C-07 Thematic 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 PARAMATERS 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 (TQ_{50}), 100 (TQ_{100}), and 200 ms (TQ_{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=0.105), TQ_{50} (p=0.156), early (p=0.162), and late (p=0.074) RTD were similar between groups. TQ_{100} (MM=69.71±16.85 vs. OM=55.99±18.54 $Nm \cdot s^{-1}$; p=0.046), TQ_{200} (MM=114.76±26.79 vs. OM=91.56±28.10 $Nm \cdot s^{-1}$; p=0.031), and $IMP_{100-200}$ (MM=4.79±1.11 vs. OM=3.83±1.17 Nm·s; p=0.032) were lower in OM. Normalized torque variables showed no differences (p>0.05). RER (p=0.057-0.072) 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.

1295 Board #2 May 28 9:30 AM - 11:30 AM

Associations Between Physical Fatigability, Vo_2 Peak And Measures Of Muscle Strength In Older Adults

Brett Davis[1], James Sampley[1], Heather Quiriarte[1], Eunhan Cho[1], Bailey Theall[1], Josh Granger[1], Matthew C. Scott[1], Steven B. Heymsfield[2], Frank Greenway[2], Neil M. Johannsen[1], Guillaume Spielmann[1], Brian A. Irving, FACSM[1]. [1]*Louisiana State University, Baton Rouge, LA.* [2]*Pennington Biomedical Research Center, Baton Rouge, LA.* (Sponsor: Brian A. Irving, FACSM)
Email: bdav159@lsu.edu
(No relevant relationships reported)

Age related declines in cardiorespiratory fitness (VO_2 peak) and muscle strength lead to impaired physical function and frailty in older adults. Higher levels of perceived fatigue, fatigability, exacerbate impairments in physical function and frailty in older adults. However, the independent and combined associations between VO_2 peak, muscle strength and fatigability remain incompletely defined. **PURPOSE:** This study examined the cross-sectional associations between VO_2 peak, muscle strength, and self-reported physical fatigability among untrained older adults. **METHODS:** The present analyses included, twenty (13F, 7M), older adults (X±SD, 71±4y) participating in an ongoing exercise intervention (REALPA). VO_2 peak was determined using a graded exercise test on treadmill. Isometric and isokinetic knee extensor strength was assessed on the non-dominant leg using a Biodex Dynamometer. Peak isometric torque was measured at an angle of 60°, while peak isokinetic torque was measured at 60°/second. Physical fatigability were determined using the Pittsburgh Fatigability Scale. We used multiple linear regression to measure the association between the Physical Fatigability Score (0-50, no fatigue to extreme fatigue), VO_2 peak, peak isometric strength, and peak isokinetic strength after adjusting for age. **RESULTS:** The X±SD for body mass index (BMI), VO_2 peak, peak isometric torque, and peak isokinetic torque, were 28±4 kg/m^2, 20±4 ml/kg/min, 149±34 Nm, and 119±40 Nm, respectively. The physical fatigability scores were 12±7, ranging from 2 to 26. Before adjusting for age, peak isometric and isokinetic strength were inversely correlated with physical fatigability (r= -0.42, p = 0.07 and r = -0.41 p = 0.07, respectively). After adjusting for age, the partial correlations became statistically significant (r= -0.48, p=0.04 and r= -0.50 p = 0.03, respectively). In contrast, VO_2 peak was not correlated to physical fatigability. **CONCLUSION:** The present results suggest that untrained older adults with lower measures of peak isometric and isokinetic strength report higher perceived physical fatigability. Further studies should examine the impact of increased skeletal muscle strength and its effect on perceived physical fatigability in older adults. This study was supported by the NIH 5R21AG058181-02.

1296 Board #3 May 28 9:30 AM - 11:30 AM

Perceived Physical Fatigability Explains The Association Between Physical Activity And Gait Speed

Yujia (Susanna) Qiao[1], Robert M. Boudreau[1], Mary K. Wojczynski[2], Kaare Christensen[3], Stacy L. Andersen[4], Stephanie Cosentino[5], Nancy W. Glynn[1]. [1]*University of Pittsburgh Graduate School of Public Health, Pittsburgh, PA.* [2]*Washington University School of Medicine in St. Louis, St. Louis, MT.* [3]*Institute of Public Health, University of Southern Denmark, Odense, Denmark.* [4]*Boston University School of Medicine, Boston, MA.* [5]*Columbia University Medical Center, New York, NY.* (Sponsor: Andrea M Kriska, FACSM)
Email: susannaqiao@pitt.edu
(No relevant relationships reported)

Lower physical activity (PA) and greater perceived physical fatigability (fatigability) contribute independently to slower gait speed.
PURPOSE: To fully understand these complex relationships and inform potential interventions, we examined the bidirectional effects between PA and fatigability on gait speed in two generations of older adults (probands and their offspring) enrolled in the Long Life Family Study, a cohort enriched for exceptional longevity.
METHODS: At Visit 2 (2014-2017), we measured self-reported PA (typical day over past year) using the Framingham PA Index, perceived physical fatigability with the Pittsburgh Fatigability Scale (PFS, 0-50), and usual gait speed (m/s, fastest of two 4m trials). Linear mixed-effect models (accounting for family relatedness) were used to conduct regressions and mediation adjusted for age, sex, BMI, current smoker, health indicators, depression and field center.
RESULTS: At Visit 2, participants (N=2059) ranged in age from 60-107 yrs, with 54.1% female, 99.6% white, PA = 36.6 ± 7.0 MET-hrs/day, PFS = 13.9 ± 9.4, and gait speed = 1.02 ± 0.31 m/s. Compared to offspring (mean ± SD 69.9 ± 6.2 yrs, n=1762), probands were older (92.0 ± 6.9 yrs, n=297), with lower PA, greater PFS scores, and slower gait speed (all p<0.001). Each five MET-hrs/day less PA was directly associated with 0.025 m/s (probands) and 0.005 m/s (offspring) slower gait speed; for fatigability, each five points greater PFS was directly associated with 0.04 m/s (probands) and 0.03 m/s (offspring) slower gait speed (all p<0.001). Further, fatigability explained 41.2% (probands) and 44.4% (offspring) of the effect of less PA on slower gait speed, whereas PA explained 11.0% (probands) and 4.8% (offspring) of the effect of greater fatigability on slower gait speed.
CONCLUSIONS: Given that fatigability largely explained PA's effect on slower gait speed, and the consistency between generations, our findings support fatigability as a potential mediator in the pathway from PA to gait speed. Although we need longitudinal data to confirm the casual directionality, increasing PA may be a likely intervention to reduce perceived physical fatigability and slow the downward spiral leading to worse physical function among older adults.
Funded by NIA U01AG023712, U01AG023744, U01AG023746, U01AG023749, U01AG023755.

1297 Board #4 May 28 9:30 AM - 11:30 AM

Aerobic Fitness Protects Against Age-Related Cognitive Decline In A Population At Risk For Alzheimer'S Disease

Ryan J. Dougherty, Clayton Vesperman, Brandon Mergen, Julian Gaitán, 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 2.54 ± 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_{2peak}, mL/kg/min) value recorded during the final stage of the maximal exercise test when standardized 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_{2peak} of 26.57 ± 6.40 mL/kg/min. At baseline, age was negatively associated with fitness (r = -.43; p < .001) and cognitive function (r = -.27; p = .007). Longitudinal analysis revealed a significant time × VO_{2peak} 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 Alfini, Jeremy Purcell, Lauren Weiss, Wang Zhan, J. Carson Smith, FACSM. *University of Maryland, College Park, MD.*
Email: ddcc2442@gmail.com
(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, Neuropsychiatric Symptoms And The Risk Of Incident Mild Cognitive Impairment

Janina Krell-Roesch[1], Jeremy A. Syrjanen[2], Maria Vassilaki[2], Alexander Woll[1], Walter K. Kremers[2], Mary M. Machulda[2], Michelle M. Mielke[2], David S. Knopman[2], Ronald C. Petersen[2], Yonas E. Geda[3]. [1]*Karlsruhe Institute of Technology, Karlsruhe, Germany.* [2]*Mayo Clinic, Rochester, MN.* [3]*Mayo 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 3206 cognitively unimpaired persons aged ≥ 50 years (1629 males; 853 APOE ε4 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 (agitation, 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) ε4 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.

C-08 Thematic Poster - **Dietary Nitrate**

Thursday, May 28, 2020, 9:30 AM - 11:30 AM
Room: CC-2009

1300 **Chair:** Anni Vanhatalo, FACSM. *University of Exeter, Exeter, United Kingdom.*
(No relevant relationships reported)

1301 Board #1 May 28 9:30 AM - 11:30 AM

Dietary Inorganic Nitrate Supplementation And Ventilatory Threshold In Patients With Reduced Ejection Fraction Heart Failure

Joaquin Ortiz de Zevallos[1], Christopher Neil[2], Luke C. McIlvenna[3], Itamar Levinger[3], Jason D. Allen, FACSM[1], Mary N. Woessner[3]. [1]*University of Virginia, Charlottesville, VA.* [2]*Western Health, St Albans, Australia.* [3]*Victoria University, Melbourne, Australia.* (Sponsor: Professor Jason D. Allen, FACSM)
Email: jo3dd@virginia.edu
(No relevant relationships reported)

Patients with chronic heart failure (HF) are characterized by exercise intolerance. Maximal oxygen consumption (VO_{2peak}) is predictive of health outcomes, but is

often influenced by early onset fatigue or external factors. Oxygen consumption at the ventilatory threshold (V_{O2}AT) is a submaximal marker of sustainable oxygen uptake and has been shown to predict 6 month mortality in HF. An intervention that increases V_{O2}AT in HF would likely produce beneficial clinical and quality of life outcomes. Nitric oxide (NO) bioavailability is a mediator of skeletal muscle perfusion, mitochondrial function and contractile efficiency during exercise. Heart Failure with reduced ejection fraction (HFrEF) is characterized by a reduction in endothelial function and bioavailable NO. Dietary inorganic nitrate supplementation has been shown to increase NO bioavailability and exercise tolerance in patients with other cardiovascular diseases and HFpEF. **PURPOSE**:To determine the effect of dietary inorganic nitrate supplementation on V_{O2}AT in patients with HFrEF.
METHODS: Sixteen patients with HFrEF (15 men, 63 ± 4 y, BMI: 31.8 ± 2.1 kg·m-2) participated in a 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 (511.5 ± 461.0nM vs. 195.0 ± 176.8nM; 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 V_{O2}AT (BRJ: 1159.7 ± 207.8ml·min^{-1}; PL: 1132.4 ± 221.0ml·min^{-1}; p=0.53).
CONCLUSIONS:Dietary nitrate supplementation, despite significant increase in circulating nitrite, produced no changes time to anaerobic threshold or sustainable sub-maximal oxygen uptake. Supported by Australian Heart Foundation Vanguard Award 101389 to Jason D. Allen

1302 Board #2 May 28 9:30 AM - 11:30 AM

Nitrate Supplementation And Exercise Tolerance In Well-trained Middle And Older-aged Adults

Michael J. Berry, FACSM, Gary D. Miller, Daniel B. Kim-Shapiro, Macie S. Fletcher, Caleb G. Jones, Zachary D. Gauthier, Summer L. Collins, Swati Basu, Timothy Heinrich. *Wake Forest University, Winston-Salem, NC.*
Email: berry@wfu.edu

Reported Relationships: **M.J. Berry:** *Industry contracted research; Isagenix International LLC.*

PURPOSE: Nitrate (NO_3^-), through its conversion to nitrite (NO_2^-) and nitric oxide, has been shown to increase exercise tolerance in healthy younger adults and older diseased patients. Nitrate's effect in well-trained middle to older-aged adults has not been studied. Therefore, the purpose of this investigation was to examine the effects of a NO_3^- rich beverage on submaximal constant work rate exercise time in well-trained middle to older-aged adults.
METHODS: Fifteen, 41-64 year-old, well-trained middle to older-aged adults were assigned to receive one of two treatments (NO_3^- rich beverage then placebo or placebo then NO_3^- rich beverage), after which an exercise test at 75 percent of the subject's maximal work rate was completed.
RESULTS: The NO_3^- rich beverage increased plasma NO_3^- and NO_2^- levels by 270 µM and 0.81 µM, respectively (p<0.001). Exercise time was not significantly different (p=0.31) between the NO_3^- rich versus placebo conditions (1130±151 vs 1060±132 sec, respectively). Changes in exercise time between the two conditions ranged from a 55% improvement to a 40% decrease with the NO_3^- rich beverage. Oxygen consumption and rating of perceived exertion were not significantly different between the two conditions.
CONCLUSIONS: In middle to older-aged well-trained adults, NO_3^- supplementation has non-significant, albeit highly variable, effects on exercise tolerance.

1303 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, Glasgow, United Kingdom.* (Sponsor: Jason David Allen, FACSM)
Email: mia.burleigh@uws.ac.uk

(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 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 (~12.4 mmol NO_3^-) (NO_3^-) or (d) 140 ml NO_3^--depleted beetroot juice (placebo). 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 for these samples. **Results** As expected, nitrite (NO_2^-) and NO_3^- 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 ± 0.2, positive-control - Pre-exercise 7.1 ± 0.3 Post-exercise 6.9 ± 0.2, placebo - Pre-exercise 7 ± 0.3 Post-exercise 7 ± 0.2, all *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 34.8 ± 2.5, Post-exercise 34.5 ± 2.6, 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.

1304 Board #4 May 28 9:30 AM - 11:30 AM

Dietary Inorganic Nitrate Supplementation And Exercise Tolerance In Patients With Reduced Ejection Fraction Heart Failure

Jason D. Allen, FACSM[1], Christopher Neil[2], Luke C. McIlvenna[3], Joaquin Ortiz de Zevallos[1], Itamar Levinger[3], Mary N. Woessner[3]. [1]*University of Virginia, Charlottesville, VA.* [2]*Western Health, St Albans, Australia.* [3]*Victoria University, Melbourne, Australia.*
Email: ja6af@virginia.edu

(No relevant relationships reported)

Exercise intolerance is the primary cause of morbidity and decreased quality of life in patients with chronic heart failure (HF). The strong prognostic value of exercise capacity in patients with HF warrants identification of interventions which maximize exercise capacity in this population. Although the etiology of HF is complex, reduced nitric oxide (NO) bioavailability is an underlying characteristic that has been shown to moderate physiological processes related to exercise including vascular function, tissue perfusion, mitochondrial function and contractile efficiency. Dietary inorganic nitrate supplementation has been shown to increase NO bioavailability and increase exercise tolerance in several clinical populations, including peripheral arterial disease, pulmonary disease, and HF with preserved ejection fraction. **Purpose:** To determine the effect of dietary inorganic nitrate supplementation on exercise capacity in patients with heart failure with reduced ejection fraction (HFrEF). **Methods:** Sixteen patients with HFrEF (15 men, 63 ± 4 y, BMI: 31.8 ± 2.1 kg·m-2) participated in a randomized, double-blind, crossover design study. Participants consumed either a nitrate rich beetroot juice (16mmol nitrate/day), or a nitrate-depleted placebo for five days prior to the first testing visit, with continued dosing until completion of a cardiopulmonary exercise test (CPX). Between treatment differences were analysed via paired- t-test analysis. Statistical significance was set *a-priori* at p< 0.05. **Results:** Both plasma nitrate and nitrite increased following nitrate supplementation (933%, p<0.001 and 94%, p< 0.05, respectively). No differences were observed for VO_{2peak} (nitrate 18.5 ± 5.7ml·kg-1·min-1, placebo: 19.3 ± 1.4ml·kg-1·min-1; p=0.13) or time to exhaustion (nitrate: 1165 ± 92sec, placebo: 1207 ± 96sec, p=0.16) following supplementation. Similarly, there were no differences between the two treatments in blood pressures or deoxygenated or oxygenated haemoglobin at rest or at any stage of the exercise testing. **Conclusion:** Inorganic nitrate supplementation did not improve exercise tolerance, blood pressures or tissue perfusion in patients with HFrEF.
Supported by Australian Heart Foundation Vanguard Award 101389 to Jason D. Allen

1305 Board #5 May 28 9:30 AM - 11:30 AM

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

Javier Zaragoza[1], Stacie Urbina[1], Brian Brabham[1], Camille Rex[1], Vince Kreipke[2]. [1]*University of Mary Hardin-Baylor, Belton, TX.* [2]*Onnit Labs, Austin, TX.* (Sponsor: Lemuel Taylor, FACSM)
Email: jazaragoza@mail.umhb.edu

(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 is paramount. Thus, with proper nutrition and 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 ± 1.1yrs; mass: 74.8 ± 8.0kg; body fat: 13.6 ± 4.0%) were randomly assigned into one of four

groups: nitrate plus placebo (NIT), beta-alanine plus placebo (BA), placebo (PLA), or active treatments (ACT) and participated in this 12-week double-blind, placebo-controlled study. At pre-intervention testing, participants completed body composition measures, VO_2 max, 30-second Wingate test on day one, and 40-yard dash and Yo-Yo Intermittent Recovery: Level 2 (YOYOIR2) on day two and testing sessions were repeated at 6- and 12-weeks post training and supplementation. A 4x3 repeated measures ANOVA was used to analyze the data with a-priori p value set at ≤ 0.05.
RESULTS: There was a significant time effect for the following variables indicating that the training protocol induced performance adaptations: VO_2 max ($p = 0.0$), Wingate peak power and mean power ($p = 0.04$; $p = 0.006$), 40-yard dash ($p = 0.003$), and YOYOIR2 ($p = 0.0$). Change in performance over time (% change) for VO_2 max was NIT: 9%, BA: 7%, ACT: 12% vs PLA: 8%. Wingate mean power % change was NIT: 17%, BA: 6%, ACT: 4% vs PLA: 5%. Wingate peak power % change was NIT: 10%, BA: 11%, ACT: 10% vs PLA: 9%. YOYOIR2 % change was NIT: 48%, BA: 54%, ACT: 74% vs PLA: 10%. Despite this, there were no significant group by time effects for any variables.
DISCUSSION: After 12 weeks of daily supplementation, no statistical differences were shown between groups for the variables tested. Despite this, improvements were made by each group in comparison to the placebo group.
CONCLUSIONS: Although further research is warranted, addition of these supplements may be beneficial to soccer players.

1306 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)

Dietary nitrate (NO_3^-) supplementation can improve exercise performance with this effect mediated by reduction of NO_3^- to nitrite (NO_2^-) and then nitric oxide. The reduction of NO_3^- to NO_2^- is catalyzed by oral NO_3^- 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_3^- supplementation can be ascribed to impaired oral NO_3^- 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_2^- concentration ($[NO_2^-]$), 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 a 1 mM KNO_3 solution (NIT). Salivary $[NO_2^-]$ 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 difference in ONR between ES (0.10 ± 0.07 μmol·min-1) and NS (0.12 ± 0.13 μmol·min-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-1) and AM-Pre (0.10 ± 0.07 μmol·min-1) or PM-Post (0.17 ± 0.15 μmol·min-1) and PM-Pre (0.16 ± 0.10 μmol·min-1) conditions (P>0.05). Oral NO3- reduction in NIT was higher in PM-Pre 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.

