 (0.20-0.99) and 0.47 (0.19-1.20) for the middle and upper step tertiles, respectively, after adjusting for the full model including FC. In a joint analysis, compared with the inactive and low climbers, the ORs (95% CIs) were 0.38 (0.15-0.97), 0.33 (0.11-0.94), and 0.16 (0.07-0.38) for the active and low climbers, inactive and high climbers, and active and high climbers, respectively.

Conclusions: Objectively-measured FC was associated with reduced odds of DM, regardless of daily physical activity. However, the joint analysis indicated the lowest odds of DM were among those who climbed ≥4 floors per day (high climbers) and walked ≥4,000 steps/day (active).
step-based recommendation greatly varied between the 34 examined optical cut-point methods (mean $= 10.381$, median $= 9.898$, minimum $= 3.262$, maximum $= 14.899$, $P_1= 8.656$, $P_3= 13.581$). CONCLUSION: The optical cut-off methods to determine the optimal steps/day cut-point threshold based on current MVPA recommendation for adolescents may drastically affect the step-based recommendation. Further studies should examine the daily step-based thresholds adopting the best evidence-based decisions regarding the optical cut-point method.

### 1595 Board #189 May 28 10:30 AM - 12:00 PM Effectiveness Of Virtual Reality On Individuals’ Physiological, Psychological, And Rehabilitative Outcomes: A Systematic Review

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(No relevant relationships reported)

**PURPOSE:** Considering the benefits of VR-based exercise on sports and health compared to traditional exercise alone, this review synthesized the literature examining the effects of VR-based exercise on physiological, psychological, and rehabilitative outcomes in various populations. **METHODS:** Hundreds of articles were retrieved using key words such as “VR,” “exercise intervention,” “physiological,” “psychology,” and “rehabilitation” through multiple databases including Google Scholar, Academic Search Premier, and PubMed. Articles which met the following criteria were included in the review: (1) peer-reviewed; (2) published in English; (3) randomized controlled trials (RCTs) or controlled trials; (4) intervention was VR-based; and (5) examined effects on physiology, psychology, and/or rehabilitation. Descriptive and thematic analyses were used. **RESULTS:** In total, 14 studies (10 RCTs, 4 controlled trials) met the criteria across various ages. Most articles observed a cross-influence on physiological, psychological, and rehabilitative outcomes. Of the 11 articles examining physiology, 63.6% showed a positive effect on physical fitness, muscle strength, balance, and extremity function. Only four articles examined the effects on psychological outcomes, 75% of which showed positive effects such that VR exercise could ease fatigue, tension, and depression, induce calmness, and enhance quality of life. Eight articles investigated the effects of VR-based exercise on rehabilitative outcomes with physiological and/or psychological outcomes, 62.5% of which showed significant positive changes. In detail, patients who suffered from chronic stroke, hemodialysis, spinal-cord injury, cerebral palsy in early ages, and cognitive decline usually saw better improvements using VR-based exercise. **CONCLUSIONS:** Findings suggested VR exercise has potential to exert positive impact on individuals’ physiological, psychological, and rehabilitative outcomes compared with traditional exercise. However, the quality, quantity, and sample size of existing studies are far from ideal. Therefore, more rigorous studies are needed to confirm the positive effect and more efforts should be made on this aspect in future studies.

### 1596 Board #190 May 28 10:30 AM - 12:00 PM The Relationship Of Habitual Physical Activity With All-cause Mortality Among Obese Adults In US.

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(No relevant relationships reported)

Obesity is associated with increased risk for all-cause mortality. It is unclear if obese individuals need to engage in the same or more levels of physical activity in order to reap the benefits of an active lifestyle. **PURPOSE:** We test the hypothesis that regular habitual physical activity of 5 or more times a week among obese individuals, regardless of duration, intensity or mode, will be associated with lower all-cause mortality when compared to sedentary obese adults. **METHODS:** We used data from the Third National Health and Nutrition Examination Survey (NHANES III) conducted from 1988 to 1994. Participant records were linked to mortality data from the National Death Index to establish all-cause mortality. Detailed health information was obtained via a home interview and a medical examination. Measured weight and height were used to calculate obesity with a body mass index (kg/m2) $\geq 30$. Self-reported participation in leisure time physical activity was used to classify participants as inactive (0 times/wk) and infrequently active (1-4 times/wk) and habitually active (5+times/wk). Cox proportional hazard was used to study the association of physical activity and all-cause mortality after controlling for age, socioeconomic status, smoking and chronic diseases. **RESULTS:** We studied 16,573 adults aged 20+ years. Both obesity and physical inactivity were independent risk factors of all-cause mortality. The prevalence of obesity in this group was 22%. We then studied the relationship between frequency of physical activity and all-cause mortality among obese persons. Obesity individuals who exercised during leisure time habitually (5+ times/wk) had significantly lower risk (HR=0.74, 95% CI: 0.62,0.89) of all-cause mortality than the physically inactive obese group. **CONCLUSION:** For obese individuals, exposure to habitual physical activity 5+ times/wk is associated with lower all-cause mortality. All people should engage in habitual physical activity regardless of body weight.

### 1597 Board #191 May 28 10:30 AM - 12:00 PM Differences In Physical Activity, Calcium And Vitamin D Intakes In Caucasian, East-asian, And South-asian Women

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In addition to genetic factors, inadequate non-genetic factors, such as physical activity, and calcium and vitamin D intake can limit the achievement of optimal peak bone mass and increase the risk of fractures later in life (Heaney et al, 2000). These lifestyle factors are however subject to cultural variations and their adherence and importance varies among ethnic groups. **PURPOSE:** The purpose of this study was to determine differences in physical activity levels and dietary calcium and vitamin D intakes in premenopausal women aged 18-45 years belonging to three different racial/ethnic groups: Caucasians, South-Asians, East-Asians. **METHODS:** This was a cross-sectional study consisting of 108 participants. Based on their race/ethnicity the participants were categorized into one of the three independent racial/ethnic groups: Caucasian (Cau; n= 46); East-Asian (EA; n= 34); and South-Asian (SA; n= 28). Physical activity was measured using bone specific physical activity questionnaire (BPAQ) and international physical activity questionnaire (IPAQ), while calcium and vitamin D were assessed using calcium and vitamin D food intake questionnaires, and sun exposure questionnaire. **RESULTS:** Past (Cau: 60.6 ± 7.79 vs. EA: 30.51 ± 9.31, SA: 22.76 ± 5.25; p=0.004; $\eta^2$=0.103) and total (Cau: 33.13 ± 4.17 vs. EA: 17.13 ± 4.94, SA: 13.67 ± 2.67; p=0.005; $\eta^2$=0.098) BPAQ scores were significantly greater in Caucasians in comparison to East- and South-Asian women. Although no significant differences were observed for daily vitamin D intake, sun exposure scores were significantly higher in Caucasian and East-Asian women in comparison to South-Asians (Cau: 18.26 ± 1.54, EA: 21.91 ± 1.98 vs. SA: 12.21 ± 1.41; p=0.001; $\eta^2$=0.116). Moreover, daily calcium intake (mg/day) was higher in Caucasians and South-Asians compared to East-Asians (Cau: 893.07 ± 32.95, SA: 964.21 ± 110.20 vs. EA: 685.15 ± 52.65; p=0.002; $\eta^2$=0.116). **CONCLUSION:** The results of this study can be used for creating awareness among the at-risk ethnicities regarding the importance of adequate calcium and vitamin D intake and role of physical activity in enhancing cardio-metabolic fitness and bone density apart from merely reducing or maintaining of body weight.

### 1598 Board #192 May 28 10:30 AM - 12:00 PM Effectiveness Ofthe Health Risk Behavioron Physical Activity And Mental Health In Chinese Adolescents: A Cross-sectional Study

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(No relevant relationships reported)

**PURPOSE:** Risky behaviors have significantly impacted on youth physical and psychological health among adolescents, which can result in a tremendous public health issue. The purpose of this study is to examine the association clustering of risk behaviors with physical activity and mental health and identify what extent the clustering of various risk behaviors is associated with psychological health and physical activity in Chinese adolescent. **METHODS:** Participants were randomly chosen from 30 high school of 10 regions that consisted of 4630 students, male 2199 (47.5%), female 2431(52.5%), aged 16-18 years, male 16.21±0.3, female16.31±0.5. A structured questionnaire was developed to be based on 2017 State and Local Youth Risk Behavior Survey, which was revised, modified, translated into Chinese. Reliability of questionnaire was analyzed by Cronbach’s alpha (n=0.72). Construct validity was evaluated by factor analysis after the Kaiser-Meyer-Olkin (KMO=0.81) and Bartlett test ($\chi^2$>2.2, p<0.00) had been performed. Study Checklist 90 (SCL-90) was used to investigate the mental health status for Chinese adolescent.

Abstracts were prepared by the authors and printed as submitted.
RESULTS: Two-step cluster analysis (TCA) identified four clusters in risk behaviors that details are presented. Logistic regression demonstrated the relationship between risk behaviors and mental health based on the different clustering. In somatization, compared with cluster1 in factor1, the odds ratios (ORs) and 95% confidence intervals (CIs) were 0.97(0.83-1.13), 1.01(0.91-1.11) and 0.99(0.85-1.16) for cluster 2, cluster 3, and cluster 4, respectively. In the hostility, compared with cluster 3 in factor 5, the odds ratios (ORs) and 95% confidence intervals (CIs) were 1.61(1.00-2.33), 1.12(0.98-1.29), 1.06(0.99-1.24) for clusters 1, 2, and 4. The results found that physical activity affects significantly somatization behavior and screen time and bully behavior.

CONCLUSION: This study found that the specific cluster behaviors influence significantly on mental health and physical activity among Chinese adolescents. This study suggest that more effective and feasible clustering-based intervention programs may be designed to prevent adolescent risk behaviors and mental health.

1599 Board #193 May 28 10:30 AM - 12:00 PM Daily Step Counts And Cardiometabolic Risk In Adults Robert Buresh, FACSM, Brian Kliszczewicz, FACSM, Jennifer Julian, Katy Hayes. Kennesaw State University, Kennesaw, GA. Email: rburesh@kennesaw.edu

No relevant relationships reported

Physical activity (PA) is known to contribute to improvements in cardiometabolic risk (CMR) factors, but doses of PA necessary to achieve healthy CMR profiles are not well understood.

PURPOSE: To quantify the relationships among various expressions of PA and CMR profiles in adults. METHODS: Between 6:00 and 9:00 am, participants arrived at the laboratory having fasted for at least 10 hours. Height and body mass were measured, and 4-compartment body composition (percent fat %BF, fat mass [FM] and fat-free mass [FFM]) was determined using data derived from bioelectric impedance analysis and dual energy X-ray absorptiometry (DEXA). Resting heart rate and diastolic blood pressure were measured, and mean arterial pressure (MAP) was calculated. Blood samples were collected and plasma lipids (total, HDL, and LDL cholesterol [TCT-C, HDL-C, LDL-C]), triacylglycerides (TG), insulin (INS), and glucose (GLU) were measured. Quantitative insulin sensitivity check index (QUICKI) and TCT-C:HL-C ratio were calculated. Accelerometers were then provided and were worn for 21-28 days. Thereafter, associations between markers of PA and CMR factors were analyzed. RESULTS: A total of 21 females (age = 31.3 ± 4.1 years, weight = 80.3 ± 22.7 kg, height = 167.8 ± 8.0 cm, BMI = 28.6 ± 7.5 kg/m²) and 20 males (age = 32.2 ± 5.4 years, weight = 93.7 ± 19.1 kg, height = 180.4 ± 7.2 cm, BMI = 28.8 ± 5.3 kg/m²) participated. STEPS expressed in absolute terms (STEPS·day⁻¹) was not associated with any CMR factors. STEPS expressed relative to body mass (STEPS·kg⁻¹·day⁻¹) was correlated with %BF (r = 0.44), MAP (r = 0.48), HDL-C (r = 0.41), TG (r = 0.33), TCT-C:HL-C ratio (r = 0.36), INS (r = 0.56), and QUICKI (r = 0.59). STEPS relative to FFM (STEPS·kgFFM⁻¹·day⁻¹) was correlated with INS (r = 0.32). Power regression analysis showed that STEPS·kgFFM⁻¹·day⁻¹ was the best predictor of %BF (r² = 0.85), QUICKI (r² = 0.47) and TCT-C:HL-C ratio (r² = 0.29).

CONCLUSIONS: These findings suggest that STEPS expressed relative to FFM are strongly associated with CMR factors, and that expressing STEPS relative to FFM may be efficacious for improving CMR profiles in adults.

1600 Board #194 May 28 10:30 AM - 12:00 PM Associations Among Physical Activity, Measures Of Adiposity, And Serum Vitamin D Levels In Healthy Women Stephen W. Farrell, FACSM, Kristen Meyer, Carolyn Barlow, Benjamin Willis, Andjelka Pavlovic, David Leonard, Laura DeFina. Cooper Institute, Dallas, TX. Email: sfarrell@cooperinst.org

No relevant relationships reported

PURPOSE: Although physical activity, body weight status, and serum vitamin D [25(OH)D] levels are associated with various health outcomes in women, the understanding that details are presented. Logistic regression demonstrated the relationship between risk behaviors and mental health based on the different clustering. In somatization, compared with cluster1 in factor1, the odds ratios (ORs) and 95% confidence intervals (CIs) were 0.97(0.83-1.13), 1.01(0.91-1.11) and 0.99(0.85-1.16) for cluster 2, cluster 3, and cluster 4, respectively. In the hostility, compared with cluster 3 in factor 5, the odds ratios (ORs) and 95% confidence intervals (CIs) were 1.61(1.00-2.33), 1.12(0.98-1.29), 1.06(0.99-1.24) for clusters 1, 2, and 4. The results found that physical activity affects significantly somatization behavior and screen time and bully behavior.

CONCLUSION: This study found that the specific cluster behaviors influence significantly on mental health and physical activity among Chinese adolescents. This study suggest that more effective and feasible clustering-based intervention programs may be designed to prevent adolescent risk behaviors and mental health.

1601 Board #195 May 28 10:30 AM - 12:00 PM Identifying Threshold Of Daily Sedentary Behavior Time For Prevention Of Obesity Hoontae Kim, Seungho Ryu, Minsoo Kang, FACSFM. The University of Mississippi, University, MS. (Sponsor: Minsoo Kang, FACSFM) Email: hkim35@olemiss.edu

No relevant relationships reported

PURPOSE: Sedentary behavior (SB) has been related to the prevalence of obesity. To establish SB guidelines that define being recognized, healthy CMR has been limited research on the threshold of SB time influencing obesity in adults. Therefore, the purpose of this study was to determine the threshold of SB time through the relationship between SB and obesity. METHODS: Data from the 2003 to 2006 National Health and Nutrition Examination Survey (NHANES) were analyzed for this study. A total of 5,127 adults (>17 years old), who were an accelerometer (Actigraph AM7164) for a minimum of 4 valid days (which included at least three weekdays and one weekend days) were included in the analysis. Accelerometers were used to measure the average duration of minutes spent in SB. To determine the threshold of SB time, five sub-groups were created according to daily SB hours (e.g., < 6 hours, 6 hours [i.e., 6 hours to 6 hours and 20 minutes], 7 hours, 8 hours, > 8 hours). Obesity status was classified by body fat percentage measured by Dual-energy X-ray absorptiometry (DEXA). Logistic regression was used to examine the association between SB time and obesity after controlling for covariates (i.e., age, race/ethnicity, gender, education, income, accelerometer wear-time). A total of five logistic regression analyses were conducted by changing the reference group to calculate the odds ratio between all possible groups. The SAS v9.4 SURVEYLOGISTIC procedure was used to account for the complex nature of the NHANES sampling scheme. RESULTS: An estimated 70.67% reported obesity among US adults. Participants who spent in SB time for 8 hours, and 9 hours or more were more likely to report obesity (OR = 1.54; 95% CI: 1.11, 2.12 and OR = 1.60, 95% CI: 1.24, 2.06, respectively) compared to those who spent in SB time below 6 hours. However, participants who spent in SB time for 9 hours or above were not more likely to be obese (OR = 0.96; 95% CI: 0.77, 1.20) compared to those who spent in SB time for 8 hours. CONCLUSIONS: We found sitting up to 8 hours did not affect obesity, but sitting more than 8 hours was related to obesity negatively. In the future, an additional validation study for establishing the threshold is warranted.

1602 Board #196 May 28 10:30 AM - 12:00 PM Role Of Leisure Centers Supporting Active Living: Data Shows Impact And A Significant Gender Challenge Alfonso Jimenez, Maria Ayuso, Alejandro Lopez-Valenciano, Xian Mayo, Gay Liguori, FACSM.1 3GO fit LAB, Alcobendas, Spain. 2University of Rhode Island, Kingston, RI. Email: alfonso.jimenez@ing sport.es

No relevant relationships reported

Physical inactivity is one of the most important public health problems of the 21st century, being a key contributor to the increased risk of several chronic conditions. However, the number of people failing to achieve the minimum recommended amount of physical activity (PA) is still too high. In this context, leisure centers could play a potential positive role supporting inactive individuals to achieve PA recommendations. PURPOSE: To compare physical activity levels and time spent by paying members of leisure centers and the largest operator of leisure centers’ GO fit, against the 2018 Physical Activity and Sport Special Eurobarometer data from Spain. METHODS: Data from the seven questions of the International Physical Activity Questionnaire (IPAQ) were collected from all consenting GO fit members’ annual survey (n = 4,062). Data were analyzed and compared through Z-Score tests for two population proportions considering the Spain’s 2018 Eurobarometer data (n = 1,001) regarding physical inactivity for the whole sample, and men and women separately. Additionally, sex differences were also analyzed through Z-Score tests for two population proportions comparing women and men in each sample. RESULTS: Prevalence of physical inactivity of leisure centers’ members (14.9%) was lower in San Francisco, California

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non-significant associations with the SPBP score. In the hierarchical regression model, moderate PA significantly predicted SPBP ($p<0.001$; $R^2 = 0.153$). Adding age to the regression model increased $R^2$ from 0.42 to 0.44, but this was not significant ($p = 0.10$). Moderate PA was associated with a smaller SPBP score (9.42 ± 2.98 vs. 9.89 ± 3.01; $p = 0.04$). CONCLUSIONS: Moderate PA predicts SPBP score even after controlling for age among adults with ID. Moderate PA may be an important factor for improving the functional performance and health profiles of adults with ID.

1605 Board #199 May 28 10:30 AM - 12:00 PM Yoga, Health-Related Quality Of Life And Mental Well-Being: A Meta-Analysis Using The Quality Effects Model

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(No relevant relationships reported)

Robust and practically relevant information regarding the association between yoga, health-related quality-of-life (HRQOL) and mental well-being (MWB) in older adults has not been established. PURPOSE: Provide robust and practically relevant information regarding the association between yoga, health-related quality-of-life (HRQOL) and mental well-being (MWB) in older adults. METHODS: Data were derived from a meta-analysis of 12 randomized controlled yoga trials representing 752 adults ≥60 years of age. Standardized mean difference effect sizes (ES’s) were pooled using the recently developed quality effects model and 95% confidence intervals (CI). Small-study effects were examined using the Hedges’ (1981) and Linley- Kanamori (1997) LFK index. RESULTS: Sensitivity and cumulative meta-analyses were conducted as well as percentile improvement, number needed to treat (NNT), and number to benefit. The GRADE instrument was used to assess the strength of the evidence. RESULTS: Yoga was associated with improvements in both HRQOL (ES = 0.51, 95% CI, 0.25 to 0.77, $I^2 = 63.1$%) and MWB (ES = 0.39, 95% CI, 0.15 to 0.63, $I^2 = 56.2$%). Percentile improvements were 19.5 for HRQOL and 15.3 for MWB while the NNT was 4 for HRQOL and 5 for MWB. An estimated 378,222 and 302,578 US yoga-practicing adults ≥65 years of age could potentially improve their HRQOL and MWB, respectively. Major asymmetry suggestive of small-study effects was observed for MWB (LFK = 0.23) but not HRQOL. CONCLUSIONS: Yoga is associated with improvements in HRQOL and MWB among older adults. Studies to determine the dose-response effects of different types of yoga on HRQOL and MWB and minimally important thresholds for improvement are needed.

1606 Board #200 May 28 10:30 AM - 12:00 PM A Meta-analysis Of The Acute And Chronic Effects Of Exercise Training On Paraoxonase-1 (PON1)

James Kyle Taylor 1, Elizabeth Carpio-Rivera 1, Yamilet Chacón-Araya 2, 3, José Moncada-Jiménez 2, 3. Auburn University at Montgomery, Montgomery, AL. 1University of Costa Rica, Costa Rica, Costa Rica. 3University of Mississippi, Oxford, MS. (Sponsor: George A. Kelley, DA, FACSM, FACSM)

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(No relevant relationships reported)

Paraoxonase 1 (PON1) is a high-density lipoprotein (HDL) - associated enzyme partially responsible for the anti-atherogenic properties of HDL. However, a lack of consensus exists regarding the effects of exercise training on PON1 concentration and activity. PURPOSE: Determine the acute and chronic effects of exercise training on PON1 concentration and activity. METHODS: A literature search was performed in PubMed, Web of Science, and Spanish language electronic databases, including “PON1”, “exercise”, “paraoxonase”, “paraoxonase-1”, “paraoxonase 1”, “aerobic”, “resistance”, “training”, and “concurrent”. Experimental studies in adults 18 years of age and older were included. Dual selection and data abstraction were conducted. Results were pooled using the random-effects model. Effect sizes (ES) were computed and two-tailed alpha values <0.05 and non-overlapping 95% confidence intervals (95%CI) were considered statistically significant. Statistical heterogeneity (Q) and inconsistency (I) were examined as well as small-study effects using the Doi plot and LFK index. RESULTS: Seventeen studies representing 360 participants met the criteria for inclusion. The acute effects of exercise on PON1 concentration were trivial and non-significant (ES = 0.03, 95% CI, -0.39 to 0.45; $I^2 = 56.2$%); homogenous (Q = 2.39, $p>0.05$), and minimally important thresholds for improvement are needed.

Abstracts were prepared by the authors and printed as submitted.
0.01 to 0.77, p<0.05), homogeneous (Q = 6.43, p = 0.17), moderately inconsistent (I² = 38%), with no asymmetry (LEF index = 0.94). **CONCLUSION:** Exercise training, overall, exerted a trivial effect on PON1 while chronic exercise had a small but more pronounced effect on PON1 activity. Additional research is needed before any firm conclusions can be drawn.

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**RESULTS**

An active behavior is associated with a range of positive social outcomes. Accordingly, the Global Action Plan on physical activity 2018-2030 (World Health Organization, 2008) indicates that the guiding principle of the implementation of the policy action should be based on the active evaluation of impact. **PURPOSE:** To analyze the 2017 economic and social impact in international Dollar (INT$) of GO fit, the largest leisure center operator in Spain, with 18 facilities and more than 200,000 members. **METHODS:** The Social Return on Investment (SROI) was estimated from 114,000 active members, with data collected through the access control of each individual. The SROI is a framework for measuring and understanding non-market economic and social values produced by an organization. For this analysis, reductions in physical and mental health spending, absenteeism costs, disability-adjusted life years avoided, and increases in subjective wellbeing were studied, considering the prevalence of main illnesses and quantifying the annual healthcare cost of an inactive Spanish person. **RESULTS:** For the year 2017, GO fit generated more than $378 million of social impact. This includes $27 million on health care savings spending ($23 million in physical illness and $4 million in mental illness), $9 million in savings related to reducing workplace absenteeism, and $87 million derived from the maintained productive capacity of the workforce. The result from the disability-adjusted life years prevented. Additionally, $255 million were generated due to improvements in subjective wellbeing among GO fit members. As a positive consequence of this, GO fit contributes to generating benefits among its members valued at $3.17 for every INT$ of turnover. **CONCLUSIONS:** An extensive economic and social impact is attributable to the active behavior of GO fit members, indicating the critical role that leisure centers have in improving wellbeing and tackling a myriad of community-level social threats. Examples of this are helping to reduce health care spending, increasing subjective wellbeing, and increasing years without disability. Considering these findings, policymakers should account for leisure centres as an ally in the public health agenda.

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**RESULTS**

The AHA’s 7 Health Metrics And Chronic Disease mortality in patients with CHD, stroke, and cancer.

**CONCLUSIONS**

Examples of this are helping to reduce health care spending, increasing subjective wellbeing, and increasing years without disability. Considering these findings, policymakers should account for leisure centres as an ally in the public health agenda.

**ACCOMPLISHMENTS**

The AHA’s 7 ideal health metrics are associated with a lower risk of chronic disease mortality in men and women with a personal history of CHD, stroke, or cancer. The AHA should recommend maintaining AHA’s 7 ideal health metrics across persons who suffer from CHD, stroke, or cancer.

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**RESULTS**

The AHA’S 7 Health Metrics And Chronic Disease mortality in patients with CHD, stroke, and cancer. We identified cardiometabolic risk markers from the EMR system to characterize the cardiometabolic profile of PLWH in this region. The cardiometabolic variables considered were: cholesterol (≥ 200 mg/dL), triglycerides (TG) (≥ 150 mg/dL), glycated hemoglobin (HbA1C) (≥ 6.5%), body mass index (BMI) (≥ 30 kg/m²), and blood pressure (SBP ≥ 140 mmHg / DBP ≥ 90 mmHg). Demographic variables retrieved from the EMR were: height (in), weight (lbs), age (yrs), gender (M/F), race, viral load (copies/mL), and CD4+ T-cell percentage (%CD4). We identified the first encounter as representation of the initiation of care. Descriptive statistics such as percentages, means, standard deviations (SD) or ranges were calculated for all variables. **RESULTS:** The sample was comprised of 35% Hispanics and 65% Non-Hispanics, primarily Caucasians (75%) and Black (19%). Approximately 77% classified themselves as men. Age, weight, and height were 49.88 ± 12.2 y; 179.1 ± 44.3 lbs; 67.4 ± 3.8 in, respectively. %CD4 and viral load were 28.0 ± 10.5 % and 27.102 ± 102,813 copies/mL, respectively. On average, the values of the cardiometabolic risk markers were borderline high: HbA1C=6.17 ± 1.84% (range: 4-13); TG=190 ± 156.1 mg/dL (range: 37-1,099); cholesterol=177 ± 42.7 mg/dL (range: 80-362); SBP=129.9 ± 17.2 mmHg (range: 92-187); DBP=78.2 ± 11.8 mmHg (range: 52-117); BMI=29.5 ± 7.4 kg/m² (range: 21-53); and %CD4 and viral load were 28.0 ± 10.5 % and 27.102 ± 102,813 copies/mL, respectively. On average, the values of the cardiometabolic risk markers were borderline high: HbA1c=6.17 ± 1.84% (range: 4-13); TG=190 ± 156.1 mg/dL (range: 37-1,099); cholesterol=177 ± 42.7 mg/dL (range: 80-362); SBP=129.9 ± 17.2 mmHg (range: 92-187); DBP=78.2 ± 11.8 mmHg (range: 52-117); BMI=29.5 ± 7.4 kg/m² (range: 21-53). However, after evaluating the range of values of the sample, close to 50% of PLWH had elevated values in at least 3 of the cardiometabolic risk markers. **CONCLUSIONS:** PLWH in the South Texas region exhibit an elevated cardiometabolic risk profile. Due to the greater morbidity and mortality in PLWH with cardiometabolic disease, early intervention is imperative. Exercise professionals should be included as part of the healthcare team at the initiation of care to improve the cardiometabolic profile of PLWH.
Motor Development-2. RESULTS: A two-way ANOVA (groups by measurements) showed no significant results for POC (M±SD values for pretest: [T: 3.3±0.4, NT: 3.3±0.5, CG: 3.1±0.4] and posttest: [T: 3.3±0.5, NT: 3.2±0.4, CG: 3.2±0.5]) nor PGM (M±SD values for pretest: [T: 3.1±0.4, NT: 3.1±0.4, CG: 3.0±0.5, CG: 3.0±0.3] and posttest: [T: 3.2±0.5, NT: 3.2±0.3, CG: 2.9±0.4, CG: 3.1±0.3]). PL, GPMC, L, and GM did not show normal distribution, therefore a one-way ANCOVA (4 groups; pretest as co-variable) was used. The ANCOVA revealed that the three experimental groups (T: 3.9±1.1, NT: 3.5±2.0, CG: 4.3±2.1) had significantly higher scores at posttest than the CG (1.1±0.4) in OC. No significant differences were found between groups at posttest for L (T: 4.9±1.7, NT: 4.9±1.7, CG: 4.4±1.9, CG: 2.3±1.3), GM (T: 8.6±1.9, NT: 7.8±3.3, CG: 9.0±3.3, CG: 3.5±1.4), PL (T: 3.2±0.6, NT: 3.1±0.5, CG: 3.0±0.5, CG: 3.2±0.4), and GPMC (T: 3.0±0.5, NT: 3.0±0.5, CG: 3.0±0.4, CG: 3.0±0.3). CONCLUSION: Traditional and non-traditional PA can be used to enhance OC in fourth graders.

RESULTS: More males (33%) than females (19%) were in the highest quartile of moderate-vigorous PA (MVPA). Females had lower MVPA (106 ± 26.2 min/day) than males (129 ± 46.9 min/day), but higher BMI (31.5 ± 6.96 kg/m² vs 26.8 ± 4.99 kg/m² respectively). Males had higher CVD risk score (10.4 ± 10.8) and higher vascular age (vascular age 49.4 ± 16.5 years) than their female counterparts (3.99 ± 5.02 CVD risk score and 43.4 ± 17.4 years respectively). CVD risk score (rho: 0.32, p=0.003) and vascular age (rho: 0.32, p=0.003) were positively correlated with light PA. MVPA was inversely correlated with vascular age (rho: -0.27, p=0.01) and waist circumference (rho: -0.22, p=0.046).

CONCLUSIONS: Despite females having higher BMI and lower MVPA than males, CVD risk is higher in males. There were significant correlations between MVPA and lower vascular age, while light PA was correlated with higher CVD risk in factory workers.

| Board #205 | May 28 10:30 AM - 12:00 PM | The Effects of Aerobic Exercise On Free Radical Expression In Hippocampus Of Aging Rats | XianYi Ding1, Xue Li2, Cuilan Wei2, Yu Jin1 | 'Chengdu Sport University, Chengdu, China. 2Chengdu sport institute, Chengdu, China. |

PURPOSE: The effects of aerobic exercise on free radical expression in hippocampus of aging rats.

METHODS: Eighty male SD rats were divided into 4 groups(n=20) at random: control group(C), D-galactose aging model group(A), pre-aging aerobic exercise intervention group (S1), aerobic exercise intervention on aging group (S2). Following a 1 week acclimation to laboratory conditions, D-gal were injected in D, S1 and S2 groups rat’s peritoneal to make aging model, the injection dosage via body weight of the rats, 100mg / kg, once a day for 6 weeks. Group C were injected the same dosage of saline. We did 1 hour per day, six times per week’s swimming training separately before and during the injection of D-gal administration in group S1 and S2. At the end of modeling and swimming, Morris water maze was used to evaluate the spatial learning and memory function of rats; the activities of SOD, GSH PX and MDA expression in hippocampus of rats in each group were measured. All data were processed with one-way ANOVA, level of significance was set at α=0.05.

RESULTS: (1) Compared with group C, group A had obvious symptoms of aging. (2)Water maze navigation trial showed that group C, S1 and S2 formed stable spatial learning and memory function on day 3 but that of group A formed on day 4; in the space exploration experiment group C reached the destination for most times, the percentage of the original site quadrant of group C was the highest, and there were significant differences between other groups (P<0.01); group S2 followed but group A and S1 were relatively low. (3) Morphological observation showed that the hippocampal neurons of rats in group A appeared derangement, deepening of cell staining and cytoplasmic edema. (4) The activities of SOD and GSH PX in the hippocampus of group S2 were similar to group C, and the activities of group A and S1 were significantly lower than group C (P < 0.01); the expression levels of MDA were significantly down-regulated in group C, group S2 followed, and all significantly lower than those in group A and S1 (P<0.05).

CONCLUSIONS: Swimming in the process of aging can improve and maintain the spatial learning and memory function of brain and delay brain aging. The mechanism may be related to reduce free radical expression’s regulation.
concentrations. Glucose concentrations were measured with the colorimetric glucose assay, (CV = 6.22% ± 3.36). Insulin concentrations were measured with an ELISA, CV = 5.21% ± 3.19. Insulin resistance was calculated utilizing the homeostatic model assessment of insulin resistance (HOMA-IR). RESULTS: Participants averaged 8.6 ± 1.6 h/day of SB, had a fasting glucose concentrations 80.6 ± 10.2 mg/dL, fasting insulin of 1.8 ± 2.1 µIU/L, HOMA-IR of 0.5 ± 0.9, and an average PWV of 7.8 ± 1.38 m/s. Two regression analyses were conducted: SB did not significantly predict IR, $F(1, 57) = 0.04$; PWV, $F(1, 57) = 2.59$, $p = 0.04$. CONCLUSION: Healthy individuals who meet PA guidelines of at least 150 minutes of moderate-vigorous intensity per week is not expected to develop insulin resistance or excessive arterial stiffness even when averaging 8.6 ± 1.6 h of SB/day. The benefits of PA remain intact even when healthy, middle-aged adults have sedentary jobs or spend more than half of their wakeful day in a reclined or seated position. PA guidelines, therefore, should remain a solid benchmark goal for those who participate in 8 or more hours of sedentary behaviors per day and may be the negating catalyst for the development of type 2 diabetes and/or cardiovascular diseases.

Table 1: Multivariate linear regression with PAL as continuous variable (METs/min/week)

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>SE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<td>9.9</td>
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<td>BMI (kg/m²)</td>
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<td>17.6</td>
<td>0.001</td>
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<tr>
<td>Gender</td>
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<td>191.4</td>
<td>0.19</td>
</tr>
<tr>
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<tr>
<td>Rank</td>
<td>83.6</td>
<td>149.7</td>
<td>0.58</td>
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<tr>
<td>Educational level</td>
<td>381.1</td>
<td>134.7</td>
<td>0.005</td>
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<tr>
<td>QoL, physical domain</td>
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<td>0.33</td>
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<tr>
<td>QoL, environmental domain</td>
<td>12.8</td>
<td>5.6</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Role: field or administrative; rank: officer or enlisted; educational level: ≤secondary or >higher; QoL: quality of life

Police officers (PO) need to engage in training and duty activities in which one’s performance might be affected by their physical activity level (PAL).

PURPOSE: To compare predictors of PAL among Brazilian military law enforcement personnel.

METHODS: We performed a cross-sectional study of 418 volunteers, recruited by convenience in a state of the PA. PAL was calculated using the IPAQ-questionnaire as the sum of total min/week of walking (3.3 METs), moderate (4.0 METs), and vigorous activity (8.0 METs). The effect of independent variables on the PAL, as a continuous outcome, was first assessed using simple linear regression. Variables that had a p-value ≤0.2, namely, age, BMI, gender, role, rank, partner status, educational level and the 4 domains of quality of life (QoL) assessed by WHO QoL questionnaire, were included in the final multivariate regression model.

RESULTS: The majority of the volunteers were men (88%) with an average age 38.6 ± 6.6 years. Average BMI was 25.6 ± 3.4 kg/m² with 16% of the participants being obese (BMI ≥ 30 kg/m²) while 185 (44%) did not meet the physical activity guidelines. After adjusting for covariates BMI, educational level, and QoL, Environmental domain were significantly associated with PAL (Table 1). One unit decrease in BMI was associated with a 56 METs/min/week increase in PAL and each unit increase in QoL Environmental Domain was associated with 13 METs/min/week increase in PAL. Also, having a college degree or above, vs. having only secondary education, was associated with an increase of 381 METs/min/week in PAL, which corresponds to more than half of the PAL guidelines. CONCLUSION: In this sample of military PO, BMI, educational level and the Environmental Domain of QoL showed to be significant predictors of IPAQ-based PAL.

Competitive video game play (gaming) has become increasingly popular in the past decade. However, behaviors of those who actively participate in gaming ("gamers") is not well understood. Gaming is typically a sedentary activity, therefore it is possible that "gamers" may be more sedentary and less physically active than their "non-gamer" peers. Additionally, it is possible gamers may be prone to outcomes associated with an inactive lifestyle (e.g., elevated body mass index (BMI), anxiety). PURPOSE: To compare physical activity, sedentary behavior, BMI, and anxiety in "gamers" versus "non-gamers." METHODS: College students (N=377, 20.9±1.81 years old) at a public university in the American Midwest completed a questionnaire that assessed demographics, gaming habits (reported whether or not they identified as a "gamer" and min/week of video game play), physical activity and sedentary behavior (via the International Physical Activity Questionnaire), and anxiety (via Beck's Anxiety Inventory). A Multivariate Analysis of Variance (MANOVA) was conducted comparing these aforementioned variables in "gamers" versus "non-gamers". RESULTS: As expected, "gamers" (n=90, 808±621 min/week) allocated significantly (p<0.001) more time to gaming than “non-gamers” (n=226, 67±124 min/week). "Gamers" also participated in significantly (p=0.042) less vigorous (217±282 min/week), light
(634±704 min/week) and total physical activity (4938±4111 MET min/week) than “non-gamers” (296±325 min/week vigorous, 980± 012 min/week light, and 6849±5260 MET min/week total). “Gamers” (4296±1854 min/week) allocated significantly (p<0.001) more time to sedentary behavior than “non-gamers” (3316±1581 min/week). Lastly, there were no differences (p=0.29) between “gamers” and “non-gamers” for BMI, moderate intensity physical activity, or anxiety. CONCLUSION: College-aged individuals who self-identified as “gamers” had a >13 fold greater amount of weekly video game play than “non-gamers.” This robust difference in time allocated to gaming was associated with lower vigorous, light, and total physical activity and greater sedentary behavior in “gamers” versus “non-gamers.” This is concerning as inadequate physical activity and elevated sedentary behavior are independent risk factors for cardio-metabolic disease.

1618 Board #212 May 28 10:30 AM - 12:00 PM The Associations Of Objectively Measured Physical Activity With Exercise Capacity And Health-related Quality Of Life In Patients With Congenital Heart Disease

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Although self-reported moderate to vigorous physical activity (MVPA) levels and exercise capacity are associated with various health parameters, the relative contributions of objectively measured MVPA levels and exercise capacity to health-related quality of life (HRQoL) remain unclear in patients with congenital heart disease (CHD). PURPOSE: This study examined the independent associations of objectively measured MVPA and exercise capacity with HRQoL in patients with CHD. METHODS: Eighty-two Korean patients with CHD (19.3±1.9 years, 21.7±3.7 kg/m²) who visited an outpatient clinic were consecutively recruited to participate in this study. Objectively measured MVPA levels were assessed using the accelerometer device (GENEActiv) worn on the wrist for seven consecutive days. Exercise capacity (EC) was directly measured by peak oxygen uptake (VO2peak) using progressive, symptom-limited maximal treadmill exercise testing to volitional fatigue. HRQoL was evaluated using the PedsQLTM 4.0 Generic Core Scale questionnaire. RESULTS: In a univariate correlational analysis, objectively measured MVPA was positively correlated with EC (r=0.31, p=0.024) and HRQOL (r=-0.21, p=0.048). When both variables were entered into the same regression models, EC, but not objectively measured MVPA (r=0.088, p=0.535), was independently associated with HRQOL (r=0.348, p=0.016). In the mediation analysis, exercise capacity showed a mediating effect in the association between objectively measured MVPA and HRQol (z=1.973, p=0.048). CONCLUSIONS: These findings suggest that objectively measured MVPA levels and EC were associated with better HRQOL, but the association between objectively measured MVPA and HRQOL was fully mediated by EC, highlighting the importance of improving exercise capacity to potentially enhance quality of life in patients with CHD.

1619 Board #213 May 28 10:30 AM - 12:00 PM Abstract Withdrawn

1620 Board #214 May 28 10:30 AM - 12:00 PM Impact Of Sports Participation On Healthcare Costs: Findings From A Brazilian Longitudinal Study

Jamile Sanches Codogno1, Bruna Turi-Lynch2, Romulo Araujo Fernandes1, Henrique Luiz Monteiro1, 1 Sao Paulo State University; 2 University of Sao Paulo, Brazil. Email: jamile.codogno@unesp.br (No relevant relationships reported)

PURPOSE: To identify the potential impact of sports participation on healthcare costs among Brazilian adults. METHODS: The sample was composed of 620 adults (166 males and 454 females) aged 50 years or older followed from 2010 to 2014 in the city of Bauru, Sao Paulo, Brazil (FAPESP Research Project). Physical activity was assessed using questionnaires (Baeeke et al. Am J Clin Nutr, 1982 [face-to-face interview]) and subjects were stratified according to the engagement in sports in leisure-time (180 minutes/week over the last four months) as: Engaged (n=595; p=0.01) and Non-engaged (n=251). Annual healthcare costs covered by the Brazilian National Health Service were assessed from 2010 to 2014 (in US dollar [US$]), including expenditures with medicine, appointments and exams. Analysis of covariance (ANCOVA) adjusted by sex, age and body mass index compared monetary values between the two groups, while statistical significance (p-value) was set as p-value lower than 0.05 and effect-size was expressed using eta-squared values. RESULTS: From 2010 to 2014, the amount of money spent by these 620 adults accounted US$ 207,175.00. Adults engaged in sports spent less with healthcare services (US$ 260.61 [95%CI: 184.09 to 337.14]) than those in sports (US$ 348.12 [95% CI: 315.01 to 381.23]). The magnitude of the difference was small (eta-squared= 0.007 [0.7%]), but significant (p-value= 0.040). CONCLUSIONS: Sports participation was a determinant factor on decreasing the expenditure with healthcare services among Brazilian adults. This finding highlight the importance of public health actions promoting healthy behaviors aiming the prevention of harmful health outcomes and reduced healthcare costs, especially in countries with unified health systems.

1621 Board #215 May 28 10:30 AM - 12:00 PM Limitations In Knowledge And Practice Of Healthy Lifestyle Guidelines In A Sample Of Australian Adults.

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PURPOSE: Cardiovascular disease (CVD) is the leading cause of death in Australia. Physical activity (PA), optimal sleep, ample fruit/vegetable consumption, reduced screen time, limited alcohol consumption and not smoking are all protective against CVD, however, evidence shows that knowledge of Australian health guidelines and engagement in healthy behaviours is less than sufficient. We aimed to identify knowledge and engagement in 6 lifestyle behaviors in a convenience sample of Australian adults.

METHODS: Australian adults (>18 years) were invited through social media to complete an online anonymous survey via Survey Monkey assessing healthy lifestyle behavior choices and knowledge of Australian health guidelines. Data were reported as means and standard deviation or percentages. Simple linear regressions were performed to identify any significant associations between knowledge and practice.

RESULTS: Australian adults (n=219; 69% female; M=30±14; range 18-73) completed the survey. Only 26% of the sample knew and self-reported BMI (M=23.00±5.7) and only 32% of the sample reported their health as very good or excellent. Correct knowledge of individual health guidelines was 67% PA, 61% sleep, 42% fruit and 41% vegetable consumption, 30% screen time, and 29% alcohol, of which 30%, 84%, 23%, 16%, 21%, 53% met the guidelines respectively. Eighty percent of the sample reported smoking as harmful; however, only 28% of the sample had not smoked in the prior 6 months. Alarming, on average participants reported spending 8.6±4.2 hours/ day watching a screen and sat for 8±3.6 hours/day. Knowledge of the guidelines was associated with adherence to the guidelines for moderate PA (r=0.22; p<0.01), sleep (r=0.15; p=0.04) and fruit (r=0.41; p=0.01) and vegetable (r=0.38; p<0.01) intake.

CONCLUSIONS: On average, less than 50% of this sample of the Australian adult population are aware of the national guidelines for 4 out of 6 healthy lifestyle behaviors and less than 30% meet the national health guidelines for PA, screen time and fruit/vegetable consumption. Moreover, greater than 70% of the sample have smoked or tried smoking in the past 6 months. More research is needed to identify ways to not only help Australians become more aware of the individual health behavior guidelines but also to improve healthy lifestyle choices.

1622 Board #216 May 28 10:30 AM - 12:00 PM Barriers To The Practice Of Physical Activity Among Adults According To Socioeconomic Status In Chile

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PURPOSE: to identify personal and environmental barriers for physical activity practice and the stage of change in residents of communities with three different socioeconomic status (SES). METHODS: Cross-sectional analytical study. Three communes of the city of Santiago de Chile with high, medium and low SES were selected. The stage of behavior change was determined with the “Physical Activity Stages of Change Questionnaire” and the barriers for physical activity practice through the “Barriers to Being Active Quiz”. The precontemplation, contemplation and preparation stages were grouped as inactive state, and the action, maintenance as active state. The barriers were compared between communes and associated with the inactive state with a multivariate regression.

RESULTS: 296 participants were surveyed, age ~49 (P9 = 37, P25 = 57) years, 60.1% women. In an inactive state, 48.5% in high SES, 60% in medium SES and 63.1% in low SES. The most prevalent barrier to physical activity according to SES was: lack of...
time for high SES (74.2%); lack of will for medium SES (62%) and lack of resources for low SES (59.2%). The lack of skills is the only barrier that presents a significant difference p < 0.05 across all communities, 31.8% high SES, 46% medium SES and 19.2% low SES. The lack of skills presented an OR 1.15 (1.02-1.31) p = 0.05 for the inactive state in a multivariate analysis.

CONCLUSIONS: the barriers to practice physical activity differ according to SES and can be a guide for personal and environmental interventions. Overcoming the lack of skills barrier could increase the active subjects.

### RESULTS

• Gender is a predictive factor of the type of exercises and equipment individuals use in exercise regimes and educating individuals on health benefits of exercise and further investigating social determinants of health.

### CONCLUSIONS

Mensural cycle symptoms are common in exercising women and can have a detrimental effect on elements of health and wellbeing. The derivation of a MCSS enables an easy way to quantify mensural cycle symptoms. Future research needs to investigate risk factors and non-pharmaceutical treatment options.

### MEDICINE & SCIENCE IN SPORTS & EXERCISE®

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**Board #217 May 28 10:30 AM - 12:00 PM**

**Associations Of Occupational And Leisure-time Physical Activity With Cardiovascular Disease**

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(No relevant relationships reported)

**PURPOSE:** Emerging evidence describes opposing effects of occupational and leisure-time physical activity (LTPA) on cardiovascular health although little research has been done in the U.S. This analysis examines cardiovascular disease (CVD) prevalence associated with occupational physical activity and LTPA in a nationally representative U.S. sample. **METHODS:** This is a cross-sectional analysis of the 2015 National Health Interview Survey (NHIS) data and its occupational health supplement from the National Institute for Occupational Safety and Health (NIOSH) (n=19,429). Logistic regression estimated the odds of self-reported composite CVD (coronary heart disease, heart attack, stroke, or angina) with self-reported total occupational activity (TOA), occupational exertion (OE), occupational standing (OS), and LTPA. Occupational activity was measured using two questions: “How often does your job involve repeated lifting, pushing, pulling, or bending?” (OE) and “How often does your job involve standing or walking around?” (OS) where participants responded to a 5-item Likert scale (0=Never, 4=Always). Total occupational activity (TOA) was categorized similarly after summing the individual OE and OS scores. LTPA was defined as three categories: 0, 1-149, or ≥150 minutes/week of reported moderate- to vigorous activity. Additional analyses were stratified by sex, smoking status, and LTPA level. All models were adjusted for age, sex, race/ethnicity, smoking status, alcohol consumption, family income, body mass index, education, U.S. nativity, LTPA, and TOA. **RESULTS:** “Always” performing TOA, OE, and OS was associated with higher odds for CVD, compared to “never” (OR=1.65, p=0.026, OR=1.63, p=0.003, and OR=1.56, p=0.031, respectively). LTPA level was not associated with odds of CVD (p>0.05). Associations of high OE with CVD outcomes were equally apparent in females and males and stronger in lower LTPA levels. Associations between TOA, OE, and OS with CVD were stronger in the sample restricted to never smokers. **CONCLUSIONS:** While LTPA was not associated, individuals with higher TOA, OE, and OS had higher rates of CVD. While uncontrolled confounding is still possible even after adjustment, the seemingly paradoxical adverse associations with occupational activity and CVD should be investigated further.

### Board #218 May 28 10:30 AM - 12:00 PM**

**Menstrual Cycle Symptoms In 6,812 Exercising Women And The Development Of A Novel Symptom Score**

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(No relevant relationships reported)

**PURPOSE:** More than half of athletes report detrimental effects on exercise caused by their menstrual cycle. However, the specific menstrual cycle symptoms experienced by exercising women, and a means to quantify occurrence and prevalence of symptoms is lacking. Therefore, we aimed to: identify the most common menstrual cycle symptoms experienced; devise a way to quantify symptoms; and to ascertain the impact of that menstrual status; the presence of, and frequency of symptoms; use of medication

**RESULTS:** The most frequent symptoms reported included mood changes/anxiety (90.6%), tiredness/fatigue (86.2%), stomach cramps (84.2%), and breast pain/tenderness (83.1%). Participants in Germany and France had a significantly lower MCSS and reported fewer MCSS than those in Spain, the UK & Ireland, the USA and Brazil (p<0.05). After controlling for BMI, training volume and age, those participating in running (p=0.038), swimming (p=0.033), cycling (p=0.001), team sports (p=0.027), racket sports (p=0.010), and dance (p=0.001) had a lower MCSS. While participation in gym-based activities (p=0.023) and weight training (p<0.005) were associated with a higher MCSS. Total MCSS was correlated with a greater need to miss or change training (r=0.44; p=0.0008) and work/academic absences (r=0.31; p=0.007).

**CONCLUSIONS:** Menstrual cycle symptoms are common in exercising women and can have a detrimental effect on elements of health and wellbeing. The derivation of a MCSS enables an easy way to quantify menstrual cycle symptoms. Future research needs to investigate risk factors and non-pharmaceutical treatment options.

**Board #219 May 28 10:30 AM - 12:00 PM**

**Gender As A Determine Of Exercise Type Preference**

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(No relevant relationships reported)

Regular physical activity decreases the risk for many diseases such as obesity, stroke, osteoporosis, type 2 diabetes, and certain types of cancer. Barber and colleagues (2011) found that the health benefits from exercise depend not only the duration and amount of exercise but also on the type of exercise, indicating that cross training athletes experience the most benefits. Despite health benefits of cross training many athletes tend to comprise training by either aerobic or weight training regimes. To investigate the predictability of gender differences on type of exercise equipment preference at one university gym. **Methods:** A small gym with both cardiovascular and weight training equipment, easily observable from a single concealed location, was selected. Two pairs of observers each collected data, participants were assigned as the first 25 people (n females, n males) to walk into the exercise area from the locker rooms or stairwell. Participants were coded as participating in either cardiovascular exercise, strength training exercise, or both and were observed until they left the gym. This process was repeated on different days at varying times for a total n=150. A Chi-square analysis was used to determine correlation of gender and exercise type. **Results:** Pairs of observers demonstrated inter-rater reliability on the “exercise type” measure; Pair 1, gamma=1; Pair 2, gamma=1. The overall sample size for this study was N=150 (female n=68, male n=82). The female participants showed a preference for cardiovascular exercise with n=40 participating in cardiovascular exercise only. Male participants showed a preference for strength training exercise with n=48 completing exclusively strength training while n=15 participated in cardiovascular training only. Both males and females had similar amounts of cross training with 19 of the men and 14 of the women participating in this type of exercise. The study revealed a significant predictive relationship between gender and exercise type completed p < 0.13×10^-10. **Conclusion:** Gender is a predictive factor of the type of exercises and equipment individuals use in a college campus gym setting. This information may be beneficial when prescribing exercise regimes and educating individuals on health benefits of exercise and further investigating social determinants of health.

**Board #220 May 28 10:30 AM - 12:00 PM**

**Associations Of Lifestyle Behaviors With Body Mass Index In Adolescents: A Quantile Regression Analysis**

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(No relevant relationships reported)

**PURPOSE:** The purpose of this study was to examine the associations between lifestyle behavior variables such as physical activity, television watching, computer use, and school night sleep duration with Body Mass Index percentile (BMI%) using quantile regression within a representative sample of adolescents who completed the 2013 National Youth Risk Behavior Survey (YRBS). **METHODS:** A multi-stage cluster sampling procedure obtained a representative sample of US adolescents. The target population consisted of public and private high schoolers from grades 9 through 12. The number of sampled adolescents submitting questionnaires with BMI% data was 13,146. To examine the associations between lifestyle behaviors and BMI%, simultaneous quantile regression was employed. Relationships were modeled at 10 percentile increments and examined independent variables on the continuous measurement scale to determine how the parameter estimates (b-coefficients) vary across percentiles. Post hoc analysis involved modeling the relationships across BMI%’s interquartile range, specifically at the 25th, 50th, and 75th percentiles, in addition to using independent variables treated on the categorical measurement scale.
RESULTS: When relationships were modeled at every 10 percentile, more precise parameter estimates were observed at higher percentiles. Across the interquartile range, physical activity associated with lower BMIs at the 50th and 75th percentiles ($b_{50} = -2.27$% to $-5.24$%, $p<0.05$), television watching associated with higher BMI at the 25th to 75th percentiles ($b_{25} = -2.92$% to $-4.16$%, $p<0.05$), sleep durations less than 8 hours per school night associated with higher BMI at the 25th and 50th percentile ($b_{25} = -2.81$% to $-8.26$%, $p<0.05$), and 10 or more hours of school night sleep associated with higher BMI at the 50th and 75th percentile ($b_{50} = -3.43$% to $-7.53$%, $p<0.05$). CONCLUSIONS: Higher levels of physical activity associated with lower BMI and longer time watching television, school night sleep durations less than 8 hours, and school night sleep durations of 10 hours or more at higher quantiles associated with higher BMIs in adolescents. Estimates of association were more precise within higher percentiles.

1627 Board #221
May 28 10:30 AM - 12:00 PM
Occupational Sitting and Work Engagement Among University Faculty and Staff
Raymond Jones, Daniel P. Credeur, Stephanie M. McCoy. University of Southern Mississippi, Hattiesburg, MS. Email: raymondjones@usm.edu (No relevant relationships reported)

Acute periods of sedentary behavior, particularly uninterrupted sitting, can negatively affect physiological outcomes (e.g., reduction in blood flow, endothelial dysfunction, and arterial stiffness) related to cardiovascular disease development. This is of importance, given that many occupations require employees to sit for extended periods of time (i.e., 6-8 hours). For example, evidence suggests that university employees spend a majority of their time sitting; however, little is known about the relationship between sedentary behavior and work engagement in this population. PURPOSE: To determine the relationship between occupational sitting and work engagement among university employees. METHODS: Participants included 103 university employees (mean age 48.5±10.4 years, 80% female, 77% staff), who completed an online survey based on the Utrecht Work Engagement Survey (UWES) and the Occupational Sitting and Physical Activity Questionnaire (OSPAQ). The UWES assessed elements of work engagement (vigor, absorption, dedication) and workplace well-being. The OSPAQ assessed time spent sitting, standing, walking, and in heavy labor during a typical workday in the previous 7 days. RESULTS: Compared to staff members, faculty members self-reported less time seated during the workday (373.8±109.7 min/day vs. 321.1±97.3 min/day, p=0.03). Elements of work engagement with comorable analysis was significant (vigor: p=0.04; absorption: p=0.68; dedication: p=0.71). After adjusting for covariates, associations of work engagement with occupational sitting were not significant. CONCLUSIONS: These pilot findings suggest that university staff members tend to engage in more occupational sitting compared to faculty members. However, being absorbed and engaged at work is not associated with occupational sitting.

1628 Board #222
May 28 10:30 AM - 12:00 PM
Physical Activity and Bullying in Adolescents With Overweight and Obesity
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Adolescents with overweight and obesity, are more likely that their healthy weight peers to experience bullying behaviors; including, being a bully victim and both a bully perpetrator and victim. However, it is unknown whether engagement in physical activity (PA) is associated with bullying behaviors in this population. PURPOSE: To examine associations between bullying behaviors (perpetrator, victim, both, or neither) and PA. METHODS: Analyses included 9,114 (50% male) adolescents classified as overweight or obese, ages 10-17 years (mean 13.6±2.3 years), from the middle through the early 17th National Survey of Children’s Health. Adolescents were grouped into categories based on PA frequency (≥60 minutes): none, 1-3 days/week, 4-6 days/week, or daily. Outcomes included bullying behaviors: neither perpetrator nor victim of bullying, bully perpetrator, bully victim, or both bully perpetrator and victim. Logistic regression models, adjusted for age, sex, household income, education, and comorbid ADHD assessed the odds of each outcome comparing PA categories. RESULTS: Overall, approximately 13% of adolescents with overweight and obesity engaged in no PA throughout the week, 45% engaged in 1-3 days, 28% engaged in 4-6 days, and 14% engaged in daily PA. Compared to their inactive peers with overweight and obesity, adolescents with overweight and obesity that engaged in PA were less likely to be victims of bullying: 30% less likely for 1-3 days/week, 58% less likely for 4-6 days/week, and 61% less likely for daily PA ($p<0.01$). Further, adolescents who engaged in PA were less likely to be both a bully perpetrator and victim compared to their inactive peers with overweight and obesity. Adolescents who engaged PA were 46%, 65%, and 71% less likely to be both a bully perpetrator and victim for 1-3 days/week, 4-6 days/week, and daily PA, respectively in comparison to their inactive peers ($p<0.05$). CONCLUSIONS: Adolescents with overweight and obesity, who engage in PA, are less likely to experience bullying behaviors than their inactive peers with overweight and obesity. This suggests that PA may be protective against engagement in bullying victimization as well as co-occurring bully perpetration and victimization.

1629 Board #223
May 28 10:30 AM - 12:00 PM
Association Between Chronic Diseases, Sports Participation and Obesity: Findings From a Brazilian Longitudinal Study
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PURPOSE: To analyze the association between leisure-time physical activity (specifically sports participation), obesity and the incidence of chronic diseases among Brazilian adults. METHODS: The sample was composed of 620 adults (166 males and 454 females) aged 50 years or older followed from 2010 to 2014 in the city of Bauru, Sao Paulo, Brazil. Physical activity was assessed using a questionnaire (Beaek et al. Am J Clin Nutr, 1982 [face-to-face interview]) and subjects were stratified according to the engagement in sports in leisure-time (180 minutes/week over the last four months) as: Engaged (n= 99) and Non-engaged (n= 521). Body mass index (kg/m²) was used as diagnosis of obesity (BMI ≥30). Sports participation and obesity were combined and participants were stratified as: Obese/Non-sport (n=300), Obese/Engaged (n= 33), Non-obese/Non-sport (n= 291) and Non-obese/Engaged (n= 66). The incidence of new cases of arterial hypertension, dyslipidemia and diabetes mellitus were verified through medical records. Chi-squared test for linear trend analyzed associations and statistical significance was set as p-value < 0.05. RESULTS: The incidence of arterial hypertension was not associated with the combination of sports participation and obesity (p-value= 0.853). However, the incidence of new cases of dyslipidemia (Obese/Non-engaged [37.8%], Obese/Engaged [30.3%], Non-obese/Non-engaged [27.8%] and Non-obese/Engaged [22.7%]; p-value= 0.004) and diabetes mellitus (Obese/Non-engaged [15.2%], Obese/Engaged [12.1%], Non-obese/Non-engaged [8.6%] and Non-obese/Engaged [6.1%]; p-value=0.006) were associated with the lack of sports participation and obesity. CONCLUSION: There was an association between non-engagement in sports, obesity, and the incidence of dyslipidemia and diabetes mellitus among Brazilian adults. This finding highlight the importance of public health actions promoting healthy behaviors aiming the prevention of chronic diseases, especially in countries with universal health systems. Supported by the Sao Paulo Research Foundation (FAPESP), process number: 2018/01744-7 and CAPES.

1630 Board #224
May 28 10:30 AM - 12:00 PM
Relation Between Physical Activity, Sedentary Behavior and Chronic Disease Risk Factors Using Principal Component Analysis.
Fiona Skelly1, Brona Furlong2, Lisa Loughney2, Noel McCaffrey2, Kieran Dowd2, Leslie Daly2, Catherine Woods3, Andrew McCarren1, Niall Moyna1, 2Dublin City University, Dublin, Ireland. (No relevant relationships reported)

INTRODUCTION: The overall health status of individual’s with chronic disease (CD) is affected by many factors. Physical activity (PA) and sedentary behavior (SB), respectively. The purpose of this study was to examine the relation between PA, SB and selected indices of health in a diverse CD population using a principal component analysis (PCA). METHODS: Participants (n=237, 54.4% female, age (mean±SD) 62±11.1 yr) were recruited at induction to a community-based exercise program for CD. Primary CD included cardiovascular (n=101), respiratory (n=48), cancer (n=80), diabetes (n=34), arthritis (n=26) and unclassified (n=78). Samples were combined and participants were stratified as Obese/Non-sport (n= 300), Obese/Engaged (n= 33), Non-obese/Non-sport (n= 291) and Non-obese/Engaged (n= 66). BMI and waist to hip ratio (WHR) were measured and calculated using standard procedures. Upper and lower body strength, flexibility and cardiorespiratory fitness were assessed using a hand-grip test, sit-to-stand test (STS), sit and reach test (SRT), and 6-min time trial (6MTT), respectively. PA and SB were recorded using an activPAL micro accelerometer. QoL was assessed using the EQ5D V AS and the PHQ8. Fasting serum levels of glucose, triglycerides, HDL-C, LDL-C and CRP were measured. Blood pressure (BP) was measured using a 24-hour ambulatory BP monitor. ActivPAL generated PA and SB variables were analyzed using PCA. General linear models were used to investigate the association between PA and SB and indices of health. RESULTS: PCA analysis of sedentary time, standing time, stepping time,
LIPA, MVPa, step count, sedentary bout lengths and total number of sedentary bouts generated three distinct factor; i) prolonged sedentary behavior (PSB), ii) physical activity (PA), and iii) broken sedentary behavior (BSB). The three derived variables account for 86% of the total variance in PA and SB. There was a significant main effect for PSB on LDL-C ($F(1,189) = 9.06$) and PIQH scores ($F(1,162) = 6.82$). There was a significant main effect for PA on BMI ($F(1,199) = 14.48$), WHR ($F(1,199) = 5.77$), STS ($F(1,222) = 77.08$), 6 MITT ($F(1,222) = 77.08$), EQSD VAS ($F(1,162) = 14.13$), triglycerides ($F(1,188) = 4.95$), CRP ($F(1,155) = 28$), and systolic BP ($F(1,199) = 4.94$). There was a significant main effect for BSBD on HDL cholesterol ($F(1,188) = 6.25$).

**CONCLUSIONS:** The PCA derived factors PSB, PA and BSB are associated with established disease risk factors in patients with CD.

**Purpose:** Craftsmen and workers in the construction industry are at an increased risk of developing knee osteoarthritis due to their work-related burdens. In order to maintain the ability to work, occupational co-operative measures for secondary prevention can be carried out (Kniekolleg). The aim was to evaluate the efficacy after two years, depending on the degree of exercise adherence. **Methods:** In a repeated measurements design (T1 before, T2 after Kniekolleg, T3 one year after (first refresher), T4 after two years (second refresher)), 140 construction patients were assessed for their dynamic muscular strength (knee extension, 60°/s), their quality of life (SF-36) and their characteristics for knee osteoarthritis (WOMAC). They were evaluated using analyses of variances, whereby one group trained after the Kniekolleg in the gym with personal guidance (G1 n=63), one group completed a home training program (G2 n=38) and one group did not train (G3 n=39).

**Results:** For all parameters, significant acute efficacy and 2-year sustainability effects were observed (p<.05, d: 0.2-0.8). There was no interaction with adherence during training after the Kniekolleg (p> 0.05). **Conclusion:** The Kniekolleg has proved to be effective in the long term, with a critical questioning of future research, why there are no differences between guided, reduced or even missing long-term maintenance training.

**CONCLUSIONS:**

**Results:** Overall, a significant acute efficacy and 2-year sustainability effects were observed (p<.05, d: 0.2-0.8). There was no interaction with adherence during training after the Kniekolleg (p> 0.05). **Conclusion:** The Kniekolleg has proved to be effective in the long term, with a critical questioning of future research, why there are no differences between guided, reduced or even missing long-term maintenance training.

**Purpose:** The Kniekolleg has proved to be effective in the long term, with a critical questioning of future research, why there are no differences between guided, reduced or even missing long-term maintenance training.
Goal setting is a common motivational behavior change technique used by individuals trying to increase their current physical activity levels. However, it can be difficult for people to set realistic goals based on their current and past activity experiences. The purpose of this study was to examine if activity status influenced adherence to the 10% step increase recommendation.

METHODS: Adult participants (N=38) enrolled in a four-week walksite walking intervention completed a demographic and stage of change questionnaires. Active (n=14) and inactive (n=24) participants were provided accelerometers for 7 days to obtain baseline average daily step counts. Participants reviewed baseline numbers with a researcher to determine daily step goals for each week of the intervention. First, participants were informed that setting daily goals to increase 10% each week from baseline is recommended for safe and effective step increases. Then participants were able to choose their daily step goals for each week of the intervention. Goals set by participants in Week 1 were used to examine if activity status influenced adherence to the 10% step increase recommendation.

RESULTS: A one-way ANOVA was conducted to compare the effect of activity status on Week 1 goal setting in active and inactive participants. There was a significant effect of activity status on Week 1 goal setting at the p < 0.05 level for the two conditions [F(1, 36) = 4.834, p = 0.034]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for active participants (M = 70.94, SD = 1397.81) was significantly different than active participants (M = -242.59, SD = 1029.58). CONCLUSION: Participants who were currently inactive set their goals higher than the recommended 10% increase from baseline for Week 1 while participants currently active set their goals lower than the recommended goal. Goal setting should be realistic but challenging and activity status may impact a client’s desire to adhere to suggested recommendations. Considering a client’s current physical activity status may be valuable to consider when advising during the goal setting process and can be applied for a beneficial rehabilitation or exercise program.

The population around the world indicates that lack of time is the principal barrier to practice physical activity (PA). This perception is preponderant in undergraduate students (UE). The UE is a population characterized by high levels of psychological stress and low PA levels; these conditions increase the risk to suffer metabolic diseases. The Sprint interval training (SIT) is a training modality that shows an efficient time to modify cardiovascular variables and body composition in healthy, unhealthy population and athletes. However, the impact of SIT on UE is not completely catheterized. Purpose: To characterize the cardiovascular and anthropometric effects of short-term running SIT in UE. Methods: 19 physically active males (UE; age:22 ± 2yrs; weight:67±6.3 kg; height: 1.71±0.07 m) participated in this study. They were randomly assigned to control (CON) (n=9) or to SIT (n=10). After baseline parameters (systolic and diastolic blood pressure -SBP and DBP-, resting heart rate (HR), resting double product (DP) and body composition measurements were obtained, both groups performed a graded exercise test to determine VO_{max} and the running speed associated with their VO_{max} (VO_{smax}). The exercise protocol consisted of 12 sessions (For sessions 1-3, participants ran at 100% VO_{smax} with interval ratios of 1:2 (n=4) and 1:3 (n=5) for each interval. For sessions 4-7, the interval ratio was 2:1 with 4 intervals and finally from the 8 to 12 session, the interval ratio was 2:1 with 5 intervals). Baseline cardiovascular, and body composition were repeated within 2 days post-intervention. Results: Body composition did not change significantly by group or over time. In the SIT group, HR_{smax} was significantly lower after training (p < 0.018). Resting SBP and DP were also decreased in the SIT group compared to CON (p < 0.05). Conclusions: The data presented in the current study indicate that resting hemodynamic variables are improved by short-term run SIT in active males UE. Thus, the running SIT could be an alternative model of training with lower volume of activity for the improvement of cardiovascular health in UE. Further studies are necessary to establish the impact of the gender in response to run SIT.
transformation to units of energy expenditure, and then converted to METs using standard algorithms. A one-sample t-test was used to compare each mean predicted MET value (WU = M1-M7) to the 3.0 MET threshold and a Bonferroni corrected alpha of 0.006 (0.05 overall alpha). RESULTS: Average MET values for the WU (Mean±SE: 4.3±0.06 METs), as well as all seven matches (M1: 4.1±0.09, M2: 4.1±0.07, M3: 4.2±0.09, M4: 4.4±0.10, M5: 3.9±0.12, M6: 3.9±0.14, M7: 4.1±0.10 METs, respectively) exceeded the 3.0 MET threshold (p<0.001). CONCLUSIONS: The results of this study support previous research with moderate walking for 30 minutes of competitive walking football typically meets or exceeds the 3.0 MET threshold for promoting positive changes in both metabolic fitness and cardiovascular health risk. Support provided by Edith Cowen University to the lead author.

1638 Board #232 May 28 10:30 AM - 12:00 PM Chronic Lower Back Pain And Hamstring Flexibility From A Population In Urban Midwestern University Morgan Lange, Ana B. Freire Ribeiro. Augsburg University, Minneapolis, MN. (Sponsor: Dr. Mark Blegen, FACSM)

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(No relevant relationships reported)

Introduction: Chronic lower back pain (CLBP) is defined as pain, muscle tension, or stiffness localized at the lumbar region that persists for 12 weeks or more (Chou, R. 2011). It can be caused by tight hamstrings in both active and inactive people. Studies suggest that stretching the hamstrings improves pain and flexibility in adults (Lee, 2014, Sattar, 2015, Gordon, 2016). It is not known if a flexibility training intervention would have similar effects in faculty, staff, and students in a Midwestern University.

Purpose: To investigate the effects of a 6-week static stretching intervention on perceived pain and sit and reach scores, as surrogate measurements of hamstring flexibility and CLBP risk in faculty, staff, and students at an Urban Midwestern University.

Methods: Participants (n=41) were recruited and consented to participate in this study. Males had an average age of 31 years (n=12, SD=13.8) and females 33 years (n=29, SD=13.4). At the initial visit, flexibility was tested by performing the sit and reach test. Perceived pain was assessed using a pain scale between 1-10. Participants were then taught an at-home hamstring flexibility protocol to complete 3 days a week for 6 weeks. Check-ins for reassessment occurred at 3 and 6 weeks.