1307 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-Stegall, FACSM, Owen Sloop, Alyssa Q. Eastman. *Hamline University, St Paul, MN.*
(No relevant relationships reported)

Beetroot supplements are high in dietary nitrate, which increases nitric oxide (NO) in the blood circulation. While NO can lower blood pressure and reduce the oxygen cost of exercise, this has mainly been studied in male athletes. Less is known about the effects of BRS in female athletes, especially swimmers. **PURPOSE:** To determine if acute beetroot supplementation (BRS) lowers blood pressure (BP) and improves exercise efficiency in female masters swimmers during treadmill exercise.
METHODS: 11 swimmers (57.8±10.5 y) underwent 2 randomized, double-blinded trials and ingested beetroot supplement (BE) or placebo (PL). BP, heart rate (HR), and NO response, determined indirectly via changes in salivary nitrite (NO_2^-), was measured pre-ingestion (Base), pre-exercise (Pre), and 5 min post-exercise (Post). Oxygen consumption (VO_2), HR, and rating of perceived exertion (RPE) were measured during the modified Balke test until HR reached 85% of age-predicted maximum. Changes in salivary NO_2^- were determined using NO_2^- detection strips and quantified as percentage of reference standard. 2-way repeated measures ANOVA was used to determine differences in BP, HR and salivary NO_2^-. Peak VO_2, treadmill time, and peak RPE were analyzed by 2-tailed t-tests. **RESULTS:** Salivary NO_2^- increased from Base to Post in BE compared to PL (32.5 ± 7.0 vs 2.7 ± 3.9%, p=0.001). No treatment differences existed for peak VO_2 (BE: 29.3 ± 2.0 vs PL: 29.7 ± 2.7 $ml \cdot kg^{-1} \cdot min^{-1}$, p=0.31), treadmill time (BE: 15.5 ± 1.9 vs PL: 15.4 ± 1.8 min, p=0.92), or peak RPE (BE: 6.2 ± 0.5 vs PL: 6.5 ± 0.5, p=0.26). Diastolic BP was significantly lower in BE vs PL, respectively (Base: 74.6 ± 1.7 vs 73.2 ± 2.3, Pre: 73.6 ± 1.8 vs 74.5 ± 2.1, Post: 74.5 ± 1.7 vs 76.1 ± 2.2 mmHg, p=0.03, treatment x time), while systolic BP changes trended towards significance in BE vs PL (Base: 116.6 ± 1.5 vs 115.5 ± 1.6, Pre: 115.0 ± 1.7 vs 116.0 ± 1.7, Post: 116.5 ± 1.4 vs. 118.3 ± 1.5 mmHg, p=0.053). HR at Base, Pre, and Post was not different in BE vs PL (62.0 ± 2.4, 63.2 ± 2.5, and 72.6 ± 3.2 vs 63.6 ± 2.1, 65.4 ± 2.2, and 74.6 ± 2.4 bpm, p=0.86). **CONCLUSIONS:** Acute BRS lowers diastolic BP, but does not improve exercise efficiency in this group of trained, normotensive female masters swimmers. More research is needed in other female masters athlete groups such as runners and cyclists, and in female athletes with hypertension.

1308 Board #8 May 28 9:30 AM - 11:30 AM

The Effects Of Beetroot And Tart Cherry Supplementation On Repeated Sprint Performance

Mojtaba Kaviani[1], Majid Surena Koozehchian[2]. [1]*Acadia university, Wolfville, NS, Canada.* [2]*Jacksonville State University, Jacksonville, AL.*
Email: mojtaba.kaviani@acadiau.ca
(No relevant relationships reported)

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, including 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 (11.6±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.

C-09 Thematic Poster - **Energy Balance and Weight Control**

Thursday, May 28, 2020, 9:30 AM - 11:30 AM
Room: CC-2011

1309 **Chair:** Barry Braun, FACSM. *Colorado State University, Fort Collins, CO.*
(No relevant relationships reported)

1310 Board #1 May 28 9:30 AM - 11:30 AM

Yoga Participation And Weight Loss Within A Behavioral Intervention

Sally Sherman, Ph.D., Renee J. Rogers, Ph.D., FACSM, Kelliann K. Davis, Ph.D., FACSM, Nalingna Yuan, M.S., John M. Jakicic, Ph.D., FACSM. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John M. Jakicic, Ph.D., FACSM)
Email: sally.sherman@pitt.edu
(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/m^2; 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 decreased from 87.3±2.6 kg to 81.8±2.6 kg in RES and from 88.4±2.6 kg to 82.5±2.6 kg in VIN ($p<0.0001$), with no difference between yoga conditions ($p=0.882$). Total participation days in yoga was significantly and linearly related to weight loss in both RES and VIN styles ($\beta=0.088$, $p=0.018$; $\beta=0.089$, $p\leq0.001$, respectively). Total participation minutes in yoga was significantly and linearly related to weight loss in both RES and VIN styles ($\beta=0.002$, $p=0.034$; $\beta=0.003$, $p\leq0.001$, 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 studies need 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.

1311 Board #2 May 28 9:30 AM - 11:30 AM

Energy Expenditure Measured Overnight In A Whole-room Indirect Calorimeter In Four Collegiate American-style Football Linemen

Timothy D. Allerton[1], Eric Ravussin[1], Jennifer Rood[1], Brian Irving, FACSM[2], Nathan Lemoine[2], Shelly Mullenix[2], Jack Marucci[2], Neil Johannsen[2]. [1]*Pennington Biomedical Research Center, Baton Rouge, LA.* [2]*Louisiana State University, Baton Rouge, LA.* (Sponsor: Brian Irving, FACSM)
Email: timothy.allerton@pbrc.edu
(No relevant relationships reported)

Purpose: Increased adiposity during football playing career increases the prevalence of post-career obesity and poor cardiometabolic health. Lineman are often required to alter body weight to meet performance goals, but validated energy expenditure equations (EE) for athletes with high body weights and high physical activity level are lacking. Furthermore, data regarding resting energy expenditure using the gold standard methodology of whole-room indirect calorimeter (metabolic chambers) is not available. The purpose of this study was to measure EE in collegiate American-style football lineman overnight. **Methods:** Participant's oxygen consumption and carbon dioxide production were measured in 1-minute intervals over a 12-hour period in a metabolic chamber. Sleeping energy expenditure (sleep EE) was defined as the average EE during the periods between 0000 and 0500 hours. Resting metabolic rate (RMR) was defined as period after waking between 0600 and 0700 hours with the participant remaining still. Measured sleep EE and RMR were compared to values obtained from predication equations established by Ravussin et al (1986) to estimate RMR and sleep EE using anthropometric data. **Results**: Participants (n=4) were young (19.5 ± 1.0 years old) males with a mean weight of 161.1 ± 10.2 kg with 32 ± 4% body fat. Anthropometric predicted RMR (3260 ± 132 kcal/day) over-estimated RMR by 419 ± 161 kcal/day (14%) when compared to measured RMR (2841 ± 154 kcal/day, P=0.01). However, estimated sleep EE, predicted by Ravussin et al. (1986) (2312± 41 kcal/day) was under-estimated by 13% when compared to measured sleep EE (2760 ± 348 kcal/day, P=0.01). **Conclusions:** Prediction equations to estimate RMR and sleep EE can over-predict or under-predict, respectively, actual EE in American-football lineman. Studies with a larger number of participants are required to develop better prediction equations for young athletes with high fat mass and high levels of physical activity.

1312 Board #3 May 28 9:30 AM - 11:30 AM

Non-exercise Activity During Dietary Restriction Or Aerobic Exercise Interventions In Individuals With Overweight Or Obesity

Sarah A. Purcell[1], Kristina T. Legget[1], Tanya M. Halliday[2], Seth A. Creasy[1], Jennifer M. Blankenship[1], Allison Hild[1], Jason R. Tregellas[1], Edward L. Melanson, FACSM[1], Marc-Andre Cornier[1]. [1]*University of Colorado - Anschutz Medical Campus, Aurora, CO.* [2]*University of Utah, Salt Lake City, UT.* (Sponsor: Dr. Edward Melanson, FACSM)
Email: sarah.purcell@cuanschutz.edu
(No relevant relationships reported)

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 ActivPAL 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/m^2, 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.

Table 1. Changes in non-exercise physical activity and sedentary behavior between dietary restriction (DIET) and aerobic exercise (EX) groups

Measurement	Baseline	Follow-up	Change	*P*, analysis of variance for repeated measures		
				Within-group	Between-group	Inter-action
Steps, average number						
DIET	4134±1004	4051±1068	-83±1129	0.56	0.82	0.84
EX	4106±761	3936±854	-171±971			
Sit time, minutes						
DIET	568±102	600±114	32±84	0.76	0.18	0.14
EX	547±104	526±38	-21±91			
Stand time, minutes						
DIET	280±96	253±92	-27±64	0.07	0.98	0.70
EX	275±67	257±53	-18±52			
Step time, minutes						
DIET	106±28	102±26	-5±27	0.44	0.84	0.91
EX	104±21	100±23	-3±24			
Light activity, minutes						
DIET	44±16	40±14	-4±12	0.24	0.98	0.86
EX	43±17	41±13	-3±15			
MVPA, minutes						
DIET	63±15	62±16	-1±17	0.80	0.68	0.99
EX	60±11	60±14	-1±14			

1313 Board #4 May 28 9:30 AM - 11:30 AM

Obesity Does Not Modulate Men'S Eating Behavior After A High Intensity Interval Exercise Session

Wagner Luiz Prado[1], Caio Machado de Oliveira Terra[2], David Thivel[3], Bryan Haddock, FACSM[1], Jaddy Antunes Guijo[2], Neal Malik[1], Joao Paulo Botero[2]. [1]*California State University San Bernardino, San Bernardino, CA.* [2]*Sao Paulo Federal University, Santos, Brazil.* [3]*California State University San Bernardino, Clermont Auvergne University, France.* (Sponsor: Bryan Haddock, FACSM)
Email: wagner.prado@csusb.edu

(No relevant relationships reported)

PURPOSE: To investigate the impact of obesity on acute and subacute responses to High Intensity Interval Exercise (HIIE) on hunger feelings and energy intake (EI) in young men.
METHODS: Ten men with obesity (OB) (body mass index [BMI]: 34.6 ±4.4 kg / m²) and 10 normal weight (CG) (BMI: 23.1±3.9 Kg/m²) participated in a HIIE session, comprised of a series of three, 6-minute intervals consisting of 6 sprints for a duration of 30 seconds at 100% of maximum aerobic velocity (MAV), followed by 30 seconds of active recovery at 50% MAV, and concluding with 4 minutes of passive recovery. Participants' food intakes were measured using 24h dietary recalls at baseline and 24h-post HIIE. Hunger feelings were measured using a visual analog scale at Baseline, 2h and 24h after HIIE.
RESULTS: CG individuals achieved higher MVA (P<0.01) and VO_{2peak} (P=0.04) than OB ones. No differences in energy expenditure during the HIIE session were observed between groups (OB: 234 ±90 kcal and CG: 254 ±72 kcal, P=0.8). No effect of HIIE on EI (kcal), fat and protein consumption in either group was observed. Carbohydrate intake increased in both groups after the HIIE (P<0.01). Relative energy intake post HIIE session was lower in the OB group (1749±976kcal) compared with CG (2274±536kcal) (P=0.05). Hunger feelings increased 2h and 24h-post HIIE compared with baseline, CG from 12 (1-79) mm at baseline to 72 (10-98) mm post-2h and to 60 (4-86) mm post-24h and in OB from 19.5 (0-50) mm at baseline to 50 (9-73) mm in Post-2h and 60 (8-92) mm in Post-24h (Group: P=0.71, Time: P<0.01, GXT: P=0.06). The desire to eat increased in both groups when compared with baseline, CG from 17 (0-81) mm at baseline to 70 (12-87) mm in Post-2h and to 47 (7-85) mm in Post-24h and in OB from 34 (1-89) ±36.0 mm at baseline to 63 (11-86) mm in Post-2h and 51 (7-84) mm in Post-24h (Group: P=0.65, Time: P<0.01, GX: P=0.29).
CONCLUSIONS: Obesity did not appear to influence eating behavior or hunger feelings post-HIIE in young men.

1314 Board #5 May 28 9:30 AM - 11:30 AM

The Impact Of Exercise Energy Expenditure On Total Daily Energy Expenditure.

Gregory Hand, FACSM[1], Robin Shook[2], Daniel O'Connor[3], Clemens Drenowatz[4], Steven Blair, FACSM[5]. [1]*West Virginia University, Morgantown, WV.* [2]*Children's Mercy Kansas CIty, Kansas City, KS.* [3]*University of Houston, Houston, TX.* [4]*University of Education Upper Austria, Linz, Austria.* [5]*University of South Carolina, Columbia, SC.*

(No relevant relationships reported)

PURPOSE: The present study examined, among weight-stable overweight or obese adults, the effect of increasing doses of exercise energy expenditure (EEex) on changes in total daily energy expenditure (TDEE), total body energy stores (Es) and body composition.
METHODS: Participants included healthy, sedentary females and males aged 21 to 45 with a body mass index between 25 and 35 kg/m² who were randomized to one of three groups for a period of 26 weeks: moderate exercise group (ModEX; EEex goal of 17.5 kcal/kg/week), high exercise group (HighEX; EEex goal of 35 kcals/kg/week), or observation group (OBS). Participants maintained body weight within 3% of baseline weight. Pre/post measurements included body composition, EEex, calculated energy intake, total daily energy expenditure (TDEE), total body energy stores (Es), and resting metabolic rate (RMR). Outcomes were compared among groups, and among group by sex.
RESULTS: Sixty weight-stable participants (31 males and 29 females) completed the protocols. There were no differences among groups in any baseline variable. EEex increased in a stepwise manner as compared to OBS (p<.001). As compared to OBS, there was no group effect on changes in TDEE, energy intake, fat free mass or RMR. Fat mass and total energy stores decreased among the HighEF female participants (p = 0.007).
CONCLUSIONS: The increase in EEex did not result in an equivalent increase in TDEE. There was a sex difference in the relationship among energy balance components. These results suggest that, without substantial weight change, the doses of exercise produced a compensatory reduction in non-exercise energy expenditure, and potentially a sex-specific change in body composition. This project was funded by an unrestricted grant from the Coca Cola Company.

1315 Board #6 May 28 9:30 AM - 11:30 AM

Decreased Ghrelin And Increased PYY And GLP-1 Following Acute Aerobic Vs Resistance Exercise

Tanya Michelle Halliday[1], Mollie H. White[2], Allison K. Hild[2], Jonathan R. Miller[2], Edward L. Melanson, FACSM[2], Marc-Andre Cornier[2]. [1]*University of Utah, Salt Lake City, UT.* [2]*University of Colorado - Anschutz Medical Campus, Aurora, CO.* (Sponsor: Edward L. Melanson, FACSM)
Email: tanya.halliday@utah.edu

(No relevant relationships reported)

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, 35±1.7 yrs, BMI: 28.5±1.0 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 resistance exercises). Each condition was 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 and every 30 minutes for 3 hours following consumption of 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 mm vs. REx: 42±4 mm, p=0.08). AUC for ghrelin (AEx: 143,592±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 higher 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, an oreixgenic gut peptide, as well as PYY and GLP-1, anoretic 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.

1316 Board #7 May 28 9:30 AM - 11:30 AM

The Effects Of High Intensity Interval Training Versus Moderate Intensity Continuous Training On Energy Compensation

Brandon J. Sawyer, Kai Pattison, Eric Dowden, Breanna Beaver, Jacob A. Barragan, Heidi M. Lynch. *Point Loma Nazarene University, San Diego, CA.* (Sponsor: Glenn A Gaesser, FACSM)
Email: bsawyer@pointloma.edu

(No relevant relationships reported)

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 8 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/m^2; VO_{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/m^2; VO_{2max} = 26.2 ± 7.3 ml/kg/min).
Resting metabolic rate (RMR), body composition, and maximal oxygen uptake (VO_{2max}) were measured at baseline and after 4 and 12 wks. Physical activity and dietary intake were measured for 7-day periods pre-intervention and during wks 5 and 12. Compensation was calculated through caloric equivalents of fat and lean mass compared to cumulative total exercise energy expenditure.
5 of 11 in MICT and 6 of 13 in HIIT were categorized as compensators. Change in fat mass (kg) (MICT: -0.59 ± 1.89, HIIT: -0.03 ± 1.72, p=0.45), change in weight (kg) (MICT: +0.66 ± 2.11, HIIT: -0.54 ± 1.45, p=0.12), and overall compensation (kcal) (MICT: 3111 ± 17220, HIIT: 3870 ± 15911, p=0.91) were similar between exercise groups. The difference between actual and predicted weight loss was greater for MICT (-1.61 ± 2.15 kg) than HIIT (-0.07 ± 1.45 kg, p=0.049). Potential compensatory variables including changes in RMR, VO_{2max}, daily steps, and sedentary time were not different between the compensator and non-compensator groups (P > 0.05). 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 closer to that predicted by exercise energy expenditure when compared to MICT.

1317 Board #8 May 28 9:30 AM - 11:30 AM

Effects Of Different Forms Of Exercise On Metabolism Following Short-term Overfeeding And Reduced Physical Activity

Jean-Philippe Walhin[1], Yung-Chih Chen[2], Aaron Hengist[1], James L. J. Bilzon[1], James A. Betts, FACSM[1], Dylan Thompson[1]. [1]*University of Bath, Bath, United Kingdom.* [2]*National Taiwan Normal University, Taipei City, Taiwan.* (Sponsor: Professor James Betts, FACSM)
Email: jpw23@bath.ac.uk

(No relevant relationships reported)

PURPOSE: Short-term overfeeding combined with reduced physical activity impairs metabolic function and alters the expression of key genes within adipose tissue. We have shown that daily vigorous-intensity running can prevent these changes even with a matched energy surplus. However, the influence of exercise type, intensity and/or duration on these responses remains to be ascertained. **METHODS:** Forty-eight healthy young men (mean ± SD; age 22 ± 3 y; body mass 73.8 ± 7.2 kg; height 1.77 ± 0.06 m) were randomly allocated for 1 week to either: (1) over-consume their habitual diet by 50% whilst restricting their physical activity below 4000 steps.day^{-1} (*energy surplus*; n=13); (2) the *energy surplus* regimen plus 45 min of daily vigorous-intensity arm-crank ergometry at 70% $\dot{V}O_{2peak}$ (*arm-crank*; n=11); (3) the *energy surplus* regimen plus 45 min of daily moderate-intensity walking at 50% of $\dot{V}O_{2peak}$ (*moderate exercise*; n=12) or; (4) the *energy surplus* regimen plus intermittent short bouts of walking every hour during waking hours to meet a prescribed step count each day (*activity breaks*; n=12). All prescribed physical activity (groups 2-4) was isoenergetic and matched by additional food intake to standardize energy surplus across groups. At baseline and follow-up, fasted blood samples, abdominal subcutaneous adipose biopsies and skeletal muscle biopsies were obtained and oral glucose tolerance tests conducted. **RESULTS:** The matched energy surplus across all groups resulted in an increased insulinemic response from baseline to follow-up (time effect: p<0.001), with little evidence that prescribed physical activities offset this response (group*time: p=0.09). Similarly, the energy surplus *per se* increased expression of FAS, GLUT4 and SREBP-1c and decreased the expression of HSL, AMPK and PDK4 within adipose tissue, with no difference between groups. Key genes within skeletal muscle were unaffected baseline to follow-up in any condition. **CONCLUSIONS:** A short-term energy surplus induced by overfeeding and reduced physical activity impaired metabolic function at the systemic and adipose level. The forms of physical activities investigated were not sufficient to clearly offset those changes.

C-10 Thematic Poster - Skeletal Muscle Health and Aging

Thursday, May 28, 2020, 9:30 AM - 11:30 AM
Room: CC-2007

1318 **Chair:** Edward Merritt. *Southwestern University, Georgetown, TX.*

(No relevant relationships reported)

1319 Board #1 May 28 9:30 AM - 11:30 AM

The Impact Of Age On The Transcriptional And Morphological Profile Of Skeletal Muscle

Nathan Serrano[1], Andrew C. D'Lugos[1], Jordan C. Ormsby[1], Nicholas T. Thomas[1], Kaylin R. Sweeney[1], Chad C. Carroll[2], Farshad Fani Marvasti[1], Marcus A. Naymik[3], Matthew J. Huentelman[3], Jared M. Dickinson, FACSM[4]. [1]*Arizona State University, Phoenix, AZ.* [2]*Purdue University, West Lafayette, IN.* [3]*Translational Genomics Research Institute, Phoenix, AZ.* [4]*Arizona State University and Central Washington University, Ellensburg, WA.* (Sponsor: Jared M. Dickinson, FACSM)
Email: nserrano1991@gmail.com

(No relevant relationships reported)

Aging is associated with many physiological changes that impact physical function. Most notably, older adults experience a progressive loss of skeletal muscle mass and function, termed sarcopenia. A better understanding of the molecular and phenotypical changes associated with advancing age may provide therapeutic targets for interventions to slow the progression of sarcopenia. **PURPOSE:** To characterize the transcriptional and morphological profile of aging skeletal muscle. **METHODS:** Resting *vastus lateralis* muscle biopsies were collected from 9 young (Y; 27±3yr, 179±7cm, 82±10kg, 26±3BMI) and 9 older adults (O; 68±5yr, 172±8cm, 77±19kg, 26±5BMI) following an overnight fast. Whole transcriptome next-generation RNA sequencing was performed on cDNA synthesized from skeletal muscle RNA. Differentially expressed genes (FDR-adjusted P-value ≤ 0.05) were identified through DESeq2 and subjected to bioinformatic analyses using DAVID (v6.8). Skeletal muscle morphology including fiber type, satellite cell (SC) content, and capillarization was assessed through immunofluorescent microscopy **RESULTS:** In total, 900 differentially expressed genes were identified in the skeletal muscle of O versus Y (+1.5 fold change = 213; -1.5 fold change = 127). DAVID functional analyses indicated that aging was associated with functions related to glycogen metabolism, amino acid metabolism, ubiquitination, and transition between fast and slow fibers. Consistent with the latter, a significant difference (P=0.048) in myosin heavy chain (MyHC) fiber type profile was identified (Y = MyHCI: 29±4%, MyHCII: 71±4%; O = MyHCI: 46±7%, MyHCII: 54±7%). Moreover, aging was associated with a numerical reduction in SC specific to MyHCI (Y = 0.13±0.02, O = 0.07±0.02 SC/MyHCI fiber, P=0.07) but not MyHCII fibers (Y=0.12±0.03, O=0.08±0.02 P=0.373). Independent of fiber type, capillaries per fiber was significantly lower (P=0.015) in O (1.53±0.34) vs. Y (4.59±0.85). **CONCLUSION:** Advancing age is associated with changes in the transcriptional and morphological profile of skeletal muscle. These findings highlight potential therapeutic targets for the preservation of skeletal muscle mass and function with advancing age.
Supported by a JumpStart Grant, CHS, ASU.