Results: Baseline mean score in sit and reach of CLBP group was 28.0 cm (SD=10.1) and control group was 27.3 cm (SD=10.5). At week 3, CLBP scored a mean of 29.3 cm (SD=11.2) and controls scored 26.9 cm (SD=7.5), indicating 8.9% and 5.9% flexibility increase, respectively. At week 6, only 9 individuals from CLBP continued and scored a mean of 32.2 cm (SD=10.8), representing a 6.95% flexibility increase, but it was not significant (p=0.07). Mean baseline pain score for CLBP group was 3.3 (SD=1.2) and for controls was 1 (SD=0.7). At week 3, participants in the CLBP group scored a 3 (SD=1.0) - a 10% reduction in pain - and the controls scored 1 (SD=0.5). At week 6, only 9 individuals from CLBP continued and scored a 1.88 (SD=0.64), representing a decrease in pain by 47%. Changes were not significant (p=0.06).

Conclusion: Following a 6 week stretching protocol, participants in the CLBP group tended to have reduced perceived pain and increased flexibility, as assessed by the sit and reach test, suggesting that static stretching protocols may be an important part of CLBP management.

1639 Board #233 May 28 10:30 AM - 12:00 PM Change In Perceived Barriers To Physical Activity In A Weight Loss Intervention Andrea C. Kozai, Renee J. Rogers, FACSM, Nalingna Yuan, John M. Jakicic, FACSM. University of Pittsburgh, Pittsburgh, PA.

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(No relevant relationships reported)

Physical activity (PA) is an important aspect of behavioral weight loss programs, but the adoption of PA behavior is incumbent on overcoming individual level barriers. It is unclear whether perceptions of barriers change through the course of a behavioral weight loss intervention, or whether the dose of prescribed PA impacts perceived barriers.

Purpose: To investigate the change in perceived PA barriers within a 12-month behavioral weight loss intervention with differing doses of prescribed PA.

Methods: 383 adults with overweight or obesity (age=46.2±7.7 years; BMI=32.1±3.8 kg/m²) were randomly assigned to one of three 12-month intervention groups: Diet alone (DIET, n=127, no prescribed PA); Diet plus Moderate Dose PA (DIET+MOD, n=127, 150 min/week prescribed PA); Diet plus High Dose PA (DIET+HIGH, n=129, 250 min/week prescribed PA). All intervention conditions received the same prescribed diet (1200-1800 kcal/day) and behavioral intervention. Perceived PA barriers were assessed at baseline, 6 months, and 12 months. Barriers were analyzed on a Likert scale (1=strongly disagree; 5=strongly agree) as Total barriers and three subcategories of Time (e.g., too busy), Effort (e.g., lack of motivation), and Obstacles (e.g., family obligations) barriers.

Results: There was significant weight loss in all intervention conditions across the 12-months (DIET=−9.8 kg; DIET+MOD=−10.2 kg; DIET+HIGH=−10.3 kg) (p<0.05). Total barriers to PA decreased significantly across the 12 months (2.67 to 2.44; p<0.0001), with no difference between groups. A similar pattern was observed for obstacle barriers (2.11 to 2.01; p=0.037). Effort barriers decreased significantly across the 12 months (p<0.001), with a Group X Time interaction (p=0.0133) also observed (DIET: 3.04 to 2.76; DIET+MOD: 3.00 to 2.51; DIET+HIGH: 2.97 to 2.32).

Conclusion: Perceived barriers to PA decreased across a 12 month behavioral weight loss intervention, and this was observed regardless of the amount of PA that was prescribed within the intervention. It does not appear that prescribing a higher amount of physical activity within the context of a behavioral intervention negatively impacts perceived barriers to PA participation. However, time barriers appear to persist, which may have implications for interventions to promote PA in adults with obesity.

1640 Board #234 May 28 10:30 AM - 12:00 PM Interaction Effect Of Smoking And Physical Activity On Cardiopulmonary Endurance In Male Adults Wang Yan¹, Shui Rui Xiangⁱ, Xu Shou Sheng¹, Wang Zheng Zhen¹. ¹Beijing Sport University, Beijing, China. ²Kunshan Experimental Primary School, Kunshan, China. (Sponsor: Zhengzhen Wang, FACSM)

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(No relevant relationships reported)

Cardiopulmonary endurance was a crucial part of health in people. The physical activity benefited the cardiopulmonary endurance, while both active smoking and passive smoking made it decrease. PURPOSE: To determine whether there existed the interaction effects between cigarettes smoking and physical activity on cardiopulmonary endurance.

METHODS: 420 male adults were recruited in Beijing and Hezhou,Guangxi. The investigation on cigarette smoking and physical activity were carried out by the international PA questionnaire and the health P.E. questionnaire, according to the smoke, all the subjects were divided into two main groups(CS group and nCS group), and then each main group were further divided into three sub-groups(CS group and nCS group of each intervention group) depending on their individual daily light, moderate or heavy physical activity. The subjects numbers of each group(CS group and nCS group) in turn were 45, 69, 74, 38, 92, 102 respectively. The peak VO₂ max were measured by GXT protocol on cycle ergometer.

RESULTS: (1)Cardiopulmonary endurance of the smokers were lower than that of the nonsmokers significantly(25.9±6.11ml/kg/min VS 27.7±7.17ml/kg/min,P=0.003),and smoke index(Number of daily smoking multiply years of smoking) had negative relative with cardiopulmonary endurance(r=-0.395,p<0.01).The study found that the higher smoke index led to the lower cardiopulmonary endurance in men. (3)Cardiopulmonary endurance of the smokers showed significantly different with nCS group or CS group(p<0.05).But statistical difference were not found between nCS group and CS group(p>0.05) (4)Smoking and physical activity showed no interaction effect on cardiopulmonary endurance(p>0.05).

CONCLUSIONS: (1)The cardiopulmonary endurance of the male adults who smoke cigarettes were lower than that of nonsmokers. (2)The high level of physical activity displayed greater effect on cardiopulmonary endurance.(3)The interaction effects were not found between smoke cigarettes and physical activity on the cardiopulmonary endurance in this study.Acknowledgements:National Key Research and Development Program (2016YFC1300202).

1641 Board #235 May 28 10:30 AM - 12:00 PM Effect Of Post-meal Individualized Exercise Training On Postprandial Glycerinaemia In Insufficiently Active Overweight/Obese Young Males Xiaoyuan Zhang, Sinead Sheridan, Waris Wongpitip, Stephen H.S. Wong, FACSM. The Chinese University of Hong Kong, Hong Kong. (Sponsor: Zhengzhen Wang, FACSM)

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(No relevant relationships reported)

Postprandial glucose (PPG) elevation is a risk factor for cardiovascular disease and mortality. An acute bout of post-meal exercise effectively lowers PPG. However, the optimal timing for the initiation of post-meal exercise remains to be elucidated. Since there is great inter-individual variability in the PPG response, the optimal timing for the initiation of exercise to lower PPG should be personalized. PURPOSE: To investigate the effect of post-meal individualized exercise timing on PPG in overweight/obese young males.

METHODS: Fifteen males (age: 23.2±4.0 years; body mass index: 27.0±2.4 kg/m²) completed three 4-hour trials in a randomized order: 1) SIT: Sitting for 4 hours; 2) 20iP: Walking initiated at 20 minutes prior to individual PPG peak time, with each trial separated by 6-14 days. Walking was performed at 50% VO₂ max for 30 minutes in iP and 20iP trials. PPG peak time was determined by continuous glucose monitoring.
Low cardiorespiratory fitness (CRF) is an important risk factor for cardiometabolic disease and individuals with prediabetes tend to have low CRF. Trials that have compared High-Intensity Interval Training (HIIT) to Moderate-Intensity Continuous Training (MICT) by imposing group-randomized trials to HIIT or MICT have established that HIIT is effective for improving CRF. However, to maintain these improvements, individuals need to adhere to HIIT. Self-determination theory states that providing choice has a positive impact on exercise adherence. PURPOSE: To address whether having the choice to engage in HIIT or MICT for 6 months (CHOICE) leads to greater changes in CRF (absolute and relative VO2peak) at 6 months when compared to MICT (IM-MICT). METHODS: In this single-site randomized trial, 68 low-active adults (56.8±6.6yrs, mean±SD) living with prediabetes were randomized to CHOICE (n=24), IM-HIIT (n=21), or IM-MICT (n=23). After an initial supervised training period (6 sessions over 3 weeks) participants exercised unsupervised on their own in free-living conditions for 6 months. A ramp increase cycle ergometer test to exhaustion was conducted by the same technician pre- and post-testing to determine VO2 peak. Missing data was accounted for using linear interpolations generated with SPSS® v.20.0. RESULTS: ANCOVA results with baseline CRF as a covariate revealed no significant differences between increases in absolute VO2peak (CHOICE: 0.38, 95% CI: 0.20; 0.55, vs. IM-HIIT: 0.56, 95% CI: 0.37, 0.74 vs. IM-MICT: 0.30, 95% CI: 0.12, 0.48 L/min, F2,67=1.99, P>0.1), with similar findings for relative VO2peak (CHOICE: -0.32, 95% CI: -0.56, to -0.08, vs. IM-MICT: -0.30, 95% CI: -0.51, to -0.09). Within group changes over time indicated small effect sizes (Hedges’ g) for increases in absolute (CHOICE: 0.00; HIIT = 0.26; and MICT=0.01) and relative VO2peak over time (CHOICE: -0.11; HIIT = 0.33; and MICT=0.15). CONCLUSION: Changes in CRF between groups were not significantly different at 6-months post-intervention. Providing choice for selecting HIIT or MICT did not appear to enhance the benefits of exercise for improving fitness in low active adults. Supported by the Research Endowment from the American College of Sports Medicine Foundation.

Participation in physical activity (PA) in the US is low, as less than 50% of adults achieve at least 150 min/wk of moderate-intensity continuous training (MICT) or 75% of vigorous-intensity exercise (CDC, 2017). Low participation in PA is a problem because inactivity is one of the leading causes of premature mortality (Mokdad et al., 2004). The current recommendations including high volume MICT and resistance training require about 4 h/wk which is unrealistic for adults, as “lack of time” is cited as the primary reason for low PA (Trost et al., 2002). REHIT is a form of sprint interval training that requires only 10 minutes per session and elicits similar health related adaptations as chronic MICT (Cuddy et al., 2019). However, there are concerns that it may be too aversive (Ekkekakis et al., 2011). PURPOSE: To compare changes in affective valence and enjoyment to a single session of REHIT in adults with varying fitness levels. METHODS: 85 healthy non-obese subjects participated in the study. Baseline testing consisted of incremental cycling to VO2max during which participants were familiarized with reporting Rating of Perceived Exertion (RPE) and affective valence. The VO2max results were used to group subjects into above and below average cardiorespiratory fitness (CRF). Subsequently, they completed a REHIT session consisting of two 20-second sprints interspersed with 3 minutes of active recovery. During the session, heart rate (HR), RPE, affective valence, blood lactate concentration (BLA), and enjoyment were assessed. RESULTS: RPE increased and was highest after sprint 2 (p < 0.01), but BLA was not significantly different across groups. CONCLUSION: Findings suggested small-group exergaming offered less time in sedentary behavior, but had greater time in MVPA, greater steps, and greater enjoyment compared to exergaming, suggesting small-group exergaming to be ideal for promoting enjoyable exercise at higher intensities and lower sedentary time in urban adolescents.
Each participant completed sessions of either an accumulation of 45 min at 80 %HR max. Study participants who were familiar with the modality, in standard cardiac rehabilitation care.

Engagement in exercise-based cardiac rehabilitation following cardiac procedures reduces the risk of secondary coronary artery disease (CAD) events. Interval training can be a time-efficient and effective alternative to traditional moderate-intensity exercise in cardiac rehabilitation programming, and an accessible way to deliver interval training is through stair climbing. PURPOSE: To assess the feasibility and effectiveness of high-intensity interval training intervention, using stair climbing as the modality, in standard cardiac rehabilitation care. METHODS: Twenty participants with CAD (61±7 y, 18M/2W) were randomly assigned to one of two exercise programs: traditional moderate-intensity exercise (TRAD) or high-intensity interval stair climbing (STAIR). VO2peak was assessed at baseline, one month and three months after exercise initiation. Exercise was completed two times/week for one month under clinical supervision, and three times/week for two months unsupervised. Each participant completed sessions of either an accumulation of 45 min at 80 %HR max (TRAD) or 3 bouts of 6 flights of 12 stairs at a self-selected vigorous intensity (~90% of HRmax) separated by recovery periods of walking (~90%) (STAIR). RESULTS: Eighteen participants (90%) completed the intervention without any adverse events. Following one month of supervised exercise, the STAIR versus TRAD group achieved a higher peak HR 131±9 vs. 111±13 bpm (p=0.002, means±SD), and exercise intensity 106±11 vs.89±15%HRmax across a shorter time 3±1.0 vs. 8±6.7±1.5 min (p<0.001). Peak VO2 increased in both TRAD and STAIR, (23.3±25.4 and 21±25 to 24±6 mL/kg/min) respectively. Additional unsupervised training (2mo), the STAIR group achieved a higher peak HR, 126±13 vs 111±19 bpm (p=0.018) and less time at prescribed intensity 6±5.3 vs. 9±24.2±17 min (p=0.012), when compared to the TRAD group. There was no difference in exercise intensity 96±8 vs. 87±8 %HRmax (p=0.055) or adherence 3.0±3.2 vs 3.2±2.2 (p=0.70) exercise sessions/week, between the STAIR and TRAD groups. CONCLUSIONS: High-intensity interval training using stair climbing as the modality, is safe and effective within cardiac rehabilitation programming.

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were completed. Results showed a significant main effect of training for VO₂ max in C and H (30 ± 3.7 to 33.6 ± 3.9 mL/kg/min and 30.1 ± 2.6 to 32.4 ± 1.8 mL/kg/min, F = 11.6, p = 0.004), but there was no group by training interaction (p = 0.69). Significant increases were also exhibited in PPO (p < 0.001), SV (p = 0.02), and CO (p = 0.018), but there was no group by training interaction for any variable (p = 0.13 - 0.66). Physical activity did not change during the study (p = 0.33) and there was no group by training interaction (p = 0.60). CONCLUSION: Our data show no effect of ethnicity on the outcomes and hypothesized to HITL, although longer studies in similar populations are needed to verify this result.

1650 Board #244 May 28 10:30 AM - 12:00 PM
Can Financial Incentives Promote Exercise Adherence Amongst Cardiac Rehabilitation Graduates? A 24-week Pilot Randomized Controlled Trial
Madison S. Hiestra1, Sean K. Spilsbury1, Marc S. Mitchell1, Paul Oh2. 1Western University, London, ON, Canada. 2University Health Network, Toronto, ON, Canada. (Sponsor: Dr. Michelle Mottola, FACSOM)
(No relevant relationships reported)

The health benefits of cardiac rehabilitation (CR) and sustained physical activity (PA) post-CR are well known; yet, CR graduates often fail to adhere to their exercise prescriptions post-program. Financial incentives have shown promise in increasing PA in adults but have been rarely evaluated in a CR context. PURPOSE: To examine the impact of adding financial incentives to a multi-component eHealth (MCE) intervention on moderate-vigorous physical activity (MVPA) amongst CR graduates. Second, to determine whether financial incentives increased eHealth platform engagement compared to non-incentive controls. METHODS: In this 24-week pilot randomized controlled trial participants were recruited from a large outpatient CR program and randomized to control (CT) or intervention (FI) conditions. CTs were instructed to track their exercise daily using a MCE website that included self-monitoring, individual and group-level feedback, and virtual (non-monetary) rewards for exercise session completion. Only FIs could earn $1.00 CAD per day when exercise was tracked and completed. Group differences in MVPA minutes per day (min/d) during the final intervention month were made using a one-way ANOVA. Participants with five or more ‘valid’ days during the final month (days with objectively measured step counts between 500 and 40000) were included in the analysis. RESULTS: Seventy-four CR graduates (63% male; mean age 69±11 years) were randomized to CT (n=38) or FI (n=36) groups, and 34 participants (15/38 CT, 19/36 FI) had at least five valid days (mean 19.7±6.4 days). No significant group difference in mean MVPA min/d in the final intervention month was observed (CT: 21.90±18.56; FI: 27.18±15.52; p=0.41), nor between the mean number of eHealth website logins over the six month intervention (CT: 101.2±129.5; FI: 109.7±91.5; p=0.75). CONCLUSION: While this pilot trial was not powered to detect group differences, our initial results suggest that adding modest financial incentives (1$ per day) to a MCE intervention may not boost engagement (a main driver of eHealth program effectiveness), nor MVPA in a sample of Canadian CR graduates. However, higher study retention, mean MVPA min/d, and total logins in the FI compared to the CT shows intervention promise. These data will inform the design of a fully powered program effectiveness), nor MVPA in a sample of Canadian CR graduates. However, higher study retention, mean MVPA min/d, and total logins in the FI compared to the CT shows intervention promise. 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1651 Board #245 May 28 10:30 AM - 12:00 PM
Psychosocial Effects Of A Community-Based And Mentored Mountain Biking Group In Adolescents
Dana L. Bolduc1, Erich Petushek2, Connor Ryan2, Phil Watts, FACSM1. 1Northern Michigan University, Marquette, MI. 2Arkansas State University - Mountain Home, Mountain Home, AR (Sponsor: Phil Watts, FACSM)
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(No relevant relationships reported)

Besides physical activity promotion, an adult mentored mountain bike program in at-risk youth has the potential to create positive role models and peer relationships. Further, the augmentation of group cohesionness and enhanced individual self-esteem may be invoked. PURPOSE: To determine the effects of a mentored adolescent mountain biking group on self-esteem (SE), depression (DEP), and social connectedness (SC) from pre- to post-program. METHODS: Participants included (mean ± SD) new members (NM, n = 15, age = 13.6 ± 1.8 years), returning members (RM, n = 15, age = 15.9 ± 2.3 years), and combining members (CM, n = 30, age = 14.7 ± 2.4 years) in the Start the Cycle (STC), non-profit youth cycling program. Free mountain bikes were provided to participants by STC with a promise of ownership if the full program was completed. Participants met 16-wks, 1 x week, and 2-hrs/day starting late spring and into late summer. Indoor physical conditioning and bike maintenance classes were implemented, and participants, group rides occurring the last 12-wks. Surveys were completed pre- and post- intervention following the indoor training sessions (i.e., after 4-wks) and immediately prior to a final, 28-mile organized bike race. Data was analyzed using paired t-tests with significance set at P < 0.05. RESULTS: Significant differences were found from pre- to post-program (mean ± SD) in SE and DEP scores, respectively, in the NM group (29.44 ± 5.13 vs. 33.33 ± 4.74, P = 0.043 and 4.30 ± 2.87 vs. 2.20 ± 2.20, P = 0.040). No significance (P > 0.05) occurred in NM for SE from pre- to post-program were observed for CM. Lastly, composite scores were compiled for the included three surveys, pre- to post-program, respectively, significant differences for DEP (2.75 ± 2.79 vs. 1.71 ± 1.94, P = 0.029) and SC (39.35 ± 10.12 vs. 42.74 ± 8.09, P = 0.041). No significant results (P > 0.05) were seen from pre- to post-program for DEP and CM. Therefore, our findings suggest that adding a financial incentive to the mentored mountain bike program is beneficial, demonstrating a positive effect on SE, but further investigation is needed to examine the extent of the improvements observed. CONCLUSION: Our findings add to the growing evidence that physical activity programs can play a vital role in improving the psychosocial well-being of at-risk youth. Future research should focus on the long-term effects of such programs and the potential for generalization to other populations in need.
High-intensity interval training (HIIT) has been proposed as a time-efficient exercise protocol to improve metabolic health. However, its combined training effects with traditional moderate-intensity continuous exercise (MICE) remains unclear.

**PURPOSE:** This study evaluated the effects of 16-week MICE-HIIT combined training on cardio-metabolic and psychological responses in physically inactive middle-aged males.

**METHODS:** Forty participants (mean age: 40.2 ± 5.3 years) were randomly assigned to four groups: HIIT (12 x 1-min run at 80-90% HRmax interspersed with 1-min active rest), MICE (40-min brisk walk at 65-75% HRmax), combined (COMB) (alternate between HIIT and MICE) or control (CON). Exercise sessions were conducted three times per week for 16 weeks using independent living conditions. Cardiovascular fitness, blood pressure, percentage body fat (%BF), waist circumference, lipid profile, glucose and insulin sensitivity were assessed at baseline and after the 16-week intervention. Enjoyment and self-efficacy were also assessed at the end of intervention.

**RESULTS:** All exercise groups showed substantial (~15%) and similar increases in VO2max (HIIT: 34.3 ± 4.4 to 39.1 ± 5.4; MICE: 34.9 ± 5.0 to 39.4 ± 7.2; COMB: 34.4 ± 5.0 to 40.3 ± 4.6 mL kg⁻¹ min⁻¹, p < 0.05) compared to CON over the 16-week intervention. There was a similar reduction in weight, BMI, %BF and waist circumference in all groups compared to CON (p < 0.05). Compared to baseline, total cholesterol and LDL cholesterol decreased only following COMB intervention whereas the increase in HbA1c level significantly increased and insulin sensitivity improved in the HIIT group. Enjoyment, self-efficacy and adherence were similar among all exercise groups.

**CONCLUSION:** These findings suggested that combined MICE-HIIT training can elicit comparable improvements in cardiovascular fitness and adherence under free living conditions as performing HIIT and MICE alone in physically inactive middle-aged males, serving as an alternative exercise strategy for health promotion.

**REFERENCES:**

1. **INTRODUCTION:** Previous studies suggest that youth may follow temporal patterns of physical activity (PA). Research has provided evidence for both the compensatory and synergistic effects of PA among youth. It is unclear, however, how the presence of a PA intervention may play a role in children’s normal patterns of physical activity.

**PURPOSE:** To determine if the Girls on the Move intervention influenced the proportion of girls obtaining various levels of PA across a 9-month follow-up.

**METHODS:** Participants (n = 63) were divided into an intervention group and a control group. Intervention sessions were conducted twice a week for 16 weeks. Measures of MVPA were collected using accelerometers (ActiGraph GT3X+) for 14 days before and after intervention. Accelerometer data were downloaded and analyzed using ActiLife software.

**RESULTS:** The intervention group significantly increased the proportion of girls who achieved higher levels of MVPA after the intervention (p = 0.001). The greatest difference was seen in the proportion of girls obtaining MVPA at or above the 50th percentile before (52%) and after (75%) the intervention.

**CONCLUSION:** These results suggest that an after-school PA intervention may be effective in increasing girls’ PA after school even after the completion of the intervention.
intervention. This study may inform future PA interventions to examine changes to temporal patterns (e.g. how much PA youth are getting during specific times of the day) in addition to total overall PA.

1658  Board #252 May 28 10:30 AM - 12:00 PM Socioeconomic Status And The Quality And Accessibility Of Community Health Resources Maggie Babcock, Eric Medenblik, Savanna Chriscos, Christina Johnson. Cornell College, Mount Vernon, IA.

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(No relevant relationships reported)

Health is multidimensional and can include aspects of physical, social, emotional, and spiritual wellness. Social Ecological Models (Sallis et al., 2012; Van Dyck, et al., 2010) suggest that health behaviors are influenced by community resources and built and natural environments. Inequalities exist in access to and quality of resources across socioeconomic status and other social strata, which, in turn, impact health behaviors (Byrne, 2012; Gordon-Larsen, et al., 2006). PURPOSE: To demonstrate differences in quality and accessibility of community health resources across neighborhoods of varying levels of household income in both rural and urban communities. METHODS: The Community Health Resources Checklist (CHRC) was used as a guide to structure observations of parks, trails, grocery stores, clinics, banks, and other health resources that represented various dimensions of health (physical, emotional, social, spiritual). Resources (rural n=27; urban n=51) in Iowa communities (2 rural; 1 urban) were evaluated, mapped, and displayed with respect to the household income to create a graphical representation of community resource quality between and within high-income and low-income neighborhoods in both rural and urban settings. RESULTS: Mapping analysis demonstrated less access to high-quality health resources in both income and low-income neighborhoods in both rural and urban settings. RESULTS: evaluated, mapped, and overlayed with neighborhood household income to create that represented various dimensions of health (physical, emotional, social, spiritual). Observations of parks, trails, grocery stores, clinics, banks, and other health resources that represented various dimensions of health (physical, emotional, social, spiritual). Resources (rural n=27; urban n=51) in Iowa communities (2 rural; 1 urban) were evaluated, mapped, and displayed with respect to the household income to create a graphical representation of community resource quality between and within high-income and low-income neighborhoods in both rural and urban settings. RESULTS: Mapping analysis demonstrated less access to high-quality health resources in both income and low-income neighborhoods in both rural and urban settings. CONCLUSIONS: This preliminary study examined community health resources representing multiple dimensions of health and demonstrated notable disparities across household income in rural and urban communities. These disparities should be addressed through targeted, focused health promotion interventions.

C-44 Free Communication/Poster - Physical Activity Interventions II Thursday, May 28, 2020, 9:30 AM - 12:00 PM Room: CC-Exhibit Hall

1659  Board #253 May 28 10:30 AM - 12:00 PM High-Intensity Interval Low-Volume Vs Moderate-Intensity Continuous Training On Exercise Enjoyment And Quality-of-life In Metabolic Syndrome Jorge L. Petro1, Laura Pérez1, Daniel Restrepo1, Daniel Aguirre-Acavedo1, Camila Trillos1, Manuela Yepes-Calderón1, Luis Valbuena2, Yeliana L. Sánchez1, Juan C. Aristizábal1, Raul Narvaez-Sánchez2, Juan C. Calderón1, Jaime Gallo-Villegas1, 1University of Antioquia, Medellín, Colombia. 2Indeporntes Antioquia, Medellin, Colombia.

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(No relevant relationships reported)

Exercise improves quality of life in patients with metabolic syndrome (MS). However, some people may not benefit because do not to meet the recommended amounts of exercise. The most argued reasons for not doing PA is lack of time and poor enjoyment. PURPOSE: to evaluate the efficacy of high-intensity interval training low-volume (HIIT-low volume) compared to moderate intensity continuous aerobic training (MICAT) on exercise enjoyment and quality of life in adults with MS. METHODS: a controlled, randomized, clinical trial using the minimization method, with two parallel groups for the purpose of showing superiority. Sixty patients with MS, of both genders, 40-60 years old, were included. A clinical evaluation, biochemical tests, Physical Activity Enjoyment Scale test for enjoyment (PACES), and Medical Outcomes Study Questionnaire Short Form 36 Health Survey version 2 (SF-36v2) test for quality of life were carried out, before and after a treadmill exercise program of 12 weeks, 3 sessions/week. Participants assigned to the intervention (n=29) received HIIT-low volume in 22 min sessions that included six intervals at a load of 90% of maximum oxygen consumption (VO2max) for 1 min followed by 2 min at 50% of VO2max. The control group (n=31) received MICAT at an intensity of 60% of VO2max for 36 min. RESULTS: patients had a mean age of 50.8±6.0 years, body mass index of 30.6±4.0 kg.m-2, body fat percentage of 38.7±7.0% and VO2max of 29.0±6.3 mL O2 .kg-1.min-1; 70% were women. Compared to MICAT, HIIT-low volume was not superior in increasing Ln of PACES test score (marginal mean difference: 0.041 [95% CI: 0.015–0.068]; Cohen’s d: 0.032; (-0.043 [-0.095–0.008]; Cohen’s d: -0.438; p<0.101) and mental components (0.043 [-0.027–0.115]; Cohen’s d: 0.325; p=0.220) of SF-36v2. When comparing before and after the intervention, both training groups increased physical component of SF-36v2 (Glass’ Δ: 0.41 to 0.43) but only HIIT-low volume increased PACES test score (Glass’ Δ: 0.30) and mental component of SF-36v2 (Glass’ Δ: 0.64). CONCLUSION: HIIT- low volume, compared to MICAT, is not superior in increasing exercise enjoyment and quality of life in adults with MS. Supported by Colciencias 111562638757. Interinstitutional 2016-13041. Colciencias Doctoral scholarships 727-2015.

The life quality, namely among aged population, has been widely studied. Observational data on behavioral context, especially regarding physical activity epidemiology, has shown efficiency in improving physical fitness with an impact on the dimensions of well-being. However, little research has been made regarding the impact of intervention on cardiorespiratory, strength, agility and quality of life, across different European contexts. PURPOSE: we aimed to investigate the impact of exercise intervention on life quality, among elderly from 4 different European countries [Portugal (PT), Italy (IT), Bulgaria (BL) and Hungary (HU)]. METHODS: 364 (87 PT, 121 IT, 76 BL and 80 HU) older adults (68.0±6.3 yrs, 73.6±12.7 Kg, 1.61±0.08 m), male (26%) and female (74%), were recruited from local populations. Intervention program was based on 2 sessions/week (90 minutes each), supported on aerobic activities (40min), muscle strength (20min), body balance (10min), technical skill (10min) and stretching specific exercises (10 min). Pre (baseline assessment) and post one year intervention assessments were done on anthropometric measures, senior Fitness Test and EQ-SD-5L questionnaire, applied by trained technicians. ANOVA was performed to describe country’s group differences and the adaptations observed among different determinants, in pre and post intervention. When a significant effect was detected post-hoc comparisons were performed with Bonferroni adjustment to identify the locations of the difference. Significance was set at p<0.05. Results: The effect of the time (one year intervention) were found to be significant, indicating changes on health determinants (hip-to-waist ratio, F = 13.895, p< 0.001; chair to stand, F = 20.314, p< 0.001; and handgrip muscle force, F = 21.023, p< 0.001), in all groups. However, Post-hoc analysis with Bonferroni adjustment indicated that the difference over the time were similar between groups as time maintenance was sustained. Conclusions: Context, country environment, seems have not influence on intervention output. Rather than country or geographical location, the intervention features may be the most important factor in increasing health status, by the association with health determinants.

1661  Board #255 May 28 10:30 AM - 12:00 PM Effect Of A Personalized Community-based Exercise Program On Metabolic Syndrome Risk Factors Sophie Seward, Mackenzie Kehmneier, Lance Dalleck. Western Colorado University, Gunnison, CO.

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(No relevant relationships reported)

Community exercise programs have been used to increase physical activity and reduce cardiovascular risks. PURPOSE: To investigate the effectiveness of a personalized community-based exercise program based on intensities personalized to individual ventilatory thresholds (VT) on decreasing metabolic syndrome (Mets) risk factors. METHODS: One hundred and fifty inactive community members were physician referred to a 12-week community exercise program between June 2016 and May 2019. Participants were separated into two groups: non-exercise control (age: M= 43.6±2.5 yrs) and exercise intervention (age: M= 46.6, SD= 16.7 yrs) prescribed via VT1 and VT2, exercising three times per week. VT1 and VT2 measurements were significant by performing treadmill talk tests. MetS risk factors, abdominal obesity as measured by waist circumference (WC), hypertriglyceridemia, low HDL-C, hypertension as measured by systolic blood pressure (SBP) and diastolic blood pressure (DBP), and fasting blood glucose (BG), were analyzed retrospectively using MetS z-score. Paired and independent sample t-tests were used to compare within-group changes from pre-to post-intervention and between-group changes for all outcomes measures, respectively. Significance was set at p<0.05. RESULTS: The non-exercise group experienced unchanged WC, triglycerides, and BG and had a statistically significant worsening in HDL-C (M±SD) (pre: 50.7± 18.2, post: 49.4± 16.5), SBP (pre: 119.0± 7.4, post: 121.3± 8.0). Abstracts were prepared by the authors and printed as submitted.
1662 Board #256 May 28 10:30 AM - 12:00 PM
Estimated Versus Calculated Time from Home To Squares/parks, in Three Different Socioeconomic Status Neighborhoods
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PURPOSE: Purpose of the research is to determine the influence of the public space near the home and the places for leisure time on the PA participation of people living in three different SES contexts.

Methods: Sample consisted of 296 individuals (18-70 years old) from 3 neighborhoods of low, medium and high socioeconomic status (SES) in a South American metropolitan city. The distance from home to the nearest square or park was calculated in meters and walking minutes using GoogleMaps and compared with the estimated time reported by the participants. Data were compared using Kruskal Wallis test, alpha 5%.

Results: The median age was 49 years, 47.8% recognize public space as a place to practice leisure time PA. The estimated time was greater than the calculated with a difference P50 = 5 (P25 = 3; P75 = 13) minutes. This difference was greater in the low SES neighborhood P90 = 3 (P25 = 19) minutes and in the groups of 30-44 P50 = 8 (P25 = 16; P75 = 16) and 65-80 years P50 = 19 (P25 = 16). Those who recognized public space as a place to perform PA had a lower overestimation of distance than those who didn’t. P50 = 4 vs P50 = 9 min (p<0.05).

Conclusion: There was an overestimation of the home - park/square walking time distance. The magnitude of overestimation was related to SES and subjects age. Recognizing public spaces as a place to do leisure time PA reduced bias. This should be considered in programs aimed to promote physical activity.

Key Words: Physical activity, public space, urban interventions, distance.

1663 Board #257 May 28 10:30 AM - 12:00 PM
Effect Of Aerobic Exercise On The Learning And Memorizing Abilities And Hippocampal Vegf In Depressive Rats
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PURPOSE: Depression model building in rats on 4 weeks of CUMS (Chronic Unpredictable Mild Stress) and the investigation of the effect of aerobic exercise intervention on hippocampal VEGF expression and spatial learning and memorizing ability in depressive model rats.

METHODS: 30 male SD rats randomly divided into 3 groups: the Control group (C), the Model group (M), and the Exercise group (E). M and E were subjected to CUMS stimulation and aerobic exercise for 4 weeks respectively. E received swimming training for 4 weeks (60 min/day, 6 days/week). SPT was used to test rats’ sucrose preference and detect the success of model. MWZ was performed to evaluate their spatial learning and memorizing ability. The expression of VEGF was tested by RT-PCR. The percentage of moving time was calculated using video tracking software.

Results: The depressive rats (M: 36.67±10.61; E: 36.00±16.43) showed depressive behaviors in rats pretreated by CUMS stimulation. In addition, aerobic exercise can rescue and significantly up-regulate the expression of VEGF in hippocampus which suppressed by CUMS stimulation. The correlation between the VEGF expression level and depressive behaviors in rats suggests that the enhanced expression of VEGF in hippocampus might be one of the neurobiological mechanisms mediating the effects of aerobic exercise on depression and spatial learning and memorizing ability.

PURPOSE: A defined environment is typical for long-term expeditions, i.e. Antarctica and Space. During a 4 months international Space mission simulation in the SIRIUS habitat in Moscow, the influence of isolation and different endurance exercise trainings (continuous/interval exercise) on cardiovascular functions were studied. This study analyzed the focus on pulmonary oxygen uptake (VO₂) and heart rate (HR) regulations and steady states.

Method: Six healthy individuals (3 males, 35±6 y, 22±1 kg m⁻²) received continuous and interval treadmill training (4 wk each in a cross-over design). 7 exercise tests were performed: Before (PRE), after 1 wk of isolation (IN1), after 2, 4 wk of training (CON1/2, INT1/2) and 1 wk after isolation (POST). The protocol on a treadmill consisted of 300 m at speeds (3, 6, 9 km/h) and pseudo-random changes of speed (3.6 km/h). HR and VO₂, kinetics responses were assessed by cross correlation functions (CCF) of speed vs. the respective parameter (Hoffmann et al., 2020).

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(No relevant relationships reported)

1664 Board #258 May 28 10:30 AM - 12:00 PM
Influence Of Affective Valence And High Intensity Intervention On Exercise Engagement
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PURPOSE: The pre-intervention period consisted of significant decrease in sedentary to 61.4±5.2% (p<0.001) while MVPA significantly increased to 79.2±4.9% (p<0.001) during the intervention period. The high-intensity exercise intervention elicited only a minimal decrease in exercise enjoyment during the session which allowed participants to maintain overall positive affective valence. This potentially influenced the decrease in sedentary behavior and increased MVPA. These results indicate recreational exercisers may misinterpret exercise intensity. To reduce this misinterpretation, it may prove beneficial for practitioners to further explain and demonstrate activities categorized as different intensities.

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(No relevant relationships reported)
Results: Regarding V\textsubscript{O2}, no effects of MD were found for kinetics but for steady states. HR was significantly influenced by MD for both, kinetics (see Fig.) and steady states. The detailed analysis revealed differences for PRE/IN1 compared to the other days. No significant differences were found between INT and CON. HR steady states decreased during the mission (e.g. CON2:9 km h\textsuperscript{-1}: 120±11 bpm) compared to PRE/POST values (e.g. PRE/POST 9 km h\textsuperscript{-1}: 142±11 bpm/ 132±9 bpm). CONCLUSIONS: The specific environment and controlled daily routines influence V\textsubscript{O2} and HR during exercise. Endurance exercise training during 4 months of confinement prevent or even improve HR regulations. These data are in line with findings from other simulation studies.

Sensorimotor control exercises (SCE) increase trunk stability by enhancing neuromuscular activity and strength, perhaps preventing low back pain (LBP). A trunk-specific intervention based on 4 exercises improved trunk stability, however a reduced set of 1 exercise may have similar effects and increase compliance concurrently.

Purpose: To assess the response of a standard training (SG) and a low volume set of sensorimotor control exercises (EG) on trunk function and compliance.

Methods: 29 healthy subjects were randomly allocated to SG (n=15) or EG (n=14). A trunk-specific SCE protocol (3 weeks) was completed which differed in training volume (SG: 4 exercises; EG: 1 exercise). Training intensities were identical (1 familiarization session/ 6 home-based sessions; 3 sets; 10 repetitions). Pre-post intervention (MI; M2) isokinetic mean peak torque was measured for trunk extension (30°/s) and rightward rotation (30°/s) in concentric (CON), eccentric (ECC) and perturbed eccentric (PECC) mode. During testing neuromuscular activity of Mm. erector spinae, lattissimus dorsi, external/external obliques and rectus abdominis were recorded by sEMG and summarized subsequently: dorso left (DL), dorso right (DR), ventral right (VR) and ventral left (VL). Mean peak torque was normalized to body weight (Nm/kg), EMG data was normalized to concentric MVC (%). Compliance was assessed using a training diary (sessions per week). Data was analysed descriptively (mean\pmSD) and by using a repeated measures ANOVA (α = .05).

Results: Mean peak torque in CON/ECC extension and rotation showed no group differences. During PECC rotation, SG (M1: 2.3±0.3, M2: 2.5±0.2) showed a significant larger increase of mean peak torque compared to EG (M1: 2.5±0.3, M2: 2.7±0.3) (p=.035). Both groups showed a significant increase in EMG activity of DR muscles for unperturbed ECC rotation (SG M1: 93±18, M2: 118±19; EG M1: 83±9, M2: 103±14) (p=.010) muscle activity improved significantly during ECC rotation. Overall compliance was 76±3 (SG) and 72±2 (EG) sessions.

Conclusion: Both protocols enhanced trunk function in terms of neuromuscular activity and mean peak torque in trunk rotation. LBP patients might benefit from a low volume approach due to improved time-efficiency.

Exergames are videogames that require physical movement or exertion from the user. Exergames have been suggested to be a motivating alternative to increase physical activity for adults not engaged in traditional exercise. However, limited high-quality data is supporting the long-term effectiveness of exergames for improving health outcomes.

Purpose: To determine if sedentary adults access to a high-intensity exergame could improve cardiometabolic health.

Methods: This was a randomized controlled trial in which 52 inactive but otherwise healthy adults were randomly allocated to either an exergaming (EXG; n=25) or control (CON; n=27) group. Participants in EXG got free, unlimited access to the Playpuzzles exergaming platform for six months, whereas participants in CON continued with their normal daily routine. We measured maximum oxygen uptake (V\textsubscript{O2max}), blood glucose response to a 2-h oral glucose tolerance test, fasting blood variables (glucose, cholesterol, high-sensitivity C-reactive protein, triglycerides), body composition, blood pressure and physical activity levels before and after the intervention period. We also assessed exergaming frequency and enjoyment (according to the -5 to +5 Feeling Scale) in the EXG group. Data were analyzed using covariance analyses (ANCOVA) with baseline values as covariates or a two-way mixed ANOVA.

Results: There were no significant differences between CON and EXG for the primary outcome, post-intervention V\textsubscript{O2max}, after controlling for pre-intervention V\textsubscript{O2max} (42.34 ± 0.76 vs 41.71 ± 0.82 mL/min/kg, p = 0.58). Even if not reaching statistical significance, there was a tendency of lower post-intervention low density lipoprotein cholesterol in EXG compared to CON (2.7 ± 0.7 vs 3.0 ± 0.7, p = 0.063). No other changes in secondary outcomes differed between groups. The participants in EXG played 15 ± 13 sessions (range, 0-42) during six months. Their rating of enjoyment was 3 ± 1 on the Feelings Scale.

Conclusion: Our data show that free, unlimited access to an exergaming platform was not sufficient to improve V\textsubscript{O2max}, blood markers of cardiometabolic health, body composition, or increase physical activity levels in sedentary adults, even if the participants rated the exergame as enjoyable.

Funded by The Norwegian Fund for Post-Graduate Training in Physiotherapy
in overweight and obese individuals. Future iterations of the ForeverFit Weight Loss Program should augment the supervised exercise sessions to more effectively target cardiovascular changes.

Despite improvements in pain and function, adults after total knee replacement (TKR) remain largely inactive on average and subsequently are at risk for cardiovascular disease, diabetes, and other lifestyle-related chronic diseases. However, there is large variability of change, and little is known about what distinct physical activity (PA) trajectories may exist. PURPOSE: To explore trajectories of objectively-measured PA in adults after TKR and describe baseline (BL) functional and psychosocial measures of the trajectory groups. METHODS: We used data from an ongoing PA intervention study in adults after TKR. Daily steps/day were collected via Fitbit and averaged across 7 days. We identified trajectory groups of PA via a group-based trajectory model. We selected the optimal number of trajectory groups by requiring the smallest group to include ≥ 5% of the subjects in the sample. We used posterior probabilities of group membership from each individual to assess model fit. BL differences for functional [6 Min Walk, Timed Up & Go, 30 Sec Chair Rise] and self-reported [Pain Catastrophizing Scale (PCS), Tampa Scale of Kinesiophobia (TSK), Self-Efficacy for Exercise (SEE), SF-36] measures between the groups were assessed using independent t-tests and Cohen’s d effect sizes. RESULTS: 27 subjects were allocated to two trajectory groups: high PA (n=12) and low PA (n=15) (Figure 1). The high PA group had more males (8 vs 3) and better scores on the PCS (13.4 ± 5.6 vs 6.2, p = 0.049), TSK (33.2 ± 6.7 vs 27.6 ± 4.1, p = 0.027), and SF-36 (34.3 ± 18.6 vs 40.2 ± 29.2, p = 0.037), but were not different on age, functional measures, or pain, compared to the low PA group. CONCLUSIONS: We identified two potential trajectories of change in PA after TKR. Both groups showed improvement in PA after 15 weeks of intervention. Greater improvement may be influenced by psychosocial factors, such as pain and movement perception, rather than functional ability. Supported by NIH R21 AR07079.
Dual-task gait, Post-Concussion Symptom Inventory, and Pittsburgh Sleep Quality Index values were collected at both visits. We compared outcomes between those who recorded an average of ≥10,000 steps/day (high physical activity) and <10,000 steps day (low physical activity) between initial and return-to-play clearance visits.

**RESULTS:** Six concussed athletes were classified as having high physical activity (33% female; 14.9±2.0 years of age; 13.9±0.3, 390 steps/day), and five were classified as having low physical activity (40% female; 15.8±1.7 years of age; 8,415±1,775 steps/day). There were no significant differences found at initial visit for total sleep severity (44.3±30.8 vs. 52.8±28.4; p=0.46), sleep quality (6.8±4.4 vs. 8.8±2.0; p=0.38), or dual-task gait cost (22.4±7.9% vs. -20.1±13.5%; p=0.73) between the high and low physical activity groups. At the time of return-to-play clearance, however, the high physical activity group reported significantly better sleep quality (1.3 ± 1.9 vs. 6.7±1.5; p=0.009) and lower sleep severity (0.3±0.8 vs. 3.0±2.0; p=0.02) than the low physical activity group.

**CONCLUSIONS:** Adolescents with a concussion who participated in more physical activity after their initial clinical visit reported better sleep quality and lower sleep severity at return-to-play clearance than the low physical activity group. These preliminary results further support the utility of physical activity in concussion management.

**PURPOSE:** Major depressive disorder is associated with less productivity, earlier retirement, and more sick-days at the workplace. These associations also exist for patients with metabolic syndrome. For both, exercise is a generally recommended part of multimodal treatments. However, for individuals with metabolic syndrome, in which depression is more prevalent and severe, evidence for the efficacy of exercise interventions is limited.

**METHODS:** Company employees with diagnosed metabolic syndrome (n=314, age: 48 ± 8 yrs) were randomized to a 6-month exercise intervention (150 min per week) or wait-list control. Participants received individual recommendations for exercise activities by personal meetings, telephone or via a smartphone app. Physical activities were supervised and adapted using activity monitor data transferred to a central database. Work ability (work ability index), depression severity (hospital anxiety and depression scale [HADS]), and health-related quality of live (short form 36 [SF-36]) were assessed.

**RESULTS:** We included 318 subjects from which 287 finished the intervention. After baseline and intervention period, there were significant improvements in physical activity (HADS scores 8-21) individuals with increased severity scores had similar age, body composition, blood lipids, and cardiorespiratory fitness compared to those with normal scores, but lower total work ability (33.1 ± 5.4 vs. 38.2 ± 4.9 points, p<0.05) and component sum scores of health-related quality of life. After 6 months total work ability increased in the exercise group compared to controls with the magnitude of the observed increase being significantly greater for subjects with increased depression severity at baseline (3.7 ± 3.4 points) compared to those with normal severity scores (1.2 ± 2.4 points) (p=0.021).

**CONCLUSIONS:** A 6-month exercise intervention for company employees with metabolic syndrome showed strongest effects on self-perceived work ability in individuals with mild to severe depression severity. This suggests exercise programs offered to workers with metabolic syndrome not only reduces individual disease risk but may also reduce healthcare and employers costs arising from metabolic syndrome and mental disease conditions.

**METHODS:** The literatures of PubMed and Web of Science databases were searched up to July 14th, 2018. Two authors screened the documents simultaneously. The Cochrane bias risk assessment tool was used to evaluate the quality of the documents, and the Reviewer Manager 5.3 software performs statistical processing on the data.

**RESULTS:** Twenty-three eligible studies were included, involving 917 female subjects, including 483 in the single RT group (RTG) and 434 in the control group (CG). The results of Meta-analysis showed single RT significantly reduced females’ FM (WMD: 1.17; 95% CI: 1.03, 1.30; P < 0.001) and BF% (WMD: 0.54; 95% CI: 0.09, 0.98; P=0.02), and also significantly increased their FFM (WMD: -0.81; 95% CI: -0.93, -0.69; P=0.00001). But there was no statistically significant increase in their MM (WMD: -0.20; 95% CI: -0.59, 0.19; P= 0.32).

**CONCLUSIONS:** The results of this study confirm that single RT can effectively reduce females’ FM and BB%, and increase their FFM significantly. But it does not help MM growth for all females. Therefore, single RT may not be suitable for females to increase MM. However, it can be recommended for females as a means of rationalizing body composition, including FM decrease and FFM growth. Keywords: Single Resistance Training; Female; Body composition; Meta-analysis

Moderate intensity continuous aerobic training (MICAT) and high-intensity interval training (HIIT-low volume) intervention is limited.

**PURPOSE:** To evaluate the safety of HIIT-low volume compared to MICAT in adults with MS. The safety of these interventions on patients with MS has not been evaluated in depth.

**METHODS:** Sixty patients with MS, of both genders, 40-60 years old, were included. A clinical evaluation, biochemical tests, and an ergospirometry were carried out, before and after the intervention group received HIIT-low volume (n=29) in 22 min sessions that included 2 min at 90% of maximum oxygen consumption (VO2max) for 1 min and 2 min at 50% of VO2max. The control group received MICAT (n=31) with 8 min at 90% of VO2max for 1 min and 10 min at 60% of VO2max for 1 min.

**RESULTS:** HIIT-low volume group and 48 in MICAT. Most of them (59.3%) were classified as having high physical activity (40% female; 15.8±1.7 years of age; 8,415±1,775 steps/day) between initial and return-to-play clearance visits. We compared outcomes between those who recorded an average of ≥10,000 steps/day (high physical activity) and <10,000 steps day (low physical activity) between initial and return-to-play clearance visits.

**RESULTS:** Six concussed athletes were classified as having high physical activity (33% female; 14.9±2.0 years of age; 13.9±0.3, 390 steps/day), and five were classified as having low physical activity (40% female; 15.8±1.7 years of age; 8,415±1,775 steps/day). There were no significant differences found at initial visit for total sleep severity (44.3±30.8 vs. 52.8±28.4; p=0.46), sleep quality (6.8±4.4 vs. 8.8±2.0; p=0.38), or dual-task gait cost (22.4±7.9% vs. -20.1±13.5%; p=0.73) between the high and low physical activity groups. At the time of return-to-play clearance, however, the high physical activity group reported significantly better sleep quality (1.3 ± 1.9 vs. 6.7±1.5; p=0.009) and lower sleep severity (0.3±0.8 vs. 3.0±2.0; p=0.02) than the low physical activity group.

**CONCLUSIONS:** Adolescents with a concussion who participated in more physical activity after their initial clinical visit reported better sleep quality and lower sleep severity at return-to-play clearance than the low physical activity group. These preliminary results further support the utility of physical activity in concussion management.
63 of the 92 students participated in the eight-week intervention study after filling the informed consent form. They were randomly divided into three groups: the Yoga group (Y), HIIT group (H) and control group (C) (n=21, per group). During the experiment, the subjects were asked to record their daily diet logs and wear accelerometers to measure physical activities. The exercises were as follows: (1) Y: 60 min/bout (including 5 min of regulated breathing, 45 min of Yoga Asana training and 10 min of relax), 3 times/ wk. (2) H: treadmill exercise, 5 min of warm-up, 4×(3 min of 90% VO2max exercise + 2 min of 50% VO2max exercise), 5 min of relax, 3 times/wk. (3) C: daily physical activity without extra exercise. At the end of 8-week experiment, ED-I was conducted again.

RESULTS: (1) In reducing the value of Drive for Thinness (ΔDT=-2.74), Y was significantly better than H (p<0.05); however, in reducing the value of Body Mass Index (BMI), H was significantly better than Y (p<0.05). (2) In reducing the value of Bulimia(B), both Y (ΔB=-3.32, p<0.05) and H (ΔB=-5.7, p<0.01) were effective in contrast to C. (3) In reducing perfectionism value (ΔP=-2.95), Y was very significantly better than H (p<0.01). (4) The subscales of DT and B were positively correlated with the subscales of Interceptive Deficits (ID) and Emotional Dysregulation (EDy) (p<0.05). CONCLUSIONS: (1) 23.96% of female university students were at high risk of ED. (2) Both Yoga and HIIT could effectively reduce the risk of ED. (3) Yoga were more effective in reducing the DT behavior and improving the mental state in terms of EDy and P. (4) HIIT were more effective in reducing the BMI and B behaviors. (4) The risks of DT and B was correlated with the psychological status such as ID and EDy. Acknowledgment:This study was supported by 2018 Education Reform Project of BUU.
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1680 Board #274 May 28 10:30 AM - 12:00 PM
The Effect Of Traditional Chinese Exercise On Diabetic: A Non-randomized Controlled Trial
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Objectives: Clinical practice recommendations issued by the American Diabetes Association in 2019 include the health status and quality of life of people with diabetes as part of their daily care, and believe that it’s important to strengthen physical exercise for diabetic patients. Previous studies have shown that the Baduanjin, a traditional Chinese sport, can regulate blood glucose and blood lipids, weight loss and improve immunity. This study was aimed at investigating the effects and safety of Modified Baduanjin patients on type 2 diabetes. Methods: Forty patients were divided into the Modified Baduanjin group (A group, n=22) and the control group (B group, n=18) for 12 weeks according to their individual motivation. On the basis of conventional hypoglycemic treatment, Group A practiced Baduanjin for 30 minutes per day, 4 times per week, while no exercise intervention was given in group B. The main study outcomes included changes in fasting blood glucose, blood lipids, glycosylated hemoglobin, Quality of Life score (Qol score, 100 in total), muscle endurance, and flexibility after 12 weeks. Results: There were no significant differences in patient characteristics between the two groups at baseline. Group A in glycosylated hemoglobin (pre 6.56±0.70 vs post 6.28±0.70), Qol score (pre 80.189±9.02 vs post 86.64±9.91), muscle endurance (pre 3.76±4.48 vs post 6.91±5.73) and flexibility (p=2.86±0.69 vs post 5.88±9.75). All the above results were statistically significant (P<0.05). There were no statistical significance in group B (P>0.05). 2) Few changes were found in fasting blood glucose and lipid parameters both in two groups (P>0.05). 3) All patients completed the exercise programme with no adverse effects. Conclusion: Chinese traditional exercise is effective and safe in regulating and control the level of blood glucose, enhancing physical fitness and improving the quality of life.

1681 Board #275 May 28 10:30 AM - 12:00 PM
Peer-led Fall Prevention Program For People Aged 50+: Are We Attracting The Right People?
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(No relevant relationships reported)

Falls are established as the leading cause of hospitalization among older adults leading to institutionization and premature mortality. Peer-led exercise has been recognized as a powerful intervention for reducing the risk of falls. However, it is unclear if current community programs are attracting individuals at risk of falling.

Purpose: To examine the characteristics of participants enrolled in a community-based peer-led fall prevention exercise program.

Methods: Between 2012-2018, 912 older adults participated in this program. The 12-week peer-led fall prevention exercise program was offered to older adults 50+ twice per week for a total duration of 120 minutes. The program consisted of endurance, strength and balance exercises. At baseline, sex, age, falls, injuries due to falls, balance, hospital visits and medications were self-reported. Five time sit-to-stand (S-S) tests and 8ft up and go (8UG) tests were also measured to assess lower extremity strength and dynamic balance in relation to risk of mobility loss and falls.

Results: A total of 87.5% were women with an average age of 68 years old. Sixteen percent of participants reported falling in the past year, 58% of which resulted in injury. One-third of the participants reported having issues with balance, 9% had been to hospital in the past year and were prescribed an average of three medications. On average, females completed the 8UG test in 9.18 seconds and the S-S test in 13.10 seconds while males completed the tests in 10.25 seconds and 14.35 seconds, respectively. According to norms, all test means classified participants as at risk for mobility loss and falls. Females performed significantly better than males in the 8UG test (p<0.001) and S-S test (p=0.040).

Conclusion: The peer-led fall prevention program is attracting mainly women participants with various physical capacities and risks of falls.

Funding: NBHRF and GNB-Wellness

1682 Board #276 May 28 10:30 AM - 12:00 PM
Impact Of Psychological Effects On Adolescent Physical Activity: An Intervention Study
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(No relevant relationships reported)

Adolescent physical health is associated with the behaviour of physical activity (PA). To date, the intervention studies on improving adolescent PA emerge in an endless stream, however, those put few emphasis on the generation process of PA, especially in the psychological effects of PA. PURPOSE: This current study is to examine the intervention impacts of psychological effects on adolescent PA behaviour based on the Theory of Planned Behaviour (TPB) and the Self-efficacy Theory (SET). METHODS: Participants (n=51, 12±0.3y) in seventh grade from a Chinese junior middle school were assigned to two groups: the intervention group (n=24) and the control group (n=27). Both groups were pre and post tested with the related psychological effects questionnaires which were selected according to the TPB and SET, and PA behaviour measured by PA Scale and ActiGraph accelerometer (Model: wGT3X-BT). The intervention group took part in 8 times 45-minutes classes during 8 weeks, including 5 courses related to health, nutrition and PA, and 3 outdoor interesting basketball matches. The control group was not asked to make any change to their normal school day. A 2×2 repeated measure ANOVA was mainly conducted. RESULTS: In terms of psychological effects of PA, the intervention group showed significant increases in perceived behavioral control (F=5.297, p=0.024), perception of social norms (F=10.662, p=0.002) and self-efficacy (F=6.427, p=0.013) over the control group, but in not exercise attitude, subjective norms and outcome expectancy. Furthermore, with regard to PA behaviour, the intervention group presented significant improvement in the duration of PA per time (F=5.406, p=0.022) and percentage of light intensity in 7 days (F=6.443, p=0.013) as well as the reduction in percentage of sedentary behaviour in 7 days (F=3.934, p=0.048) compared to the control group. No significant change in the rest of PA behaviour parameters were found between two groups. Moreover, the chi-square test indicated that the number of intervention group students participating in MVPA significantly increased compared to the control group after the eight-week intervention (χ²=6.21, p=0.036). CONCLUSION: It was concluded that the psychological effects intervention towards PA based on TPB and SET can improve adolescent PA over the eight-week specific courses.

1683 Board #277 May 28 10:30 AM - 12:00 PM
Pilot Study- Effects Of A Standardized Eight-week Exercise Program On Fundamental Physical Components
Kendra Holte1, Brittany N. Followay2, Mark E. Cole2. 1Ripon College, Ripon, Wisconsin and Kansas State University, Manhattan, KS. 2Ripon College, Ripon, WI.
(No relevant relationships reported)

Purpose: To understand the effects of an eight-week resistance training program on the fundamental physical components of muscular endurance, strength, gait speed, flexibility, and balance, as well as sleep habits, pain levels, and quality of life.

Methods: Six individuals, consisting of five females and one male (48-69 years of age) were tested on six tasks: 30 second chair stand, 30 second arm curl, two-minute step test, chair sit-and-reach, back scratch, and an eight-foot, timed up-and-go. Data was collected at baseline and following the completion of an eight-week resistance training program, in which participants performed eight exercises, twice a week for a total of eight weeks. The resistance training program aimed to provide a total body workout, at constant, slow speeds. Data was analyzed using paired-samples t-tests. Additionally, a questionnaire was administered at baseline, after four weeks, and after the eight-week program concluded to reflect on their sleep habits, pain levels, and overall quality of life.

Results: Significant improvements were observed between pre and post for the Chair Stand (10.7±0.9; 16.0±1.8; p<0.002), Up&Go Right Foot (5.4±0.3; 4.7±0.3; p=0.010), and Up&Go Left Foot (5.5±0.3; 4.7±0.3; p=0.037). Additionally, two participants reported improved sleep habits, while four participants stated a decrease in pain levels during exercise. Conclusion: Results of the present investigation suggest that an eight-week resistance training program may lead to increased leg strength, gait speed, dynamic balance, and physical function, indicated by improvements in Chair Stand and Eight-foot Up&Go performance. As these functional tests can be used to identify fall risk and replicate required activities of daily living, the findings highlight the need to implement training programs for the maintenance and/or improvement of locomotor function in older adults, as well as improve quality of life components such as sleep habits and perceived pain during daily activity.
The nature of office work promotes a sedentary lifestyle associated with an increased risk of obesity. Many interventions have attempted to combat physical inactivity among sedentary office workers. The sit-to-stand (STS) workstation is a modality aimed at improving workers’ physical health. 

**PURPOSE:** Therefore, the purpose of this study is to evaluate the effects of using a STS workstation on body composition over the course of 12 months. **METHODS:** All participants were volunteer faculty and staff of the University of Central Oklahoma randomly assigned to a control (n = 19) or STS workstation intervention (n = 13) group. Participants of both groups consented to a pre-test, 6-month, and 12-month dual-energy X-ray absorptiometry (DXA) scan to assess variables of body composition including, but not limited to, body fat percentage (BF%), total fat mass, total lean mass, total bone mineral density (BMD), and the ratio of android to gynoid (A/G) fat. The STS intervention group was tasked with standing at least two hours per work day, while the control group was instructed to continue their day as normal without incorporating the use of a STS workstation. 

**RESULTS:** Multiple 2 x 3 mixed-design ANOVA tests were conducted to examine the effects a STS workstation has on body composition over time (pre-, 6mos., and 12mos.). There were no significant interactions between time and group for total BF% (F2, 60 = 1.077, p > .05), total fat mass (F2, 60 = 26.6, p > .05), total lean mass (F2, 60 = 51.4, p > .05), total BMD (F2, 60 = 15.5, p > .05), and A/G ratio (F2, 60 = 37.2, p > .05). Additionally, there was no significant main effect found for groups among any of the five body composition variables. A significant main effect was found for total BMD (F2, 60 = 11.6, p < .001) and A/G ratio (F2, 60 = 3.2, p = .046), but not for BF%, total fat mass, and total lean mass. 

**CONCLUSIONS:** The implementation of a STS workstation did not significantly improve body composition when compared to the control group. Future research is needed to determine if utilizing a STS workstation improves other body composition variables. 

**ACKNOWLEDGEMENTS:** This study was funded by the University of Central Oklahoma, Research and Sponsored Programs office. 

The metabolic inflexibility (limitation to respond or adapt to conditional changes in metabolic demand due to dietary patterns, energy availability, or circulating energy substrates) may be associated with variations in estrogen concentrations observed during the monthly ovarian cycle, whereas that apparently healthy women of childbearing age exhibit variation in substrates oxidation rates that may lead to overweight, type II diabetes and other associated conditions. **Purpose:** The aims of this study were to verify and compare the influence of eight treadmill high-intensity interval training (HIIT) sessions on carbohydrate and lipid oxidation rates (CHOox and LIPox, respectively) and intensities of ventilatory anaerobic thresholds (V ATs) of women in different phases of monthly ovarian cycle. **Methods:** Eleven irregularly active women performed incremental treadmill exercise testing followed by submaximal work-rate running for 45min to determine V O2max, peak velocity ( V\text{p}}\text{eak}), and substrate oxidation rates, before and after training period, in different phases of their monthly ovarian cycle (“Follicular” phase group, FPG, n = 6; “Luteal” phase group, LPG, n = 5). The training period consisted of eight HIIT sessions, composed each one of eight sets of 60s running at 100%V \text{ATs}. 

**Results:** Multiple 2 x 3 mixed-design ANOVA tests were conducted to examine the effects a STS workstation has on body composition over time (pre-, 6mos., and 12mos.). There were no significant interactions between time and group for total BF% (F2, 60 = 1.077, p > .05), total fat mass (F2, 60 = 26.6, p > .05), total lean mass (F2, 60 = 51.4, p > .05), total BMD (F2, 60 = 15.5, p > .05), and A/G ratio (F2, 60 = 37.2, p > .05). Additionally, there was no significant main effect found for groups among any of the five body composition variables. A significant main effect was found for total BMD (F2, 60 = 11.6, p < .001) and A/G ratio (F2, 60 = 3.2, p = .046), but not for BF%, total fat mass, and total lean mass. 

**Conclusions:** The implementation of a STS workstation did not significantly improve body composition when compared to the control group. Future research is needed to determine if utilizing a STS workstation improves other body composition variables. 

**Acknowledgements:** This study was funded by the University of Central Oklahoma, Research and Sponsored Programs office.
CONCLUSIONS: 8-week yoga can reduce the Fat% and improve cardiorespiratory fitness of sedentary overweight female students. Acknowledgment: this study was supported by 2018 Education Reform Project of BSU and The Laboratory of the Ministry of Education.

1688 Board #282 May 28 10:30 AM - 12:00 PM IMPROVEMENT IN ELEMENTARY STUDENTS PREFERENCE FOR PHYSICAL ACTIVITY ENGAGEMENT FOLLOWING PHYSICAL LITERACY PROGRAMMING Abigail Daugherty, Brandi Eveland-Sayers, Alyson Chrost, Andrew Dotterweich, Brianna Steffen, East Tennessee State University, Johnson City, TN. (No relevant relationships reported)

How children perceive their physical ability and body image can impact their involvement in physical activities. Teaching children basic mechanics and exposing them to new activities may increase the likelihood of selecting a physically active option versus a passive option. Purpose: The purpose of this research was to examine the relationship between body mass index (BMI) and self-perception of adequacy in and enjoyment of physical activity following implementation of a six-week physical literacy (PL) intervention. Methods: Students (n=92) in grades 2-5 completed the Children’s Self-Perceptions of Adequacy and Predilection for Physical Activity (CSAPPA) scale pre- and post- PL intervention. The PL intervention program consisted of a once weekly, 30-minute program conducted by trained individuals during the school day. This program was designed to focus on the mechanics of running, jumping, and throwing. Height and weight were measured pre- intervention to calculate BMI using the Center for Disease Control’s Youth and Teen calculator. Results: A significant interaction between CSAPPA score and BMI category was found, (F (1,82) = 4.988, p < 0.05). Further evaluation of the interaction indicated that students in the unhealthy BMI category were more likely to choose an active over a passive physical activity option following the PL intervention. Conclusion: Based on the aforementioned results, PL programming seems favorable in improving self-perception of physical activity selection in children with abnormal BMIs. Previous research has shown that students who do not feel confident performing a task are less likely to participate. Following the trend of decreased exposure to physical activity during school, students with unhealthy BMIs are not getting proper exposure to the mechanics of movement. This may lead to less physical activity participation and increases in unhealthy BMI ranges. By teaching children that they can move proficiently, children are making more active choices possibly leading to improvements in self-perception.

1689 Board #283 May 28 10:30 AM - 12:00 PM Effects Of Different Types Of Exercise Programs And/ or Nutritional Guidance On Body Fat And Muscle Mass Distribution In Overweight Adults: A Secondary Analysis Of A Randomized Controlled Trial Mikel Izquierdo1, Katharine Gonzalez-Ruiz2, Carolina Medrano-Mena3, Jorge E. Correa-Bautista1, Robinson Ramírez-Vélez1. 1Public University of Navarra, Pamplona, Spain, 2Universidad Manuela Beltrán, Bogotá, Colombia. 3Universidad Autónoma de Nuevo León, Nuevo León, Mexico. (No relevant relationships reported)

PURPOSE: Both exercise training and diet are recommended to prevent muscle mass loss and excessive fat accumulation. The aim of the present study was to investigate whether 12 weeks of high-intensity interval training (HIIT), resistance training (RT), combination training (CT=HIIT+RT) or a nutritional guidance (NG) plan induced differential responses on body composition components, and to compare the responses between the four intervention groups. METHODS: Subjects were 57 sedentary subjects with abdominal obesity or excess weight for body mass index ≥20 wt./ht.2 (mean age, 40.7±7.0 years) who were allocated to a 12-week individualized programme intervention (HIIT, RT or CT) or NG (changing the quality of the diet with changing the total energy intake to encourage weight loss). The main outcomes were the change in total fat/muscle mass, percentage of body fat, percentage of body lean, trunk fat/muscle mass, leg fat/muscle mass, and fat/muscle android gynoid distribution were measured by segmental dual-energy X-ray absorptiometry. RESULTS: Two-way ANOVA revealed a significant group effect from HIIT and CT groups on trunk fat mass (%) [F (5,53) = 0.024, p = 0.058], legs fat mass [F (4,44) = 0.037, p = 0.056], android fat mass (%) [F (5,8) = 0.023, p = 0.123] and total fat mass (%) [F (5,2) = 0.025, p = 0.057]. Additionally, significant effect was observed for the group × time interaction between RT and CT group for the muscle mass (g) in arms [F (4,3) = 0.006, p = 0.130] and group × time interaction between RT and NG group in total muscle mass (g) [F (2,9) = 0.038, p = 0.093]. CONCLUSIONS: Physical exercise has beneficial effects on body composition distribution in sedentary adults with excess weight. Further clinical trials are needed to investigate the underlying mechanisms related for physical exercise training and modification in body composition.

1690 Board #284 May 28 10:30 AM - 12:00 PM A Short-term Longitudinal Study Of The Effectiveness Of Kids Get Fit Fitness And Nutrition Curriculum Pranav Gupta1, Benjamin Hoag1, Jose Miguel Malaspina1, Ana Mafalda Martins1, Toyin Ajisafe2, Jon Roberts1. 1Driscoll Children’s Hospital and Texas A&M College of Medicine, Corpus Christi, TX. 2Texas A&M College of Medicine, Corpus Christi, TX. Email: pranav.gupta@dhstx.org (No relevant relationships reported)

PURPOSE: This study investigated the effects of the Kids Get Fit (KGF) fitness (premised on integrative neuromuscular training) curriculum and nutritional education on measures of movement competence, muscular endurance, and dietary behavior in elementary school age children. METHODS: Participants were 4th graders at two local schools (94 ± 2% Hispanic/Latino) in Corpus Christi, Texas, i.e., experimental (n = 69; 31 males) (8.5 ± 0.5 years; 132.6 ± 6.3 cm; 36.3 ± 10.7 kg) and control (n = 40; 14 males) (8.4 ± 1.2 years; 131.7 ± 17.1 cm; 35.7 ± 11.5 kg). KGF instructors delivered an engaging curriculum that included fitness, dance, yoga, and nutritional education to children at the intervention school, while the control school had traditional physical education class across 12 weeks. Movement competence (standing long jump), muscular endurance (90° push-up), and dietary behavior (BNPE 1-5 Grade Survey) were assessed at baseline and within a week of concluding the intervention. A series of factorial ANOVA and Mann-Whitney U Test was used to explore differences within and between groups. Statistical significance was set at P < .05. RESULTS: There was a significant interaction of time and intervention (F (1,108) = 7.973, P = .006); the control group had higher resting heart rate increase compared to the experimental group. There was a significant interaction of time and intervention (F (1,96) = 8.579, P = .004); the experimental group showed greater increase in standing long jump performance compared to the control group. There was a significant main effect of the intervention (F (1,107) = 6.192, P = .014); the experimental group showed increased 90° push-up and dietary (BNPE 1-5 Grade Survey) performance. No significant differences in sugar-sweetened beverage (U = 1311.500, P = .505), vegetable (U = 1359.500, P = .924), and fruit (U = 1341.500, P = .629) consumption between groups after 12 weeks. CONCLUSIONS: Findings suggest the intervention improved muscular endurance and movement competence. Improved stability of resting heart rate suggests favorable cardiovascular effects attributed to enhanced fitness. Lack of differences in dietary behaviors further underscore the importance of involving entire families in nutritional education and addressing access to healthy foods in elementary school age children.