1320 Board #2 May 28 9:30 AM - 11:30 AM

Effects Of Old Age And Contraction Mode On Knee Extensor Muscle Metabolic Economy In Vivo

Liam F. Fitzgerald, Miles F. Bartlett, R. Anthony Martin, Ericber Jimenez Francisco, Frank C. Sup IV, Rajakumar Nagarajan, Jane A. Kent, FACSM. *University of Massachusetts Amherst, Amherst, MA.*
Email: l.fitzgerald@ufl.edu

(No relevant relationships reported)

The energetic cost of generating force is greater than maintaining it. Additionally, dynamic contractions are more energetically costly than isometric contractions. Metabolic economy (ME; mass-normalized torque or power produced per unit ATP consumed) is similar between young and older adults during isometric contractions,

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, isokinetic, and isotonic 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±1.6, 5 men) healthy adults performed three 24-s bouts of maximal knee extensor contractions: 1) sustained isometric contraction (MVIC), 2) isokinetic contractions ($120°\cdot s^{-1}$ ($MVDC_{120}$; 0.5 Hz), and 3) isotonic contractions with a load of 20% MVIC ($MVDC_{20\%}$; 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 $MVDC_{120}$ and $MVDC_{20\%}$, 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 $Nm\cdot s\cdot cm^{-3}\cdot mM\ ATP^{-1}$) and older ($0.11\pm0.01$ $Nm\cdot s\cdot cm^{-3}\cdot mM\ ATP^{-1}$; p=0.765) muscle during the MVIC. However, during both $MVDC_{120}$ and $MVDC_{20\%}$, ME was greater in young than older muscle (MVDC120: 0.011 ± 0.001 vs. 0.007 ± 0.001 $W\cdot s\cdot cm^{-3}\cdot mM\ ATP^{-1}$; p=0.002, respectively; and MVDC20%: 0.011 ± 0.001 vs. 0.009 ± 0.001 $W\cdot s\cdot cm^{-3}\cdot mM\ ATP^{-1}$; 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 rats' dorsiflexor muscles were SSC RTET *in vivo* for 1 month on a custom-built isokinetic rodent 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; α was set at $p < 0.05$. **Results:** Rodents receiving no SSC RTET prior to injury had significant static (-48.6% and -54.5%, respectively) 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 Perlman[1], Abbas Doctor[1], Ziad Mahmassani[2], Alec McKenzie[2], Jonathan Petrocelli[2], Naomi de Hart[2], Paul Reidy[1], Micah Drummond[2]. *[1]Miami University, Oxford, OH. [2]University 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 plantaris (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 impaired recovery vs adult (p=0.056). In the plantaris, the difference between Control and RL7 was 1.84±0.77, 0.37±0.65, 1.45±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. The plantaris myofiber CSAs were not recovered in the Young due to an impaired recovery in the MHC IIx+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 Larsen[1], John Belletiere[1], Matthew Allison[1], Robyn L. McClelland[2], Iva Miljkovic[3], Chantal Vella, FACSM[4], Pamela Ouyang[5], Michael Criqui[1], Jonathan Unkart[1]. *[1]UC San Diego, La Jolla, CA. [2]University of Washington, Seattle, WA. [3]University of Pittsburgh, Pittsburgh, PA. [4]University of Idaho, Moscow, ID. [5]Johns 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 quality 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.

Multivariable Associations of Abdominal Muscle Density and Muscle Area with Total Mortality

	Quartile 1	Quartile 2	Quartile 3	Quartile 4	p-trend
Males (n=946)					
Density	1 (ref)	0.57 (0.39-0.83)	0.33 (0.20-0.55)	0.27 (0.14-0.51)	<0.001
Area	1 (ref)	0.93 (0.63-1.39)	0.91 (0.57-1.48)	1.31 (0.77-2.22)	0.515
Females (n=955)					
Density	1 (ref)	0.67 (0.40-1.10)	0.63 (0.35-1.14)	0.43 (0.18-1.01)	0.042
Area	1 (ref)	0.97 (0.59-1.60)	0.94 (0.51-1.73)	1.11 (0.54-2.29)	0.925

Data are hazard ratio (95% confidence interval); Model adjusts for age, race/ethnicity, height, diabetes, systolic blood pressure, antihypertensive medication, total cholesterol, HDL cholesterol, statin use, cigarette smoking, cancer history, kidney function, physical activity, sedentary time, visceral fat and BMI.

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. Long[1], S. Craig Tuggle[2], Alejandro G. Villasante Tezanos[1], Marcas M. Bamman, FACSM[2], Philip A. Kern[1], Charlotte A. Peterson[1], R. Grace Walton[1]. *[1]University of Kentucky, Lexington, KY. [2]University 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

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 (mean Hounsfield unit ± SD, 42.1 ± 4.0 HU), but not IMAT (mean area ± SD, 12.5 ± 4.3 cm^2), was significantly associated with all physical function and performance variables (R^2 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 (R^2 0.17) and muscle power (R^2 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.

1325 Board #7 May 28 9:30 AM - 11:30 AM

Effects Of Age And End-stage Osteoarthritis On Markers Of Skeletal Muscle Long INterspersed Element-1 Activity

Shelby C. Osburn[1], Matthew A. Romero[2], Petey W. Mumford[3], Derek Wiggins[4], Regina Seay[4], Christian Kelley[4], S. Louis Bridges[4], Marcas M. Bamman[4], Michael D. Roberts[1]. *[1]Auburn University, Auburn, AL. [2]University of California, Los Angeles, Los Angeles, CA. [3]Lindenwood University, Saint Charles, MO. [4]UAB Center for Exercise Medicine, Birmingham, AL.*

(No relevant relationships reported)

PURPOSE: Long INterspersed Element-1 (L1) is the only active, autonomous transposable element (termed retrotransposon) in the mammalian genome. L1 retrotransposons can insert themselves into the genome and, consequently, have been associated with a number of diseases and aging. L1 transcripts that are not reverse transcribed into the genome can accumulate in the cytoplasm and activate an inflammatory response via the cGAS-STING pathway. The purpose of this study was to examine skeletal muscle L1 markers and STING protein levels in younger/healthy participants as well as older participants with end-stage osteoarthritis (OA) undergoing total hip or knee arthroplasty.
METHODS: Skeletal muscle was obtained perioperatively from OA patients (62 ± 11 years old) undergoing total hip or total knee arthroplasty (THA n=4; TKA n=6; total n=10) who were enrolled in the TWEAK Trial (R01HD084124, NCT02628795) at UAB. Muscle samples were collected from both surgical (Sx) and contralateral (CTL) thighs. A third cohort of young, healthy individuals (Y; 22 ± 2 years old) (Auburn, AL, USA) served as a comparator group (n=10). RNA, DNA, and protein were isolated for analysis. L1 mRNA expression and DNA content were quantified using primer sets for L1.3, the most active element, as well as ORF1. DNA methylation status and chromatin state of the L1 promoter were also interrogated. Protein targets included ORF1p and STING. Dependent variables were analyzed using a one-way ANOVA with Fisher's LSD post hoc where appropriate.
RESULTS: Both L1.3 and ORF1 mRNA were higher in Sx vs Y (p=0.003 and p<0.001, respectively) as well as CTL vs Y (p<0.001). Protein expression was higher in Sx vs Y for both ORF1p (p=0.003) and STING (p=0.013). There were no between-group differences in DNA content for L1.3 or ORF1, or the methylation status and chromatin state of the L1 promoter.
CONCLUSIONS: These data show higher L1-related mRNA expression in old vs. young adult muscle irrespective of OA status. Alternatively, indices of protein signaling were elevated in Sx muscle only, suggesting upregulation of the cGAS pathway may play a role in the inflammatory burden often unique to muscle surrounding an OA joint. Future work will enable us to better determine if increased muscle L1 activity contributes to localized muscle inflammation susceptibility with aging or OA.

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., ATG 12, PIK3R4, ULK 2, 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: stevenpf@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/m^2) participated in this study. Habitual walking speed was assessed over a 6-meter walkway using infrared timing 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 SI) from the medial femoral cartilage were averaged. Separate, stepwise linear regression models were used to

determine the associations between WOMAC-Function and walking speed (predictor variables) and the medial femoral cartilage CSA and EI (criterion variables) after accounting for BMI and Kellgren-Lawrence scores of the involved limb.
RESULTS: Smaller CSA was associated with slower habitual walking speed (ΔR^2=0.249, P=0.014) and greater EI was associated with worse WOMAC-Function (ΔR^2=0.261, P=0.014).
CONCLUSIONS: PRO and habitual walking speed are easily obtainable measures for clinicians and significantly associate with medial femoral cartilage CSA and EI measured using ultrasound. CSA and EI may provide valuable information about potential structural and compositional alterations in femoral cartilage in individuals with KOA. A comparison of ultrasound outcomes to previously established imaging modalities, such as MRI, is needed to determine the clinical significance of CSA and EI.

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 Cagnin[1], Maria Celia Bazan[1], Robert Pontbriand[2], Manon Choinière[3], Nicola Hagemeister[1]. [1]*École de technologie supérieure, CRCHUM, Montreal, QC, Canada.* [2]*Centre de médecine sportive de Laval, Laval, QC, Canada.* [3]*Université de Montréal, CRCHUM, Montreal, QC, Canada.*
Email: cagninal@gmail.com

(No relevant relationships reported)

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 trials. To ensure that the local anesthetic effect was properly activated, the second trial started at least 15 minutes after the injection. 3D knee kinematics were captured at comfortable speed and statistical analyses were conducted on 10 mechanical markers 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;65) 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.

Differences on 3D mechanical markers between pain and pain-free trials			
*: p<0.05; **: p<0.001; Confidence interval: CI	**Pain trial** *Mean in degrees (95%CI)*	**Pain-free trial** *Mean in degrees (95%CI)*	**Paired samples tests** *(T-test or Wilcoxon test)*
Sagittal plane: Flexion(+)/ Extension(-)			
Flexion at heel strike	9.9° (7.0;12.7)	9.7° (5.8;13.7)	p=0.84
Flexion amplitude during loading **	10.8° (7.7;13.9)	20.5° (16.6;24.4)	**p<0.001 ****
Flexion amplitude during stance	15.2° (10.9;19.6)	16.7° (12.5;20.9)	p=0.13
Maximum flexion during swing	62.6° (57.7;67.5)	63.0° (56.8;63.9)	p=0.59
Range of motion during gait cycle	58.4° (53.5;63.2)	60.3° (56.8;63.9)	p=0.25
Frontal plane: Varus(+)/ Valgus(-)			
Varus at heel strike	6.9° (4.1;9.7)	8.3° (3.0;13.6)	p=0.59
Varus thrust during loading	2.5° (1.3;3.7)	2.4° (0.1;4.8)	p=0.48
Varus during stance	6.5° (3.2;9.7)	5.2° (2.4;8.1)	p=0.19
Transversal plane: External rotation(+)/ Internal(-)			
External tibia rotation at heel strike	4.0° (1.4;6.6)	5.0° (2.5;7.6)	p=0.59
Internal tibia rotation during loading **	-0.3° (-2.2;1.6)	2.0° (-0.1;4.2)	**p<0.001 ****

This was funded by the FPQIS (Quebec Government).

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 Kang[1], Prathap Jayaram[1], Theodore S. Zhang[1], Jay Deo[2], Brian Xu[3], Guillermo Beckman[4], Bijan Najafi[1]. [1]*Baylor College of Medicine, Houston, TX.* [2]*University of Houston, Houston, TX.* [3]*Morehouse School of Medicine, Atlanta, GA.* [4]*University of Texas at El Paso, El Paso, TX.*
Email: gueon.kang@bcm.edu

(No relevant relationships reported)

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.
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 ultrasound guided intra-articular LR-PRP injection. Our primary endpoint was balance using previously validated wearable sensors (BioSensics, Newton, MA) at 6-8 weeks post LR-PRP injection. Secondary endpoints included: pain symptoms, activity of daily life and quality of life using the 12-item Knee Injury and Osteoarthritis Score (KOOS-12), and gait speed.
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. Medio-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.

Primary and secondary endpoints				
	Baseline	Follow-up	P-value	Effect size (Cohen's d)
KOOS-12: Pain symptoms	50.0 ± 17.6	65.3 ± 18.3	0.178	0.85, Large effect
KOOS-12: Activity of daily life	55.0 ± 28.6	73.3 ± 20.5	0.223	0.74, Medium effect
KOOS-12: Quality of life	34.2 ± 10.4	50.1 ± 20.8	0.148	0.97, Large effect
Gait speed, m/s	0.97 ± 0.16	0.94 ± 0.18	0.696	0.18, No effect
Balance: Medio-lateral center-of-mass sway (degree)	0.46 ± 0.31	0.30 ± 0.09	0.178	0.70, Medium effect
Balance: Anterior-posterior center-of-mass sway (degree)	0.75 ± 0.40	0.64 ± 0.22	0.512	0.34, Small effect
Balance: Center-of-mass sway area (degree)	0.27 ± 0.27	0.16 ± 0.08	0.253	0.55, Medium effect
Balance: Medio-lateral ankle sway (Degree)	1.11 ± 0.75	0.87 ± 0.33	0.416	0.41, Small effect
Balance: Anterior-posterior ankle sway (Degree)	1.26 ± 0.82	1.05 ± 0.21	0.507	0.35, Small effect
Balance: Ankle sway area (Degree)	1.03 ± 1.00	0.72 ± 0.33	0.415	0.42, Small effect
Balance: Medio-lateral hip sway (Degree)	0.96 ± 0.58	0.58 ± 0.18	0.098	0.88, Large effect
Balance: Anterior-posterior hip sway (Degree)	1.64 ± 0.73	1.48 ± 0.78	0.684	0.21, Small effect
Balance: Hip sway area (Degree)	1.29 ± 1.28	0.70 ± 0.42	0.232	0.62, Medium effect

1331 Board #4 May 28 9:30 AM - 11:30 AM

Associations Between Flexion Deformity And Sagittal Gait Impairments In Knee Osteoarthritis Patients

Nicola Hagemeister[1], Manon Choinière[2], Nathalie J Bureau[2], Nolwenn Eriau[1], Alix Cagnin[1]. [1]*École de technologie supérieure, CRCHUM, Montreal, QC, Canada.* [2]*Université de Montréal, CRCHUM, Montreal, QC, Canada.*

(No relevant relationships reported)

PURPOSE: Knee flexion deformity and gait impairments (GIs) are common clinical findings in knee osteoarthritis (KOA) patients. This study aimed at assessing the associations between the presence of flexion deformity and sagittal GIs in KOA patients.
METHODS: Patients were included if 1) KOA was the main cause of knee pain, 2) their worst pain in the past 7 days was ≥ 4 on a 0-10 pain intensity scale, 3) they had Kellgren-Lawrence grade ≥ 2. Therapists involved in the study (N=10) assessed flexion deformity by goniometry. They assessed the presence of four known sagittal GIs in KOA patients (flexum at heel strike, fixed flexion during loading and during stance, limited dynamic range of motion (DROM) during a cycle) with a knee kinesiography. Fischer's tests were used to assess between-group (presence or absence of flexion deformity) differences on the proportion of patients with each GI.
RESULTS: 214 patients from 54 clinics participated. 61.2% were women, the mean age was 63 years (95%CI: 62;64), and the mean BMI was 29.4 kg/m² (28.7;30.1). Almost one out of two patients (40.2%) had a flexion deformity. More than two thirds of the participants showed a limited DROM (69.2%). The proportion of patients with a limited DROM was significantly higher in the group who had a flexion deformity (+22.4%; p<0.001). However, more than half of the patients with a limited DROM did not have a flexion deformity (77/148: 52.0%). Similar results were observed on the three other sagittal GIs (Table; all p≤0.01).
CONCLUSION: Results support that patients with knee flexion deformity are more likely to have sagittal GIs. However, the majority of patients who had sagittal GIs did not have a flexion deformity. It supports that it remains essential to assess deformity and also the value of completing clinical evaluation with a dynamic kinematic measurement to ensure that assessors do not miss the presence of gait alterations, even in the absence of flexion deformity.

Between-group differences on the presence of sagittal gait impairments				
*: p<0.05; **: p<0.005	**All patients** *N=214*	**Presence of flexion deformity** *N=86*	**Absence of flexion deformity** *N=128*	**Fischer's test**
Presence of sagittal gait impairment:	*N (%)*	*N (%)*	*N (%)*	*p-value*
Flexum at heel strike	146 (68.2%)	68 (79.1%)	78 (60.9%)	p<0.005 **
Fixed flexion during loading	156 (72.9%)	73 (84.9%)	83 (64.8%)	p<0.005 **
Fixed flexion during stance	173 (80.8%)	77 (89.5%)	96 (75.0%)	p=0.01 *
Limited dynamic range of motion	148 (69.2%)	71 (82.6%)	77 (60.2%)	p<0.001 **

This was funded by the FPQIS (Quebec Government).

1332 Board #5 May 28 9:30 AM - 11:30 AM

Effect Of Power Output And Knee Osteoarthritis On Frontal Plane Knee Joint Moments During Cycling

Harsh H. Buddhadev. *Western Washington University, Bellingham, WA.*
Email: harsh.buddhadev@wwu.edu

(No relevant relationships reported)

Cycling is often prescribed for rehabilitation of older adults with knee osteoarthritis (OA), during which the power output or external workload is manipulated to facilitate training for muscular and aerobic fitness. The effect of cycling power output on external knee adduction moment (a surrogate measure of severity and progression of knee OA) in older adults with and without knee OA is unknown. **PURPOSE:** To determine the effect of cycling power output on external knee adduction moment in older adults with and without knee OA. **METHODS:** Thirteen 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 (5.8±3.5 vs. 7.7±3.9 Nm, p<0.001) compared to the control group (6.1±3.5 vs. 6.8±3.9 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.

1333 Board #6 May 28 9:30 AM - 11:30 AM

Age-related Difference In Perceived Pain, Health Status, And Fall Risk Following Total Knee Replacement

Michael Daniel Canlas, Jennifer Ballard, Jorge Ceja, Brian D. Street. *California State University Bakersfield, Bakersfield, CA.*

(No relevant relationships reported)

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 were 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

younger TKR patients also reported less perceived knee pain when completing tasks of daily living (18.2.4±3.2 v. 12.7±3.7:OKS subset for pain) and higher overall health-related quality of life (76.7.4±1.2 v. 68.7±1.7) than reported by the older TKR patients ($p < 0.05$). **Discussion:** The younger TKR patients are at reduced risk (higher balance confidence and functional mobility) of falling and reported less falls than the older TKR patients. The age-related differences in perceived knee pain and health-related quality of life following TKR suggest a patient's age should be a factor when deciding the intervention protocol strategies used for rehabilitation following TKR. Future research should investigate potential age-specific intervention protocol strategies, including pain management and psychomotor training.

1334 Board #7 May 28 9:30 AM - 11:30 AM

A Comparison Of Gait Biomechanics And Clinical Outcomes Between Traditional And Robot-Assisted Total Knee Arthroplasty

JJ Hannigan[1], Christine D. Pollard[2]. [1]*San Jose State University, San Jose, CA.* [2]*Oregon State University - Cascades, Bend, OR.*
Email: jj.hannigan@sjsu.edu

(No relevant relationships reported)

More than 600,000 knee replacements are performed each year in the U.S. for patients with knee osteoarthritis (OA), a rate expected to rise as high as 3 million by 2030. However, mechanical axis malalignment during total knee arthroplasty (TKA) has been found in almost one-third of surgeries. Recent advances in surgical technology include the use of robots to improve implant precision, including the Mako Robotic-Arm Assisted System, with the goal of improving clinical outcomes and gait biomechanics. **PURPOSE**: To compare gait biomechanics and clinical outcomes between patients who underwent TKA with the Mako System (MAKO) and patients who underwent traditional TKA (TRAD), as well as to healthy participants. **METHODS**: Gait biomechanics were collected on female participants (6 MAKO, 7 TRAD, 16 HEALTHY limbs; age: 50-80 years) using an 8-camera Vicon motion capture system and two force plates. The Forgotten Joint Score (FJS) and Knee Injury and Osteoarthritis Outcome Score (KOOS) surveys were collected on all TKA participants. One-way ANOVAs compared biomechanics between participants, while unpaired t-tests compared survey data between surgical groups. Effect sizes (ES) were calculated using Cohen's d. **RESULTS**: Both surgical groups exhibited lower hip extension excursion (MAKO: 23.9 ± 3.8°, TRAD: 24.0 ± 5.4°, HEALTHY: 32.7 ± 8.0°, p = 0.008, ES = 1.41). The external knee varus moment was trending lower for the MAKO group compared to the HEALTHY and TRAD groups with a large effect size (MAKO: .33 ± .17 Nm/kg, TRAD: .44 ± .09 Nm/kg, HEALTHY: .49 ± .14 Nm/kg, p = .051, ES = 1.15). No differences were seen in survey scores between groups, but a large effect size was observed for the FJS (MAKO: 68.8 ± 21.9, TRAD: 50.5 ± 23.6, p = 0.17, ES = 0.80). **CONCLUSIONS**: TKA participants exhibited limited hip extension excursion, which may indicate compromised gait stability compared to healthy participants. The external knee varus moment was trending lower in Mako participants compared to traditional TKA and healthy participants. Because elevated knee varus moments have been correlated with pain and disease progression in knee OA, this finding indicates the Mako procedure may lower a major correlate of disease. Mako participants had higher FJS scores, which indicates they are less aware of their artificial joint. No grant support was provided.

1335 Board #8 May 28 9:30 AM - 11:30 AM

Knee Kinetics Of Patients With Different Types Of Total Knee Arthroplasty Implants During Downhill Walking

Songning Zhang, FACSM[1], Chen Wen[1], Harold Cates[2]. [1]*The University of Tennessee, Knoxville, TN.* [2]*Tennessee Orthopaedic Clinics, Knoxville, TN.*
Email: szhang@utk.edu

(No relevant relationships reported)

Ramping walking is a common daily activity that is often incorporated in rehabilitation for total knee arthroplasty (TKA) patients. However, no studies have investigated knee biomechanics of patients with total knee arthroplasty (TKA), and comparisons between posterior stabilized (PS), cruciate retaining (CR) and bi-cruciate stabilized (BCS) TKA implants during ramp walking.
Purpose: To examine the differences in knee biomechanics between patients with the three different types of TKA implants and healthy controls during downhill walking on a 10° ramp.
Methods: Five BCS, 10 CR, 10 PS TKA patients and 10 healthy controls performed five downhill walking trials at their self-selected pace, on a 10° instrumented ramp mounted through rigid contact surface structures mounted onto two force platforms (AMTI). Three-dimensional kinematic data (240 Hz, Vicon) were collected in conjunction with ground reaction force data (1200 Hz). A 2 × 4 (limb × group) mixed design ANOVA was used to examine selected knee joint kinematic and kinetic variables.
Results: In downhill walking, a significant limb effect was found in peak loading-response (p=0.005) and push-off knee extension moment (KEM, p=0.015). Peak loading-response KEMs were smaller (p=0.006) in replaced limbs (0.94 Nm/kg) than non-replaced limbs (0.97 Nm/kg). Similar findings were seen in peak push-off (p=0.015) KEMs. Peak loading-response knee abduction moment (KAbM) were mostly similar between the replaced limbs of three TKA groups and healthy controls in downhill walking. Peak loading-response KAbMs were smaller in non-replaced limbs of BCS (-0.34 Nm/kg, p=0.018) and PS (-0.37 Nm/kg, p=0.001) patients compared to that in their non-replaced limbs (BCS: -0.53 Nm/kg & PS: -0.49 Nm/kg).
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.

C-12 Free Communication/Slide - **Strength, Size, and Power**

Thursday, May 28, 2020, 9:30 AM - 11:30 AM
Room: CC-3020

1336 **Chair:** Christopher D. Black, FACSM. *University of Oklahoma, Norman, OK.*

(No relevant relationships reported)

1337 May 28 9:30 AM - 9:45 AM

Using Critical Power To Predict Ramp Incremental Cycling Performance: Three Parameters Are Better Than Two

Troy J. Cross[1], Timothy A. Hardy[2], Jennifer MJ Isautier[1], Eli F. Kelley[1], Matthew Chadwick[2], Bruce D. Johnson[1], Bryan J. Taylor[2]. [1]*Mayo Clinic, Rochester SW, MN.* [2]*University of Leeds, Leeds, United Kingdom.* (Sponsor: Dr Michael Joyner, FACSM)
Email: cross.troy@mayo.edu

(No relevant relationships reported)

The two-parameter critical power (CP_{2p}) model states that the tolerable duration (T_{lim}) 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 T_{lim} across a variety of exercise modes, the two-parameter model (CP_{2p}) consistently overestimates T_{lim} for ramp incremental exercise. **PURPOSE:** To determine whether a three-parameter model of CP (CP_{3p}) provides more accurate predictions of T_{lim} compared with those made by the CP_{2p} model. **METHODS:** Seventeen healthy, recreationally-active adults (1 female; age: 29 ± 4 yrs, BMI: 25 ± 3, peak O_2 uptake: 50 ± 8 ml·kg^{-1}·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-T_{lim} relationship, from which the CP_{2p} and CP_{3p} models were fitted to data. Cross-validation (CV) was used to assess external model validity. Finally, the observed T_{lim} during the ramp incremental protocol was compared to that predicted by the CP_{2p} and CP_{3p} models. **RESULTS**: CP_{2p} was higher than CP_{3p} (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* 27.2 ± 2.9 kJ, $P < 0.05$). The CP_{3p} model yielded a better fit to power-T_{lim} data than the CP_{2p} model, as judged by the lower root-mean-square error (RMSE) computed from the CV procedure (128 s *v* 141 s). The predicted ramp T_{lim} obtained via the CP_{2p} model was longer than the actual T_{lim} for ramp incremental cycling (Δ21.9 s, $P < 0.05$); however, the ramp T_{lim} predicted by the CP_{3p} model was not different from the actual ramp T_{lim} (Δ1.7 s, $P < 0.05$). Furthermore, there was higher absolute agreement between actual and predicted ramp T_{lim} for the CP_{3p} compared with the CP_{2p} model, as evidenced by a higher concordance correlation coefficient (0.98 *v* 0.94) and lower RMSE (16.4 s *v* 27.7 s). **CONCLUSIONS:** Our findings indicate that the CP_{3p} model provides better predictions of ramp exercise performance than the CP_{2p} model. These findings provide further support for the idea that T_{lim} for supra-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.

1338 May 28 9:45 AM - 10:00 AM

Muscle Strength And Size Correlations At Baseline And Following Unilateral Resistance Training

Christopher Carey[1], Heather Gordish - Dressman[2], Paul D. Thompson, FACSM[3], Thomas B. Price[4], Theodore J. Angelopoulos[5], Priscilla M. Clarkson, FACSM[6], Paul M. Gordon, FACSM[7], Niall M. Moyna[8], Linda S. Pescatello, FACSM[9], Paul S. Visich[10], Robert F. Zoeller[11], Eric P. Hoffman[12], Monica J. Hubal, FACSM[1]. *[1]IUPUI, Indianapolis, IN. [2]Children's National Medical Center, Washington, DC. [3]Hartford Hospital, Hartford, CT. [4]University Bridgeport, Bridgeport, CT. [5]University of Vermont, Burlington, VT. [6]University of Massachusettes, Boston, MA. [7]Baylor University, Waco, TX. [8]Dublin City University, Dublin, Ireland. [9]University of Conneticut, Storrs, CT. [10]University of New England, Portland, ME. [11]Florida Atlantic University, Boca Raton, FL. [12]Binghamton University, Binghamton, NY.* (Sponsor: Dr. Monica Hubal, FACSM)
Email: cjcarey@iu.edu
(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 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 (r=0.04 in all, p=0.3; 0.13 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.

1339 May 28 10:00 AM - 10:15 AM

Hormonal, Psychological, And Muscle Damaging Effects Of An Acute Bout Of Farmers' Walk Resistance Exercise

Jeb F. Struder[1], Arriana M. McDonald[2], Jordan B. Wainwright[2], Joseph B. Eberhardt[2], Zeina Nader[2], Noe DeAnda[2], Souhad Z. Bachnak[2], Daniel E. Newmire[2], Mikaela D. Boham[2], Heather E. Webb[2]. *[1]University of Connecticut, Storrs, CT. [2]Texas A&M University-Corpus Christi, Corpus Christi, TX.*
Email: jeb.struder@uconn.edu
(No relevant relationships reported)

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 (VPMS), blood sampling for myoglobin (Mb) and creating 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 VPMS 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 VPMS 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 (VPMS) during the FWC may be related to differences in primary muscle recruitment and their joint concentric, eccentric, and isometric muscle actions. These variances may have indirectly minimized post-exercise muscle damage, hormonal responses, and neuromuscular inhibitions of lower body performance.

1340 May 28 10:15 AM - 10:30 AM

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, Cristine L. Alberton. *Federal University of Pelotas, Pelotas, Brazil.*
Email: gustavoschaun@hotmail.com
(No relevant relationships reported)

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 was 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.

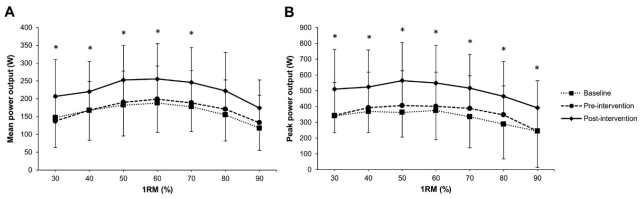


Figure 1. Mean (A) and peak (B) power output adaptations to twelve weeks of high-velocity resistance training in elderly individuals (n = 13). * = post-intervention significantly different from baseline and pre-intervention moments (p < 0.05). Mean and peak power output improvements ranged, on average, from 23-43% and 34-52% when compared to baseline and 20-40 and 20-34% when compared to pre-intervention values, respectively.

1341 May 28 10:30 AM - 10:45 AM

The Effects Of Practice On Maximal Force And Low-Frequency Fatigue In Collegiate Basketball Players

Aaron Heishman, Ryan Miller, Eduardo Freitas, Brady Brown, Keldon Peak, Christopher Black, FACSM, Michael Bemben, FACSM. *University of Oklahoma, Norman, OK.* (Sponsor: Michael G. Bemben, FACSM)
(No relevant relationships reported)

Low-Frequency Fatigue (LFF) refers to the disproportionate loss of force at low as compared to high firing frequencies. LFF is thought to manifest during high intensity, moderate-to high-force, repetitive eccentric, or stretch-shortening cycle activities,

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 $p \leq 0.05$. Effects sizes (Cohen's *d*) were calculated for pairwise comparisons and interpreted as trivial (0-0.19), 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 = 135 ± 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, $p = 0.019$), with post-hoc pairwise comparisons revealing no significant difference 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.

1342 May 28 10:45 AM - 11:00 AM

Relative Contributions Of Muscular Strength, Muscle Size, And Tissue Oxygenation To Isometric Performance Fatigability

Joshua L. Keller, Terry J. Housh, FACSM, John Paul V. Anders, Tyler J. Neltner, Kipp J. Hergenradar, Richard J. Schmidt, Glen O. Johnson, FACSM. *University of Nebraska - Lincoln, Lincoln, NE.* (Sponsor: Terry Housh, FACSM)
Email: joshuakeller10@gmail.com
(No relevant relationships reported)

PURPOSE: Performance fatigability (PF) has been defined as fatigue-induced decline in force. It has been hypothesized that muscle mass and strength may affect the magnitude of PF by limiting oxygenated blood to the muscle during sustained isometric muscle actions. Therefore, the purpose of the present study was to determine the relative contributions of muscular strength, muscle cross-sectional area (mCSA), and the rate of decline in tissue saturation index (TSI%) to PF.
METHODS: Fifteen men (± SD: 20.9 ± 1.7 yr) performed a sustained bilateral isometric leg extension muscle action at 45% of maximum voluntary isometric contraction (MVIC) until failure. PF was quantified as the percent decline in force from pretest to posttest MVIC. mCSA was defined as the sum of the right and left vastus lateralis (VL). Muscular strength was defined as pretest MVIC. Near-infrared spectroscopy was used to assess TSI% from the right VL and was log transformed to determine the linear slope coefficient (b) of TSI% vs. Time (every 5%). A paired *t*-test was used to examine differences between pretest and posttest MVIC. Regression analyses were used to determine the full-model and stepwise linear regression model.
RESULTS: The mean (±SD) sum of the VL mCSA was 51.3 ± 8.6 cm^2. The pretest MVIC (119.4 ± 17.6 kg) was significantly (p=0.003; d=1.3) greater than the posttest MVIC (96.7 ± 16.9 kg). The mean PF was 17.5 ± 16.5%, and there was a significant (p=0.031), negative b (-0.005 ± 0.003 au) for TSI% vs. Time. The muscular strength standardized ß was 3.25 times and 6.5 times greater than mCSA and TSI% standardized ßs, respectively (Table 1). The stepwise linear regression analysis indicated that only muscular strength was a significant predictor of PF.
CONCLUSION: Muscular strength independent of muscle mass and rate of decline in TSI% contributed to PF. There was, however, 59% unexplained variance, so future investigations should examine the contribution of neuromuscular and metabolic responses to PF.

Table 1. Regression models for predicting performance fatigability.

Full-model regression				Stepwise regression model		
Predictor	R	*p*-value	Standardized Beta	R	*p*-value	Standardized Beta
Strength	0.64	0.01	0.52	0.64	0.01	0.52
mCSA	0.66	0.52	0.16			
TSI%	0.66	0.77	0.08			

1343 May 28 11:00 AM - 11:15 AM

Effect Of Loading On Unintentional Lifting Velocity In The Overhead Press And Deadlift

Maddison Beck[1], Jonathan Boring[2], Lindsay Levault[1], William Varner[1], Christopher A. Fahs[3]. [1]*Lindenwood University-Belleville, Belleville, IL.* [2]*Lindenwood University, St. Charles, MO.* [3]*Logan Univeristy, Chesterfield, MO.* (Sponsor: Michael Bemben, FACSM)
Email: maddibeck14@gmail.com
(No relevant relationships reported)

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: 30 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±11%) followed by 90%OHP (0.19±0.10 m/s; 43±16%), 70%DL (0.16±0.08 m/s; 31±14%), and 90%DL (0.09±0.06 m/s; 26±17%). For the 70%OHP condition, ACV was significantly ($p\leq0.014$) greater for the third repetition (0.59±0.15 m/s) compared to all subsequent repetitions; for 90%OHP, ACV was significantly ($p\leq0.004$) 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 ($p\leq0.014$) 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 ($p\leq0.043$) 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).

1344 May 28 11:15 AM - 11:30 AM

Neuromuscular Fatigue Following Concentric Versus Eccentric Maximal Single Joint Exercise Of Similar Mechanical Work

Pierre Clos[1], Yoann M. Garnier[2], Alain Martin[1], Romuald Lepers[1]. [1]*University of Bourgogne Franche Comté, Dijon, France.* [2]*Clermont-Auvergne University, Dijon, France.*
Email: Pierre.Clos@u-bourgogne.fr
(No relevant relationships reported)

PURPOSE: This work aimed to examine the effect of contraction type (eccentric-ECC- or concentric- CON) on neuromuscular fatigue magnitude and etiology following exercise performed at maximal intensity and similar total mechanical work.
METHODS: Ten males participated in 4 experimental sessions (separate days) during which they performed 2 sets of maximal knee extensors contractions. The first and the second sets of the two first sessions (one in ECC and one in CON) ended when the dynamic peak torque loss reached 20% and 40%, respectively. The work achieved per set in each contraction type was then completed in the other contraction type. Two sessions (four sets) were thus performed both in ECC and CON. Knee extensors neuromuscular function (maximal voluntary isometric contraction- MVIC; voluntary activation level- VAL; high-frequency potentiated doublet- Dt) was examined before, immediately after the first and the second set of contractions. Dynamic fatigue was assessed through the decline in dynamic peak torque at the end of each sets. Two-way repeated measures ANOVA served to test the effect of time and condition on MVIC, VAL and Dt, and was followed-up by Tukey's HSD test. Non-parametric Friedman's ANOVA was applied to dynamic peak torque, and followed-up by Wilcoxon's matched pairs test. **RESULTS**: MVIC declined similarly for ECC and CON at the end of the first (-14.4 ± 8.5; $P < 0.001$) and the second set (-20.6 ± 11.1; $P < 0.001$). Dynamic peak torque decreased more in CON (from -22.5 ± 4.0 to -37.8 ± 10.7; all $P < 0.01$) than ECC (from -9.1 ± 5.7 to 21.9 ± 5.1; $P < 0.01$), except in the set in which the greatest work was reached (-35.3 ± 14.3 vs -38.0 ± 6.8; $P = 0.51$). Only the ECC session in which participants achieved the highest work led to a significant reduction in VAL (-9.5 ± 11.2%; all $P < 0.03$). Dt declined after three of the four CON sets (from -4.8 ± 25.8 N.m to -23.4 ± 22.4 N.m; all $P < 0.02$), those featuring the largest works.

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.

C-13 Clinical Case Slide - **Hand**

Thursday, May 28, 2020, 9:30 AM - 11:10 AM
Room: CC-2005

1345 **Chair:** Aaron Lee. *MacNeal Hospital, Berwyn, IL.*
(No relevant relationships reported)

1346 **Discussant:** Christopher McMullen. *University of Washington, Seattle, WA.*
(No relevant relationships reported)

1347 **Discussant:** Sherrie L. Ballantine-Talmadge, FACSM. *CU Sports Medicine and Performance Center, Boulder, CO.*
(No relevant relationships reported)

1348 May 28 9:30 AM - 9:50 AM

Right Hand Dominant Musician With Right Hand Weakness

Sarah Merrill[1], Marcia Faustin[2]. *[1]UC San Diego, San Diego, CA. [2]UC Davis, San Diego, CA.*
(No relevant relationships reported)

HPI: EM is a RHD 19yF musician presenting with insidious onset, progressive RH weakness worsening over the last 1-2 years. No trauma. She has difficulty with pincer grasping. Weakness is constant but exacerbated when playing guitar or flute for long periods of time. No numbness, pain, tingling or swelling of the RUE. Denies any fevers, chills, recent URI, polyarthralgia. No family history of neurologic or autoimmune disease.
PE: No notable muscle atrophy or TTP in the RUE. Full ROM in neck, shoulder, elbow and wrist. 4/5 strength in pincer grip on right, 5/5 strength in right rotator cuff muscles, tricep, bicep, wrist flexion/extension. +Median nerve weakness, radial and ulnar nerve intact. Normal sensation and RUE reflexes. Positive Adson's. Negative Spurling, Roos tests., Hoffman, Negative Tinel's and Phalen's at the wrist. **DDX**: Radial neuropathy, Carpal tunnel syndrome, Paget Schroetter Syndrome, Thoracic outlet syndrome, Parsonage-Turner syndrome
TEST AND RESULTS: Labs: Within normal limits EMG: Results consistent with a significant True Neurogenic Thoracic Outlet Syndrome on the right. There is also electrodiagnostic evidence of a mild right ulnar mononeuropathy at the ulnar groove. Xray cervical spine: Enlarged transverse processes bilaterally at C7, larger on the right. Partial fusion at C3-4 with 2 mm retrolisthesis of C4 on C5 in extension that reduces with flexion. MRI Brachial plexus: Right cervical rib (at C7), with a hyperintense C8 spinal nerve coursing through this area, as are the medial cord, and visualized proximal ulnar nerve and possibly of the median nerve, likely attributable to mass effect from the cervical rib and/or an accompanying fibrous band. RUE vascular study: negative
FINAL WORKING DIAGNOSIS: Neurogenic Thoracic Outlet Syndrome
TREATMENT AND OUTCOMES: Initial EMG pointed to neurogenic TOS. Subsequently, patient completed cervical spine xrays and MRI of the brachial plexus, revealing cervical ribs with likely brachial plexus compression. Patient attended physical therapy to focus on posture while playing instruments, stretching of scalene muscles and strengthening scapular stabilizers. Unfortunately, she did not improve with conservative management. She has been seen by orthopedics and vascular surgery and is currently awaiting cervical rib resection surgery.