1691 Board #285 May 28 10:30 AM - 12:00 PM Maternal Fitness And Physical Activity Levels Decrease Infant Adiposity Up To 1 Year Of Age Jacob K. Rasey, Jeannine Mincher, Sara F. Michaliszyn. Youngstown State University, Youngstown, OH. Email: jkrasey02@student.ysu.edu (No relevant relationships reported)

Maternal obesity and excess gestational weight gain (GWG) are associated with increases in infant birth weight and childhood obesity. While greater levels of physical activity are associated with lower GWG and may contribute to reduced infant birthweight and infant adiposity, this remains to be substantiated. Purpose: The objective was to examine the relationships between aerobic physical activity during pregnancy, maternal cardiorespiratory fitness, GWG, and infant adiposity from birth to one year of age. Methods: Nineteen pregnant mothers with singleton pregnancies were randomized into either aerobic intervention (N=9) or control (N=10) groups and followed for 12 months postpartum. At 12±2 weeks, 20±2 weeks and 36±2 weeks, maternal cardiorespiratory fitness (VO2peak ml/kg/min) was assessed using cycle ergometry, 12 months postpartum. Infant body mass index (BMI) was assessed using cyclical (Vo2peak ergometer) and dietary behavior in the BodyMedia Sensewear Armband. Infant skinfolds, length, weight, and waist circumference were obtained at birth, 6 months, and 12 months postpartum. Results: Higher total energy expenditure, moderate to vigorous physical activity (MVPA), step count, and MET level were associated with lower maternal and percent body fat (range r = -.59 to -.82; p<0.02) and GWG (range r = -.32 to -.40; p<0.05). Multiple linear regression analysis with energy expenditure, MVPA, step count and MET level included in the model showed that, MVPA independently predicted 43% of the variability in infant percent body fat and that MET level independently predicted 22% of the variability in GWG. Total time spent in physical activity during pregnancy did not associate with infant adiposity at birth or during follow-up. However, women with higher cardiorespiratory fitness participated in greater MVPA throughout pregnancy compared to those who were less fit (67±1 vs. 38.3±2).
**1692 Board #286 May 28 10:30 AM - 12:00 PM Sedentary Behavior, Physical Activity And Bone Mineral Density In Ckd Patients: An Isotemporal Substitution Approach**

Masaki Yoshikoha1, Keisei Kosaki1, Masahiro Matsui1, Kanako Takahashi1, Atsuhisa Takahashi1, Koichiro Oka2, Makoto Kuro-o3, Chie Saito1, Kunihiko Yamagata2, Seiji Maeda2. 1University of Tsukuba, Ibaraki, Japan. 2Waseda University, Saitama, Japan. 3Ichi Medical University, Tottori, Japan.

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**[No relevant relationships reported]**

**[BACKGROUND]** Both insufficient moderate-to- vigorous-intensity physical activity and excessive amount of sedentary behavior may contribute to a declined bone mineral density, which is associated with an increased mortality in patients with chronic kidney disease (CKD). However, the benefits of behavior modification (e.g., replacing sedentary behavior with physical activity) on bone mineral density remains obscure. Isotemporal substitution approach is a statistical approach which estimates the associations when replacing time from one behavior to another, while keeping total time and other behavior fixed. **[PURPOSE]** The purpose of this study was to determine the associations of sedentary behavior and physical activity with bone mineral density in patients with CKD, using isotemporal substitution approach. **[METHODS]** A total of 108 middle-aged and older patients with CKD (65 ± 9 years) participated in this study. The time spent in sedentary behavior, light-intensity physical activity (LPA), and moderate-to vigorous-intensity physical activity (MVPA) were assessed using triaxial accelerometers. As indices of bone mineral density, speed of sound (SOS), broadband ultrasound attenuation (BUA) and stiffness index were used. SOS and BUA were measured using ultrasound bone-densitometer. Stiffness index was calculated from SOS and BUA. **[RESULTS]** The time spent in MVPA was significantly and positively associated with SOS (B = 1.329, 95%CI; 0.094, 2.652), BUA (B = 0.837, 95%CI; 0.046, 0.609) and stiffness index (B = 0.926, 95%CI; 0.091, 1.762) after adjusting for age, sex, body mass index and kidney function. However, the time spent in sedentary behavior and LPA were not significantly associated with bone mineral density measurements. Isotemporal substitution approach showed that replacement of 10 min/day of sedentary behavior with equivalent MVPA time was beneficially associated with SOS (B = 1.455, 95%CI; 0.224, 2.686), BUA (B = 1.015, 95%CI; 0.289, 1.742) and stiffness index (B = 1.088, 95%CI; 0.311, 1.864). **[CONCLUSION]** These cross-sectional findings suggest that replacing sedentary behavior with the same amount of MVPA may benefit bone health in middle-aged and older patients with CKD.

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**1693 Board #287 May 28 10:30 AM - 12:00 PM Effects Of A Personalized Six-week Resistance Exercise Program On Senior Citizens’ Cardiometabolic Health And Adherence**

Garrett L. Peltonen1, Takahiro Sato1, Susumu Iwasaki1. 1Western New Mexico University, Silver City, NM. 2Fort Lewis College, Durango, CO.

**[No relevant relationships reported]**

The cardiometabolic benefits of resistance training in senior populations are well documented however, adoption and adherence remain low. Rigidly structured resistance-training interventions and lack of quality, personalized instruction may be to blame. **PURPOSE:** We tested the hypothesis that a community-based, personalized, resistance-training program offered to senior citizens would improve cardiometabolic health and positively influence exercise adherence by accommodating a wide range of fitness levels. **METHODS:** Five senior citizens (2M/3F, 74 ± 5 years) completed a personalized resistance-training program that consisted of meeting with a trainer twice a week, for 60-minutes, over the course of six weeks. Pre and post exercise intervention, physical fitness and body composition were determined with the Senior Fitness Test and anthropometric measures, respectively. Metabolic health was assessed by measuring circulating plasma lipids (total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglycerides) and glucose, and determination of blood pressure. Adherence was calculated as the percentage of resistance-training sessions attended. Semi-structured interviews were conducted on a weekly basis to grasp detailed approaches trainees utilized in each exercise session to promote adherence. **RESULTS:** In support of our hypothesis, a six week, community-based, resistance-training program improved performance in the Senior Fitness Test (chair stand test; 13 ± 3 vs. 18 ± 4 repetitions, p = 0.03 and chair sit and reach test; -6 ± 12 vs 4 ± 6 centimeters, p = 0.03) and decreased waist circumference (91 ± 12 vs 88 ± 14 centimeters; p = 0.04). In contrast to our hypothesis, there were no changes in circulating plasma lipids, glucose, or blood pressure. Adherence to exercise sessions was high at 86%. Qualitative analysis revealed that instructors provided physical and psychological assistance for their participants, while making accommodations to their fitness levels and welcoming feedback. **CONCLUSIONS:** These preliminary data indicate that a six-week, community-based, personalized, resistance-training program offered to senior citizens is an effective method to improve cardiometabolic health while encouraging adherence.

Support: Western New Mexico University Research Grant

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**1694 Board #288 May 28 9:30 AM - 11:00 AM Effects Of High-fat Diets On Physical Performance: A Meta-analysis**

Christopher Carrigan, Nancy Murphy, Lee Margolis. USARIEM, Natick, MA.

**[No relevant relationships reported]**

**[BACKGROUND]** Use of high-fat diets to support physical performance has grown in popularity over recent years. While this strategy allows for enhanced fat oxidation and reduced reliance on carbohydrate for fuel during exercise, its ability to improve physical performance has not been consistently shown. **PURPOSE:** Determine effect of high-fat diets (FAT) on physical performance compared to control carbohydrate diets (CHO). **METHODS:** Meta-analysis was conducted on studies with healthy (BMI < 30) trained or untrained men or women consuming isocaloric FAT (> 50% total energy intake) compared to control CHO diets for > 2 days, followed by a physical performance test. Performance outcomes were grouped as endurance (time to exhaustion, time trial, and VO2max) and power/strength. Data presented as effect size [ES (95% CI)] using Hedges’ g with random effects. Analysis was conducted on crossover and parallel study designs separately. **RESULTS:** A total of 31 studies (21 crossover, 10 parallel) containing 51 subgroups (31 crossover, 20 parallel) were identified. Overall, FAT had no effect on physical performance in crossover [-0.13 (-0.36, 0.11)] or parallel [-0.18 (-0.53, 0.17)] studies compared to CHO. Stratified by training status, FAT had no effect on trained individuals in crossover [-0.08 (-0.26, 0.09)] or parallel [0.05 (-0.17, 0.26)] studies compared to CHO. In untrained individuals, FAT had a negative effect [-1.14 (-2.01, -0.28), P < 0.05] in parallel studies compared to CHO, and no effect [-0.32 (-1.22, 0.57)] in crossover studies compared to CHO. Stratified by performance outcome, FAT had no effect on endurance performance in crossover [-0.10 (-0.26, 0.09)] or parallel [-0.27 (-0.80, 0.25)] studies compared to CHO. FAT had a negative effect on power/strength [-0.23 (-0.45, 0.00), P < 0.05] in crossover studies compared to CHO. FAT had no effect on power/strength [-0.08 (-0.44, 0.27), P < 0.05] in parallel studies compared to CHO. **CONCLUSION:** Overall, these data indicate FAT does not have a positive effect on physical performance compared to control CHO. This material is based on the work supported by MRDC; authors’ views not official U.S. Army or DoD policy.

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**1695 Board #289 May 28 9:30 AM - 11:00 AM Interval Training Versus Continuous Training On Glycemic Control In Prediabetes And Type 2 Diabetes: Meta-analysis**

JUAN WANG, Zhengzhen Wang, FACS, Yan Wang, Yan Yan. BEIJING SPORT UNIVERSITY, BEIJING, China. (Sponsor: Zhengzhen Wang, FACS)

**[No relevant relationships reported]**

Several randomized controlled trials indicated that high-intensity interval training (HIIT) can improve the glycemic control and cardiorespiratory fitness in prediabetes or type 2 diabetes, but there is no consensus that HIIT is a superior model than moderate-intensity continuous training (MICT). **PURPOSE:** To compare the effects of HIIT versus MICT on glycemic control and cardiorespiratory fitness in prediabetes and type 2 diabetes (T2D) patients. **METHODS:** This search was performed in PubMed, EBSCO, Web of Science and the Cochrane Library, and relevant randomized-controlled trials (RCTs) were included based on the including criteria: participants were prediabetes or type 2 diabetes; had both HIIT and MICT groups; had at least one of the outcomes of fasting glucose, HbA1c, fasting insulin, insulin resistance (HOMA), VO2peak. **RESULTS:** 1) Eighteen studies (122 prediabetes in four studies and 375 T2D patients in 14 studies) were included and meta-analyzed. 2) In T2D patients, HIIT showed a...
great improvement in fasting insulin [mean difference: -0.59, 95%CI (-0.69—-0.12), P = 0.005] and HbA1c [mean difference: -0.15, 95%CI (-0.27—-0.04), P = 0.006], compared with MICT. 3) Compared with MICT, HITT improved significantly of 0.33 L/min/kg [95%CI (0.26—-0.41), P = 0.0001] of absolute VO2max in T2D patients, and 0.83 ml/min/kg [95%CI (0.03—-1.63), P = 0.04] of relative VO2max in prediabetes. 4) Compared with MICT, HITT significantly reduced BMI [-0.49, 95%CI (0.73—-0.25), P = 0.0001] in T2D patients. 5) HITT was more than MICT in lowering systolic blood pressure [-6.23, 95%CI (-8.48—-3.98), P = 0.0001] in T2D patients. But there were no differences between two exercise models in diastolic blood pressure, total cholesterol, HDL, LDL, triglycerides in both prediabetes and T2D patients.

CONCLUSIONS: HITT induced more positive benefits in glycemic control and cardiorespiratory fitness than MICT in T2D patients. 2) In prediabetes, HITT may induce similar cardiometabolic adaptation compared with MICT, and more benefits in cardiorespiratory fitness, which require more high-quality RCTs to prove. Supported by National Key Research and Development Program Major Prevention and Control Research on Chronic Non-communicable Diseases (2016YFC1300202).

**RESULTS:** Overall, IF had a medium, negative effect on relative fat mass (SMD = -0.51, p = 0.029; Q = 2.09, p = 0.554; F = 0% k = 4), and a small, but significant negative effect on maximum oxygen uptake (VO2max) (SMD = -0.45, p = 0.023; Q = 12.09, p = 0.002, F = 83% k = 3). Non-significant effects were observed on body mass (SMD = -0.45, p = 0.137; k = 7), vertical jump height (SMD = 0.01, p = 0.945; k = 3) and Wingate mean power output (SMD = 0.04, p = 0.921; k = 3).

**CONCLUSIONS:** We found that, while leading to small impairments in VO2max, IF is effective for inducing positive adaptations in body composition (i.e. decreased relative fat mass).

**β-hydroxy-β-methylbutyrate (HMB) is a leucine metabolite used as a nutritional supplement purported to increase lean body mass and performance in response to resistance exercise training (RE). However, literature definitive evidence-based answer to the question of the efficacy of HMB is lacking.

**METHOD:** The aim of this systematic-review and meta-analysis was to determine the efficacy of HMB supplementation, in the calcium (HMB-Ca) or free HMB (HMB-Fa) form, to augment lean body mass and strength gains during RE.

**METHODS:** A systematic search on Medline, Embase, CINAHL and SportDiscus, from 1996-Oct 2019 was conducted. Inclusion criteria for studies were: randomized controlled trial (RCT), RET ≥ 3 weeks (training sessions at least 2 x/week), male subjects <50 y, and ingesting 3g/d of HMB-Ca or HMB-Fa with or without protein or amino acids. Random-effects meta-analysis was performed in Review Manager V5.3. Cochrane risk of-bias tool for randomized trials (RoB2) was applied. Studies with 3 domains judged as unknown risk or at least 1 domain judged as high risk of bias were excluded from the analysis. Industry-related sponsorship or authorship were considered high risk of bias. The following outcomes were investigated: total body mass (TBM), lean body mass (LBM), fat mass (FM), total 1 repetition maximum (RM), bench press (BP) 1RM, and lower body (Lbw) 1RM.

**RESULTS:** Fourteen studies fit the inclusion criteria. However, after removing studies according to RoB2 scoring, the number of analysed studies dropped to seven. A total of 291 male participants (18-45y) were included, and the mean study duration was 6 ± 3 weeks with a training frequency of 2-5 d/week. No significant effects were found on TBM (0.34kg [0.09, 0.77], p=0.12), body composition (LBM: -0.06kg [-0.55, 0.42], p=0.80; FM: 0.11kg [-0.12, 0.34], p=0.34) or strength (total 1RM: 1.30kg [-3.12, 5.72], p=0.86; BP 1RM: 1.40kg [-1.33, 4.30], p=0.30; and Lbw 1RM: 3.96kg [-1.09, 9.02], p=0.12).

**Conclusion:** This meta-analysis showed that HMB does not improve changes in body mass and composition caused by RE. In addition, effects on strength were not significant. Therefore, the claims for HMB consumption to optimize RE seem to be based on studies with considerable risk of bias. When such studies are not considered, there is no support for HMB ingestion.
Branch-chained amino acids (BCAA) influence muscle turnover through the mTOR signaling pathway and phosphorylation of translation initiation factors. It has been suggested that BCAA supplementation may decrease muscle damage, attenuate soreness, promote recovery, and improve strength and hypertrophic adaptations to resistance exercise; however, the findings are inconsistent and thus the question of efficacy of BCAA supplementation is uncertain.

**Purpose:** We performed a systematic review and meta-analysis to determine the influence of acute BCAA supplementation on perceived soreness and performance recovery following a bout of resistance exercise. Additionally, we analyzed the effect of 6-weeks of resistance training with BCAA on fat mass and strength.

**Methods:** A systematic search was conducted in Medline, Embase, CINAHL and SportDiscus. Fifteen studies with 348 participants were eligible for inclusion. Random-effects meta-analyses were performed in RevMan (Review Manager (RevMan), V.5.3). Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014). Acute outcomes included isometric knee extension, vertical jump, and perceived muscular soreness. Chronic outcomes included changes in fat free mass, upper- and lower-body strength.

**Results:** Acutely, BCAA supplementation following an acute bout of resistance exercise did not attenuate perceived soreness (SMD = -0.42; CI: (-0.95, 0.12), p = 0.13) or attenuate performance decrements in the vertical jump (MD: 0.54; CI: (-1.05, 2.12), p = 0.51) or reductions in isometric knee extension torque (SMD: 0.11; CI: (-0.39, 0.61), p = 0.66). Chronic BCAA supplementation during resistance training did not influence resistance exercise induced changes in fat free mass (MD: 0.01; CI: (-0.70, 0.73), p = 0.97), upper body strength (SMD: 0.08; CI: 0.63, 0.79, p = 0.83) or lower body strength (SMD: 0.10; CI: (-1.15, 1.34), p = 0.88).

**Conclusions:** BCAA supplementation does not effectively reduce soreness, attenuate subsequent performance decrements, or influence muscular adaptations to resistance training.

**Regenerative Changes in Resting Energy Balance Demonstrating Metabolic Efficiency and Body Composition Normalization**

Reiterating metabolism plays a critical role in healthy weight management. Metabolic adaptations in response to lifestyle cues induce acclimatization of factors involved in resting state energy homeostasis.

**Purpose:** To determine the effects of dietary modification and exercise intensity on resting energy metabolism and body composition in sedentary female cohort.

**Methods:** Subjects (n=46) with >25% fat mass participated in 10-weeks of 200 kcal·day·kg⁻¹ caloric deficit, adherence to whole-foods, plant-based diet, and resistance training into three equal groups. Energy expenditures were used to determine respiratory exchange ratio (RER) ranges determined through submaximal VO₂ uptake treadmill test; Low: RER=0.75 (n=16), Moderate: RER=0.85 (n=16), High RER=0.95 (n=14). Resting metabolic rate (RMR) variables—resting respiratory quotient (RQ), VO₂, CO₂, resting energy expenditure (REE), and macronutrient substrate oxidation rates (KCHO, KFAT)—were measured using indirect calorimetry at pre and post treatment stages with whole-body air displacement plethysmography to obtain body composition profiles. One-way ANOVA was performed to evaluate mean changes in resting energy metabolism and body composition.

**Results:** Significant differences in RQ and CO₂ were noted between groups (F=1.46, p<0.001, F=1.46, p<0.03), respectively. Significant differences in KCHO and KFAT substrate oxidation rates were noted between groups likewise (F=1.46, p<0.001, p<0.01), respectively. Changes in total body mass showed significant differences (F=1.46, p<0.04), respectively. The most positive improvements in metabolic efficiency variables were appreciated in the low and moderate intensity groups in post hoc analysis.

**Conclusion:** The combination of modest caloric adjustment, adherence to plant-based diet, and participating in a low or moderate intensity exercise program confers positive changes in metabolic efficiency and corrective energy homeostasis that promotes effective body composition normalization.
revealed that higher odd ratio of depressive symptoms appeared in the following subgroups: elder age (OR = 1.98, 95% CI — 1.41-2.79), not living with spouse (OR = 1.31, 95% CI — 1.15-3.62), lower parental-child relationship satisfaction (OR = 3.42, 95% CI = 1.86-6.32), poorer self-reported health status (OR = 3.24, 95% CI — 1.77-5.96), lower score of instrumental activities of daily living scale (OR = 2.75, 95% CI — 1.97-3.85), lower health status satisfaction (OR = 3.06, 95% CI — 1.53-6.10) and shorter sleep duration at night last month (OR = 2.59, 95% CI = 1.64-2.65). Conclusions: There was a high prevalence of depressive symptoms among Chinese elderly women, and it was significantly related to demographics, interaction with children and health status. Targeting these issues might be helpful in screening and reducing depression among Chinese elderly women.

1704 Board #298 May 28 9:30 AM - 11:00 AM

Esport Athletes’ Quality Of Life Over A Professional Season
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(No relevant relationships reported)

PURPOSE: Worldwide, video games have stormed into mainstream culture, creating a wave of opportunity for a new kind of athlete. In 2019, the global esports audience is expected to reach 453.8 million, while over 164 million adults in the United States now play video games and three-quarters of American households are home to at least one gamer. Few studies exist that address the unique set of health concerns in this growing population. Our objective was to monitor changes in health status over the 5-month competitive season among professional videogamers (n=6) from an esports team.

METHODS: Data collection included Brief Michigan Hand Questionnaire (BHHQ), Patient Rated Outcomes Measurement System (PROMIS) measures, and physical exam measures. These measures were collected during the pre-participation physical exam in March and post-season August 2019.

RESULTS: The mean age was 24 (range: 21-28 years); BMI was 28.8 kg/m2 (range: 22.9-34 kg/m2); systolic blood pressure was 130 mmHg (range: 114-156 mmHg); diastolic blood pressure was 75 mmHg (range: 74-78 mmHg); pulse 92.5 bpm (range: 66-123 bpm), waist circumference was 91.75 cm (range: 77-106 cm).

The mean post-season Quality of Life score (0.73) was lower than the mean pre-season score (0.80, p-value = 0.05). Global mental health, global physical health, physical function, upper extremity, and Brief Michigan Hand Questionnaire scores trended lower post-season, but did not reach statistical significance. Pain interference and pain intensity scores were higher post-season than the mean pre-season scores, but these differences were not statistically significant (OR = 2.10, p-value = 2.17).

LUSIONS: This study identifies potential quality of life concerns associated with professional eAthletes. Further study is needed with a larger study population of professional eAthletes to confirm the physical and mental health changes over the course of a professional season. Findings may facilitate the development of injury prevention and treatment protocols to enhance the mental and physical health and wellness of eAthletes.

1705 Board #299 May 28 9:30 AM - 11:00 AM

Daily Physical Activity And Affect In Preschoolers
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(No relevant relationships reported)

PURPOSE: Physical activity is vital to mental health yet relatively little is known about its role in young children. The study examined whether one marker of mental health, daily positive affect was higher among preschoolers meeting recommended guidelines for physical activity.

METHODS: Participants included 72 preschoolers (3-5 yrs) enrolled in a study of physical activity and mental health recruited from the general community. Preschoolers wore an accelerometer (ActiGraph GT3X- BT) for one week, obtaining objective counts of moderate-to-vigorous physical activity (MVPA). Preschoolers engaged in >60 minutes of daily MVPA were compared to those who did not. Caregivers completed a wave of opportunity for a new kind of athlete. In 2019, the global esports audience is expected to reach 453.8 million, while over 164 million adults in the United States now play video games and three-quarters of American households are home to at least one gamer. Few studies exist that address the unique set of health concerns in this growing population. Our objective was to monitor changes in health status over the 5-month competitive season among professional videogamers (n=6) from an esports team.

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LUSIONS: This study identifies potential quality of life concerns associated with professional eAthletes. Further study is needed with a larger study population of professional eAthletes to confirm the physical and mental health changes over the course of a professional season. Findings may facilitate the development of injury prevention and treatment protocols to enhance the mental and physical health and wellness of eAthletes.

1706 Board #300 May 28 9:30 AM - 11:00 AM

Association Between Sport Specialization, Athlete Burnout, And Past Injury In High School Athletes
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(No relevant relationships reported)

With the rise in early sport specialization, understanding its psychological impacts on young athletes is increasingly important. PURPOSE: To determine whether sport specialization level, past injuries, or other demographic factors are associated with burnout symptoms among high school (HS) athletes. We hypothesized that athletes with high specialization level or a history of prior injuries would report increased burnout compared to peers with lower specialization level and those without past injuries.

METHODS: We conducted a cross-sectional assessment of HS athletes who completed questionnaires during pre-participation physicals. The survey included the Athlete Burnout Questionnaire (ABQ) and Jayanthi sport specialization scale, as well as questions on injury history (stress fracture, concussion, time-loss orthopedic injuries), competition level (varsity or non-varsity) and weekly training hours. The primary dependent variable was total ABQ score. Our independent variables were low, medium, or high specialization level and history of time-loss orthopedic injury, stress fracture or concussion.

RESULTS: 186 athletes completed the survey: 49% were categorized as low specialization (mean age=15.3±2.0 yrs; 50% female), 35% medium specialization (mean age=15.3±1.3 yrs; 47% female), and 16% high specialization (mean age=15.7±1.1 yrs; 57% female). The specialization groups did not significantly differ on their total ABQ scores (mean scores: low=29.7±6, medium=28.3±6.5, high=29.9±8.8; p=0.64). Athletes with prior orthopedic injuries had significantly higher ABQ scores than those without such history (30.6±6.8 vs 27.8±7.7; p=0.01). There were no differences in ABQ scores based on history of stress fractures (31.8±7.8 vs 28.7±7.4; p=0.17) or concussion (28.8±7.2 vs 28.9±7.2; p=0.94), or whether an athlete was currently ailing from an injury (29.1±7.5 vs 28.9±7.5; p=0.91).

After covariate adjustment, history of orthopedic injury was significantly associated with higher ABQ scores (β=2.81; 95% CI 1.44 - 5.18; p=0.02). CONCLUSION: Prior history of time-loss orthopedic injuries, but not a HS athlete’s level of sport specialization, was associated with higher burnout symptoms.

1707 Board #301 May 28 9:30 AM - 11:00 AM

Adherence To A Six-Month Walking Intervention For Individuals With Schizophrenia Spectrum Disorder: Preliminary Results
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(No relevant relationships reported)

PURPOSE: Schizophrenia spectrum disorder (SSD) is one of the most debilitating mental illnesses and often results in negative lifestyle alterations, such as increased...
sedentary behavior, that increases the likelihood for the development of comorbidities, such as cardiovascular disease, leading to a decline in quality of life and decreased life expectancy of up to 25 years. Increasing physical activity in healthy populations is known to decrease risk factors and improve quality of life, along with life expectancy.

The purpose of the study was to evaluate the adherence of a 6-month group-walking program at the clinic in people diagnosed with SSD. The secondary purpose was to evaluate selected health and physical function outcomes.

METHODS: Individuals diagnosed with SSD and enrolled in a group-based, 6-month progressive exercise walking intervention meeting biweekly. Participants were given a Fitbit Charge HR to be worn for the duration of the intervention. They were expected to attend as many groups as possible to complete the 30-minute walking session at individualized intensities determined to create an exercise dose-response. Group leaders recorded attendance for each participant for the evaluation of adherence to the intervention. Health and physical function outcomes were evaluated using independent samples t-tests from baseline and post-intervention assessments.

RESULTS: Twelve individuals (6 males, 6 females) between the ages of 18-65 were included in analyses. Overall attendance was 45%. There was a significant improvement (p<0.05) in distance covered during the 6-minute walk test, increasing from 367±81.8 m to 476±99.9 m. There was no significant difference in resting heart rate, mean arterial pressure, weight, hip or waist circumferences (p>0.05).

CONCLUSIONS: Adherence to the group walk intervention was relatively low compared to previous studies. Change in group walking leaders during the study and the extremely hot summer may have contributed to the lower than expected adherence rates. However, the 6-month walking intervention promoted improvements in walking distance which is encouraging. Further studies are warranted to continue to explore the effects of increasing physical activity in people with SSD with the goal of improving their health and consequently improve life expectancy.

Previous studies on physical activity (PA) and psychological well-being have predominantly investigated the impact of PA on mental disorders and hedonic well-being. In contrast, relatively few studies have examined the association between PA and Eudaimonic well-being (EWB), a key dimension of positive psychology focusing on actualizing one’s human potentials and formulating positive human functioning.

PURPOSE: To examine the associations between PA and the six components of EWB in college students while controlling for gender and age.

METHODS: 1346 college students (685 males and 661 females, mean age = 20.33 years) voluntarily completed a Physical Activity Questionnaires. The metabolic equivalent (MET)-minutes per week was the predictor and age and gender were controlled as covariates.

The Physical Well-Being Scale (PWBS) on a 6-point Likert scale. The PWBS consists of six 7-item subscales, including growth (PG), positive relations with others (PR), purpose in life (PL), and self-actualization (SA).

The strength of the positive association is strongest between PA and SA (β = 0.21, p < 0.001), PL (β = 0.13, p < 0.001), and SA (β = 0.21, p < 0.001) in college students. PA participation to improve positive psychological well-being for college students.

RESULTS: Females reported less PA (β = −0.27, p ≤0.001), but PA was not (β = 0.003, p ≤0.001) were significant. When controlling for gender and AGAD status. Cohen’s d quantified the magnitude of differences based on gender and AGAD status. Logistic regression quantified odds of AGAD based on PA dose, adjusting for age, gender, and smoking status. Inexpedite mediation analyses examined mediation of the continuous PA-GAD symptom association by SPA.

CONCLUSION: Age is associated with the effectiveness of exercise on anxiety levels of children with moderate to severe ASD. The older the age of the child, the greater improvement was seen in anxiety levels at school following the exercise programme. This research was funded by the Institute of Technology Carlow, President’s research fellowship award.

Social Physique Anxiety (SPA) has been associated with physical activity (PA) behaviors and anxiety disorder symptoms. However, little is known about the potential influence of SPA on associations between PA and Generalized Anxiety Disorder (GAD).

PURPOSE: This study quantified associations between PA, GAD and SPA among young adults (N=470, 23.2±4.8y; 63.4% female) and explored SPA as a mediator of the association between PA and GAD.

METHODS: Seven-day PA Recall determined estimated expenditure (kcal/wk) and classified inactive, moderately active, and highly active PA dose categories. The Psychiatric Diagnostic Screening Questionnaire GAD subscale assessed GAD symptom severity; a score of ≥6 indicated analogue GAD (AGAD) status. The Social Physique Anxiety Scale assessed SPA. Independent t-tests examined baseline differences between gender and AGAD status. Cohen’s d quantified the magnitude of differences. Logistic regression quantified odds of AGAD based on PA dose, adjusting for age, gender, and smoking status. Simple mediation analyses examined mediation of the continuous PA-GAD symptom association by SPA.
College is a time when many health habits, both physical and behavioral, start to form that will remain throughout one’s adult life (Kemper & Walters, 2010). It has been estimated that between 12-50% of college students have one or more of the common mental health disorders (Hunt & Eisenberg, 2010). Mental health disorders in early adulthood have been associated with long-term physical health issues (cancer, cardiovascular disease, diabetes, hypertension, asthma, etc.) that appear throughout adulthood (Scott et al., 2016). The earlier these physical health issues can be identified, the earlier various treatments (such as lifestyle modification) could be started.

**PURPOSE:** To analyze the relationship between mental health status and cardiovascular risk factors in college freshmen. 

**METHODS:** 45 college freshmen (27 females and 18 males) were recruited from a small, liberal arts college in the Midwest. Cardiovascular risk factors (blood pressure (BP) and body composition) were measured, physical activity was self-reported, and sleep was evaluated by use of the Pittsburgh Sleep Quality Index. Mental health was evaluated by the Depression, Anxiety, and Stress Survey. The cohort was divided into three categories based on their individual mental health scores: those who scored high in all three (depression, anxiety, and stress) (n=7), those who scored low in all three (n=14), and those who had some combination of high and low (mixed) (n=24).

**RESULTS:** Participants in the mixed group had significantly higher systolic BP (110.8 ± 0.1mmHg) than those in the high (102.7 ± 0.1mmHg) and low (104.2 ± 0.1mmHg) groups (p<0.003). No significant differences were observed in diastolic BP, fat-free mass, fat mass, skeletal mass, or visceral adipose tissue were seen between groups.

**CONCLUSION:** These differences in BP could be a result of medication (such as beta blockers), which could be the cause of the reduced BP in the group with high scores on all three mental health scales. Data on medication use was not collected in this study, but should be added to future studies. Additional research should investigate this relationship in a larger cohort so additional relationships could be explored.

**Board #306 May 28 9:30 AM - 11:00 AM**

**Relationships Between Adolescents’ Physical Activity And Mental Health In Urban And Rural Areas Of China**

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(No relevant relationships reported)

The relationship between physical activity (PA) and mental health has been documented, but the relationship between PA and different dimensions of mental health problems in rural and urban areas of China need to be explored. 

**PURPOSE:** To examine differences in the relationship of PA and mental health problems and these problems between rural and urban areas of China. 

**METHODS:** Data were collected over 2 months in 1884. Four representative regions of China were selected: Beijing, Shanghai, Nanchang, and Urumchi, 9629 adolescents completed questionnaires assessing mental health, PA and individual characteristics. The Diagnostic Test of Anxiety Tendency Scale was used to assess mental problems including eight subscales.

**RESULTS:** Participants in the mixed group had significantly higher systolic BP (110.8 ± 0.1mmHg) than those in the high (102.7 ± 0.1mmHg) and low (104.2 ± 0.1mmHg) groups (p<0.003). No significant differences were observed in diastolic BP, fat-free mass, fat mass, skeletal mass, or visceral adipose tissue were seen between groups.

**CONCLUSION:** These differences in BP could be a result of medication (such as beta blockers), which could be the cause of the reduced BP in the group with high scores on all three mental health scales. Data on medication use was not collected in this study, but should be added to future studies. Additional research should investigate this relationship in a larger cohort so additional relationships could be explored.

**Board #308 May 28 9:30 AM - 11:00 AM**

**Home-based Pilates For Symptoms Of Anxiety, Depression, And Fatigue Among Women With MS**

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(No relevant relationships reported)

Evidence supports positive effects of exercise on mental health outcomes among people with Multiple Sclerosis (PwMS). However, non-traditional exercise modes like Pilates remain understudied.

**PURPOSE:** This randomized controlled trial investigated the effects of eight weeks of twice weekly home-based Pilates training compared to delayed-start wait-list condition on symptoms of anxiety, depression, and fatigue among 54 females (46.7 ± 9.6 years, Disease Steps score <3), no previous Pilates experience, and no other significant physical or psychiatric condition. 

**METHODS:** Participants were randomized to twice weekly home-based Pilates sessions guided by a DVD or delayed-start wait-list. Well-validated questionnaires assessed symptoms of anxiety, depression, and fatigue at baseline, and weeks two, four, six and eight of the intervention. Compliance was documented in weekly exercise diaries and followed-up by a phone call from the first author. 

**RESULTS:** Group X time interactions were significant for depressive symptoms (F(8,414) = 3.21, p<0.02), physical symptoms of fatigue (F(8,414) = 3.45, p<0.01), cognitive symptoms of fatigue (F(8,414) = 3.08, p<0.02), psychosocial symptoms of fatigue (F(8,414) = 3.51, p=0.009), and total fatigue (F(8,414) = 3.32, p=0.007). Compared to wait-list, home-based Pilates significantly reduced (all p<0.041) depressive symptoms at weeks 6 (d=0.39) and 8 (d=0.69), physical symptoms of fatigue at weeks 2 (d=0.24), 6 (d=0.57), and 8 (d=0.87), cognitive symptoms of fatigue at weeks 4 (d=0.39), 6 (d=0.32), and 8 (d=0.60), psychosocial symptoms of fatigue at weeks 2 (d=0.51), 6 (d=0.48), 8 (d=0.58), and 8 (d=0.69), and total fatigue at weeks 2 (d=0.23), 4 (d=0.37), 6 (d=0.53), and 8 (d=0.84). 