1349 May 28 9:50 AM - 10:10 AM

Not Your Ordinary Cause Of Hand Pain

Shannon C. Clemons, Haven Donavan. *UHS Wilson Memorial Hospital, Vestal, NY.* (Sponsor: Andy Getzin, MD, FACSM)
Email: sportsdocshannon@gmail.com
(No relevant relationships reported)

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 had again.
PHYSICAL EXAMINATION: Mild Boutonierre'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 digit PIP 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.
DIFFERENTIAL DIAGNOSIS: 1. Stress fracture 2.Trigger Finger 3. Dieterich's Disease 4. Bone Contusion 5. Improper rehab from initial splint immobilization from original injury
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 the comparison study. MRI: Abnormality 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)
TREATMENT AND OUTCOMES: 1.Curettage of avascular necrosis and autogenous bone graft from distal radius, internal Fixation of metacarpal with K-wire and Ulnar gutter splint 4. Removal of K-wire at 6 weeks, application of ulnar gutter OT brace. 5. Home OT with ROM and muscle strengthening exercises. 6. Formal OT. Patient regained full function of the hand and returned to sports.

1350 May 28 10:10 AM - 10:30 AM

Hand Injury - Basketball

Jared W. Willard, Ashlee Lafontaine, Andrew Gregory, David Liddle. *Vanderbilt University Medical Center, Nashville, TN.*
Email: jared.willard@vumc.org
(No relevant relationships reported)

HISTORY - 16-year-old male presenting with left thumb injury. Patient presented due to thumb injury during basketball 5 weeks prior to presentation. He reported a basketball was thrown extremely hard and hit him on the lateral side of the thumb, pushing his thumb towards his 5th digit. Despite pain, he was able to finish the game. He had noticeable swelling when the game ended. Despite icing, he continued to have swelling in addition to pain with pinching items or texting. This led him to the urgent care 1 week prior to presentation. X-rays were obtained at the urgent care and he was sent to sports medicine clinic.
PHYSICAL EXAMINATION - Examination of left hand showed noticeable deformity at MCPJ, with proximal phalanx appearing subluxed on MC. Flexible deformity on radial aspect of the thumb MCP joint. Tenderness to palpation over the radial side of the MCP joint where there is a prominence. No swelling or bruising. Full range of motion of the thumb without limitation. Strength 4/5 with thumb flexion, extension, abduction, adduction. Pain with thumb manual muscle strength testing. Stable to UCL stress at 0 and 30 degrees. RCL laxity at 0 and 30 degrees without clear endpoint. Normal thumbs up and okay sign. Normal thumb to pinky opposition. Normal grip. Neurovascularly intact.
DIFFERENTIAL DIAGNOSIS:
1.Radial collateral ligament tear
2.Flexor pollicis brevis tear
3.1st proximal phalanx fracture
4. Sesamoid fracture
TESTS AND RESULTS:
XR Left Hand
Impression: No fractures identified. Subluxation of thumb at MCP joint.
MRI Left Hand
Impression: Complete disruption of radial collateral ligament of the MCP joint of the thumb with ulnar subluxation of the phalanx compared to the metacarpal. Significant joint fluid. Ulnar deviation of the flexor policis longus and sesamoids. Some marrow edema of the distal metacarpal as well as subchondral bone of first phalanx.
FINAL/WORKING DIAGNOSIS
Chronic radial collateral ligament rupture at metacarpal level
TREATMENT AND OUTCOMES:
1.Surgical radial collateral ligament repair
2.Initially immobilized with thumb spica splint
3.Casted from 1-5 weeks post operatively
4.Out of cast at 5 weeks post op out; into OT formed hand-splint and range of motion exercises started
5.Follow up planned 9 weeks post-op. Work with OT to achieve full, painless ROM and normal strength prior to returning to basketball

1351 May 28 10:30 AM - 10:50 AM

Hand Injury- Football: Thumbs Up

Joshua H. Wood, Arturo Islas, Mark Stovak, FACSM, Robert Bogart. *University of Nevada, Reno, NV.*

(No relevant relationships reported)

HISTORY: 22 yo 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.
DIFFERENTIAL DIAGNOSIS:1. Recurrent Bennett's Fracture
2. Ulnar collateral ligament injury
3. Rolando's fracture
4. Scaphoid fracture
5. Bone bruise
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: Re-current Bennett's fracture
TREATMENT AND OUTCOMES: 1. The patient was immediately placed in a thumb Spica brace. Due to the continued pain and previous history of a Bennett's fracture and concern for a new fracture a CT was ordered. The CT showed a new Bennett's Fracture.
2. Surgical repair with 3 screws
3. Started rehab 3 weeks after surgery and was cleared for competitive play 7 weeks out from surgery.
Author Comments: Images available

1352 May 28 10:50 AM - 11:10 AM

Hand Injury - Football

Marshall N. Leonard, MD[1], George P. Ackerman, MD[2], John Grossi[2]. [1]*North Shore, Manhasset, NY.* [2]*NY Orthopedics, Westbury, NY.*
Email: leonardsportsmed@gmail.com

(No relevant relationships reported)

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.
DIFFERENTIAL DIAGNOSIS:
1.Fracture of metacarpal bones
2.Soft tissue contusion
3.Sprain of hand ligaments
IMAGING:AP, lateral, and oblique views of the right hand revealed a mildly displaced transverse right fifth metacarpal shaft fracture. Volar angulation of approximately 30°
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 pre-fabricated 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

C-14 Clinical Case Slide - **Hip II**

Thursday, May 28, 2020, 9:30 AM - 11:10 AM
Room: CC-2016

1353 **Chair:** Yi-Meng Yen. *Childrens Hospital, Boston, MA.*

(No relevant relationships reported)

1354 **Discussant:** Bryan Wiley. *Kaiser Permanente Medical Group, Ontario, CA.*

(No relevant relationships reported)

1355 **Discussant:** Jacob Jones. *Boston Children's Hospital, Brookline, MA.*

(No relevant relationships reported)

1356 May 28 9:30 AM - 9:50 AM

Hip Pain In A Female Military Trainee: A Cautionary Tale Of Catastrophic Complications

Jaime Gonzalez, Alexis Ortiz, FACSM. *University of the Incarnate Word, San Antonio, TX.* (Sponsor: Alexis Ortiz, FACSM)

(No relevant relationships reported)

Hx: A 31 y/o F client presented to a PT by self-referral, with a primary c/o R hip and groin pain. The client was a previously competitive runner and triathlete and was currently undergoing US Army Initial Entry Training.
PE: The client presented with a moderately antalgic gait, exhibiting a "compensated gluteus medius" gait pattern. Grossly limited ROM in the R hip complex due to pain. No apparent edema, erythema, ecchymosis, atrophy, or deformity on observation. Positive heel tap, fulcrum, patellar-pubic percussion test.
DDx:
1. Femoral Neck Stress Fx
2. Pelvic stress fx
3. Adductor strain/avulsion
4. Hip flexor strain/avulsion
5. Femoral shaft stress fx
6. Lumbar spinal referral
7. Non-organic etiology
Tests & Results:
Plain radiography, bone scan, and MRI: consistent with the primary clinical hypothesis following the clinical examination, a FNSF.
Final Diagnoses:
FNSF, mid-femur fx, osteomyelitis
Treatment & Outcomes: Pre-op the client was given crutches and instructed in a NWB gait. She underwent an uncomplicated ORIF. The immediate post-op course, including PT, was uneventful and included reinforcement of the importance of compliance with the post-op instructions, including NWB progressing to TTWB gait with crutches. The client experienced a fall shortly after being d/c'd from her inpatient stay, which resulted in a fx of the ipsilateral femur. She underwent a 2nd uncomplicated ORIF of her R femur fx. Again, the immediate post-op course, including PT, was uneventful. However, approximately 2 weeks following her d/c from the inpatient stay, the client began to report vague constitutional symptoms including fatigue, fever, and nausea. The PT ordered lab studies including CBC/diff, CMP, and ESR. Results were broadly abnormal and the ortho surgical service was contacted directly and a same-day referral made. Subsequent imaging and serial lab studies confirmed an infection and the patient was taken back for a 3rd surgery, ultimately resulting in an osteotomy and revision of the FNSF ORIF. After a brief stay in the ICU, the patient was transferred to the ortho floor and remained there for several weeks, while receiving IV antibiotics and serial imaging and lab studies. The client was d/c'd and transferred to the medical hold unit to begin the process to be removed from military service.

1357 May 28 9:50 AM - 10:10 AM

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, 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, positive log roll, internal rotation over pressure and Stinchfield's tests. Strength 5/5 in bilateral lower extremities, except for 4/5 on right hip flexion and extension due to pain. DIFERENTIAL DIAGNOSIS:1.Right hip OA2.Lumbar facet joint arthropathy3.Lumbar radiculopathy4.Gluteus Medius tendinosis 5. Femur fracture6.Dysbaric osteonecrosis of the right femoral head TEST AND RESULTS:1. Lumbar spine AP and lateral views X-rays-multilevel degenerative changes of the lumbar spine with osteopenia and spondylosis2. Pelvis AP xray- osteoarthritic changes of the hip bilaterally with sclerotic pattern involving the right femoral head3. Right hip AP and lateral view xray- Dysplastic changes of the femoral head with evidence of the osteonecrosis and articular collapse4. Right hip MRI w/o contrast-Advance degeneration of the right hip joint secondary to prior AVN of the femoral head and subchondral collapse5. Quantitative bone scan:Increase uptake in the right hip acetabulum and femoral neck area. 6.Electrodiagnostic study:Acute L4-L5 radiculopathy with no electrodiagnostic evidence of the right lumbosacral radiculopathy
FINAL/WORKING DIAGNOSIS:Dysbaric osteonecrosis of the right femoral head.
TREATMENT AND OUTCOMES:1. Right total hip replacement2. Admission to acute inpatient rehabilitation hospital3. Standard protocol for total hip replacement 4. Neuromuscular and proprioceptive training5. Return to scuba diving after 3 months as recommended by his orthopedic surgeon and PM&R specialist. Patient was able to walk without assistive device and have the strength to carry a diving equipment.

1358 May 28 10:10 AM - 10:30 AM

Right Groin Pain In A Collegiate Offensive Lineman

Michael Pitzer[1], Heather Bauby[2], Kaylyn Hill[2]. [1]*Virginia Commonwealth University, Richmond, VA.* [2]*Randolph-Macon College, Ashland, VA.*

(No relevant relationships reported)

HISTORY: The patient was a 21-year-old football player who had been having atraumatic right groin pain for one month. He reported feeling a lump in the area of the pain. The pain was worse with activity and relieved by rest. He had also been experiencing subjective fevers, night sweats, nausea, and fatigue. He endorsed an intermittent rash during the course of the first month of symptoms that became very pronounced during a short episode of viral gastroenteritis. Trials of antibiotics did not improve symptoms.
PHYSICAL EXAMINATION: He was a well appearing male that was afebrile. His abdominal and genitourinary exam revealed a soft and nontender abdomen with normal bowel sounds. There was no evidence of a right inguinal hernia. There was no testicular mass or epididymal tenderness. No discrete nodules were palpable in the right groin but there was fullness in the area compared to the opposite side. On examination of the right hip he was nontender to palpation over the anterior hip and moderately tender over the proximal hip adductors. There was no tenderness to palpation over the greater trochanter. He had full range of motion with hip flexion, extension, abduction, and adduction without pain. He reported some pain with resisted adduction. FADIR test was negative.
DIFFERENTIAL DIAGNOSIS: Adductor tendonitis, Inguinal hernia, Lymphadenopathy, Lymphoma, Lymphogranuloma venereum, Kawasaki disease, and Kikuchi-Fujimoto disease. **TEST AND RESULTS**: CMP, CBC, and UA were without significant findings. HIV, hepatitis B, hepatitis C, and Epstein Barr virus were negative. ESR, CRP, rheumatoid factor, and ANA were within normal limits. Lyme Disease test was negative. A diagnostic ultrasound showed a lobulated hypoechoic nodule with a fatty hilum in the right inguinal region with a volume of 6.9 mL consistent with a reactive lymph node. Pathology of the lymph node showed histiocytic necrotizing lymphadenitis consistent with Kikuchi-Fujimoto without evidence of malignant lymphoma or metastatic carcinoma.
FINAL WORKING DIAGNOSIS: Kikuchi-Fujimoto Disease
TREATMENT AND OUTCOMES: He was started on a prednisone taper to which he had dramatic symptom improvement but with a rebound in symptoms after completing the course. He was then started on hydroxychloroquine and reported adequate symptom improvement for football participation.

1359 May 28 10:30 AM - 10:50 AM

Hip And Groin Pain - Skating

Sarah A. Pierotti. *Advocate Lutheran General, Park Ridge, IL.*

(No relevant relationships reported)

Hip and Groin Pain - Skating
Sarah Pierotti, Kaleigh Suhs, Advocate Lutheran General Hospital, Park Ridge, IL
HISTORY: A 14-year-old female softball catcher was seen in Sports Medicine clinic for follow up for left hip injury. She sustained a fall with hyperextension her left leg while rollerblading. She was evaluated at an urgent care for left hip and groin pain. An X-ray pelvis was normal and she was discharged with a diagnosis of a hip flexor strain. She was re-evaluated the next day in the ER as the pain had progressed. After CT 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+.
DIFFERENTIAL DIAGNOSIS:
• Hip flexor 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 musculature along the iliac bone 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 pelvic hematoma possibly a small area of active extravasation. No discrete connecting vessel identified.
FINAL DIAGNOSIS:
• Iliopsoas hematoma
• Femoral nerve neuropraxia
TREATMENT AND OUTCOMES:
1 Refer to Neurology with follow up for monitoring of neuropraxia
2. MRI to re-evaluate hematoma size, evaluate muscle and nerve involvement
3. Collaboration with pediatric surgery, vascular surgery and orthopedics for monitoring. Drainage of hematoma not recommended.
4. Referral to PT for mobilization

1360 May 28 10:50 AM - 11:10 AM

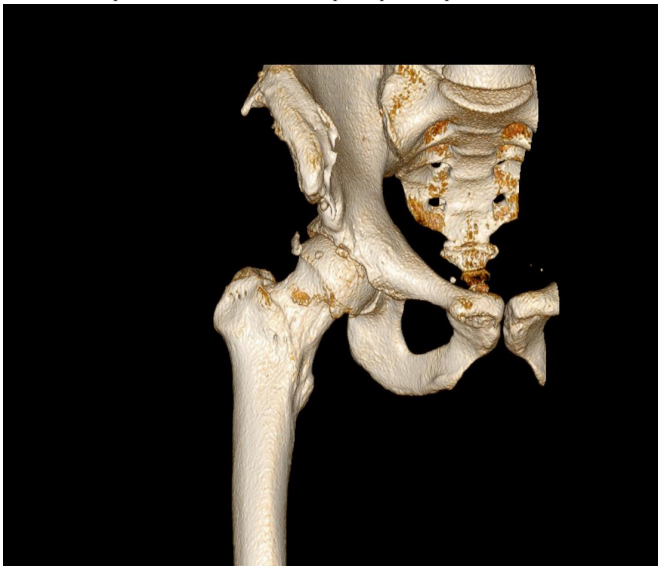
HIP INJURY -- WRESTLING

Terri A. Zachos, Jay F. Deimel. *Allegheny Health Network Saint Vincent Hospital, Erie, PA.*

(No relevant relationships reported)

Hip Injury - Wrestling
Terri A. Zachos, Jay F. Deimel, Allegheny Health Network Saint Vincent Hospital, Erie, PA.
HISTORY: A 21-year-old college wrestler presented with progressive, persistent pain in his right hip after undergoing arthroscopy at an outside institution. Despite multiple attempts at non-operative management, including activity modification, rest, physical therapy, and use of nonsteroidal anti-inflammatory drugs, pain and stiffness limited his sport-specific function.
PHYSICAL EXAMINATION: Markedly limited active range of motion, particularly with hip flexion beyond 90 degrees; pain with range of motion
DIFFERENTIAL DIAGNOSIS:
1. Chondral injury to femoral head
2. Injury (recurrence of tear) to acetabular labrum
3. Persistent cam type impingement of right hip
4. Chondromalacia of right acetabulum
TEST AND RESULTS:
Plain radiographs of pelvis and both hips
MRI of right hip
MR-arthrogram of right hip
Results of all imaging studies were consistent with early progression of osteoarthritis, with changes considered advanced for a patient of his age.
FINAL/WORKING DIAGNOSIS:

Chondral injury and heterotopic ossification (HO) secondary to chronic cam type femoroacetabular impingement
TREATMENT AND OUTCOMES:
1. Right hip revision arthroscopy with labral resection and labral reconstruction with allograft tissue
2. Right hip revision arthroscopic cheilectomy/femoroplasty
3. Right hip arthroscopic excision of HO fragment measuring 3 cm x 2 cm in anterior lateral joint capsule
4. Right hip arthroscopic chondroplasty of acetabulum with microfracture/bone marrow stimulation procedure
5. Immediate post-operative physical therapy (day of surgery)
6. Single dose of external beam radiation on post-operative day 1 to minimize risk of recurrence of HO
7. 20 pounds flat foot weightbearing restriction for six weeks
8. Naproxen 375 mg bid x 6 weeks to minimize risk or recurrence of HO
9. Continuous passive motion in immediate post-operative period



C-15 Clinical Case Slide - **Shoulder I**

Thursday, May 28, 2020, 9:30 AM - 10:50 AM
Room: CC-2022

1361 **Chair:** Thomas Moran. *University of Chicago-NorthShore, Chicago, IL.*
(No relevant relationships reported)

1362 **Discussant:** Eric E. Coris. *University of South Florida College of Medicine, Tampa, FL.*
(No relevant relationships reported)

1363 **Discussant:** Melissa W. Christino. *Boston Children's Hospital, Boston, MA.*
(No relevant relationships reported)

1364 May 28 9:30 AM - 9:50 AM

Shoulder Injury - Recreational Alpine Skiing

Arie J. van Duijn[1], Jacqueline van Duijn[1], Shawn D. Felton[1], John Mehalik[2], Mitchell L. Cordova, FACSM[1]. [1]*Florida Gulf Coast University, Fort Myers, FL.* [2]*Orthopedic center of Florida, Fort Myers, FL.* (Sponsor: Mitchell L. Cordova, FACSM)
Email: avanduij@fgcu.edu
(No relevant relationships reported)

HISTORY:
54-year old female recreational alpine skier with history of left shoulder pain following a fall on hyperabducted outstretched arm after being hit from behind by another skier 3 days earlier. She noted immediate local pain of 8/10 on VAS and noticed a popping sound in the shoulder at injury. She was unable to lift her arm.
PHYSICAL EXAMINATION:
Edema was noted at the anterolateral shoulder, no gross deformity present. Palpation of soft tissues, tendon and bony structures revealed significant point tenderness at the greater tuberosity. Limited active ROM of 20 deg. in flexion, abduction and external rotation due to pain. Passive ROM was 80 degrees in flexion and abduction, 30 deg in ext. rotation. Resistive testing was weak and painful in flexion, abduction and ext. rotation. Due to significant pain complaints, further physical examination was suspended and clinician progressed to point-of-care ultrasound imaging of the shoulder complex.
DIFFERENTIAL DIAGNOSIS:
1. Rotator Cuff Tear
2. Labral Tear/ Bankart Lesion
3. Proximal Humerus Fracture
4. Shoulder Sprain
5. Reduced Shoulder Dislocation
TEST AND RESULTS:
MSK Ultrasound Imaging of the shoulder complex revealed 10mm displacement of supraspinatus footprint of humerus in LAX. Patient was referred to orthopedic surgeon for further diagnostic imaging. XRI revealed displaced and comminuted greater tuberosity fracture. 3D CT also revealed acute greater tuberosity avulsion fracture with 9mm displacement.
FINAL WORKING DIAGNOSIS:
L shoulder displaced greater tuberosity fracture
TREATMENT AND OUTCOMES:
Patient underwent open ORIF of greater tuberosity fracture with two 6.5 PEEK anchors and parachute suturing. During procedure anterior/lateral rotator cuff tear was noted and repaired using high five sutures. Post surgical rehabilitation consisted of a modified RCR protocol:
-Week 0-2: Brace immobilizer and PROM only in flexion to 90 deg.
-Week 2-4: Brace continued. Progressed to PROM in all directions and pendulums in 4 weeks
-Week 4-8: Progressive AAROM to AROM and gentle isometrics
-Week 8-12: Progressed to RC strengthening and functional activities
Patient outcomes were excellent with SPADI 4/100, full ROM in all directions, and only minor weakness in abduction/external rotation. Patient returned to full recreational athletic activities.

1365 May 28 9:50 AM - 10:10 AM

An Unusual Case Of Shoulder Pain In A High School Football Player

Eric Wayne Pettyjohn, Jason L. Zaremski, FACSM. *University of Florida, Gainesville, FL.*
Email: epettyjohn@ufl.edu
(No relevant relationships reported)

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. Tender to palpation (TTP) at the AC joint and scapular angle; no TTP at scapular body. Strength: 2/5 supraspinatus, 3/5 external rotation, 4/5 internal rotation, abduction, and biceps. Positive empty can and drop arm. No erythema, normal sensation throughout left upper extremity, and radial and ulnar pulses 2+ and regular.
DIFFERENTIAL DIAGNOSIS:
1. Acromioclavicular sprain
2. Rotator Cuff injury
3. Glenoid labrum injury
4. Distal clavicle contusion
5. Glenohumeral dislocation
TEST AND RESULTS:
1. XR Left Shoulder: no acute fracture, dislocation, or soft tissue abnormality2. XR 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 initiated.
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 Jayabalan MD, PhD. *Shirley Ryan AbilityLab/ Northwestern University, Chicago, IL.*
(Sponsor: Dr. Joseph Ihm, MD, FACSM)
Email: rnussbaum@sralab.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 thumb. 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, Hawkin's, and Neer's tests caused left anterior shoulder pain. Decreased sensation over the left lateral upper arm to pinprick and light touch. Hoffman's elicited on the left. Reflexes: 3+ left biceps. Cervical forward and left lateral flexion limited due to pain. Left Spurling's exacerbated shoulder pain.
DIFFERENTIAL DIAGNOSIS
1. Cervical radiculopathy/myelopathy
2. Left supraspinatus tear
3. Left subacromial impingement
4. Left adhesive capsulitis
4. Left brachial plexopathy
TESTS AND RESULTS
Left Shoulder MRI
-No supraspinatus tear
-Subtle superior/posterior labral tear
-Trace biceps tenosynovitis
Cervical Spine MRI
-Left paracentral 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.
-Denervation 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 with myelopathic features
TREATMENT AND OUTCOMES
-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. Ngan, 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 fingertips; 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.
Physical Examination:
No atrophy or deformity. Full range of motion (FROM) of cervical spine, (-) Spurlings. FROM shoulders, 5/5 strength. (-) Speeds, O'Briens, impingement, instability. (+) tenderness of the anterior to lateral humerus head, and the left 1-3 ribs starting from supraclavicular region to sternoclavicular (SC) joints. (-) pain acromioclavicular (AC) joint. Neurovascular status normal.
Differential Diagnosis:
1. Proximal humerus fracture
2. SC joint sprain
3. Rib dysfunction
4. Rib fracture(s)
5. Clavicle fracture
6. Intercostal muscle strain
7. Biceps tendon strain
8. Pectoralis muscle strain
Tests and Results:
Left shoulder imaging:
Radiographs: left AC and coracoclavicular joints each 11 mm; axillary view showed possible periosteal calcification proximal humerus
Magnetic resonance imaging (MRI): High-grade partial tearing of accessory head of biceps tendon
MRI review by sports medicine team: Calcific deposit along greater tuberosity and humeral shaft; abnormal signal at insertion of pectoralis major tendon
Final/Working Diagnosis:
Chronic distal pectoralis major tendon avulsion
Treatment and Outcomes:
1. Seen by orthopaedic surgery 6 months post injury; declined surgery in order to wrestle high school season
2. One year post injury, open repair of pectoralis major tendon, excision of heteropic ossification, and biceps tenodesis
3. Sling x 6 weeks; at week 2 passive ROM per physical therapy (PT)
4. At week 6 active ROM with 3# lifting restriction; jogging allowed
5. At 3 months post-op, 5/5 strength, no pain, and good progression; no wrestling until reevaluation at 5 months post-op
6. Last PT visit at 4 months post-op; lost to follow up after

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C-16 Rapid Fire Platform - **Athletes and Behavior**

Thursday, May 28, 2020, 9:30 AM - 10:50 AM
Room: CC-Exhibit Hall

1368 **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 Montejo-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.

		BHS	
		Slight hopelessness	Moderate hopelessness
EE	With BO	-†	-†
	High risk	1.87 (0.56 - 6.20)	15.96* (1.22 - 209.07)
	Moderate risk	2.17* (1.15 - 4.11)	3.77 (0.35 - 40.32)
D	With BO	3.42* (1.13 - 10.36)	3.06 (0.26 - 36.70)
	High risk	1.02 (0.37 - 2.79)	2.35 (0.33 - 16.72)
	Moderate risk	1.05 (0.48 - 2.30)	-†
RPR	With BO	1.47 (0.44 - 4.94)	4.66 (0.33 - 66.15)
	High risk	3.32* (1.58 - 7.01)	-†
	Moderate risk	1.86 (0.85 - 4.05)	3.86 (0.58 - 25.53)

Data expressed as OR (95% CI). BHS: Beck Hopelessness Scale. BO: Burnout. D: Depersonalization. EE: Emotional Exhaustion. RPR: Reduced Personal Realization.
†Sample size was too low to perform the analysis.
* p<0.05

1370 May 28 9:40 AM - 9:50 AM

A Pilot Study To Examine Collegiate Athletes' Attentional Focus And Goal Orientations With And Without Injury Experience

Susumu Iwasaki[1], Issei Ogasawara[2]. [1]*Fort Lewis College, Durango, CO.* [2]*Osaka University, Toyonaka, Japan.*
Email: siwasaki@fortlewis.edu

(No relevant relationships reported)

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 = 3.68, ± .77; Group 2: M = 4.19, ± .52) and ego orientations (Group 1: M = 3.22, ± .91; Group 2: M = 3.71, ± .52) than Group 1. The subsequent ANOVA revealed that there was a significant difference for task orientation in the Group 2 (p = .019): Athletes' who reported major injury experience demonstrated lesser task orientation (M = 3.89, SD = .56) compared to those who did not (M = 4.27, SD = .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 lesser 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 mindfulness. 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.

1371 May 28 9:50 AM - 10:00 AM

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

(No relevant relationships reported)

Flow, Optimism and Hope are psychological constructs that have been studied separately in applied sport psychology and positive psychology, but never together at the same time. **PURPOSE:** The purpose of the present study was to explore the relationships among Flow, Optimism and Hope, and determine whether Optimism and/or Hope was/were a predictor 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 χ^2 (x2) (1162, N = 640) = 2466.24, p < .00; TLI = .93, CFI = .93, GFI = .86, RMSEA (90%CI) = .042 (.040 - .044) denoted that the data fit the structural model objectively well. In the mediation model, Hope, and Optimism through Hope, 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.

1372 May 28 10:00 AM - 10:10 AM

Differences In Wellness Levels Between Division Ii Athletes' Completion/non-completion History Of A College Wellness Course

Mindy Mayol[1], Urska Dobersek[2], Matthew D. Beekley, FACSM[3]. [1]*University of Indianapolis, Indianapolis, IN.* [2]*University of Southern Indiana, Evansville, IN.* [3]*DePauw University, Greencastle, IN.*
Email: mmayol@uindy.edu

(No relevant relationships reported)

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_{males} = 355, $n_{females}$ = 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 $p \leq .05$ was set for statistical significance. **RESULTS:** There was a statistically significant multivariate effect in SAs, $F(9, 451) = 4.72$, $p < .001$, Wilk's $\Lambda = .91$, partial $\eta^2 = .09$ 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 = 13.36, 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.

1373 May 28 10:10 AM - 10:20 AM

Characteristics Of Resting State Networks Of Elite Skating Athletes: An ICA Analysis

Keying Zhang[1], Chunmei Cao[1], Yih-Kuen Jan[2]. *[1]Tsinghua University, Beijing,China, China. [2]University of Illinois at Urbana-Champaign, Champaign, IL.*
Email: bsuzky0812@163.com

(No relevant relationships reported)

(No relevant relationships reported)
Long-term motor skill learning can lead neuro plasticity 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 fronto-parietal 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 multiple comparison correction (cluster $p< 0.01$). Coordinates are given in Montreal Neurological Institute(MNI) space.
RESULTS:
1. Athletes showed higher spontaneous activity in postcentral gyrus (cluster size =230, peak coordinate =69, -12,18, peak t =11.88) and cingulate gyrus (cluster size =167, peak coordinate= 6, -3,39, peak t =6.65) in somatomotor network.
2. Athletes showed higher spontaneous activity in precuneus (cluster size =337, peak coordinate =30, -66,39, peak t =10.38) 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.

1374 May 28 10:20 AM - 10:30 AM

Sexual Harassment, Abuse, And Assault Experienced And Reported By Female Athletes In India And Pakistan

Md. Dilsad Ahmed[1], Bradley J. Cardinal, FACSM[1], Salahuddin Khan[2], Shaheen Begum[3]. *[1]Oregon State University, Corvallis, OR. [2]Gomal University, Pakhtoonkhwa, Pakistan. [3]S.P. Pune University, Pune, India.* (Sponsor: Bradley J. Cardinal, FACSM)
Email: ahmedm@oregonstate.edu

(No relevant relationships reported)

PURPOSE: The "#MeToo Movement" has brought sexual harassment, abuse, and assault experienced by females to the forefront of society, particularly in the workplace. Within the athletic realm, females have also reported such experiences, often referred to as the maltreatment of athletes. While maltreatment has been reported for decades, in recent years victim's voices have been amplified - particularly in the USA. Yet, for various political and social reasons, the maltreatment of female athletes in countries around the world remains poorly understood. In this study female athletes from India and Pakistan were asked to report their experiences of sexual maltreatment by their coaches.
METHODS: Female student-athletes with male coaches participated in this study (N = 395; India = 180, Pakistan = 215). The athletes represented a large variety of sports (>26). Participants (M age = 20.57±2.59; M years of athletic experience = 2.73±1.49) completed the Auweele et al. (2008) *Sport-Specific Touch and Behaviour Versus Unwanted Intimacy from Coaches* measure. Each item was rated by the athletes on a 6-point Likert scale. Three composite dependent variables were assessed: "Unwanted Sexual Behavior" (14 items, Cronbach α = .91), "Physical and Verbal Behavior with a Sexual Undertone" (5 items, Cronbach α = .72), and "Sexist and Discriminatory Behavior" (3 items, Cronbach α = .77). Data were analyzed using a 2 (Country) by 2 (Type of Sport: Individual vs. Team) MANCOVA, with age as a covariate.
RESULTS: Main effect differences for all three variables were observed for Country (p<.001, η^2 = .30), with no differences observed for Type of Sport or the interaction effect (p>.05). Each between country variable differed significantly (p<.001) with η^2 values ranging from .05-.30. The athletes from Pakistan reported experiencing maltreatment from their coaches more so than the athletes from India.
CONCLUSION: Female athletes from both countries reported experiencing a wide range of sexual maltreatment issues at the hands of their coaches. The issues ranged from being told sexist jokes, to having the front side of their body massaged, to sexual encounters. The females athletes in Pakistan experienced such incidences more so than did those in India.
Keywords: Cross-cultural, inappropriate coaching behaviors, sexual maltreatment of athletes

1375 May 28 10:30 AM - 10:40 AM

Can Athletes Be Tough And Kind To Themselves? Improving Mental Health Best Practices In Ncaa

Grant B. Morgan[1], Andreas Stamatis[2], Paul Deal[2], Zacharias Papadaki[3], Jeffrey Forsse[1], Sarah McKinley-Barnard[4], Eric Scudamore[5]. *[1]Baylor University, Waco, TX. [2]State University of New York at Plattsburgh, Plattsburgh, NY. [3]Barry University, Miami Shores, FL. [4]University of South Alabama, Mobile, AL. [5]Arkansas State University, Jonesboro, AR.*
Email: grant_morgan@baylor.edu

(No relevant relationships reported)

Recent events and official NCAA reports indicate that student-athletes' well-being is compromised by sub-clinical issues of mental health (MH) disorders. Self-compassion (SC) and mental toughness (MT) are two psychological constructs that have been demonstrated effective against sports stressors. However, their conceptualizations seem contradictory ("machismo" mentality vs. self-kindness). Wilson, Bennett, Mosewich, Faulkner, and Crocker (2019) were the first to explore the compatibility of the two constructs towards athletic performance.**PURPOSE**: To investigate the three constructs in a NCAA environment and provide evidence towards updating current MH best practices.
METHODS: In total, 542 NCAA student-athletes from all three NCAA Divisions participated (Mage=19.84, SD=1.7). Three inventories were administered: the Mental Toughness Index (MTI), Self-Compassion Scale (SCS), and Mental Health Continuum - Short Form (MHC-SF). After IRB approval, all three questionnaires were administered via student email using Qualtrics. A multiple regression model was estimated using MTI and SCS scores as predictors of MHC-SF along with a moderation effect between MTI and SCS.
RESULTS: The model explained about 34% of variability in MHC-SF and indicated that MTI and SCS were positively related with MHC-SF (r=.407, p<0.01; r=0.541, p<0.01, respectively). There was also a negative moderation effect [B=-0.245, SE=0.097, p<0.05], meaning that MT and SC mitigate each other to an extent as they both increase.
CONCLUSIONS: Our findings generally agree with Wilson et al., 2019. Nevertheless, they indicate that -although MT and SC are compatible processes in the same athlete- their interaction may not be beneficial to MH. A possible explanation could be timing: SC and MT may enhance MH when they are employed at separate times, but not simultaneously. Including MT and SC training and teaching all athletes how to hold these competing qualities in a way that complement rather than conflict may strengthen current NCAA MH best practices.

1376 May 28 10:40 AM - 10:50 AM

Does Mindfulness Underpin The Mental Toughness - Self-compassion Relationship In Collegiate Athletes?

Shana M. Walsh[1], Grant B. Morgan[2], Zacharias Papadakis[3], Andreas Stamatis[4]. *[1]Peru State College, Peru, NE. [2]Baylor University, Waco, TX. [3]Barry University, Miami Shores, FL. [4]SUNY Plattsburgh, Plattsburgh, NY.*
Email: swalsh@peru.edu

(No relevant relationships reported)

Self-compassion (SC) and *mental toughness* (MT) are two psychological constructs that protect athletes against the stressors of sports, despite their seemingly contradictory conceptualizations. In the first exploration of their compatibility towards athletic performance at the elite level, Wilson, Bennett, Mosewich, Faulkner, and Crocker (2019) concluded that the connection between SC and MT is underpinned by *mindfulness*. This relationship however has not yet been explored at other levels. National Association of Intercollegiate Athletics (NAIA) programs can be compared with Division II (DII) and Division III (DIII) National Collegiate Athletic Association (NCAA) programs given their similar financial, competitive, and enrollment philosophies. **PURPOSE**: To investigate if mindfulness underpins the MT - SC relationship in DII, DIII, and NAIA student-athletes. Hypothesis: MT and SC are compatible via mindfulness in all three collegiate environments. **METHODS**: Two inventories were administered via Qualtrics: the Mental Toughness Index and the Self-Compassion Scale, which includes a mindfulness subscale. The total sample was 396 student athletes: 313 DII or DIII; 86 NAIA. Statistical analyses consisted of zero-order correlations and regression analysis in SPSS. **RESULTS**: The estimated zero-order correlation between MT and SC was .46, but dropped to .31 after controlling for mindfulness. To further explore this relationship, the percentage of variability

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 compatibility 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.

C-33 Free Communication/Poster - **Firefighter Physiology**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1407 Board #1 May 28 9:30 AM - 11:00 AM

Deterioration Of Lipid Metabolism Despite Fitness Improvements In Wildland Firefighters

Patrick S. Dodds[1], Alejandro M. Rosales[1], Walter S. Hailes[1], Joseph A. Sol[1], Robert H. Coker, FACSM[2], John C. Quindry, FACSM[1], Brent C. Ruby, FACSM[1]. *[1]University of Montana, missoula, MT. [2]University of Alaska Fairbanks, Fairbanks, AK.*

(No relevant relationships reported)

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 seasonal wildland fire suppression. **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 (~VO_2=20.7 mL/kg/min) for heart rate (HR) steady state were recorded. Blood samples 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<0.01). 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±9 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<0.0001) 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 1.6±1.3 (p<0.0001). **CONCLUSIONS:** Despite favorable changes in BP and aerobic fitness, there were maladaptive changes in serum lipids that occurred in conjunction with an increase in body mass. Further studies should explore the influence of diet, mental/emotional stress, and/or smoke exposure on the mechanisms responsible for the dysregulation of lipid metabolism in WLFF. Supported by the United States Forest Service, National Technology and Development Program

1408 Board #2 May 28 9:30 AM - 11:00 AM

Weight Change In Firefighters And Associated Changes In Cardiovascular Disease Risk Factors Over Five Years

Emilie Diane Bode[1], Kevin C. Mathias[1], Don F. Stewart[2], Denise L. Smith, FACSM[1]. *[1]Skidmore College, Saratoga Springs, NY. [2]Public Safety Occupational Health Center, Fairfax, VA.*
(Sponsor: Denise L. Smith, FACSM)

(No relevant relationships reported)

Obesity is a substantial risk factor (RF) for cardiovascular disease (CVD), and research suggests that 23-35% of firefighters (FFs) have a body mass index (BMI) categorized as obese. To date, limited research has examined weight change and associated changes in CVD RFs among FFs. **PURPOSE:** To assess changes in body weight and CVD RFs among an occupationally active cohort of US FFs over a 5-year period, and to investigate changes in CVD RFs in FFs who lost weight, maintained a stable weight, or gained weight. **METHODS:** Changes in CVD RFs (e.g., BMI, blood pressure [BP], total cholesterol [TC], low and high density lipoproteins [LDL; HDL], and blood glucose [BG]) were measured during two occupational medical exams an average of 4.8±0.6 years apart in a cohort of 672 active FFs. Changes in CVD RFs within subgroups of FFs who lost >3% body weight, maintained stable weight (±3% body weight), or gained >3% body weight were tested for statistical significance using paired t-tests. **RESULTS:** FFs on average had a significant increase (p<0.001) in BMI (0.8kg/m^2), TC (5.5mg·dl^{-1}), LDL (5.2mg·dl^{-1}), and BG (2.1mg·dl^{-1}). FFs who gained weight had a significant increase (p<0.001) in TC (12.9mg·dl^{-1}), LDL (11.1mg·dl^{-1}), and BG (2.9mg·dl^{-1}) with a significant decrease (p≤0.05) in HDL (-1.3mg·dl^{-1}). In contrast, FFs who lost weight showed a significant decrease (p≤0.05) in TC (-8.5mg·dl^{-1}), LDL (-8.5mg·dl^{-1}), and BP (systolic: -5.3mmHg; diastolic -4.2mmHg) with a significant increase (p≤0.05) in HDL (2.3mg·dl^{-1}). There were significant changes (p<0.001) among weight stable FFs in BP (systolic: -3.5mmHg; diastolic: -3.8mmHg), and BG (2.7mg·dl^{-1}). **CONCLUSION**: On average, FFs gained weight and CVD RFs 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-FP-00445

1409 Board #3 May 28 9:30 AM - 11:00 AM

Influence Of Aerobic Fitness On Heart Rate Recovery Among Active-Duty Firefighters

David J. Cornell[1], Robert J. Flees[2], Sabrina E. Noel[1], Corey M. Shemelya[1], Kathryn R. Zalewski[3], Barbara B. Meyer[2], Kyle T. Ebersole[2]. *[1]University of Massachusetts Lowell, Lowell, MA. [2]University of Wisconsin-Milwaukee, Milwaukee, WI. [3]University of Wisconsin-Stevens Point, Stevens Point, WI.*

(No relevant relationships reported)

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 (VO_{2max}) 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 ($HR = HR_\infty + HR_{amp}e^{-t/HRR\tau}$) 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 VO_{2max} 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 (HRR_τ), asymptote (HR_∞), and amplitude (HR_{amp}) HRR profile parameters. **RESULTS:** High Fit firefighters demonstrated significantly faster HRR_τ (P = 0.003) and lower HR_∞ (P = 0.003) HRR parameters than Low Fit firefighters, but no difference in HR_{amp} (P = 0.812) HRR parameters, during recovery after the submaximal test. In contrast, although High Fit firefighters demonstrated significantly greater HR_{amp} (P = 0.001) HRR parameters than Low Fit firefighters, no differences in HRR_τ (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 slowed ANS recovery after maximal tasks may be a factor to consider when determining SCD risk among both High Fit and Low Fit firefighters.