**CONCLUSION:** Home-based Pilates improved mental health outcomes among females with MS, including moderate magnitude reductions in depressive and fatigue symptoms. These findings support the potential of home-based Pilates to improve several mental health symptoms prevalent among PwMS.
Promotion of mental health (MH) issues has been lately a priority in several sport organizations in the US (e.g., NCAA, NFL, NBA). Self-compassion (SC) and mental toughness (MT) have been proven successful against stressors associated with sports. Preliminary evidence have shown a positive relationship between MT and MH, SC and MH, and MT and SC. These constructs have never been investigated in eSports, an industry that has grown considerably in the recent years. **PURPOSE:** To confirm the three aforementioned relationships and explore the mechanism underlying these relationships in eSports. Hypotheses: (1) MT will correlate positively with MH, (2) SC will correlate positively with MH, (3) MT will correlate positively with SC, and (4) SC will mediate the MT-MH relationship. **METHODS:** In total, 16 recreational gamers (>6 hours per week) agreed to participate (Mage = 22, SD = 2.69). Three inventories were administered via Qualtrics: Mental Toughness Index, Self-Compassion Scale, and Mental Health Continuum—Short Form. The analysis consisted of Pearson correlations and mediation analysis in R. **RESULTS:** The estimated correlations between MT and MH was .55, MT and SC was .71, and MH and SC was .61. In the preliminary mediation model, the estimated standardized regression coefficient of MH on MT was 0.55. The same estimate after adding SC was 0.23. **CONCLUSION:** The results indicate that (a) all three variables are positively correlated to each other and (b) SC reduced, or mediated, the relationship between MT and MH by 0.32 units. Therefore, evidence to support all four hypotheses was found. The correlations are in accordance with findings from Gucciardi, Hanton, and Fleming (2017), Neff, Rude, and Kirkpatrick (2007), and Wilson, Bennett, Mosewich, Faulkner, and Crocker (2019). The mediation analysis findings suggest that the relationship between MT and MH is partially explained by SC and confirm outcomes from Padgett, Forsee, Papadakis, Deal, and Stamatis (2019). The above could have important implications for eSports Psychological Skill Training (PST) practice in the effort of general prevention/early intervention of MH: not only these three variables are positively correlated but a better understanding of the relationship between MT and MH is now offered for this unique sporting environment.

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Suicide is a national public health concern with rates increasing 33% between 1999 and 2017. Suicidal ideation (SI) or thinking of or planning suicide, typically precedes suicide attempts. Thus, recognizing risk factors for SI in populations that are at suicide risk, such as those with Major Depressive Disorder (MDD) is key for prevention. Low physical activity (PA) and high sedentary time (ST) are associated with SI in the general population, though research has not explored these in MDD. **Purpose:** This study examined whether PA and prolonged sitting in adults with MDD are associated with SI severity. **Methods:** SI over the past month was assessed using the Mini International Neuropsychiatric Interview in 47 adults (72% female) with MDD, with SI scored as None (n=16), Low (n=14), Moderate (n=4) or High (n=13). Thigh-worn accelerometers assessed PA and ST continuously for 7 days. A multinomial logistic regression analysis compared differences in average steps per day and daily average prolonged ST, defined as ST in bouts of >60 minutes, among SI severity groups. **Results:** The logistic regression demonstrated no significant difference in either behavior among groups (p>0.05). There were medium effect sizes for prolonged ST between None and High (Hedges’ g=0.57) and between None and Low/Moderate (g=0.77). For steps per day, small effect sizes were found between None and High (g=0.29) and None and Low/Moderate (g=0.42). **Conclusion:** Although non-significant, the medium effects suggest promoting decreases in prolonged ST may aid in suicide prevention in adults with MDD, in conjunction with other efforts. Future studies with larger and more diverse samples will be key for understanding the utility of reducing prolonged ST to combat suicidal ideation and attempts.
1718 Board #312 May 28 9:30 AM - 11:00 AM Anxiety And Depression As Predictor Agents Of Low Group Integration Task In Mexican College Athletes. Victor Daniel Martinez-Santillan, Víctor Hugo Montejo-Lambaren, Sara Ramírez-Hernández, Emmanuel Marquez-Gomez, Alejandro Gaytan-Gonzalez, Juan Ricardo Lopez-Taylor. Universidad de Guadalajara, Guadalajara, Mexico. (No relevant relationships reported)

PURPOSE: To identify the relationship between depression and anxiety indicators and Group Integration Task (GI-T) in college athletes.

METHODS: 224 college athletes from 11 team sports (134 men and 90 women with an age range between 19 and 24 years old) of a high-performance program were evaluated with a psychometrical battery that included the Goldberg’s anxiety and depression scale (two subscales with 9 questions each, that results in “With/Without anxiety” and “With/Without depression”); and the Group Environment Questionnaire (GEQ) which evaluates the cohesion in team sports in four group and individual factors; Group Integration Task (GI-T) was the only one analyzed, the results were summarized in quartiles, the higher the quartile, the worse the score. Multinomial logistic regression was performed to analyze the association between Goldberg’s and GI-T scores.

RESULTS: Statistically significant associations were found between for presenting depression and the presence of third (p=0.01) and fourth (p=0.01) quartiles. On the other hand, showing anxiety was significantly associated with presenting scores on the fourth quartile only (p=0.03).

CONCLUSIONS: Those athletes that scored with probable depression or anxiety are associated with higher quartile punctuations in GI-T factor. Evaluating anxiety and depression in athletes of team sports could be a way to identify probable cohesiveness problems between their members. Similar studies are suggested to corroborate this result.

| Table 1. Association between Depression and anxiety with GI-T scores. |
|-------------------|----------------|---------------|
| GI-T              | Q2             | Q4            |
| With depression   | 1.47 (0.68 - 3.15) | 2.75* (1.34 - 5.68) | 2.72* (1.27 - 5.83) |
| With anxiety      | 2.07 (0.82 - 5.23) | 1.61 (6.53 - 3.96) | 2.78* (1.14 - 6.80) |
| Data expressed in OR (95% CI). GI-T: Group integration task. Q: Quartile number.* p<0.05 |

1719 Board #313 May 28 9:30 AM - 11:00 AM Heart Rate Variability As Psychophysiological Stress Indicator In Mexican College Volleyball Players Sara Ramírez-Hernández, Víctor Hugo Montejo-Lambaren, Alejandro Gaytan-Gonzalez, Juan Ricardo Lopez-Taylor. Universidad de Guadalajara, Guadalajara, Mexico. (No relevant relationships reported)

PURPOSE: To compare the response of Heart Rate Variability (HRV) during induced stress as a psychophysiological stress indicator in Mexican college volleyball players.

METHODS: We evaluated 16 male college volleyball players (18 to 26 y). Psychophysiological assessment of stress consisted of 7 stages lasting 2 min each (baseline, exposed to a physiological stressor [unpleasant sounds], 1st rest, exposed to a cognitive stressor [mathematical task], 2nd rest, exposed to stressor emotional [talk about a stressful memory] and 3rd rest). It was done by a ProCompTM Infinity Biofeedback System. Short-term HRV was obtained by a Blood Volume Pulse (BVP) Sensor and analyzed using time-domain: SDRR (standard deviation of RR intervals) and pNN50 (percentage of successive RR intervals that differ by more than 50 ms); and frequency-domain: HRV peak frequency, Very Low Frequency (VLF) total power, Low Frequency (LF) total power, High Frequency (HF) total power, LF% power, HF% power and LF/HF power measurements. Statistical analysis was performed by repeated measures ANOVA and non-parametric Friedman test.

RESULTS: Significant differences in HRV were observed when we compared the seven stages of the assessment (with stress stimulus and without stress stimulus). During the COGNITIVE stage there was a difference with the BASELINE (p=0.01) and EMOTIONAL (p=0.004) stage in HF peak frequency; in VLF% between PHYSIOLOGICAL and 1st REST (p=0.01) stage; among the BASELINE and the EMOTIONAL (p=0.04) stage on SDRR; and with pNN50 on COGNITIVE and 3rd REST (p=0.02) stage. (Table 1).

CONCLUSIONS: The results showed significant changes in the variables associated with sympathetic activity in stages that had stressors compared to baseline and rests, which may indicate psychophysiological response to stress. These results support the idea of HRV is a useful psychophysiological stress indicator and maybe a helpful tool to identify and have better stress management in Mexican college athletes.

1720 Board #314 May 28 9:30 AM - 11:00 AM Relationship Between Time Practicing A Sport And Risk Of Burnout In Mexican College Athletes. Ethel Nayeli Moreno-Lopez, Víctor Hugo Montejo-Lambaren, Sara Ramírez-Hernández, Alejandro Gaytan-Gonzalez, Juan Ricardo Lopez-Taylor. Universidad de Guadalajara, Guadalajara, Mexico. (No relevant relationships reported)

PURPOSE: To determine the association between the experience of practicing a sport and the risk of suffering Emotional Exhaustion and Depersonalization.

METHODS: 307 college athletes from a high-performance program in Guadalajara, Mexico, were evaluated. Trained psychologists applied the Sport Burnout Inventory - Reviewed (18 questions and 3 subscales: Emotional Exhaustion (EE), Depersonalization (D) and Reduced Personal Realization (RP); it brings four possible conclusions: “Low Risk”, “Moderated Risk”, “High Risk” and “With Burnout”) to identify Burnout problems. The years of experience practicing their sport were obtained through an interview with the athletes before the questionnaire was answered. A logistic regression analysis was performed to predict the presence of Depersonalization and Emotional Exhaustion depending on the years practicing the sport.

RESULTS: EE was not related to the years practicing a sport. On the other hand, D showed a relationship with the time of experience in the moderated risk of suffering Burnout Syndrome when an athlete mentioned have been practicing their sport for 7-9 years (p=0.02), 4-6 years (p=0.01) and 1-3 years (p=0.01).

CONCLUSIONS: Burnout Syndrome seems to be a time practicing an activity related problem. In our sample, nonetheless, the time was not directly related to a high risk of suffering burnout scores in the analyzed factors. Those who have most time practicing the sport showed a relationship with the time of experience in the moderated risk of suffering Burnout Syndrome when an athlete mentioned have been practicing their sport for 7-9 years (p=0.02), 4-6 years (p=0.01) and 1-3 years (p=0.01).
CONCLUSION: Performance burnout following a period of restrictive eating and overtraining.

RESULTS: Four major themes emerged, including the pursuit of the “ideal of the runner” (0.37%), current distress (1.23%), physical activity and resting heart rate (1.88%), and burnout (2.81%).

METHODS: Motivated by feminist theory, we conducted semi-structured, in-depth qualitative investigation of collegiate distance runners with low energy intake, with or without disordered eating.

The increased use of sedatives and hypnotics coupled with their known adverse health effects, particularly the increased risk of emigration, death or study end 1 of January 2018. Baseline CRF (ml/kg/min) was determined using non-exercise algorithms based on sex, age, waist circumference, physical activity, and resting heart rate (eCRF). Baseline eCRF was further grouped into age- and sex-specific tertiles. Cox regression models were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between baseline eCRF and incident use of sedative-hypnotics. The multivariable analyses were adjusted for age, sex, education, smoking status, anxiety and depression, limiting longstanding illness, and sleep problems. Results: During follow-up, 2,132 (15.2%) of the participants used sedative-hypnotics. In fully adjusted models comparing with the lowest tertile of eCRF, those in the middle and upper eCRF tertiles had 8% (HR: 0.92, 95% CI: 0.84-1.00) and 24% (HR: 0.86, 95% CI: 0.77, 0.92-0.94) lower risk of incident use of sedative-hypnotics. Conclusion: Higher CRF is associated with less prescribed sedative-hypnotics in the general population. This effect seems to be more pronounced for those with highest CRF. Characters no space (max 2000): 1967

Purpose: To examine PB and WT perceptions [current: CWT, ideal: IWT, mental dissatisfaction. It is well known that moderate exercise can modulate anxiety state; however, few studies have shown the effects of severe intensity exercise over anxiety. Purpose: To compare the impact of moderate and severe exercise on anxiety state answers in healthy adults. Methods: Twenty-four male subjects (30.45±5.3yrs; 74.78±8.9kg; 174.12±4.1cm; 24.69±2.4kg/m²; 18.04±5.5%Fat mass; 27.33±4.5 Trait Anxiety Inventory in the following time-courses: baseline (B), immediately after (IA) and 30 minutes after (R) the end of exercise. The results were compared using GLM (General linear models with Duncan post-hoc, with significance p<0.05. The protocol was approved by Unifesp Ethics Committee (no.2.381.537). Results: A significant reduction in anxiety scores was found immediately after (p = 0.03) and 30 minutes after (p = 0.02) moderate exercise (60% Vpeak) when compared to pre-exercise moment. Similar pattern was observed in the severe exercise (85% Vpeak) with lower scores 30 minutes after (p = 0.01) when compared to the other time-courses. At this intensity the scores came from a moderate anxiety immediately after to low level 30 minutes after the end of exercise. Comparing the variation between IA-B and IA-R, it was observed that the reduction in anxiety scores was even greater in the severe exercise (p<0.001). Conclusion: The comparison between the exercise intensities showed that both intensities can reduce state anxiety scores but severe intensity reduced scores in a greater amplitude than the moderate exercise in adults. Financial Support: AFIP, CAPES (001 code), and CNPq

Purpose: Population-based and clinical studies suggest that higher cardiorespiratory fitness (CRF) is associated with better mental health and less sleep complaints. However, in these studies mental health and sleep are assessed through questionnaires. The increased use of sedatives and hypnotics coupled with their known adverse health associations raises potential public health concerns. So far no studies have assessed if CRF is associated with incident use of sedative-hypnotics in the general population.

Methods: This prospective study included 30,481 participants (52.2% women, mean age 51.0 years) from the third survey of the Norwegian Nord-Trøndelag Health

Table 1. Association between experience, emotional exhaustion, and depersonalization.

<table>
<thead>
<tr>
<th>Experience practicing the sport</th>
<th>Emotional exhaustion</th>
<th>Depersonalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10 years</td>
<td>Moderate risk</td>
<td>High risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate risk</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td>0.80 (0.36 - 1.76)</td>
<td>0.63 (0.10 - 4.10)</td>
</tr>
<tr>
<td>4 to 6 years</td>
<td>0.80 (0.33 - 1.91)</td>
<td>1.36 (0.23 - 8.17)</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>1.12 (0.49 - 2.53)</td>
<td>1.78 (0.33 - 9.73)</td>
</tr>
</tbody>
</table>

Data expressed as OR (95% CI).

*p <0.05. BO: Burnout.
self-reporting IWT and MWT) and the Eating Disorder Inventory-Symptoms Checklist (for PB). Basic descriptive statistics assessed demographic information. Cross-tabulations assessed the proportion of participants classified as “at risk” for PB across sport. A repeated measures ANOVA examined perceptions of WT (CWT vs. IWT vs. MWT) across sport.

**Results:** Significant differences were found for use of PB across sport (61.4%; X²(5, N=125) = 16.5, P=0.006). EQ (8.9%) and ballet had the highest risk (13.4%). Significant differences were found between excessive exercise and sport type [X²(5, N=125) = 32.7, P<0.001] for an overall risk of 52.8% with highest risk for EQ (13.6%) and ballet (16%) (10.4%). No significant differences were found for binge eating, purging, laxatives, diet pills, and diuretics. A significant main effect was revealed for WT perceptions across sport (F₁,₁,115 =16.25, P=0.001). No significant interactions for sport type were seen [F(5, 115) = 12.2, P=0.033].

**Conclusion:** Overall athletes report engaging in PB, especially dieting and excessive exercise to control their WT, with aesthetic sports at higher percentages. Athletes WT perceptions are of concern, as all sports want to be similar and assume their WT would be higher if they didn’t control their WT.

**1725 Board #319 May 28: 9:30 AM - 11:00 AM**

**Relationship Of Internalized Weight Stigma To Sleep Quality And Physical Activity Among College Students**

Jonathan Whippens, John Bennisson, Emily Guseman. Ohio University, Athens, OH.

Email: jw269717@ohio.edu

(No relevant relationships reported)

**PURPOSE:** Studies suggest weight stigma may be associated with negative health outcomes, but research has focused on the control ability to lose weight, reduced physical activity, and poor mental health outcomes. Less is known about the prevalence of weight stigma among college students and how this relates to behavioral health.

**METHODS:** Students at a large Midwestern university completed an anonymous, online cross-sectional survey. Participants self-reported height and weight to determine BMI and weight status. Participants self-reported time spent in moderate, vigorous, and resistance-based physical activity. Participants completed Pittsburgh Sleep Quality Index (PSQI) to determine sleep quality.

**RESULTS:** A total of 328 students provided complete data and are included in this analysis. The majority of participants were female (n=256, 81%), and Caucasian (n=292, 89%). Eighty-nine participants (28.1%) had obesity based on BMI classification with no difference in prevalence between genders. Mean reported sleep time was 7.0 ± 1.3 hours for all participants. Female participants reported lower overall sleep quality (7.1 ± 3.4) compared to males (6.3 ± 3.6). Mann-Whitney U group comparisons demonstrated that participants reporting higher sleep quality had lower degrees of internalized weight stigma; this relationship was seen among females (md=7.6, P=0.001) and males (md=5.2, P=0.003). The majority of injury male (77.9%) and female (75.0%) participants did not meet national physical activity recommendations. Mann-Whitney U groups comparisons demonstrated that participants with higher Participants meeting physical activity recommendations reported lower degrees of internalized weight stigma (md=4.20, P=0.01).

**CONCLUSIONS:** There is evidence that higher internalized weight stigma is related to reduced sleep quality and lack of achievement of physical activity recommendations among college students. Further research should explore this relationship to improve lifestyle counseling within this population.

**1726 Board #320 May 28: 9:30 AM - 11:00 AM**

**The Psychological And Academic Impact Of Athletic Injury**

Jessie Juennemann, Ben Resnick, Jennifer Dysterheft Robb. Hamline University, St. Paul, MN. (Sponsor: Lisa Stegall, FACSM)

Email: jjuennemann01@hamline.edu

(No relevant relationships reported)

**PURPOSE:** Awareness and research on the mental health of student athletes has been rapidly increasing and recently became a primary focus of the National Collegiate Athletic Association (NCAA) and National Athletic Trainers’ Association. Although many see athletes as individuals who have grit and strength, the impact of injury and sport can have drastic effects on an athlete’s mental health, as well as academic performance and social participation. Without proper support, critical negative secondary effects could occur during and after the rehabilitation process. Therefore, the purpose of this study was to examine the psychological and academic impact of athletic injury, specifically NCAA Division III athletes.

**METHODS:** A total of 34 collegiate student-athletes participated in the study (19 male, 15 female) from the Minnesota Intercollegiate Athletic Conference. Participants completed a mixed-methods questionnaire on the perceived mental impact of previous or current sport injuries. The questions required short answer and likert scale rating responses. A seven layer thematic analysis using three coders and triangulation to control for bias was used to analyze short answer responses and develop primary and subthemes. Quantitative data was analyzed using descriptive statistics.

**RESULTS:** Thematic analysis revealed major changes occurred in: Mental Health, Physical Health, Daily Habits, and Perceived Social Support following sport injury. Critical findings included: 38% of participants perceived negative social interactions from coaches, 35% had symptoms of depression, 74% had some type of emotional disruption, and 29% had a reduction in academic motivation.

**CONCLUSIONS:** High reports of depressive feelings, overall disruption to emotions and habits, and lack of social support alongside these mental health changes are a cause for great concern for collegiate athletes and their institutions. It is recommended that NCAA institutions utilize sports psychologists or mental health professionals to allow athletes to have a larger support system and work through mental health and academic issues they may face.

**1727 Board #321 May 28: 9:30 AM - 11:00 AM**

**The Acute Effects Of Exercise Intensity On Positive And Negative Affect**

Charles J. Fountaine, FACSM, Elizabeth McElyea, Kelley Phillips. University of Minnesota Duluth, Duluth, MN.

Email: cfountai@udunn.edu

(No relevant relationships reported)

College students commonly rate stress as the number one health problem with which they deal with on a daily basis. Aerobic exercise is often promoted as an effective tool for stress management and overall improved mental health. Less understood is the utility of exercise intensity as a means to reduce perceived levels of stress and subsequently improve mood. **PURPOSE:** to investigate the acute effects that the intensity of aerobic exercise has on positive and negative affect. **METHODS:** College students (n=28) were assessed for affect via the Positive and Negative Affect Schedule (PANAS) questionnaire. In a crossover study, students performed two cycle ergometer protocols 48 hours apart - 1) moderate-intensity at 65% of peak power output for 20-min and 2) vigorous-intensity at 85% of peak power output, performed in a 1-min-on, 1-min-off interval format for 20-min. After the conclusion of the exercise session, the students were assessed via the PANAS a second time, allowing for pre/post analysis. **RESULTS:** Initial analyses indicated no interaction effect (time x condition) for either positive affect (p=0.065) or negative affect (p=0.064). Positive affect scores increased from pre to post in both conditions (65%: p<0.001, d=1.2; 85%: p<0.001, d=1.2). Negative affect scores decreased from pre to post in both conditions (65%: p<0.001, d=0.92; 85%: p<0.001, d=0.89). **CONCLUSIONS:** The results of this study found that an acute 20-min bout of cycling at both 65% and 85% of peak power led to large improvements in positive affect (18.8%, 27.4%) and large decreases in negative affect (23.5%, 17.6%). Moderate and vigorous-intensity aerobic exercise were equally effective in improving mood in this college population.

**C-47 Free Communication/Poster - Genetics, Immunology and Endocrinology with Exercise**

**Thursday, May 28, 2020, 9:30 AM - 12:00 PM**

**Room: CC-Exhibit Hall**

**1728 Board #322 May 28: 9:30 AM - 11:00 AM**

**A Comparison Of Tnfr1 And Tnfr2 Expression On Monocyte Subsets Following Continuous And Interval Exercise**

Emily C. Tagesen,1 Elliott Arroyo2, Tricia H. Hart2, Brandon A. Miller1, Adam R. Janjua1 1Kent State University, Kent, OH. 2Lipscomb University, Nashville, TN. (Sponsor: Ellen Glickman, FACSM)

Email: etagesen@kent.edu

(No relevant relationships reported)

**Purpose:** To examine the tumor necrosis factor receptor (TNFR) 1 and 2 response among monocytes among subsets to interval and continuous aerobic exercise. **Methods:** Six men (22.5±3.9 yrs; 180±8.5±5 cm; 80±56±6 kg; 11.8±4.3 %BF; 44.2±2.4 ml·kg-1·min-1) completed three cycling protocols: moderate continuous (MCT), sprint-interval (SIT), and high-intensity-interval (HIIT), in a randomized order. Visit 1 consisted of a maximal graded exercise test (VO2max) on a cycle ergometer. HIIT consisted of 15 90-sec bouts at 85% VO2max with 30 sec active recovery periods. SIT consisted of 15 20-sec bouts at 130% max wattage and 160-sec active recovery periods. MCT was a continuous bout at 65% VO2max. Each trial duration was 53 min, including a 5-min warm-up and a 3-min recovery. Blood was collected before (PRE), immediately (IP), 30 minutes (30M), 2 hours (2H), 6 hours (6H) and 24 hours (24H) post-exercise.

Abstracts were prepared by the authors and printed as submitted.
Changes in surface expression, as measured by median fluorescent intensity (MFI) of TNFR1 and 2 on monocyte subsets (classical: CD14+CD16–; intermediate: CD14+CD16+; and nonclassical: CD14–CD16+) were analyzed via flow cytometry. Changes in TNFR1 and 2 expression were determined using a mixed model regression with fixed effects on time and condition. Results: Analysis indicated a time effect for TNFR1 expression on classical (F=4.450, p=0.001) and intermediate (F=3.517, p=0.006) monocytes. TNFR1 expression on classical monocytes decreased (p<0.05) from PRE (6391 ± 649 MFI), 30M (6618 ± 655 MFI) and 2H (6184 ± 569 MFI) at 6H (5912 ± 814 MFI) and 24H (6156 ± 516 MFI). TNFR1 expression on intermediate monocytes decreased (p<0.05) from PRE (6391 ± 649 MFI), 30M (6618 ± 655 MFI) and 2H (6184 ± 569 MFI) at 6H (5912 ± 814 MFI) and 24H (6156 ± 516 MFI). A time effect (F=4.079, p=0.002) was observed for TNFR2 expression on intermediate monocytes, with a peak effect at the 6H time point (p<0.05) from PRE (25528 ± 3188 MFI) at 30M (22227 ± 4067 MFI), 2H (21881 ± 5113 MFI) and 6H (20515 ± 5918 MFI). TNFR2 expression on intermediate monocytes recovered 24H (25483 ± 3189 MFI).

Conclusion: Changes in TNFR1 and TNFR2 expression were observed across time, with no differences observed between conditions. Therefore, TNFR1 and TNFR2 expression on monocytes may not be dependent on intensity, but more investigation is necessary. Partially supported by the NSCA Foundation

1729 Board #323 May 28 9:30 AM - 11:00 AM Diurnal Regulation Of Exercise-induced Interleukin-6 Signaling
Charli D. Aguilar, Elias M. Malek, Caitlin K. Reynolds, Graham R. McGinnis. University of Nevada Las Vegas, Las Vegas, NV. (Sponsor: James Navolta PhD., FACSM)

BACKGROUND: Exercise-induced production of specific myokines, namely Interleukin-6 (IL-6), is essential in protecting the heart against cardiac ischemia-reperfusion injury (IR) in mice. Interestingly, IL-6 production in skeletal muscle has been shown to have a circadian rhythm in vitro, which also influences the magnitude of exercise-induced IL-6 in the blood in humans. However, the interplay by which those responses are triggered and regulated during recovery after resistance exercise has not been well known.

PURPOSE: It was the purpose of this study to investigate how time-of-day affects exercise induced IL-6 signaling in the heart.

METHODS: We assessed activation of the IL-6 signaling pathway in cardiac muscle following exercise at two times of day; Zeitgeber time (ZT) 0 (beginning of light/est phase) and ZT 12 (beginning of dark/active phase). 21-week-old male C57/BL6 mice (n=38) were habituated to treadmill exercise for 5 days under red light during the active phase and immediately sacrificed at 3 time points; pre-exercise (SED), immediately after and at 20 and 40 min post-exercise. Plasma levels of TSH, IL-6, and PRL were measured immediately after and at 20 and 40 min after exercise, respectively, compared to 0±0.5 ng/ml at baseline; p<0.05). PRL levels showed a significant decrease up to 17% 20 min after exercise (18.36±2.3 ng/ml, 17.31±2.4 ng/ml at 20 and 40 min after exercise, respectively, compared to 21.59±2.9 ng/ml at baseline; p<0.05). CONCLUSION: Our findings suggest that resistance exercise at a submaximal velocity induces mild acute pituitary-thyroid hormone responses. Further studies are needed to characterize the mechanisms by which those responses are triggered and regulated during recovery after resistance exercise.

1730 Board #324 May 28 9:30 AM - 11:00 AM Pituitary-thyroid Hormone Responses Following Resistance Exercise Performed At Submaximal Movement Velocity
Anastassios Philippou1, Ilia Smilios2, Savvas Tokmakidis2, Michael Koutsilieriss, Roxana Tenta1. 1Medical School, National and Kapodistrian University of Athens, Goudi-Athens, Greece. 2School of Physical Education and Sport Science, Democritus University of Thrace, Komotini, Greece. 3School of Health Science and Education, Harokopio University, Athens, Greece. Email: tfilipou@med.uoa.gr (No relevant relationships reported)

Acute hormonal changes can be elicited by mechanical overloading of skeletal muscle, which are potentially involved in muscle adaptation following resistance exercise. In particular, previous studies have shown that resistance exercise at maximal velocity induces acute changes in circulating levels of pituitary-thyroid (P–T) hormones.

1731 Board #325 May 28 9:30 AM - 11:00 AM Relationships Of Serum And Plasma BDNF To TNF-a, IL-10, And IL-1ra During Aerobic Exercise
Brandon A. Miller1, Ryan T. Wiet2, Emily C. Tagesen1, Kyleen Boka3, Eliott Arroyo4, Ellen L. Glickman, FACSM, Adam R. Jajtner1. 1Kent State University, KENT, OH. 2Malone University, Canton, OH. (Sponsor: Ellen L. Glickman, FACSM) (No relevant relationships reported)

PURPOSE: To examine the relationship of Brain Derived Neurotrophic Factor (BDNF) in serum and plasma to serum TNF-a, IL-10, and IL-1ra in response to aerobic exercise. METHODS: Six recreationally active men (26.0 ± 2.6 yrs, 180.3 ± 5.3 cm, 85.3 ± 7.6 kg, 48.64 ± 5.2 mL kg−1 min−1) completed three exercise trials under different conditions: low temperature (5°C), moderate temperature (22°C), and high temperature (35°C). Each protocol consisted of a 60-min cycling trial at 60% VO2max, a 15-min rest, and a 1-hour to exhaustion trial at 90% VO2max (TTE). Blood was sampled before (PRE) and after the 60 min exercise trial (60), immediately following the TTE (90), and one hr post-TTE (REC). Serum concentrations of TNF-a, IL-10, IL-1ra, BDNF-S, and plasma concentrations of BDNF-P were analyzed via ELISA. Data were combined across different conditions and analyzed by calculating change scores between PRE and other time points – presented as 60, 90, REC. Relationships between analytes were determined using Pearson Product Moment Correlations, with α ≤ 0.05. Correlation coefficients were described as weak (r = 0.30 – 0.49), moderate (r = 0.50 – 0.69), or strong (r = 0.70 – 0.89). RESULTS: Correlation coefficients between changes in BDNF-S and changes in IL-1ra indicated moderate to strong positive relationships between BDNF-S and IL-1ra at 60 with IL-1ra at 90 (r = 0.513, p = 0.035) Changes in BDNF-S and IL-1ra demonstrated weak to moderate, non-significant correlation coefficients between BDNF-S and REC with IL-1ra at 60 (r = 0.456, p = 0.087; r = 0.508, p = 0.064; respectively). Similar, correlation coefficients between changes in BDNF-S and IL-1ra presented weak to moderate, non-significant relationships between BDNF-P at 60 with TNF-a at 90 (r = 0.513, p = 0.035), Changes in BDNF-S and IL-1ra shown demonstrated weak to moderate, non-significant correlation coefficients between BDNF-S at 90 and REC with IL-1ra at 60 (r = 0.456, p = 0.087; r = 0.508, p = 0.064; respectively). Therefore, there appears to be a strong relationship between BDNF-S and IL-1ra throughout the trial, suggesting BDNF may be linked to the anti-inflammatory cascade, though not corroborated in BDNF-P.

1732 Board #326 May 28 9:30 AM - 11:00 AM Sex Dimorphism In Muscle Damage-Induced Inflammation
Hui-Ying Luk1, Casey Appell1, Mohamed Fokar1, Jakob Vingen, FACSM2. 1Texas Tech University, Lubbock, TX. 2University of North Texas, Denton, TX. (Sponsor: Jakob L. Vingen, FACSM) Email: huiying.luk@ttu.edu (No relevant relationships reported)

Evidence suggests that estrogen can provide a protective effect against muscle damage-induced inflammation. However, to date, no study has directly compared the muscle damage-induced intramuscular cytokines gene expression between men and women. PURPOSE: The purpose was to determine the intramuscular cytokine response to a bout of unaccustomed eccentric exercise in men and women.

METHODS: Nine healthy males (age: 22.5 ± 3.3 years, height: 181.5 ± 5 cm, body mass: 81.6 ± 5.6 kg) underwent a protocol of resistance exercise of the knee extensors of both legs (4 sets squat and 4 sets leg press, 8 repetitions/set, with a load corresponding to that of 10-repetition maximum). A recovery period of 3 minutes was allowed between sets. Blood samples were collected and immediately analyzed. Plasma levels of TNF-a, IL-6 and PRL were measured by ELISA. One-way ANOVA was used for statistics and data are presented as mean ± SE. RESULTS: TNF-a showed a slight gradual increase up to 12% at 40 min post exercise, which failed to reach significance (p<0.05) due to a large variability shown between the subjects’ responses (3.63±0.89 ng/dl, 3.53±0.71 ng/dl, and 3.70±0.88 ng/dl immediately after, at 20 and 40 min after exercise, respectively, compared to 0±0.5 ng/dl at baseline). TNF-a levels exhibited also a non significant increase post exercise (1.33±0.09 ng/dl, 1.18±0.10 ng/dl, and 1.33±0.15 ng/dl immediately after, at 20 and 40 min after exercise, respectively, compared to 1.23±0.10 ng/dl at baseline; p<0.05). PRL levels showed a significant decrease up to 17% 20 min after exercise (18.39±1.23 ng/ml, 17.31±2.4 ng/ml and 17.46±1.10 ng/ml immediately after, at 20 and 40 min after exercise, respectively, compared to 21.59±2.9 ng/ml at baseline; p<0.05). CONCLUSION: Our findings suggest that resistance exercise at a submaximal velocity induces mild acute pituitary-thyroid hormone responses. Further studies are needed to characterize the mechanisms by which those responses are triggered and regulated during recovery after resistance exercise.
Untrained men (n=8, 22 ± 3 years) and women (n=8, 20 ± 1 years) completed a session of 80 unilateral maximal eccentric knee extensions. Vastus lateralis samples were collected and analyzed for gene expression of Interleukin (IL)-6, IL-10, IL-15, tumor necrosis factor (TNF)-α, and transforming growth factor (TGF)-β before exercise (BL), and 12 (± 2) hours and 24 hours (24h) after exercise. Data were Results: A significant (p<0.05) time x gender effect was found for IL-10 and TNF-α expression. IL-10 was increased at 12h (13.6 ± ± 4.22-fold) and 24h (29.34 ± 8.42-fold) compared to BL for men, but there was no change for women. At 24h, IL-10 was greater for men than for women. Additionally, TNF-α was increased at 24h (7.78 ± 1.17-fold) compared to 12h (3.64 ± 1.36-fold) for men; no change was found for women. A significant time effect was found for IL-6 with an increased at 12h (3.23 ± 0.7-fold) and 24h (4.80 ± 1.57-fold) compared to BL. No changes were observed for IL-15 and TGF-β expressions.

Conclusion: In response to exercise-induced muscle damage, TNF-α and IL-10 gene expression increased in men but not in women. These results suggest that there is a sex dimorphic response in muscle damage-induced pro-inflammatory and anti-inflammatory cytokines.

1733 Board #327 May 28 9:30 AM - 11:00 AM Monitoring Of Exercise And Recovery - Biomarkers From The Earlobe? Barbara Wessner. University of Vienna, Vienna, Austria. Email: barbara.wessner@univie.ac.at (No relevant relationships reported)

Venous blood samples are widely used to monitor an athlete’s health and training status. However, due to practicability reasons, the use of micro-sampling methods might be a more applicable solution to monitor training burden and recovery on a regular basis. PURPOSE: As changes in the immune system may define the susceptibility to infection, the aim of the current study was to assess test-retest reliability as well as validity of leukocyte subpopulation determination from capillary blood.

METHODS: Twenty young (25 ± 5 years, 10 males, 10 females) and healthy subjects were enrolled into the study. After performing an all-out test on a treadmill (45 min at 75% of VO2max followed by a graded increase of velocity until maximum exhaustion), venous and capillary blood samples were taken at five time points (before, immediately after, 1, 3, 5 and 24 h after the test), respectively. Additionally, a second resting blood sample was drawn on a different day with at least one week apart to assess test-retest reliability. Leukocyte subpopulations were determined on a flow cytometer (Cytobank, Beckman Coulter) in comparison to the reference method (XE-2100, Sysmex Australia).