1410 Board #4 May 28 9:30 AM - 11:00 AM

Association Between Handgrip Strength And Blood Pressure In Firefighters

Daniel RF Saint-Martin, Edgard Melo Keene von Koenig Soares, Kevin Alves Barreto, Rosenkranz Maciel Nogueira, Mayda Castro Silva, Guilherme Eckhardt Molina, Luiz Guilherme Grossi Porto. *Universidade de Brasília - UnB e Grupo de Estudos em Fisiologia e Epidemiologia do Exercício e da Atividade Física - GEAFS, Brasília, Brazil.*
Email: danielsaintmartin@hotmail.com

(No relevant relationships reported)

Elevated blood pressure (BP) is a major risk for cardiovascular morbi-mortality. Handgrip strength (HS) is associated to all-cause and cardiovascular mortality; also, low HS increases risk of developing cardiovascular disease in the general population.

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 28.1±5.7 yrs, BMI of 24.6±2.8 kg/m², systolic blood pressure (SBP) of 123.1±13.2 mmHg, diastolic blood pressure (DBP) 72.5±8.6 mmHg, and HS of 102.2±17.1 kg. Isometric HS was measured using a hand-held Saehan 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 kilograms. 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

	SBP	DBP
Absolute grip strength		
Higher (n= 119)	123.5 ± 12.9	73.8 ± 8.5
Low (n= 57)	122.3 ± 13.9	69.6 ± 8.3
p - value	0.56	<0.01*

*: 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. Aljaroudi[1], Amit Bhattacharya[2], Tyler Quinn[3], Warren J. Williams[3]. [1]*Sam Houston State University, Huntsville, TX.* [2]*University of Cincinnati, Cincinnati, OH.* [3]*National Institute for Occupational Safety and Health, Pittsburgh, PA.*

(No relevant relationships reported)

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 ºC], 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; VO_{2max}: 56.33 ± 7.42 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 % VO_{2max} 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 ºC, $p < 0.01$), exceeding the lower threshold limit of occupational hyperthermia (Tc ≥ 38 ºC). Following the exercise session, a significant increase was found in swing velocity of the torso (77.17 ± 27.05 vs. 85.17 ± 25.89 º/s, $p = 0.03$), right arm (184.33 ± 79.09 vs. 230.50 ± 104.98 º/s, $p < 0.01$), and left arm (228.92 ± 77.20 vs. 250.75 ± 74.48 º/s, $p < 0.01$). A significant increase was also found in range of motion of the right arm (184.33 ± 79.09 vs. 230.5 ± 104.98 º, $p < 0.01$), and the left arm (228.92 ± 77.20 vs. 250.75 ± 74.48 º, $p < 0.01$). **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.

1412 Board #6 May 28 9:30 AM - 11:00 AM

Longitudinal-retrospective 8-weeks Non-periodized, Non-individualized Training Program Effectiveness Of Hialeah Fire Department

Peter Beitia[1], Scott Grondin[2], Zacharias Papadakis[1]. [1]*Barry University, Miami Shores, FL.* [2]*City of Hialeah Fire Department, Hialeah, FL.*

Email: peter.beitia@mymail.barry.edu

(No relevant relationships reported)

Firefighting requires high fitness. Fire academies assess cadets' fitness. Hialeah Fire Department (HFD) academy utilizes a non-periodized, non-individualized training program to assess its recruits' fitness. **PURPOSE:** Evaluate HFD's program effectiveness across 4 years. We hypothesized a) each class-years' fitness will be improved; b) there will be no difference in gain across years, after accounting for intra- and inter- individual differences. **METHODS:** HFD cadets (age 26 ± 5 SD) from class-years 2016 (N=6), 2017 (N=7), 2018 (N=16), and 2019 (N=15) included in the study. All class-years participated in the same 8-week program. Cadets assessed at week-1 and week-8 on 1.5-mile run time, maximum pull-ups, push-ups, and sit-ups. Delta gain percentage (ΔG%) calculated as [((post-pre)/pre)*100]. Analysis of covariance (ANCOVA) by class-year and controlled for the pre-test scores was performed for each dependent variable. Significance was set at $p < 0.05$. All analyses were performed using SPSS©. **RESULTS:** Significant effect of ΔG% on class-year 1.5-mile ($F_{3,39} = 20.693$, $p = .000$, $\eta^2 = .614$); no significant effect of ΔG% on class-year pull-ups ($F_{3,38} = 2.722$, $p = .058$, $\eta^2 = .177$); significant effect of ΔG% on class-year push-ups ($F_{3,39} = 3.338$, $p = .029$, $\eta^2 = .204$); no significant effect of ΔG% on class-year sit-ups ($F_{3,39} = 1.828$, $p = .158$, $\eta^2 = .123$). **CONCLUSIONS:** HFD's program improved cadets' fitness levels across 4 year-classes but failed to account for intra- and inter-individual differences. This program may under- or over-estimate cadets' fitness training capabilities. This program is not appropriate to account for between class-years and within cadets' differences and maximize the reported benefits as dictated by the training principles. Specific individualized fitness programs that meet the needs of a broad range of individuals within the Fire Service are needed. Such tailored programs may serve better the firefighters' job-related fitness.

1413 Board #7 May 28 9:30 AM - 11:00 AM

Central And Peripheral Blood Pressure Evaluation In Association With Shift-work Intensity In Brazilian Military Firefighters

Kevin Alves Barreto[1], Daniel RF Saint-Martin[1], João Paulo A. Barbosa[1], Edgard MKVK Soares[1], Mayda Castro[1], Rosenkranz Maciel Nogueira[1], Guilherme E. Molina[1], Denise L. Smith[2], Luiz Guilherme Grossi Porto[1]. [1]*Universidade de Brasília, Unb e Grupo de Estudos em Fisiologia e Epidemiologia do Exercício e da Atividade Física - GEAFS, Brasília, Brazil.* [2]*Health and Human Physiological Sciences, Skidmore College, Saratoga Springs, NY.*

Email: thekevinalves@gmail.com

(No relevant relationships reported)

Sudden cardiac death is the leading cause of on-duty death among US firefighters and has been associated with cardiomegaly. Firefighters' job-related activities impose cardiovascular strain that might affect blood pressure (BP) regulation. Central BP (cBP) has been shown to be a better predictor of cardiovascular mortality than peripheral BP (pBP). **Purpose:** To compare the difference between cBP and pBP among Brazilian military firefighters (MFFs) according to the shift-work intensity. **Methods**: We evaluated 20 male MFFs with mean age of 33.6±5.2 yrs, BMI of 27.6±3.1 kg/m². BP was assessed in the sitting position before and after a routine 24h shift-work using the Mobil-O-Graph device®. The shift-work intensity was estimated by the number of emergencies calls multiplied by perceived intensity of each occurrence reported on a log as light, median or high intensity. The median (min-max) reported intensity was 10.5 (1.0 - 39.0). Shift-work intensity was categorized as light (<median - Group 1) or high (>median - Group 2). We compared pBP and cBP, before and after a 24h-work period using the Wilcoxon test at 5% (p<0.05). Data are presented as median (min-max). **Results:** All MFFs showed normal resting BP both before and after a routine 24h-shift work. However, after their shift, Group 2 showed a significant increase in systolic cBP but not in pBP, whereas no difference was found in Group 1 (Table 1). The diastolic cBP and pBP were normal and similar in all time periods in both groups (p>0.05; data not shown). **Conclusion:** A high workload intensity estimated during a routine 24h-shift work was associated with an unexpected increase on systolic cBP as compared to pBP. Even though systolic cBP varied within the normal range, this novel risk factor measurement may provide an opportunity to identify negative early change indicative of higher cardiovascular risk.

Table 1: Comparisons of peripheral and central systolic BP between groups according to the shift-work intensity.

	Systolic blood pressure		
	Peripheral	Central	*p - value*
Group 1 (n= 10)			
Before	120 (102 - 157)	120 (107 - 145)	0.61
After	123 (104 - 129)	125 (98 - 139)	0.48
Group 2 (n= 10)			
Before	123 (112 - 149)	123 (112 - 154)	0.55
After	119 (109 - 133)	126 (113 - 139)	0.01*

*Wilcoxon test.

1414 Board #8 May 28 9:30 AM - 11:00 AM

Relationship Between Health-Related Quality Of Life, Aerobic Fitness, And Body Composition In Professional Firefighters

Lauren Biscardi, Joel Martin, Navid Ghoddosi, Nelson Cortes, Marcie Fyock-Martin. *George Mason University, Manassas, VA.*
Email: jmarti38@gmu.edu

(No relevant relationships reported)

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/m^2) completed baseline HRQoL survey, BodPod, and maximal oxygen uptake (VO_{2max}) test. HRQoL was assessed using the SF-36, with the physical and mental composite scores used for analysis. Body fat percentage was estimated using BodPod. VO_{2max} 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 %), VO_{2max} (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/m^2) and 4 were overweight (25-29.9 kg/m^2). There were statistically significant negative correlations between VO_{2max} 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 warrant further study.

1415 Board #9 May 28 9:30 AM - 11:00 AM

Relationships Between Resting Heart Rate Variability, Maximal Heart Rate, And VO_{2peak} Among Active-duty Firefighters

Kyle T. Ebersole[1], David J. Cornell[2], Robert J. Flees[1]. [1]*University of Wisconsin-Milwaukee, Milwaukee, WI.* [2]*University of Massachusetts Lowell, Lowell, MA.*
Email: ebersole@uwm.edu

(No relevant relationships reported)

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 duration of the R-R interval. Clinically, lower resting HRV has been linked to greater risk for cardiovascular disease and higher HRV is thought to be cardioprotective and reflective of a greater fitness. Firefighters represent a unique population where sudden cardiac death is a high risk of the job that demands the ability to perform high intensity tasks. Resting HRV may provide insight into the contributions of the ANS to maximal capacity of a firefighter. **PURPOSE:** To examine the relationships between resting HRV and heart rate and aerobic capacity (VO_{2peak}) during a maximal treadmill test. **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 a 5-minute resting HRV sample followed by a maximal graded exercise test on a treadmill using a modified version of the submaximal Wellness Fitness Initiative test for firefighters. Heart rate and oxygen consumption were monitored throughout the test and maximal HR (MHR) at cessation of the test and VO_{2peak} were recorded for each participant. HRV was determined by measuring the time intervals between 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 VO_{2peak}. An alpha of 0.05 determined statistical significance. **RESULTS:** Resting RR (864.8 ± 134.0 ms) had a moderate and significant relationship with VO_{2peak} (44.6 ± 7.1 ml/kg/min; $r = 0.458$, $P = 0.004$) and MHR (181.5 ± 10.7 bpm; $r = -0.360$, $P = 0.029$), but VO_{2peak} was not related to MHR ($r = 0.308$, $P = 0.064$). **CONCLUSION:** Higher resting RR was associated with greater $VO_{2peak,}$ but lower MHR. The positive relationship between RR and VO_{2peak} 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 RR) may extend into maximal exercise tasks. Thus, for a firefighter, the benefit of a more favorable resting HRV may not only be cardioproective, but also influence the relative intensity of a maximal task.

1416 Board #10 May 28 9:30 AM - 11:00 AM

Examination Of Two Different Balance Tests In Active-duty Firefighters

Rudi A. Marciniak[1], Carly Wahl[1], Cody Tesch[2], Kyle Ebersole[1]. [1]*University of Wisconsin-Milwaukee, Milwaukee, WI.* [2]*Milwaukee Fire Department, Milwaukee, WI.*
Email: rudim@uwm.edu

(No relevant relationships reported)

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 with 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 (VO_{2MAX}). A composite score ($LQ\text{-}YBT_{comp}$) 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 (FBT_{TIME}) and total count for stepping off the beam (FBT_{ERROR}). Bivariate Pearson correlations determined the relationship between $LQ\text{-}YBT_{COMP}$, FBT, and FBT_{ERROR} and all physical fitness factors. An alpha of 0.05 determined statistical significance. **RESULTS:** Significant correlations were identified between $LQ\text{-}YBT_{comp}$ (97.0 ± 5.9%) and %FAT ($r = -0.586$, $P = 0.017$), BMI ($r = -0.695$, $P = 0.003$), and VO_{2MAX} ($r = 0.594$, $P = 0.015$). FBT_{TIME} (15.5 ± 5.2 sec) and FBT_{ERROR} (1.7 ± 1.1) were not related to any fitness measures or $LQ\text{-}YBT_{comp}$. **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, VO_{2MAX}). Thus, the FBT may have greater generalizability in evaluating balance performance in active-duty FFs.

1417 Board #11 May 28 9:30 AM - 11:00 AM

Relationship Between Muscular Fitness And Health Related Quality Of Life In Professional Firefighters

Navid Ghoddosi, Marcie Fyock-Martin, Lauren Biscardi, Nelson Cortes, Joel Martin. *George Mason University, Manassas, VA.*
Email: jmarti38@gmu.edu

(No relevant relationships reported)

High muscular fitness levels are needed to perform occupational tasks for a professional firefighter. Common occupational tasks include heavy equipment carrying, forced entry and securing. However, current evidence suggests fitness levels often decline over the course of a firefighter's career, which in turn impacts occupational task performance capabilities. Additionally, work-related stress occurring during the careers of firefighters contributes to higher rates of posttraumatic stress disorder compared to civilian counterparts. Health related quality of life (HRQoL) considers the elements that impact individual feelings of well-being and its perception may be influenced by components of physical and mental health. Currently, limited research exists describing the relationship between muscular fitness and HRQoL in professional firefighters. **PURPOSE**: To explore the relationship between muscular fitness and HRQoL in professional firefighters.

METHODS: 35 firefighters (31 males, 4 females, 36 ± 7 years, 178 ± 8 cm, 88.5 ± 18 kg) participated in the study. Five muscular fitness assessments were performed: maximum vertical jump, 1-repetition maximum bench press, maximum repetitions of pull-ups, maximum repetitions of push-ups, and the wall sit and reach. HRQoL was measured using the Short-Form (SF) 36 Questionnaire. Physical and mental composite scores were computed for the SF 36. Descriptive statistics (mean ± SD) were calculated for each variable. Pearson correlation tests were used to assess association between variables ($p < 0.05$).
RESULTS: There was a significant correlation between pull-ups and the mental component of HRQoL ($r = -0.37$; $p < 0.05$). No other statistically significant relationships were found. Mean pull-up and mental health composite scores were 7.1 ± 6.5 repetitions and 80.3 ± 10.8, respectively.
CONCLUSIONS: It was unexpected that none of the fitness assessments were found to have a significant relationship with the physical composite score. Furthermore, the finding that only a single component of muscular fitness had a significant relationship with mental health is a novel finding. Based on results, HRQoL of professional firefighters might be the product of numerous factors and deserves further study.

1418 Board #12 May 28 9:30 AM - 11:00 AM

Neuromuscular Factors Associated With Stair Climb Performance In Firefighters

Kealey J. Wohlgemuth[1], Megan R. Laffan[1], Abigail J. Trivisonno[1], Gena R. Gerstner[2], Jacob A. Mota[1], Hayden K. Giuliani[1], Pinyu Chen[1], Brian Pietrosimone, FACSM[1], Eric D. Ryan[1]. [1]*University of North Carolina at Chapel Hill, Chapel Hill, NC.* [2]*Old Dominion University, Norfolk, VA.*
Email: kealeywohlg@gmail.com

(No relevant relationships reported)

PURPOSE: The weighted stair climb is a critical and essential occupational task for career firefighters. However, limited data is available investigating the influence of neuromuscular function on stair climb performance (SCP). The purpose of this study was to examine the influence of lower extremity strength, power, fatigability, and steadiness on SCP.
METHODS: Forty-one firefighters (32.34±8.20 yrs) completed one laboratory visit where they completed leg extension strength testing of the dominant leg on an isokinetic dynamometer to determine peak torque (PT). Participants then traced a line at 10% ($Stead_{10}$) and 50% ($Stead_{50}$) of PT for 30 seconds to determine steadiness (coefficient variation of torque). Fatigability was determined from the reduction in PT following 30 consecutive isotonic contractions (80° of range of motion) at 40% of their PT. Peak power (PP) was determined from the highest value during the first five isotonic contractions. PT and PP were normalized to body mass (kg) prior to analysis (PT/kg and PP/kg). Following a 20-minute rest, participants then completed a weighted (22.73 kg vest) stair climb by ascending and descending 26 steps, four times. Pearson's product-moment correlation coefficients were used to examine the associations between each neuromuscular variable and SCP. A stepwise multiple regression analysis was then completed to determine the relative contributions of all neuromuscular variables on SCP. An *a priori* alpha level of ≤ 0.05 was used to determine statistical significance.
RESULTS: Faster SCP was associated with greater PP/kg ($r = -0.530$; $P=0.001$), PT/kg ($r = -0.421$; $P=0.007$), and lower fatigability ($r = 0.389$; $P=0.014$). The stepwise multiple regression analyses determined that PP/kg and $Stead_{50}$ were the most significant predictors of SCP ($R^2 = 0.442$; $P=0.013$).
CONCLUSIONS: Our findings suggest that lower extremity power output and motor control are the strongest neuromuscular predictors of SCP. These findings are impactful considering these variables can be improved with exercise.

1419 Board #13 May 28 9:30 AM - 11:00 AM

Health And Physical Fitness Parameters After 6 Months Of High-intensity Group Exercise In Firefighters

Matthew L. Sokoloski, Isaac F. Rowland, Ryan A. Gordon, Emily L. Zumbro, Brittany S. Patton, Dreanna M. McAdams, Chase M. White, Ryan Bachik, Brandon R. Rigby, David L. Nichols, FACSM. *Texas Woman's University, Denton, TX.*
(Sponsor: David Nichols, FACSM)
Email: msokoloski@twu.edu

(No relevant relationships reported)

Cities annually budget thousands of dollars for rehabilitation services due to work-related injuries that affect firefighters. Proper training methods may be used as an effective preventative measure for many of the musculoskeletal injuries sustained as a first responder that are inherent with the profession. The physical demands of firefighting require that the individuals employed in this profession be, at minimum, in good physical condition. The traditionally low fitness levels and poor exercise habits of firefighters may predispose this population to an increased risk of chronic conditions, such as cardiovascular and metabolic disease. **Purpose:** The purpose of this study was to analyze changes in health and fitness parameters of professional firefighters across 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

Test	Pre-Test	Post-Test	Percent Change	*p*-value
Body Mass (kg)	96.0 ± 17.9	93.1 ± 20.1	-3.0%	0.597
Body Fat (%)	30.5 ± 11.0	29.9 ± 7.2	-2.0%	0.113
BMI (kg/m^2)	29.2 ± 5.0	29.0 ± 5.0	-0.7%	0.597
Flexibility (cm)	24.9 ± 6.3	34.6 ± 7.0*	+39.0%	0.001
Pushups	28.8 ± 14.9	36.4 ± 18.1*	+26.4%	0.001
Curl ups	22.1 ± 15.8	53.4 ± 30.6*	+141.6%	0.002
Peak Power (W)	1052.2 ± 275.5	1063.3 ± 287.9	+1.1%	0.815
Mean Power (W)	633.4 ± 150.4	672.4 ± 152.2*	+6.2%	0.006
Fatigue Index (%)	60.5 ± 7.4	52.8 ± 9.3*	-12.7%	0.001
VO_{2max} (ml/kg/min)	34.7 ± 4.9	38.4 ± 5.9*	+10.7%	0.006

All values are mean ± s.d. *Significantly different than Pre-Test. BMI = body mass index; VO_{2max} = maximum oxygen consumption.