RESULTS: When comparing to the reference method ICC (95% CI) for leukocyte subpopulations ranged from 0.63 (0.27-0.83) for lymphocytes to 0.76 (0.49-0.90) for monocytes with typical errors of 0.23 (0.18-0.23) and 0.06 (0.05-0.09), respectively. However, test-retest reliability was rather low ranging from 0.19 (0.26-0.58) for monocytes and 0.55 (0.16-0.80) for lymphocytes. Nevertheless, the micro-sampling method was similarly effective to detect the exercise-induced changes in leukocytes, lymphocytes, monocytes and granulocytes.

CONCLUSION: Venous blood samples seem to be an interesting alternative to venous blood samples when measuring post-exercise alterations of leukocyte subpopulation counts. Future studies will focus on enhancing test-retest reliability and expanding the methods to intracellular markers to further enhance the informative value for athletes, coaches and sports physicians.

1734 Board #328 May 28 9:30 AM - 11:00 AM Acute Effects Of Maximal Exercise On Inflammatory Markers And Heart Rate Variability Samantha J. Goldenstein, Nate T. Berry, Zach Kincead, Travis Anderson, Allan H. Goldfarb, FACS, Laurie Wideman, FACSM. University of North Carolina—Greensboro, Greensboro, NC. (Sponsor: Dr. Laurie Wideman, FACSM) Email: sjgolden@uncg.edu (No relevant relationships reported)

BACKGROUND: It has been suggested that vagal input may influence inflammatory responses on a millisecond timescale akin to heart rate. This study aimed to investigate the relations between vagally mediated markers of heart rate variability (HRV) and inflammatory profiles in response to maximal aerobic exercise. METHODS: Eight recreationally active males (26 ± 3 years, 9 ± 2 % BF) completed two trials separated by a minimum of eight weeks. Resting HRV was assessed during a 5-min seated period at both trials; the root mean square of successive differences (rMSSD) was used to assess vagal input. Maximal oxygen uptake (VO2max) was assessed via ramp protocol on the cycle ergometer (100W + 25W per minute) until volitional fatigue. A blood draw was collected immediately pre-exercise, immediately post-maximal intensity cycle testing. Inflammatory markers were quantified in serum using a high sensitivity T-Cell multiplex (IFNy, IL-10, IL-2, IL-4, IL-6, and TNF-α). Principal component analysis (PCA) was used to form three components and a repeated measures multivariate analysis of covariance (MANCOVA) was used to examine differences in these components between the two trials and across time (pre vs post). RESULTS: After controlling for the difference in baseline rMSSD, inflammation between the two trials approached significance for two components. However, none of the 3 components were significantly different in response to maximal exercise (p<0.05). CONCLUSIONS: Vagal input was assessed by seated resting HRV (rMSSD) which influenced baseline resting inflammatory status but did not influence the exercise-induced inflammatory response. This data suggests that when investigating inflammatory responses, resting vagal input should be considered.

INTRODUCTION: Satellite cells are muscle stem cells that function to support long-term muscle homeostasis, repair and exercise adaptations. Recent evidence in rodents has revealed the existence of an additional muscle progenitor cell population with the capacity to specifically regulate the repair and maintenance of type-Ib skeletal muscle fibres. These cells are typified by the expression of the transcription factor Twist2 (Tw2) and represent a district, non-satellite cell population found within the myofibre interstitium. However, the presence and function of Tw2-positive cells within human skeletal muscle is currently unknown. Therefore, the PURPOSE of this investigation was to identify and characterize Tw2-positive cells within skeletal muscle under basal conditions. METHODS: Muscle biopsy samples were obtained from the hamstrings muscle of young healthy males and females undergoing anterior cruciate ligament repair (n=8, 3 male, 4 female, mean age ~25 years), for immunohistochemical (IHC) analysis of muscle cross-sections and immunocytochemical (ICC) analysis of cytospun mononuclear cells enzymatically digested from muscle biopsy samples. RESULTS: ICC staining revealed numerous Tw2-positive cells in the isolated mononuclear cell fraction suggesting they originated from the myofibre interstitium. This was confirmed through IHC staining for Tw2 and laminin in tissue cross-sections which revealed that Tw2 expression was localized to a population of cells outside the myofibre membrane at a density of 0.014/mm2. In agreement with previous reports, Tw2 protein expression was localized within both the cytosol and the nucleus of Tw2-positive cells. Importantly, IHC analysis of the satellite cell marker pax7 and Tw2 demonstrated that cells expressing these markers were mutually exclusive demonstrated that Tw2-positive cells represent a unique cell type, independent of satellite cells. Ongoing analysis is examining the response to Tw2-positive cells to acute and chronic exercise stimuli. CONCLUSION: These findings identify a novel non-satellite cell population typified by Twist2 expression in human skeletal muscle, the function of which currently remains unknown.

1736 Board #330 May 28 9:30 AM - 11:00 AM Changes In Brain-Derived Neurotrophic Factor Are Correlated With Changes In Il-6 During Aerobic Exercise. Ryan Wiet1, Emily C. Tagesen2, Tori Hargett1, Carly Sedlacek1, Elliot Arroyo1, Brandon A. Miller1, Kylene Boka2, Ellen Glickman, FACSM1, Adam R. Jajtner1. 1Kent State University, Kent, OH. 2Malone University, Canton, OH. (Sponsor: Ellen Glickman, FACSM) (No relevant relationships reported)

The effects of exercise on inflammation are complex. Literature suggests a reduction of chronic inflammation following exercise training, however, following acute bouts of exercise, both pro- and anti-inflammatory responses have been demonstrated. Brain-derived neurotrophic factor (BDNF) has been suggested to have an intermediary role during the inflammatory response to exercise. Therefore, observing the role of BDNF in the post-exercise inflammatory response may allow for a greater understanding of the intricacies of the inflammatory response. PURPOSE: The purpose of this study was to observe the relationship between BDNF and interleukin-6 (IL-6) during aerobic exercise in different environmental conditions. Methods: Six college aged men (26 ± 3 years) completed a VO2max test (48.6 ± 5.7 mL/kg/min) along with three separate trials in 5°C (LT), 22°C (MT), and 35°C (HT). Each trial consisted of cycling for 60 minutes at 60% VO2max, a time to exhaustion trial at 90% VO2max (TTE), and passive recovery for 60 min in the same condition. Blood was obtained before exercise (PRE), after 60 min of cycling (60), after the TTE (90), and after recovery (REC). Blood was analyzed via ELISA for serum and plasma BDNF concentrations and serum IL-6 concentrations. Change scores were calculated (PRE to APRE to REC) and analyzed using a Pearson Correlation, with significance defined as α ≥ 0.05. Results: Changes in serum IL-6 (APRE to 60) were significantly (r = -0.56, p = 0.018) correlated to changes in plasma BDNF (APRE to 60). Changes in serum
IL-6 (APRE to 90) were significantly (r = 0.511, p = 0.043) correlated to changes in serum BDNF (APRE to 90). Changes in serum BDNF were not significantly correlated to changes in plasma BDNF. Of all the other significant correlations were observed.

Conclusion: This study suggests there is a relationship between IL-6 and BDNF. This could lead to better understanding of the mechanism for both IL-6 and BDNF responses due to aerobic exercise. The insignificant correlation between serum and plasma BDNF give evidence that each may represent different pools of BDNF that respond independently to aerobic exercise.

This study was partially funded by the Kent State University Research Council.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

1737 Board #331 May 28 9:30 AM - 11:00 AM Differentially Expressed Genes In Cd8+ T-cells Following A Dual-stress Challenge Kevan W. Stout1, Jake A. Deckert2, Jacob A. Siedlik3, Stefan Graw4, Matthew P. Bubak5, John P. Vardiman6, Devin C. Koestler7, Philip M. Gallagher, FACSM7, 1University of Kansas, Lawrence, KS. 2University of Gonzaga, Spokane, WA. 3Creighton University, Omaha, NE. 4University of Arkansas for Medical Sciences, Little Rock, AR. 5Kansas State University, Manhattan, KS. 6University of Kansas Medical Center, Kansas City, KS. Email: kevan.stout@ku.edu

No relevant relationships reported

PURPOSE: The purpose of this study was to examine differentially expressed genes (DEG) in CD8+ T-Cells in response to a dual stress challenge (DSC) in resistance trained (RT) men.

METHODS: RT men (n = 6; age = 21.7 ± 2.8 years; height = 176.0 ± 4.9 cm; weight = 79.8 ± 9.6 kg) volunteered to participate in this study. Each volunteer underwent a DSC, which consisted of three exercise stages (ES) lasting 15-20 minutes each. After each ES a cognitive assessment lasting 5 minutes each (15 total minutes) was conducted, for a total DSC of roughly 65 minutes. Blood draws were collected prior to the DSC and 20 minutes after completion of the DSC. T-cells were isolated using the Negative Selection EasySep Human CD8+ T-Cell Isolation Kit and T-cells were resuspended in TRI Reagent and total RNA was isolated with the Direct-zol RNA MicroPrep Kit. The NEQBNext Ultra II Directional RNA Library Prep Kit for Illumina was then used to construct RNA sequencing libraries. An Illumina NextSeq 550 sequencing system at the University of Kansas’s Genome Sequencing Core was used to generate paired-end, 50-base pair sequence reads. Gene expression values were normalized using the TMM-method (weighted trimmed mean of M-values) using R statistical program packages and EdgeR, followed by differential gene expression analyses per EdgeR protocol. Finally, pathways affected by the differentially expressed genes were investigated using Ingenuity Pathway Analysis (IPA).

RESULTS: Forty DEG were identified (p < 0.001), with 35 of those being upregulated and five being downregulated. Further analysis with IPA showed these genes are involved in the regulation of 5 pathways (p < 0.001) including the JAK/STAT pathway, Th1 pathway and IL-6 signaling pathway. The affected pathways are involved in the inflammatory response as well as cell growth, proliferation, development, signaling, and cell survival.

CONCLUSION: Thirty-five upregulated genes and five downregulated genes were observed in response to a dual-stress challenge. These genes play a role not only in growth, proliferation, development and survival of CD8+ T-Cells but also to other immune cells via various signaling pathways. Further research is warranted to help better understand the role these genes play in the immune response to exercise.

C-48 Free Communication/Poster - Cardiovascular

Thursday, May 28, 2020, 9:30 AM - 12:00 PM Room: CC-Exhibit Hall

1738 Board #332 May 28 9:30 AM - 11:00 AM Results From The Fifa Sudden Death In Football Registry (FIFA-SDR) — Sport-specific Data Of 5 Years Florian Egger1, Jürgen Scharhag, FACSM1, Andreas Kästner2, Jürgen Scharhag, FACSM1, Andreas Kästner2, Florian Egger1, 1Faculty of Sports Science, Chulalongkorn University, Bangkok, Thailand. 2The University of Texas at Austin, Austin, TX. Sponsor: Hirofumi Tanaka, FACSM. Email: napas.ch@gmail.com

No relevant relationships reported

PURPOSE: Large population-based studies about sudden cardiac deaths (SCD) and survived sudden cardiac arrests (SCA) in athletes from the USA and Europe indicate regional differences in the underlying causes. A different ethnic and genetic mix between these regions may lead to such a heterogeneous distribution. It is of great relevance to investigate these regional patterns to possibly optimize existing screening and prevention procedures and reduce fatalities. This registry aims to investigate SCD and SCA in football (soccer) players worldwide, both at professional and recreational level.

METHODS: From 2014 to 2018 cases of SCDs and SCAs were mainly recorded by medical monitoring (Melwater®), a confidential web-based data platform and data systemization with existing national SCD registries (n=16). Inclusion criteria were met when SCD or SCA occurred during football-specific activity or up to one hour afterwards. Death during other activities was excluded.

RESULTS: A total of 632 players (mean age 34 ±16 years, 96% males) was reported from 70 countries; 150 players (24%) survived. Elite players represented a small portion (6%). A diagnosis by autopsy or definite medical reports could be established in 219 cases (35%). The leading causes over the age of 35 years were coronary artery disease (CAD), 74% and <35 years sudden unexplained death (22%), cardiomyopathy (CM), 17% and CAD (11%). Hypertrophic CM and coronary artery anomalies showed the highest fraction in North America with 15% and 36%, respectively. Myocarditis was most frequently reported from Europe (7%). CAD <35 years prevailed in Africa (38%) and CM (42%) in South America. Commotio cordis occurred infrequently (3%). In North America and Australia survival rates were the highest (53% and 47%, respectively). Early use of an automated external defibrillator was associated with a higher survival rate (86%) compared to manual cardiopulmonary resuscitation (35%).

CONCLUSIONS: Differences between countries in the underlying cardiac diseases for SCA and SCD have to be taken into account to possibly improve and modify primary and secondary prevention measures in football players. The percentage of autopsied cases is difficult to increase because this reflects the law in most countries. Therefore, an expansion of national SCD registries is urgently needed.

Advancing age is associated with reductions in athletic performance as well as declines in vascular functions in masters athletes. Regular vigorous exercise can prevent or attenuate decreases in both athletic performance and vascular functions in master athletes. Currently, it is not known if vascular functions of masters athletes are not different from younger counterparts when their athletic performance was matched. PURPOSE: The present study was conducted to compare arterial pressure and vascular function between younger and masters road cyclists who were matched for cycling performance. To avoid the potential issue of sampling less competitive younger cyclists, we recruited younger and developing cyclists.

METHODS: Young (16±1 years; n=25) and masters (40±4 years; n=23) apparently healthy road cyclists who had been cycling vigorously >720 min/week (or >200 km/week) were studied. Thirty-five upregulated genes were observed in response to a dual-stress challenge. These genes play a role not only in growth, proliferation, development and survival of CD8+ T-Cells but also to other immune cells via various signaling pathways. Further research is warranted to help better understand the role these genes play in the immune response to exercise.
Most firefighters (FF) are unaware of their BP levels, which increases their risk of undiagnosed hypertension. According to a recent study, BP medication taken at bedtime lowers levels more effectively and leads to a 66% decrease in the risk of cardiovascular disease (CVD). Coronary artery disease (CAD) was the most common risk and cardiac event. In the first year of Masters Athlete Screening Study, 798 Masters athletes (≥35 yrs) are not immune to elevated cardiovascular risk and cardiac events. In the following three years of study an additional 45 cases of CVD were detected, with an incidence rate of 1.9/100 (64.7±7.3yr; 79%M), 3.0/100 (65.1±7.3yr; 79%M) and without hypertension and identify specific microbial taxa related to BP status. Most firefighters (FF) are unaware of their BP levels, which increases their risk of undiagnosed hypertension. According to a recent study, BP medication taken at bedtime lowers levels more effectively and leads to a 66% decrease in the risk of cardiovascular disease (CVD). Coronary artery disease (CAD) was the most common risk and cardiac event. In the first year of Masters Athlete Screening Study, 798 Masters athletes (≥35 yrs) are not immune to elevated cardiovascular risk and cardiac events. In the following three years of study an additional 45 cases of CVD were detected, with an incidence rate of 1.9/100 (64.7±7.3yr; 79%M), 3.0/100 (65.1±7.3yr; 79%M) and without hypertension and identify specific microbial taxa related to BP status.

### Time And Dose Of Blood Pressure Medication Improves Hidden Hypertension Risk In A Firefighter

**Meghan T. Laslaby, Megan A. Carty, Rachel L. Dickinson, Brian Varani, DeAbu, Deborah L. Feariheller, FACSM, Urisson College, Collegeville, PA. University of New Hampshire, Durham, NH.**

**Email:** dfairporter@gmail.com

(No relevant relationships reported)

**Abstract:**

The results suggest that even when there are no subjective feelings of fatigue, but the heart rate is high, LF/HF is high, HF is low, or RSA is low, in that case, cardiac sympathetic nervous function will be predominant, and poorer performance may be expected.

### Differential Gut ScaF Microbial taxa Correlated With Blood Pressure Status In African American Collegiate Athletes

**Marc D. Cook, Jarrard Hampton-Marcell, Michael Brown, FACSM, North Carolina A&T State University, Greensboro, NC.**

**University of Illinois at Chicago, Chicago, IL.**

**Auburn University, Auburn, AL.**

**Email:** mdcook@ncat.edu

(No relevant relationships reported)

**Introduction:** The gut microbiome and reduced short-chain fatty acid (SCFA) producing microbes have been related to hypertension status in sedentary individuals. Hypertension is common amongst athletes and epidemiological data reports that cardiovascular sudden death is more common in African Americans (AA) (5-fold), compared to whites, and is related to the elevated prevalence of hypertension independently in athletes and in AA. Exercise is generally known to reduce blood pressure (BP) and stimulates beneficial changes in the gut microbiome to promote gut health (increasing gut SCFAs), but it is unknown whether there are differential gut microbial characteristics related to BP status in athletes. To determine gut microbial characteristics related to gut microbiome in AA collegiate athletes with and without hypertension and identify specific microbial taxa related to BP status.

**Methods:** The present work included 30 AA collegiate athletes stratified by normal BP (systolic BP (SBP) ≤129 mmHg, n=15) and high BP (SBP ≥130 mmHg, n=15) and we performed 16S rRNA gene sequencing on fecal samples. **Results:** Relative to BP status, we did not observe any significant differences in alpha or beta diversity, or operational taxonomic units (OTUs). However, we observed that SCFA producing microbes were differentially abundant between the 2 groups and the relative abundance of some microbes were significantly correlated with systolic BP (g. Lactococcus, R=0.5; p=0.0074; g. Adlercreutzia, R=0.59; p=0.001; g. Paraprevotella, R=0.38 p=0.044; g. Desulfovibrio, R=0.41 p=0.29). **Conclusion:** We report that SCFA producing microbes were differentially abundant in AA collegiate athletes stratified by BP status. Although exercise training broadens SCFA microbes in the gut, identification of microbial community characteristics and specific taxa will provide insight into gut microbial functional profiles related to greater BP in AA collegiate athletes.
most common diagnoses over the three years was CAD (n=15; 33.3%) and atrial arrhythmias (n=14; 31.1%). An additional 9 participants were diagnosed CVD outside of the study (e.g. high blood pressure, heart failure). The prevalence of CVD in this age group is concerning and highlights the importance of annual cardiovascular screening for masters athletes. This study suggests that a negative ETT is a strong predictor of cardiovascular health outcomes in this population.

**CONCLUSIONS:** The increase of the depth of submersion during AR significantly impacted select cardiorespiratory parameters, i.e. breathing frequency and systolic blood pressure, with a higher depth of submersion leading to a decrease in these parameters. These findings suggest that AR can be an effective method for improving cardiorespiratory fitness, particularly for individuals with limited mobility or those recovering from injury. Further research is needed to determine the optimal depth of submersion and the duration of AR for maximizing these fitness benefits.

**REFERENCES:**

Participants aged 6-12 (n=109, Non-Hispanic: 59.5%, Boys: 47.8%) came to Duke’s Children Primary Care Clinic for anthropometric measures and an assessment of physical fitness. Physical fitness was assessed via the 3-min YMCA Bench Press Test, adapted for children 5-18. Heart rate recovery was measured via pulse-oximetry 1 minute after the test. RESULTS: The mean HR (bpm) for all age groups in this study showed a “very good” CRF [younger boys: 95.9, older boys: 98.2, younger girls: 109.0, older girls: 114.2]. Boys had a greater CRF with 39% at an “excellent” CRF compared to 24% for girls. Overall, girls tended to have a lower CRF compared to boys with 10% of girls in the “poor” category compared to the 4% for boys.

CONCLUSION: Compared to normative values of children and considering their BMI, the participants of this study showed greater CRF values than expected. Irrespective of CRF levels, this study suggests children who are obese, in school and engage in some physical activity may still have a healthy level of CRF. Future studies should employ another measure such as VO2peak to examine CRF in children with obesity and how this may be related to the adiposity and health of the child.

Funded by 17SFRN33700117

C-49 Free Communication/Poster - Musculoskeletal/Neuromuscular Diseases

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

Subacromial pain syndrome (SAPS) defined as pain of non-traumatic origin localized around the acromion, is a debilitating, common and often chronic condition. Among many proposed underlying causes of SAPS, hypoperfusion and hypoxic conditions in and around the tendons may be an intrinsic cause of SAPS. Exercise therapy with low load is the advocated treatment of choice for SAPS. PURPOSE: To determine if high intensity aerobic interval training (HIIT) of the rotator cuff was feasible, more effective in improving endurance and reducing pain compared to low intensity exercises. Additionally, to examine the response of tendinous microcirculation following the exercise therapy. METHODS: 21 subjects with chronic SAPS randomized to two groups: HIIT (n=13) and control group (CG) (n=8) was tested before and after 8 weeks of exercise therapy. Endurance performance was assessed by an incremental abduction adduction exercise of the arm to exhaustion (TTE). Contrast enhanced ultrasound (CEUS) was used to examine CRF in children with obesity and how this may be related to the adiposity and health of the child.

HIIT rotator cuff exercises appeared to be a feasible intervention in SAPS, reducing pain and increasing endurance performance more than with low load. CEUS indicates that HIIT may increase tendon microcirculation, thus abating a potential hypoperfused/hypoxic state underlying the condition.

Knee osteoarthritis (KOA) is one of the most common osteoarthritis diseases which affects physical function. As a new modality in strength training, whole-body vibration (WBV) training is considered as an efficient treatment for KOA. However, the inconsistent results of previous studies dampened enthusiasm for clinical application. PURPOSE: To investigate the effect of WBV on physical function and muscle strength of KOA. METHODS: After diagnosed by orthopedic surgeon, eligible participants were randomly allocated to WBV and control groups. The supervised 8-week intervention was performed three times per week with the intensity and duration increased gradually. The participants performed static squat training on the vibration platform under the frequency of 20 Hz and amplitude of 2 mm. RESULTS: The mean HR (bpm) for all age groups in this study showed a “very good” CRF [younger boys: 95.9, older boys: 98.2, younger girls: 109.0, older girls: 114.2]. Boys had a greater CRF with 39% at an “excellent” CRF compared to 24% for girls. Overall, girls tended to have a lower CRF compared to boys with 10% of girls in the “poor” category compared to the 4% for boys.

CONCLUSION: Compared to normative values of children and considering their BMI, the participants of this study showed greater CRF values than expected. Irrespective of CRF levels, this study suggests children who are obese, in school and engage in some physical activity may still have a healthy level of CRF. Future studies should employ another measure such as VO2peak to examine CRF in children with obesity and how this may be related to the adiposity and health of the child.

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Thursday, May 28, 2020, 9:30 AM - 12:00 PM
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HIIT rotator cuff exercises appeared to be a feasible intervention in SAPS, reducing pain and increasing endurance performance more than with low load. CEUS indicates that HIIT may increase tendon microcirculation, thus abating a potential hypoperfused/hypoxic state underlying the condition.
**1752 Board #346**  May 28 9:30 AM - 11:00 AM  
**Effects Of Aerobic Training On Pentraxin 3/Toll-like Receptor 4 And Oxidative Status In Elderly Adults**  
Shawn Dinh1, Brisamar Esteban2, Alexandra A. Rodriguez3, Nishant P. Visavadiya1, Maria J. Cuevas1, Michael Whitehurst, FACSM1, Javier Gonzalez-Gallego2, Chun-Jung Huang, FACSM3, Florida Atlantic University, Boca Raton, FL, 1University of Leon, Leon, Spain. (Sponsor: Chun-Jung "Phil" Huang, FACSM)  
(No relevant relationships reported)  

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

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

**RESULTS:** No changes in plasma levels of PTX3 and oxidative stress markers (GSH, TEAC, and ROS/RNS) were observed in trained vs. control groups. However, our analyses showed a downregulation of PTX3 expression in PBMCs (P = 0.017) following aerobic training, along with decreased ratio of PTX3/TLR4 (P = 0.047). Furthermore, the tendency of oxidative stress response in PBMCs remained unchanged as shown in plasma levels. Finally, no correlation was observed between PTX3 and any oxidative stress biomarkers following training protocol.  

**CONCLUSIONS:** These findings demonstrate the downregulation of PTX3 and physiological parameters in both plasma and PBMCs of elderly subjects, irrespective of changes in oxidative stress following 8 weeks of aerobic training.

**1753 Board #347**  May 28 9:30 AM - 11:00 AM  
**Skeletal Muscle Size Is An Important Factor For RaceRunning Performance In Individuals With Cerebral Palsy**  
Emma Hjalmarsson1, Rodrigo Fernandez-Gonzalo1, Jessica Pingel1, Laura Barrero Santiago1, Alexandra Palmerantz2, Eva Pontén1, Ferdinand von Walden1. 1Karolinska Institutet, Stockholm, Sweden. 2University of Copenhagen, Copenhagen, Denmark. Karolinska University Hospital, Stockholm, Sweden. Email: emma.hjalmarsson@ki.se  
(No relevant relationships reported)  

**PURPOSE:** The RaceRunner, a three-wheeled running bike, enables individuals with cerebral palsy (CP) to propel themselves forward in a running-like motion with enough intensity to promote training adaptations. The influence of physiological parameters on RaceRunning (RR) performance is currently not well understood. The purpose of the study was to investigate correlations between physical parameters and RaceRunning performance.  

**METHODS:** Sixty-two individuals (mean age 22, range 9-45, 32 males/30 females) with CP (Gross Motor Function Classification System, GMFCS I-V; 2-28-12-23-2) completed a 6-min RaceRunning test. Before the test, selective motor control (SMC) of ankle dorsiflexion, passive range of motion and spasticity of hip, knee and ankle were assessed. Thickness of thigh and calf muscles were measured with ultrasound. Heart rate was monitored throughout the test and blood lactate was measured before and directly after the test.  

**RESULTS:** Performance on the 6-min RR test was influence by GMFCS but was independent of age. Strong correlations (r=0.500, p<0.01) were detected between the 6-min RR test performance and spasticity in extensor muscles of hip and knee, SMC of ankle dorsiflexion, muscle thickness of thigh and calf muscles of the less affected limb. Average and maximum heart rate, as well as lactate correlated positively to performance on the 6-min RR test.  

**CONCLUSION:** Spasticity in extensor-muscles of hip and knee and poor selective motor control in ankle affects RaceRunning performance negatively. Skeletal muscle mass is an important factor for RaceRunning performance. Our findings stress the need for optimization of physical exercise regimes for individuals with CP in order to stimulate maintenance of skeletal muscle mass and function enabling full performance.

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**1754 Board #348**  May 28 9:30 AM - 11:00 AM  
**Deficits In Performance Fatigability And Contractile Function Of The Plantar Flexor Muscles In Achilles Tendinopathy**  
Lauren K. Sara, Meggie Rose Hart, Sandra K. Hunter, FACSM. Marquette University, Milwaukee, WI.  
(No relevant relationships reported)  

Achilles tendinopathy (AT) is an overuse condition resulting in pain and stiffness of the Achilles tendon. While experts agree that strength and endurance deficits persist in AT, this claim lacks empirical evidence. **PURPOSE:** To determine whether individuals with AT present with deficits in strength and fatigability compared to healthy controls (CON) during a single-leg heel raise (SLHR) performed to task failure.  

**METHODS:** 6 people with AT (3 male, 26.8±9.9 yrs) and 6 controls (CON, 3 male, 21.9±1.8 yrs) performed maximal voluntary isometric contraction (MVIC) of the plantar flexor muscles before and immediately after SLHR repetitions performed to task failure (test of fatigability). Electrical stimulation of the tibial nerve was used to evoke twitch contractions of the plantar flexor muscles before and after the fatigability test at rest and during MVICs to determine contractile properties and voluntary activation, respectively. **RESULTS:** At baseline, the AT and CON groups exhibited similar plantar flexor strength (MVIC), voluntary activation and resting twitch amplitude. However, the AT group performed fewer SLHR repetitions than CON (33 vs 59, p=0.009). At task failure of the SLHR task, the reduction in plantar flexor MVIC (17.3% AT vs 23.7% CON, p=0.32) and voluntary activation (5.8% AT vs 7.5% CON, p=0.78) was similar for the two groups. However, persons with AT demonstrated larger reductions in resting twitch amplitude (34.4 Nm to 31.5 Nm, 8.4% reduction, p=0.047), while CON demonstrated no change (p=0.23). **CONCLUSION:** The plantar flexor muscles of persons with AT were more fatigable for a SLHR task compared with strength-matched controls. Deficits in contractile function rather than the ability to centrally drive the muscle appear to be responsible for deficits in endurance in people with AT.  
*This work was supported by a Promotion of Doctoral Studies Level 1 Scholarship from the Foundation for Physical Therapy and by Marquette University’s Exercise and Rehabilitation Sciences Graduate Program.*

**1755 Board #349**  May 28 9:30 AM - 11:00 AM  
**Cardiovascular Dynamics Response To Functional Electrical Stimulated Rowing In An Individual With Leukodystrophy: A Case Study**  
Cody Dulaney. Kent state university, Kent, OH.  
Email: cdulaney1@kent.edu  
(No relevant relationships reported)  

Leukodystrophy (LD) encompasses an array of rare and progressive diseases that affect the brain, spinal cord, and peripheral nerves. LD presents from a gene abnormality causing destruction of the myelin sheath rendering this individual paraplegic. FES utilizes epidural electrodes to artificially activate muscle tissue. This allows a paralyzed individual to engage in physical activity with upper and lower extremity muscle mass. **PURPOSE:** The purpose of this investigation was to assess exercise the cardiovascular response to functional electrical stimulation rowing (FES).  

Findings from the case study may provide important information to support further investigation of the benefits of FES in paraplegics. **METHODS:** One participant with LD participated in FES for 28 sessions over 4 months; with assessments done before
Multiple Sclerosis (MS) is an autoimmune disease that attacks the myelin sheath and impedes proper conduction of action potentials through the central nervous system. As a result, persons with MS (PwMS) can experience symptoms of fatigue, muscular weakness, spasticity, and balance or gait issues. Such symptoms may reduce physical activity, negatively affecting body composition and predisposing PwMS to obesity, sarcopenia and osteoporosis. PURPOSE: The aim of the current study was to compare the body composition of PwMS and controls using DXA. METHODS: Six males and 13 females with relapsing-remitting MS and 19 Age/Sex/BMI matched healthy controls were recruited for this study. Extended disability status score (EDSS) in PwMS ranged 0 to 6 (3.3 ± 2.2). DXA scans were used to assess whole body and limb specific contents of fat, muscle and mineral content. Two-way ANOVAs (Group x Sex) with post hoc comparisons were run to assess differences across group and sex.

RESULTS: Compared to male controls, MS males had a reduced whole body % lean mass (%LM) (60.9 ± 6.3% vs. 74.0 ± 11.0%, p=0.02), %LM Appendicular (66.7 ± 8.5 vs. 79.0 ± 8.6%, p=0.03), %LM Truncal (61.8 ± 6.2 vs. 75.2 ± 9.9%, p=0.02), % appendicular lean mass (alM) (28.1 ± 5.1 vs. 33.5 ± 5.8%, p=0.03), and alM/BMI (90.0 ± 21.0 vs. 115.8 ± 21.9, p=0.04) Similarly, the % body fat (%BF) was higher in MS males (36.7 ± 7.0%) compared to male controls (23.1 ± 11.7% and p=0.02). No between group differences were found for bone mineral content (p=0.05). When collapsed across sex, group differences disappeared in all measures except android fat mass, which was higher in PwMS (35.0 ± 16.0 kg) than controls (23.8 ± 16.3 kg, p=0.04). Interestingly, the Pearson’s r correlation between BMI and BF% was significant for the MS group (r=0.715, p=0.01) but not for the control group (r=0.347, p=0.15). EDSS scores in PwMS did not significantly correlate with any variables (p>0.05). CONCLUSIONS: Expected sex differences in body composition occurred regardless of group. MS males tended to have lower LM and higher %BF than controls, which was not seen in MS females. Significance in MS males may be explained by differences in sample size (n=6) or sex differences in MS symptom or disease progression. It is furthermore unclear to what extent individual differences in physical activity or medication may influence results.
Low cardiorespiratory fitness (CRF) is an independent predictor of morbidity and mortality. The majority of healthcare settings use some type of electronic health record system (EHRs). However, many EHRs do not have CRF data collected, thereby limiting the types of investigations and analyses that can be done for research.

**PURPOSE:** To develop a nonexercise equation to estimate and classify CRF (METs) using variables commonly found in EHRs.

**METHODS:** Participants were 41,861 apparently healthy adults (21.4% women) from the Aerobics Center Longitudinal Study examined from 1974 to 2005. Estimated CRF was based on sex, age, measured body mass index, measured resting heart rate, and smoking status. Actual CRF was measured by a maximal treadmill test. **RESULTS:** After nonlinear feature augmentation was conducted, separate linear regression models were used for male and female patients to calculate Pearson’s correlation and regression coefficients. Cross-classification of actual and estimated CRF was conducted using the lowest 20th percentile as the low-fit category. Correlation coefficients were 0.68 (MD 1.33) and 0.63 (MD 1.23) for men and women respectively. The models explained 46% (SEE 1.69) and 40% (SEE 1.54) variance in CRF for men and women respectively. The models explained 46% (SEE 1.69) and 40% (SEE 1.54) variance in CRF for men and women respectively. The models explained 46% (SEE 1.69) and 40% (SEE 1.54) variance in CRF for men and women respectively.

**CONCLUSION:** The regression models developed in the present study provided useful estimation and classification of CRF in a large population of men and women.

The models may provide a valid method for conducting investigations using CRF data derived from EHRs. Supported by JSPS KAKENHI Grant 19K19437

Cancer and diabetes are among the most common and fatal diseases in the United States. Following diagnosis, approximately 25% of patients develop additional chronic conditions with hypertension being the most prevalent. Exercise can mitigate this risk; however, its effect is commonly tested in isolated clinical populations. There are fewer comparative analyses.

**PURPOSE:** To compare cardiovascular responses to structured exercise among patients with cancer and type 2 diabetes.

**METHODS:** We enrolled patients who had a diagnosis of cancer or type 2 diabetes in an exercise program lasting 10 weeks. Before and after the intervention, we assessed resting heart rate (RHR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). Independent-samples t-tests compared the characteristics of each sample at baseline. Mixed model ANOVA with repeated measures compared cardiovascular changes between diagnostic groups. Linear regression tested the effect of diagnosis on change values holding confounders constant.

**RESULTS:** Among subjects who completed the program, 58 had a diagnosis of cancer and 39 had a diagnosis of type 2 diabetes. At baseline, cancer survivors had lower SBP (p = 0.006); groups did not differ in DBP, MAP, or RHR (p > 0.250). Overall, subjects experienced a reduction in DBP (p = 0.007) and exhibited a trend for improvement in MAP (p = 0.052), but not RHR or SBP (p > 0.100). There were interaction effects with diagnosis in DBP (p = 0.044) and MAP (p = 0.013), and there was a trend with SBP (p = 0.064). Holding confounding variables constant, patients with diabetes improved more in end MAP (p = 0.034) and MAP (p = 0.034) than cancer survivors.

**CONCLUSIONS:** Chronic disease populations differ in their responses to exercise. In our sample, patients with type 2 diabetes experienced larger reductions in blood pressure than cancer survivors, demonstrating the importance of individualized exercise prescription in diverse clinical samples.

Diabetes is a growing epidemic, with Type 2 Diabetes Mellitus (T2DM) being the most common type globally. There are approximately 15.5 million adults diagnosed with diabetes in Africa and over two thirds aren’t fully educated about the condition. Regular exercise has shown to have a positive effect on T2DM but is underutilized in developing countries.

**PURPOSE:** To identify the knowledge, attitudes and perceptions of T2DM and exercise interventions amongst patients attending a public hospital in KwaZulu Natal, South Africa.

**METHODS:** A quantitative, cross-sectional, purposive study design was used. Participants with T2DM who were receiving treatment from the Wentworth public hospital in KwaZulu Natal, South Africa were recruited. A piloted questionnaire was used to identify the level of knowledge, attitudes and perceptions of patients in relation to T2DM and the role of exercise as an intervention. Data was analysed using descriptive and inferential statistics.

**RESULTS:** A total of 150 participants (male=63 and females=87) made up the sample. Majority of participants were between the ages of 50-59 (30%) and of Indian race (44.7%). Furthermore, 76.7% of the cohort reported that they were educated about T2DM as a medical condition. Results further showed that 98% of participants had a good knowledge of T2DM. 90.7% of the cohort had good knowledge of T2DM and exercise. There was a significant agreement that T2DM management should include both exercise and a healthy diet, (M=4.38), p<0.0005. “I would use exercises prescribed by a professional to manage T2DM”, (M=4.27), p<0.0005; Early detection of excessive weight and physical inactivity can delay or prevent T2DM (M=4.11), p<0.0005.

**CONCLUSION:** Participants in this cohort demonstrated good knowledge, attitudes and perceptions of T2DM and the role of exercise in the management of the condition. The study provides evidence of the need for exercise interventions in a T2DM cohort in developing countries.
Introduction
Survivors of cardiac arrest (CA) frequently experience both physical and cognitive impairment. Few receive outpatient rehabilitation services. We are conducting a randomized trial to determine if therapeutic exercise (TE) improves health related quality of life, physical, and cognitive function after cardiac arrest. We assessed characteristics of included/non-included patients during the first 32 months of enrollment to determine if these populations differ from one another.

Hypothesis
Those who participate in the TE study have less severe initial illness severity, better neurologic outcomes, and more favorable baseline demographic characteristics than non-participants.

Methods
CA patients treated between June 2016 and February 2019 were included. CA survivors were eligible between hospital discharge and 6 months post-CA. Patients were called 3 times before being considered “lost to follow up” (LTF). T-test and Wilcoxon Rank-Sum were used to compare baseline demographics, initial illness severity (measured by the Pittsburgh Cardiac Arrest Category-PCAC), and discharge dispositions (measured by CPC and mRS) between groups.

Results
Of 234 eligible patients, 12 were enrolled (5.13%). Primary exclusions were LTF (n = 71, 30.34%), enrolled and later dropped or excluded (n = 66, 28.21%), or were admitted to a hospital, skilled nursing, or inpatient rehabilitation facility at the time of eligibility (n=39, 16.67%). Included participants did not differ from excluded with regards to age, gender, cardiac arrest location, PCAC, primary rhythm, temperature management, hospital or ICU length of stay, discharge disposition, mRS, or CPC score. [Table]

Conclusions
Demographic variables, illness severity, and outcome do not differ between participating and non-participating patients. Only 5% of eligible patients participated in the study. Further research to reduce LTF and increase study participation should be investigated.

Research has determined cut-off values for the minimum physical fitness levels required to generate health benefits, such as decreased morbidity and longer survival. However, extremely unfit populations, such as older adults with intellectual disabilities, may not be able to reach these cut-off values. It is unknown how improvements in fitness impact health in these unfit populations.

PURPOSE: To identify whether even among very unfit older adults with intellectual disabilities, small changes in fitness (with a focus on cardiorespiratory fitness, gait speed and grip strength) can translate into improvements in health. METHODS: In the Healthy Ageing and Intellectual Disabilities (HA-ID) study, the physical fitness of 900 older adults with intellectual disabilities (50 years and older) has been studied. Mortality was collected 5 years post baseline. The relationship between fitness and survival were analysed with multiple linear regression models and Cox proportional hazard models.

RESULTS: The HA-ID study is the first study to provide data on the impact of very poor physical fitness levels on survival in an extremely unfit population. For cardiorespiratory fitness, 100% of the older adults with intellectual disabilities scored below the average reference range of the general population, for gait speed this was 43% of the men and 54% of the women, and for grip strength 77% of the men and 67% of the women with intellectual disabilities scored below the average reference range of the general population. Within these very low fitness levels, better baseline fitness was still associated with better survival (cardiorespiratory fitness HR = 0.997 [0.995-0.999], grip strength HR = 0.97 [0.94-0.99]). CONCLUSION: Our data suggest that even small differences at the lower end of the physical fitness spectrum are associated with health benefits, which supports a stronger focus on improving fitness amongst this and other unfit patient populations. Improving physical fitness improves outcomes even in extremely unfit populations scoring well under the cut-off values for the general population.

PURPOSE: Active commuting can contribute to reaching recommended levels of physical activity (PA), and might therefore play an important role in PA promotion at the population level. The purpose of the study was to assess the changes in PA behavior after the introduction of a free ticket for local transport in the Federal State of Hessia in Germany.

METHODS: We conducted a retrospective online survey among the employees of Goethe University Frankfurt, Germany, and assessed employees’ commuting (good/bad weather) and leisure time PA prior to and after the introduction of the free ticket. Group differences were calculated with the Wilcoxon test and the Mann-Whitney/U test. Associations were tested with Pearson’s correlation coefficient. The level of significance was set at p<0.05.

RESULTS: The link to the online survey was sent to 7935 employees, 989 (12.46%) responded, and 706 datasets (59% female) could be analyzed. No gender differences were found in total commuting time. With the availability of the free ticket public transport use increased significantly (53% vs 62% and 65% vs 76%), and car use decreased (17% vs. 9% and 20% vs. 12% in good and bad weather respectively). Public transport use included significantly more active transport minutes than car use (14.7±7 vs 12±7 and 3±3 in good and bad weather respectively). No change in leisure time PA was found. Weak associations showed between transport mode and body-mass-index, but not with smoking status.

CONCLUSIONS: In this study the introduction of free tickets for public transport led to changes in commuting behavior in favor of public transport, which implies increased active travel. It is reasonable to assume that such changes, if sustained, can bear public health relevance. Since Goethe University is located in a metropolitan area with an extensive public transport network around it, our results may not be generalizable for areas with less developed transit system.

Abstracts were prepared by the authors and printed as submitted.
INTRODUCTION: Adults with serious mental illness (SMI) suffer from higher rates of premature mortality compared to the general population. Underlying modifiable cardiometabolic risk factors (e.g., obesity, poor fitness) are more prevalent and manifest earlier in those with SMI. Physical activity (PA) can improve health and quality of life in SMI populations, but challenges exist for effective PA interventions. Parks offer numerous health benefits including PA enjoyment and stress reduction, supporting them as ideal locations for PA interventions among SMI populations. Exercise Is Medicine (EIM) style park-based PA interventions are growing in popularity. Yet, little data exists for EIM interventions with SMI populations. PURPOSE: Test the feasibility, acceptability, and preliminary effectiveness of an EIM park-based PA intervention in adults with SMI. METHODS: Data were collected in Spring 2019. Participants diagnosed with SMI were recruited through a behavioral health facility. Park-based PA sessions (45 min) occurred 3 days/week for six weeks. Data were captured with baseline health assessments (e.g., body mass index: BMI), weekly attendance, and pre and post surveys. PA Class Satisfaction Questionnaire (PACSQ) captured class fun, enjoyment, and overall satisfaction on an 8-point scale (1 = strongly disagree, 8 = strongly agree). International PA Questionnaire captured minutes of PA. Fitness was captured via 6-minute walk test (6MWT). Wilcoxon signed-ranked tests explored intervention effectiveness. RESULTS: Participants (n = 4) were 50% male with mean age of 49.5 ± 7.7 years and BMI of 34.7 ± 7.4. Attendance ranged from 60-100%. All participants expressed high levels of class fun and enjoyment 7.5 ± 0.3 and overall class satisfaction 7.1 ± 0.60. All mean scores improved pre to post intervention, though not statistically significant changes were observed pre-test to post-test for BMI (30.7 ± 4.9 vs 30.1 ± 3.9 kg/m²), weight (76.8 ± 9.9 vs 75.6 ± 3.9 kg), BMI (38.3 ± 62.9 vs 40.8 ± 72.2 meters), and MET-minutes of PA (1068 ± 426.1 vs 1996 ± 1312.9). CONCLUSION: This study is the first to collect park-based PA intervention data in adults with SMI. Results indicate that adults with SMI did participate in and enjoy park-based PA sessions. Further pilot intervention work is planned to develop this intervention approach.

1767 Board #361 May 28 9:30 AM - 11:00 AM Patterns Of High And Low Response To Regular Exercise Across Multiple Clinically Relevant Traits
Mark A. Sarzynski, FACSM, Jonathan J. Ruiz-Ramie, Jacob L. Barber, Jeremy M. Robbins, Robert E. Gerzsen, Arthur S. Leon, FACSM, James S. Skinner, FACSM, Claude Bouchard, FACSM. University of South Carolina, Columbia, SC. *Beth Israel Deaconess Medical Center, Boston, MA. 1University of Minnesota, Minneapolis, MN. 2Indiana University, Bloomington, IN. 3Pennington Biomedical Research Center, Baton Rouge, LA. Email: sarz@mailbox.sc.edu

PURPOSE: We investigated if high- or low-responsiveness to exercise training aggregates in the same individuals or if the response patterns are randomly distributed across seven clinically relevant traits.

METHODS: A total of 566 participants from the HERITAGE Family Study completed a 20-week endurance training program (>95% compliance) and had complete response data available for maximal oxygen uptake, percent body fat, resting heart rate, and fasting levels of insulin, HDL-cholesterol, small LDL particles, and inflammatory marker GlycA. For each exercise response trait, race, sex, and generation-specific quintiles were created and high responders were defined as those within the 20th percentile from the least favorable end. Those between the 20th and 80th percentile were defined as average responders. RESULTS: Only one individual each was classified as a universal high or low responder for all seven traits (Table). Half (51%) of the cohort was both a low and high responder for at least one trait. About 24% had at least one high response but no low responses, 23% had one or more low-response traits but no high responses, and 2% were average responders across all traits. Pearson correlations between response traits were low, ranging from -0.22 to 0.11.

CONCLUSIONS: Individual variation in exercise responses applied to all investigated cardiometabolic traits, even with the same exercise intervention and level of compliance. Neither high- nor low-responsiveness aggregated consistently in the same individuals, as a low responder for one trait may be a high responder for another.

1768 Board #362 May 28 9:30 AM - 11:00 AM Individual, Interpersonal And Environmental Factors Associated With Exercise Prescription Utilization In Urban Minority Women
Sarah M. Camhi, FACSM, Julie Wright, Ana C. Lindsay, Philip J. Troped, Laura L. Hayman. University of Massachusetts Boston, Boston, MA. Email: sarah.camhi@umb.edu

(No relevant relationships reported)

From a clinical perspective, adherence to an exercise prescription is likely to produce multiple health benefits for an individual even if the targeted risk factor level doesn’t improve.

Table. Distribution of the high and low training response scores

<table>
<thead>
<tr>
<th># of high-response traits</th>
<th>Low-resp. total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>1</td>
<td>3.9</td>
</tr>
<tr>
<td>2</td>
<td>1.0</td>
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<tr>
<td>3</td>
<td>0.5</td>
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<td>4</td>
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<tr>
<td>5</td>
<td>0.1</td>
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<tr>
<td>6</td>
<td>0.0</td>
</tr>
<tr>
<td>7</td>
<td>0.0</td>
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Frequencies are given as percentage (number of subjects)
Comparison of Different Types of Community-based Exercise Programming In The Alberta Cancer Exercise (ACE) Study.

Christopher M. Sellar, Rosa Spence, Anil A. Joy, Ben Singh, Jodie Tanner, Sandi Hayes, Kylie J. fitness circuit classes (CT; n=118) or personalised combined aerobic and resistance training sessions (PT; n=314). CS completed fitness assessments and questionnaires before and after the program. Outcomes included 6-minute walk distance, 1-repetition maximum (1RM) bench and leg press, shoulder and trunk flexibility, plank endurance test, one-legged balance, waist circumference, fatigue, and self-reported health.

RESULTS: Adherence to the exercise program was 81.5% ± 18.1% (mean ± SD), with a trend toward better adherence in PT (mean difference = -3.5%; p < 0.03). Significant improvements (all p < 0.05; shown as mean change [MC]) were observed from baseline to 12-weeks in both groups for 6-minute walk distance (+34.8m); 1RM bench (6.3kg) and leg (14.2kg) press, trunk forward (2.7cm) and shoulder (right = 1.7°, left = 1.5°) flexion, plank endurance time (+31.3s), balance (right = 3.6s, left = 3.1s), waist circumference (-0.9 cm), fatigue (+2.3 points / 52), and self-reported health (+4.4 pts / 100). Compared to PT, those who completed CT had a significantly greater improvement in fatigue (mean change [MC]: +3.3 vs. +1.9 points; p < 0.05), and a trend toward a greater improvement in trunk flexibility (MC: +3.2 vs. +2.1 cm; p = 0.063). Compared to PT, those who completed CT had a significantly greater improvement in fatigue (mean change [MC]: +3.3 vs. +1.9 points; p < 0.05), and a trend toward a greater improvement in trunk flexibility (MC: +3.2 vs. +2.1 cm; p = 0.063). Compared to PT, those who completed CT had a significantly greater improvement in fatigue (mean change [MC]: +3.3 vs. +1.9 points; p < 0.05), and a trend toward a greater improvement in trunk flexibility (MC: +3.2 vs. +2.1 cm; p = 0.063).

CONCLUSION: Although CS experienced significant improvements regardless of program type, differences in benefit exist between CT and PT. When feasible, matching program type, differences in benefit exist between CT and PT. When feasible, matching

Do Exercise Oncology Guidelines Have To Be Met To Obtain Improvements In Breast Cancer Outcomes?

Carolina S. Sandler1, Rosa Spence1, Sheree Rye2, Ben Singh2, Jodie Tanner3, Sandi Hayes2. Queensland University of Technology, Brisbane, Queensland, Australia. 2Griffith University, Brisbane, Queensland, Australia. 1University of Calgary, Calgary, AB, Canada. (No relevant relationships reported)

The importance of integrating exercise as part of cancer care is clear, with benefit potentially extending to survival. However, treatment-, personal and behavioural-related barriers may influence exercise undertaken during any given week. PURPOSE: To explore whether compliance to weekly exercise targets predicts improvements in outcomes in women with breast cancer who participated in SAFE ACRN1261600054426.

METHODS: Physically inactive breast cancer survivors (stage II-IV; mean age 50.1 ± 9.0) were randomised to frequent- (20 sessions, n=30) or limited (5 sessions, n=30) supervision with an exercise physiologist during a 12-week individually-tailored exercise intervention. The weekly exercise target was consistent with international guidelines of 600 MET minutes including at least 2 resistance exercise sessions. Exercise undertaken (mode, frequency, minutes, intensity) was recorded weekly and used to calculate MET mins. Exercise compliance was defined as 1)

Abstracts were prepared by the authors and printed as submitted.

C-51 Free Communication/Poster - Implementation, Referral and Community Based Exercise Oncology

THURSDAY, MAY 28, 2020

Board #363 May 28 9:30 AM - 11:00 AM

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Abstracts were prepared by the authors and printed as submitted.
average weekly volume ≥ weekly target or 2) weekly target met in ≥ 80% of weeks. Multivariable regression analyses (adjustment for age, disease stage, BMI and group allocation) were used to evaluate whether exercise compliance predicted change between pre- and post-intervention in physical health (PROMIS global), aerobic fitness (6-minute walk test) and strength (YMCA bench press). RESULTS: 63% and 27% of sample (n=60) were compliant when defined by average weekly volume and ≥80% of weeks, respectively. Having an average weekly exercise volume that was ≥ weekly target predicted a clinically meaningful improvement in physical health (Δ±SE: 7.2±1.0 p<.01), aerobic fitness (59.8±11.4 metres, p<.05) and upper body strength (11.4±2.0, p<.02). Meeting weekly targets ≥80% of intervention weeks did not predict change in outcomes (p>0.05). CONCLUSION: These findings suggest that for achieving improvements in outcomes, it is important to ensure the volume of exercise undertaken over time meet targets, but that achieving weekly exercise volume targets on any given week is not. This represents reassuring evidence, particularly for patients who have short term declines in exercise undertaken as a consequence of accommodating fluctuating treatment-related symptoms, surgery requirements or new life circumstances.

PREVIOUS WORK: ECHO is a phase III, randomised, controlled trial (ACTRN12614001311640) evaluating the effect of exercise during first-line chemotherapy for women with ovarian cancer on progression-free survival (target sample, n=500). We report here preliminary findings on exercise safety and dose undertaken for the consenting women included in the intervention. METHODS: Exercise-related adverse events (EAEs) were classified as grades 1-5 according to CTC-AE, and were assessed for exercise causality (not related, unlikely, possible, likely, certain) and whether modification to exercise prescription was required. Weekly exercise dose undertaken was recorded as minutes, intensity, mode and frequency. Data were collected by an Exercise Physiologist during weekly contact with participants over the intervention duration (duration is based on length of neo- and/or adjuvant chemotherapy – 18 weeks). Exercise was considered safe if there were no grade 3 or higher EAEs, and in line with the new ACSM guidelines, the intervention was considered feasible for a participant if they completed ≥150 minutes of weekly, mixed-mode exercise ≥75% of intervention weeks.

RESULTS: To date, we have recruited 225 women, 113 of whom have been randomised to the exercise intervention. One or more EAEs were reported by 42% of participants in the exercise intervention. Typical grade 1 (85%) of EAEs reported, and 2 EAEs included delayed onset muscle soreness or adverse fluctuations in treatment-related symptoms (e.g., pain at surgical site, fatigue) that may have caused by exercise. While no grade 3 or higher EAEs were reported, 58% required exercise intervention modification (i.e., change in minutes, intensity, mode or frequency). The median weekly minutes of exercise reported was 186.5 (range: 0-610), yet only 34% of participants completed ≥150min/week of mixed-mode exercise for ≥75% of the intervention duration.

CONCLUSION: Exercise is proving safe during chemotherapy for ovarian cancer. Further, while an average of 150 minutes of mixed-mode exercise each week is feasible, feasibility in prescription is needed to accommodate individual circumstances (such as EAEs or typical treatment-related fluctuations in side effects) that inevitably present throughout the course of chemotherapy for ovarian cancer.

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**Purpose:** The role of the charity sport event on health promotion has been radically significant. In addition, cause-related marketing (CRM) is one of the most prominent strategies for event organizers to maintain the financial stability of the organization. Although many literatures focus on the business side of CRM, there is a lack of theoretical models that explains the association between CRM predictors and health campaign outcomes considering health behavior. Considering the importance of corporate sponsorship of philanthropic sport events, it is necessary to investigate how a health campaign in the sport event have an impact on stakeholders, especially those who participate in the event. Thus, the purpose of this study is to examine how the campaign is associated with the participant’s health belief and ultimately change their health-promoting behavior using an extended model of CRM campaign.

**Methods:** The structural equation modeling (SEM) was used to investigate the direct/indirect effects of the campaign on sponsor image and breast cancer test. This study was conducted with 1,000 females (18-56) who participated in the Pink Ribbon Movement.

**Results:** The overall structural model’s goodness of fit showed excellent (χ² = 15489.377, p<.01; RMSEA = .049; 90% CI =.046-.052; SRMR = .075; TLI =.910; and CFI =.918). SEM revealed that the following factors of Sponsor Fit (β =-.736, p <.01). However, sponsor image, product reputation, and CSR were found to have no significant association with the campaign impact. Also, the findings of the results indicated that the impact of the campaign was found to have statistical significance with Perceived Barriers (β = .151), Perceived Threat (β =-.168), Self-Efficacy (β =-.405), and Cues to Action (β =-.650). All four factors regarding health belief positively influence the intention to participate in breast cancer test.

**Conclusions:** The results show that the pink ribbon campaign led to a higher level of the intention for breast cancer test by mediating participants’ existing health beliefs. Also, the effect of the campaign was expanded to creating a positive sponsor image. The findings provide insights into designing their cause-related marketing initiatives for practitioners. More detailed explanations concerning theoretical and practical implications will be presented.

Previously, we showed that medical professionals are the most effective referrals to exercise oncology rehabilitation programs. Determining why patients remain in such programs beyond referral is critical if patients are to obtain any health benefits during and after cancer treatment. **Purpose:** The purpose of this study was to identify those factors that promoted adherence through a qualitative analysis of patient comments. **Methods:** Using previously collected data, four themes were identified for adhering to an exercise oncology rehabilitation program: personal reasons (46%), the trainer (28%), not yet meeting their goals (23%), and family influence (3%). Within these four themes, patient comments were reanalyzed to determine more specific response patterns clarifying patient motivations to continue with their respective program. **Results:** The four major subthemes identified were physical health, mental/emotional health, the trainer/facility staff, and progress/success achieved. Across all four original themes, 39% of patients referenced their physical health while 7% mentioned their improved mental health as reasons for remaining in the program. Furthermore, 34% noted the role of the trainer with approximately 14% specifically linking the trainer with their progress/success in the program. Separately, approximately 20% identified their progress/improvements as the reason to continue in the program. **Conclusions:** While previously and currently presented data report that physical health and improvements recognized by the patient are primary motivators to maintain adherence to the exercise program, this study found that the trainer/staff of the facility also play a significant role in maintaining enrollment, and therefore, adherence to the rehabilitation program. It is likely the progress/success identified by the patients are most likely a result of the work of the trainer/facility staff. Therefore, combining these subthemes, we conclude that the trainer/facility staff is the most important factor in building patient confidence, trust, and most importantly, adherence to an exercise oncology program.
PURPOSE: Exercise therapy programs are increasingly incorporated into oncological clinics, but it is largely unknown if this facilitates information availability or patients’ exercise readiness. This survey compares the knowledge and barriers regarding exercise in cancer patients treated in an oncological clinic with an established exercise therapy and counseling program versus an oncological clinic without any exercise offers (OC).

METHODS: Participants were recruited in an oncological outpatient clinic that provides an exercise therapy and counseling program (OC+Ex) and an oncological outpatient clinic without any exercise offers (OC). Information status concerning cancer diagnosis, treatment, exercise, and exercise-related barriers were assessed with an extended version of the EORTC QLQ-INFO-25 questionnaire and the Perceived Physical Activity Barriers (PPAB) scale. Results were compared using contingency table and chi-square tests.

RESULTS: Out of 215 patients 200 returned the questionnaire (OC+Ex: n = 109; 64±13 yrs.; 85% during treatment; OC: n = 91; 60±11 yrs.; 96% during treatment). A comparable proportion of the patients of the OC+Ex and the OC felt moderately to well informed concerning cancer treatment (90% vs. 88%) and side effects (81% vs. 79%). Regarding exercise 31% vs. 15% and 23% vs. 29% of the patients in the OC+Ex versus the OC reported a high or moderate information status, while 18% (OC+Ex) or 27% (OC) stated to not have received any information (p < .05). Patients in the OC+Ex documented receiving specific exercise recommendations more often than patients in the OC (41% vs. 16%; p < .001), 25% (OC+Ex) or 3% (OC) reported a direct referral to a concrete exercise course/program (p < .001). 53% (OC+Ex) and 60% (OC) asked for more information about exercise. Perceived exercise barriers included fatigue (39%), physical weakness (31%), nausea (24%), pain/discomfort (23%), and lack of exercise routine (25%).

CONCLUSIONS: Our results indicate that an exercise program at an oncological clinic supports patients’ knowledge about exercise. Further targeted triage and information activities including a stronger collaboration between oncologists and exercise specialists might contribute to further enhance patients’ knowledge, to diminish perceived barriers and to improve exercise behavior.

A large percentage of pancreatic cancer (PC) patients can suffer from cachexia, a syndrome characterized by an ongoing loss of skeletal muscle mass, with or without fat mass. This condition leads to reduced muscle strength, which further worsens functional capacity. Exercise (EX) could be a potential measure to counteract the loss of functional capacity, nevertheless most of cancer patients are insufficiently active. Purpose: Investigate the EX level, interest and preferences in PC patients. Methods: An anonymously survey was performed on a representative sample of PC patients at the Oncology Unit of Verona Hospital. The questionnaire assessed demographic, clinical characteristics and EX behavior, using the Leisure Score Index (LSI) from Godin’s Leisure Time Exercise Questionnaire. The items regarding EX preferences and interest were drawn from previous researches. A descriptive analysis, presented as mean/medians for continuous variables and frequencies/percentages for categorical variables, was used. Results: 173 questionnaires were completed (58% response rate). The median age of subjects was 60 years old, 54% was male, 41% had completed high school. Medical information indicated that 52% had a metastatic disease and 86% were on active treatment. Only 11% of patients resulted sufficiently active (LSI ≥24), but among 82% were willing to start a specific EX program. Patients prefer receive EX information by oncologist (54%), followed by kinesiologist (23%), with a face to face approach (66%). PC patients chose to EX with “other cancer patients” (25%) or alone (17%). Subjects picked outdoors (28%) and at home (23%) as favourite places to perform EX. PC patients prefer to train two (31%) or three (36%) times/week, at light (45%) or moderate (40%) intensity. 31% of patients indicated to prefer an individual program with a personal trainer. Conclusion: We found a small portion of PC patients active, a large interest to EX and a heterogeneity regarding the EX preferences. This underline the urgency to promote EX in this population and suggest that different EX program options should be considered to optimize compliance and adherence. This study is the first step to planning a specific EX program designed for PC patients.

Purpose: To conduct a retrospective sample audit of allied health referral for breast, prostate and colorectal cancer diagnoses scheduled for surgery at a regional hospital in Victoria, Australia. Association between ‘time in surgery’ (mins-1) and number Allied Health referrals for breast, prostate and colorectal cancer and scheduled for surgery.

Methods: A retrospective sample audit of allied health referral for breast, prostate and colorectal cancer diagnoses scheduled for surgery. Preliminary results from a small sample of pre-surgical exercise physiology referrals, indicate that breast, and prostate cancer diagnoses requiring surgery can achieve benefit from compliance with referral to Allied Health session, whereas colorectal cancer diagnoses are less clear.

Relationship between Allied Health Attendance and surgical time amongst Allied Health Referrals at a regional hospital in Victoria, Australia

Graph showing correlation between number of allied health sessions attended and minutes in surgery for breast, colorectal, and prostate cancer.

Data harvested from the files of (n=100) patients diagnosed with either breast, prostate and colorectal cancer and scheduled for surgery.

Exercise specialists might contribute to further enhance patients’ knowledge, to clinic supports patients’ knowledge about exercise. Further targeted triage and advising, and referring patients to exercise. On the part of those who work in oncology clinical settings of their role in assessing, advising, and referring patients to exercise.

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### Board #372 May 28 9:30 AM - 11:00 AM

**Effects Of Community-based Supervised Exercise Program on the Body Composition And Strength Of Breast Cancer Survivors**


Email: anaisabeljoaquim@gmail.com

(No relevant relationships reported)

**PURPOSE:** To analyze the effects of a low-cost community-based supervised exercise program on body composition and muscle strength in breast cancer survivors.

**METHODS:** Twenty-one female survivors of breast cancer concluded a single-arm clinical trial with a control and an experimental phase. Each participant was evaluated in 5 consecutive moments: 16 and 8 weeks before intervention (M1 and M2), immediately before intervention (M3), and 8 and 16 weeks after the exercise program started (M4 and M5). Participants benefited from conventional care during the control phase (M1 to M3) followed by a community-based exercise program (M3 to M5). This consisted of 3 sessions per week of 60-min combining aerobic and strength exercise at moderate to vigorous intensity in group classes of no more than 20 participants with low-cost materials. Body mass index (BMI), handgrip strength and sit-to-stand (STS) test were assessed in all the evaluation moments.

**RESULTS:** There were significant increases through time in handgrip strength in both surgical and non-surgical upper limbs (p<0.0001) and in lower limbs functional strength (p<0.0001) (table). BMI increased during control phase and decreased during the initial phase of exercise training program (p=0.050). Serious adverse events were not reported.

**CONCLUSIONS:** A low-cost community-based supervised exercise program is safe and improves body composition and strength in breast cancer survivors after primary treatment.

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>Effect size</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical limb handgrip strength (Kgf)</td>
<td>18.6±5.0</td>
<td>20.9±5.4*</td>
<td>21.2±4.9*</td>
<td>23.5±5.1*</td>
<td>26.6±6.6***</td>
<td>0.599</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>Non-surgical limb handgrip strength (Kgf)</td>
<td>19.6±5.9*</td>
<td>21.4±5.9*</td>
<td>21.9±5.8*</td>
<td>23.8±5.5*</td>
<td>25.8±4.3**</td>
<td>0.423</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>STS (Reps)</td>
<td>12.0±2.8</td>
<td>13.7±3.4</td>
<td>14.1±3.6</td>
<td>15.1±3.6</td>
<td>16.5±3.6</td>
<td>0.289</td>
<td>p&lt;0.0001</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>30.9±5.6</td>
<td>30.9±5.6</td>
<td>31.1±5.5</td>
<td>30.3±5.4</td>
<td>30.7±5.3</td>
<td>0.125</td>
<td>p=0.050</td>
</tr>
</tbody>
</table>

Legend: Results were tested with repeated measures analysis of variance and are presented as mean±SD; Post-Hoc analysis were corrected with Bonferroni. Effect size was calculated as Partial Eta Squared. *Higher than M1; ** Higher than M1-M3; ***Higher than M1-M4; † Higher than M1-M2; ‡ Higher than M3; p<0.05.

### Board #373 May 28 9:30 AM - 11:00 AM

**Accessing Medically-based Exercise Therapy Via Cardiac Rehabilitation And Preventive Cardiology**

Ellen Hitt, Jennifer Huberty, Robert Scales, Helen Whited. 

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(No relevant relationships reported)

**Background:** Cardiac rehabilitation (CR) is a potential avenue to exercise therapy for cancer survivors (CS). **Purpose:** This investigation evaluated the status of medically-based exercise rehabilitation for CS in Arizona. **Methods:** A statewide structured telephone interview (STI) was conducted with CR programs (n=34) and cancer treatment centers (CTCs; n=32). **Results:** Compliance with the STI was 97% and 44% for CR and the CTCs respectively. Thirteen CR programs (39%) offered self-pay onsite supervised exercise training for CS. Two (6%) offered a preventive cardiology exercise consultation with a home-based prescription. Six (43%) CTCs offered exercise services to CS. Eleven (79%) CTCs referred survivors to physical therapy and five (36%) recommended community-based exercise programs. **Conclusion:** CR may be a viable option for onsite medically-based exercise therapy in the growing number of CS in Arizona. Preventive cardiology has an opportunity to expand these services and increase patient accessibility by offering medically-directed exercise physiology consultations. These delivery models provide a potential solution to the lack of rehabilitation resources available to CS. **Future Directions:** It is recommended that a directory of resources remains current with routine updates in an effort to increase patient accessibility to care. Additional cancer rehabilitation efficacy studies are needed to further clarify evidence-based practice guidelines and provide direction for optimal methods of healthcare delivery.

### Board #374 May 28 9:30 AM - 11:00 AM

**Feasibility Of High-intensity Interval Training In Men With Prostate Cancer Undergoing Active Surveillance: Erase Trial**

Dong-Woo Kang, Adrian S. Fairey, Normand G. Boulé, Catherine J. Field, Stephanie A. Wharton, Kerry S. Courneya. 

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(No relevant relationships reported)

**PURPOSE:** To examine the feasibility of high-intensity interval training (HIIT) in prostate cancer patients on active surveillance from the Exercise duRing Active Surveillance for prostateCancer (ERASE) trial. **METHODS:** ERASE is a two-armed, single center, randomized controlled trial in Edmonton, Alberta, Canada. Men diagnosed with very low- to favorable intermediate-risk prostate cancer undergoing active surveillance are approached via clinic visit or telephone call. Participants are randomized to either the HIIT group or usual care group. The HIIT group performs a 12-week, thrice-weekly, supervised, aerobic HIIT protocol on a treadmill for 28-40 min/session. Work and recovery intervals alternated every 2 minutes with workloads corresponding to 85-95% and 40% VO2peak respectively. The target sample size is 66 participants to detect a significant between-group difference in VO2peak of 3.5 ml/kg/min with a two-tailed alpha level of less than 0.05, 80% power, and a 10% drop-out rate.

**RESULTS:** To date, we have recruited from July 2019 to October 2020 with a planned additional 2 months of recruitment. Of 283 patients screened so far, 131 (46%) were eligible, and 43 (33%) age 67-7 years were randomized (22 in the HIIT group; 21 in the usual care group). Ineligible patients were mostly living too far away (47%), too active (22%), or having medical issues (19%). Reasons for eligible patients declining were mostly lack of time (35%), not interested (34%), or lost contact (14%). Of 43 patients randomized so far, 33/35 (94%) have completed postintervention assessments. The reasons for dropout were unwilling to continue in the study and lost contact. Total number of attended sessions is 593/612 (96.9%) with 100% compliance to the HIIT protocol. Reasons for missed sessions were dropout (16 sessions), knee pain (2 sessions), and traveling (1 session). 6 participants in the HIIT group reported aggravation of a previous joint issue, 1 chest discomfort, and 1 light-headedness, all explainable by previous medical history. **CONCLUSION:** Prostate cancer patients undergoing active surveillance are interested in HIIT and are able to achieve high adherence. Future analyses of ERASE will report the preliminary efficacy of HIIT for improving fitness outcomes, patient-report outcomes, and biomarkers related to cancer progression and survival.
Adolescence is the period in which height increases the most and physique is formed. In adolescence, the risk of obesity during adulthood, which can be a risk factor for various serious events, is about 75%. On the other hand, the neighboring built environment may influence weight status. PURPOSE: The purpose of this study was to determine the neighboring built environments that are associated with weight status in adolescent Japanese children.

METHODS: We conducted a cross-sectional study that included 4437 children (2215 boys, and 2222 girls) enrolled in the 5th grade to the 9th grade in Japan. Monthly age, sex, height, and weight were assessed using questionnaires, and the body mass index (BMI) percentile was calculated. Using the Geographic Information System (GIS), the number of each of seven built environments (convenience store, fast-food restaurant, family restaurant, supermarket and department store, park, exercise facility, intersection) in each school district was tabulated. Data were analyzed using multiple regression analysis (stepwise method) with the BMI percentile as the dependent variable and each built environment as the independent variables. RESULTS: The number of parks ($\beta =-0.107; p<0.001$) was independently associated with the BMI percentile ($r=0.110$). In addition, when analyzed by school type, only the number of parks ($\beta =-0.081; p<0.005$) was independently related in the 5th grade and 6th grade ($r=0.081$), whereas the number of family restaurants ($\beta =-0.168; p<0.001$) and supermarkets and department stores ($\beta =-0.111; p<0.001$) were independently related from the 7th grade to the 9th grade ($r=0.112$). CONCLUSIONS: These results suggest that the number of neighboring parks affects the weight status of adolescent Japanese children.

Furthermore, for junior high school students, the number of neighboring family restaurants and supermarkets and department stores may also affect the weight status.