1420 Board #14 May 28 9:30 AM - 11:00 AM

Changes In Pulmonary Function In Us Firefighters Over A 5-year Period

Elliot L. Graham[1], Kevin C. Mathias[1], Donald F. Stewart[2], Denise L. Smith, FACSM[1]. [1]*Skidmore College, Saratoga Springs, NY.* [2]*Public Safety Occupational Health Center, Fairfax, VA.* (Sponsor: Denise L. Smith, FACSM)

(No relevant relationships reported)

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 FEV_1, FVC, and FEV_1/FVC over the 5-year period. There were significant differences ($p<0.001$) between observed changes in FEV_1, FVC, and FEV_1/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 FEV_1, FVC, and FEV_1/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-00445.
Table. 5-Year Changes in Pulmonary Measurements Among US Firefighters

	Time 1	Time 2	Change	Expected Change[a]
FEV_1 (L)	4.13 ± 0.03	3.67 ± 0.03	-0.46 ± 0.02***	-0.12***
FVC (L)	5.03 ± 0.04	4.59 ± 0.03	-0.44 ± 0.02***	-0.10***
FEV_1/FVC (%)	82.2 ± 0.2	80.1 ± 0.2	-2.1 ± 0.1***	-0.98***

Values are means ± SE
[a]Expected change based on NHANES III
***p<0.001

1421 Board #15 May 28 9:30 AM - 11:00 AM

Effects Of Environmental Conditions On Self-selected Work And Physiological Strain During Wildland Firefighting.

Joseph A. Sol[1], Molly R. West[2], Joseph W. Domitrovich[2], Brent C. Ruby, FACSM[1]. [1]*University of Montana, Missoula, MT.* [2]*USDA Forest Service, Missoula, MT.* (Sponsor: Brent C Ruby, FACSM)
Email: joseph.a.sol@usda.gov
(No relevant relationships reported)

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 (%HRmax), 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 HR (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.

1422 Board #16 May 28 9:30 AM - 11:00 AM

Effects Of Powered Air-purifying Respirators On Relative Inspiratory Time During Rest And Exercise

Edward J. Sinkule, FACSM, Tyler D. Quinn, Jeffrey B. Powell. *Centers for Disease Control & Prevention/NIOSH, Pittsburgh, PA.*
Email: esinkule@cdc.gov
(No relevant relationships reported)

Powered air-purifying respirators (PAPRs) approved by the National Institute for Occupational Safety and Health (NIOSH) are preferred respiratory protection among air-purifying respirators due to low inhalation resistance and decreased effective dead space. **PURPOSE:** This study evaluated effects from PAPR hood size (small, medium, and large loose-fitting hoods) and hood type (loose-fitting hood and tight-fitting mask) on relative inspiratory time (expressed as duty cycle) during standing rest and treadmill exercise. **METHODS:** Men (n=12) and women (n=12) were calibrated (same absolute energy expenditure) on a treadmill at VO_2 = 1, 2, and Max (3.0 for men, 2.7 for women) L/min (STPD). Four NIOSH-approved PAPRs from different manufacturers with HEPA filters were randomly selected and worn by each participant for four minutes at standing rest and four minutes at each energy expenditure. Results were averaged during the last minute of each activity period and expressed for both men and women. PAPR results were compared to exercise trials using only the instrument mask (baseline). Repeated measures ANOVA for duty cycle (inspiratory time/total time each breath, x100) was used for Table 1.

RESULTS:

Table 1 - Duty cycle (x100) by respirator and energy expenditure

	Energy Expenditure			
	Standing	1 L/min	2 L/min	Max
Baseline (instrument mask only)	34.11 (8.46)	41.07 (6.44)	41.86 (4.69)	44.17 (5.65)
Small loose-fitting PAPR	34.99 (4.77)	42.10 (2.78)	44.06 (3.50)	46.97 (3.43)
Medium loose-fitting PAPR	43.53 (9.37)*	46.32 (5.53)*	46.02 (4.92)	47.41 (3.95)
Large loose-fitting PAPR	46.86 (11.09)*	47.27 (4.59)*	46.41 (3.90)*	48.74 (4.06)*
Tight-fitting PAPR	40.24 (8.66)*	42.30 (3.34)	45.54 (3.43)	44.77 (3.40)

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 inhaled carbon dioxide and breathing resistance would be useful for future research.

1423 Board #17 May 28 9:30 AM - 11:00 AM

Effect Of Vented Helmets On Heat Stress During Wildland Firefighter Simulation

Charles L. Dumke, FACSM, Shae C. Gurney, Katie S. Christison. *University of Montana, Missoula, MT.*
Email: charles.dumke@umontana.edu
(No relevant relationships reported)

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 VO_{2max} 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°C 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 H 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 (6.08±1.45 H, 5.89±1.24 VH), RPE (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.
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1424 Board #18 May 28 9:30 AM - 11:00 AM

Muscle Soreness And Damage During Wildland Firefighter Critical Training

Katie S. Christison, Shae C. Gurney, Cassie M. Williamson-Reisdorph, Tiffany S. Quindry, Joseph A. Sol, Kathryn G. S. Tiemessen, Charles G. Palmer, Matthew W. Bundle, John C. Quindry, FACSM, Charles L. Dumke, FACSM. *University of Montana, Missoula, MT.*
(No relevant relationships reported)

Wildland firefighters (WLFF) undergo a critical training (CT) period immediately prior to the firefighting season. However, the intensive nature of preparatory CT exercise regimen could lead to muscle damage, as previously reported cases of rhabdomyolysis in WLFF have been documented. **PURPOSE:** To establish the effects of a two-week critical training period on acute markers of muscle damage in WLFF. **METHODS**: Eighteen male (29.4±1.1 years, 182.1±1.6 cm) and three female (26.7±2.6 years,

169.5±4.2 cm) Type I Interagency 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 BW and BF. Data presented as mean±SEM. **RESULTS**: No differences 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 (US: 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 (73.4±14.4 $U \cdot L^{-1}$ vs. 132.8±15.4 $U \cdot L^{-1}$, p=0.001). LDH showed a significant effect of time, where Day 11 significantly increased from Day 1 (159.4±5.5 $IU \cdot L^{-1}$ vs.164.4±6.9 $IU \cdot L^{-1}$, 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.
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1425 Board #19 May 28 9:30 AM - 11:00 AM

Physical Fitness Maintenance In Members Of A Southeastern United States City Professional Firefighting Department

Cody E. Morris[1], Scott W. Arnett[2]. [1]*University of Alabama at Birmingham, Birmingham, AL.* [2]*Western Kentucky University, Bowling Green, KY.* (Sponsor: Scott Lyons, FACSM)
Email: cemorris@uab.edu
(No relevant relationships reported)

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 (BGFD) in Bowling Green, KY, 153 firefighters had their physical fitness evaluated using standardized and recommended protocols published by the International Association of Fire Fighters. A mixed methods analysis was employed to examine differences over time for each of the dependent variables (push-ups, plank hold, handgrip strength, static arm pull, and static leg pull) using SPSS (v25).
RESULTS: Handgrip strength performance significantly improved in the first 4 years after baseline ($p < .05$) followed by a steady, significant decline each following year ($p < .05$), with the exception of year 15 ($p = .504$). 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.

1426 Board #20 May 28 9:30 AM - 11:00 AM

Impaired Sleep In Volunteer Firefighters Responding To Nighttime Calls

Thomas W. Service, Jodie R. Gawryluk, Lynneth A. Stuart-Hill. *University of Victoria, Victoria, BC, Canada.*
(No relevant relationships reported)

In Canada and the US, there are approximately 813,000 volunteer firefighters (FFs), a unique subset of shift workers who, despite possessing separate careers, provide 24-hour emergency services. Despite accounting for 67% of North American FFs, volunteers are often overlooked in firefighter research in favour of their career counterparts. It is known that calls at night reduce sleep and that sleep deprivation can adversely affect executive function however, the degree of sleep deprivation 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) wore 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 (η^2) 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 at levels previously shown to impede cognitive performance. 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.

1427 Board #21 May 28 9:30 AM - 11:00 AM

Physical Activity And Health In Career Firefighters In A Low-income Area

Jordan A. Graves, Brandy E. Phipps, Kathy Carter, FACSM. *Central State University, Wilberforce, OH.* (Sponsor: Kathy Carter, FACSM)
(No relevant relationships reported)

Fifty percent of firefighter (FF) line-of-duty deaths result from cardiovascular incidents. Factors including physical stress, sleep patterns, and sedentary behavior between runs may contribute to increased cardiovascular risk in firefighters and other first responders. Wellness programs have been shown to increase health in firefighters, but departments in low-income communities are often unable to provide wellness programming. This provides opportunities for institutions like Central State University to fill the needs of those departments as part of our land-grant mission.
PURPOSE: To determine health and cardiovascular disease (CVD) risk of local career FF in a low-income community for use in developing ongoing wellness interventions. **METHODS:** We used physical activity surveys shown to be reliable and valid, and collected anthropometric measurements [waist circumference (WC), weight, height, and body fat percentage (PBF).] Raw data was used to assess overall fatness of the department, as well as any correlations between physical activity and fatness. **RESULTS**: Almost 84% of the participants were obese/overfat, with body mass index (BMI; r=0.806) and WC (r=0.615) strongly correlated with PBF. Frequency of cardiovascular exercise (CVE; r=-0.269) and strength training (ST; r=-0.257) were negatively associated with PBF, which remained true when the data was corrected for age. **CONCLUSION:** The data collected suggest a strong need for health interventions, which is in agreement with national fire service reporting. We hope to use this information (along with other data gathered in this pilot study) to develop educational and fitness interventions to increase the wellness of this population and other first responders in our area.

1428 Board #22 May 28 9:30 AM - 11:00 AM

Comparison Of Three Internationally Certified Firefighter Protective Clothing On Mobility, Comfort And Physiological Responses

Aitor Coca, Borja Gutierrez, Iker Saez, Aitor Santisteban. *University of Deusto, Bilbao, Spain.*
Email: aitor.coca@deusto.es
(No relevant relationships reported)

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 using FPC are affected by its mass and bulkiness. Purpose: The aim of this study was to compare three internationally certified FPC from USA, European Union (EU) and South Korea (SK) on mobility, comfort and physiological responses. Methods: 10 male professional firefighters performed a battery of exercises in the laboratory following the ASTM F3031 to evaluate range of motion (ROM) for shoulder and trunk, subjective fit comfort. After these exercises, participants walked on a treadmill for 20 min at 3.2 mi/h and 5% incline. Weight, heart rate (HR) and core temperature (Tco) measurements were taken prior and after walking. All participants carried out the evaluation wearing each of the FPC in a random order. Results: There were no significant differences on any of the ROM evaluated for trunk and shoulder. Overall comfort shows no significant differences, however on a scale from 1 (worst) to 10 (best) the EU FPC was rated 7.2±1.0, SK 6.5±1.7, and USA was rated 6.0±1.1. There

were no significant differences on weight, HR or Tco between the 3 FPC but there was a significant decrease in weight and increase in HR and Tco from the start to the end of the 20 min exercise. Participants showed an elevated Tco (38.2°C US vs 38°C SK/EU) and HR (142.7 US vs 136.9 SK/137.2 EU) at the end of exercise while wearing the USA FPC. Conclusion: These findings suggest that the EU FPC might be the most comfortable and that the USA FPC creates more physiological burden. Comparing the materials and burn prediction data (Kim et al, 2017) with our comfort and physiological data, we could observe the inverse relationship between total heat loss (THL) and thermal protective performance (TPP) suggesting that comfort increases as THL increases and TPP decreases. The EU FPC, clothing material that certified to the EU standards, is more comfortable but may not protect at the same level as the other two FPCs.

1429 Board #23 May 28 9:30 AM - 11:00 AM

Electrolyte Balance And Hydration Status During Wildland Fire Suppression

Alexander N. Marks[1], Alejandro M. Rosales[1], Patrick S. Dodds[1], Joseph A. Sol[2], Joseph W. Domitrovich[2], Brent C. Ruby, FACSM[1]. [1]*University of Montana, Missoula, MT.* [2]*United States Forest Service, Missoula, MT.* (Sponsor: Brent C. Ruby, FACSM)
Email: anmarks.166@gmail.com

(No relevant relationships reported)

INTRODUCTION: Our laboratory has previously demonstrated the total energy fluid demands of wildland firefighters (WLFF) during arduous fire suppression. However, it remains unclear how current hydration strategies, occupational activity, and fire line provisions may alter overall hydration and electrolyte balance. **PURPOSE:** To determine WLFF fluid retention and urine production as influenced by environmental conditions, self-selected hydration practices, and work output during fire suppressions shifts. **METHODS:** 59 WLFF (9 female, 50 male; 29±6 yr) from various crew types were deployed to fire incidents across the United States during the 2019 fire season and were observed throughout a single work shift. Before and after shifts, a measure of nude body weight was obtained. In a subset of subjects (n=25), pre and post-shift blood samples were also drawn to evaluate serum electrolytes. Fireline-certified researchers monitored fluid intake and urine output parameters (frequency, specific gravity [USG], volume) in real-time via observational data capture using graduated cylinder, refractometer, and mobile tablets. Dependent t-tests were performed for all comparative analyses and statistical significance was established at $p<0.05$. **RESULTS:** WLFF worked shifts of 13.9±1.1 hr, during which 4.7±1.6 L of water was consumed. WLFF eliminated 2.3±1.1 L via 5.7±2.7 voids (412±192 mL·void^{-1}). There were no noted differences in USG from morning voids compared to those measured post meridiem (1.0106±0.0147 and 1.0106±0.0187 for AM and PM USG, respectively; $p>0.05$). No changes in nude body weight were observed across the work shift (80±13.4 and 79.8±13.2 kg for pre- and post-shift, respectively; $p>0.05$). Serum sodium and potassium did not change between pre- and post-shift blood draws (pre = 142±2 and 4.3±0.3, post = 141±2 and 4.2±0.3, respectively; $p>0.05$). **CONCLUSION:** These results demonstrate adequate fireline electrolyte provisions and currently employed WLFF hydration strategies. Moreover, the uniformity of pre- and post-shift measures (body weight, serum electrolytes) demonstrates that USG alone is not adequately indicative of hydration status during extended occupational stress.

1430 Board #24 May 28 9:30 AM - 11:00 AM

Comparison Of Physical Activity And Cardiorespiratory Fitness In Midwest Firefighters

Allison M. Barry[1], Mohan D. Perumal[1], Samantha R. Kopp[1], Evan L. Hutcheson[1], Michael J. Carper[1], Tanis J. Walch[2], Nathan D. Dicks[3]. [1]*Pittsburg State University, Pittsburg, KS.* [2]*University of North Dakota, Grand Forks, ND.* [3]*Concordia College, Moorhead, MN.*

(No relevant relationships reported)

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 they had a WC ≥102 cm and BMI ≥ 30 kg/m^2. Firefighters wore an accelerometer to track physical activity and associated intensities for the duration of their department's tour, which consisted of on- and off-duty days. Additionally, firefighters completed a stage-graded treadmill exercise test in their bunker gear (pants, boots, and jacket) to determine maximal oxygen uptake (VO_{2max}). **RESULTS:** Fire department one (FD1) had 29 firefighters complete the study (age: 34.45 ± 7.15 years; BMI: 28.97 ± 2.52 kg/m^2; WC: 96.48 ± 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: 94.95 ± 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 (t (38) = -0.485, p > 0.63), light physical activity (t(38)= 0.167, p = 0.87), and moderate-to-vigorous physical activity (MVPA) (t(38)=0.046, p = 0.96). Where the average daily MVPA was 31.3 ± 15.96 and 31.6 ± 18.28 minutes/day for FD1 and FD2, respectively. Similarily, there was no significant difference in cardiorespirtory fitness between FD1 and FD2 with VO_{2max} of 40.82 ± 6.95 and 39.51 ± 4.77 mL·kg^{-1}·min^{-1}, respectively (t(38)=-0.576, p = 0.58). Overall, both departments met the American College of Sports Medicine's recommendation of at least 30 minutes of MVPA per day. However, they did not meet the National Fire Protection Association's (NFPA) cardiorespiratory fitness recommendation of VO_{2max} = 42 mL·kg^{-1}·min^{-1}. **CONCLUSION:** This data demonstrates the need for increased focus on improving physical activity levels to improve overall health and wellness in firefighters. As part of the NFPA's Wellness Fitness Initiative, fire departments should strive to have at least one hour per day of dedicated time for physical activity.

C-34 Free Communication/Poster - **Military/ Firefighters/Police**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1431 Board #25 May 28 9:30 AM - 11:00 AM

Determinants Of Performance And Comparison Of Army Physical Fitness Test And Combat Fitness Test Scores

Andrew Tyler Inman, Sarah Ferreira, Andrew Plucker, Nicholas H. Gist, Diana Thomas. *United States Military Academy at West Point, West Point, NY.*

(No relevant relationships reported)

The Army Combat Fitness Test (ACFT) will replace the Army Physical Fitness Test (APFT) on 1 October 2020. The three-event APFT measures muscular and aerobic endurance, but is notably missing measurements of strength, power, and anaerobic endurance. The ACFT is designed to assess each of the aforementioned components of fitness, but the relationship between performance on the ACFT and APFT is unclear. Furthermore, while the relationship between height, weight, gender and APFT performance is well-researched, researchers have not compared those physical traits to performance on the ACFT.
PURPOSE: To determine the relationship between performance on the APFT and ACFT; to establish the relationship between height, weight, gender, and ACFT performance.
METHODS: Researchers used data from 685 Cadets (age, 22.1±1.11 years; height, 1.77±.09 m; weight, 80.3±12.8 kg) at the United States Military Academy recorded during the 2019 Academic Year. To determine the relationship between APFT and ACFT performance, researchers conducted an analysis of the variation in ACFT scores using overall APFT performance and gender. To determine the relationship between height, weight, and ACFT performance, researchers conducted statistical analysis of Body Mass Index (BMI), overall ACFT performance, and performance on each singular ACFT event.
RESULTS: Pearson correlation showed a significant ($p\leq.05$) correlation between APFT performance and ACFT performance; however, APFT scores as a single explanatory variable only accounted for 4% of the variation in ACFT scores while gender accounted for 69% of the variation. Further analysis suggested a significant correlation ($p\leq.05$) between BMI and ACFT performance, which led to the development of a strength-to-BMI ratio that accounted for 60% of the variation in ACFT scores.
CONCLUSION: Despite a significant correlation between APFT and ACFT performance, the two tests appear to provide different assessments of fitness; the inclusion of muscular strength, anaerobic endurance, and upper body pulling events in the ACFT likely contribute to the lack of ACFT variation described by the APFT.

1432 Board #26 May 28 9:30 AM - 11:00 AM

The Influence Of Age On The Recovery From Worksite Resistance Exercise In Firefighters

Hayden K. Giuliani[1], Abigail J. Trivisonno[1], Megan R. Laffan[1], Jacob A. Mota[1], Gena R. Gerstner[2], Abbie E. Smith-Ryan, FACSM[1], Eric D. Ryan[1]. [1]*University of North Carolina at Chapel Hill, Chapel Hill, NC.* [2]*Old Dominion University, Norfolk, VA.* (Sponsor: Abbie Smith-Ryan, FACSM)
Email: haydeng@live.unc.edu

(No relevant relationships reported)

Worksite resistance training may reduce injuries and improve performance in firefighters, however aging may prolong the recovery process.**PURPOSE**: This

study examined the influence of age on recovery following an acute bout of worksite resistance training.**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 velocity, participants completed 3-4 countermovement jumps 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-compression load cell. Lower body PF was examined with the participants seated in a custom-built, calibrated isometric dynamometer and their right knee 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, lunge, and upright row. Linear mixed models, controlling for WRF, were used to analyze all primary outcomes, with subject as the random effect and group and time as fixed effects. Alpha level was set *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 greater lower body PF (P=0.006), jump performance (P<0.024), and lower VL EI (P=0.008) values. Across time points, upper-body PF (P=0.023) and jump performance (P<0.029) 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 worksite resistance exercise in FFs.

1433 Board #27 May 28 9:30 AM - 11:00 AM

THE EFFECTS OF A 16-DAY COURSE ON IMPROVEMENT IN ARMY PHYSICAL FITNESS TEST SCORES

Jason A. Melnyk, Cassandra York, Michael Voight. *Central Connecticut State University, New Britain, CT.* (Sponsor: Sean Walsh, FACSM)
Email: jmelnyk@ccsu.edu

(No relevant relationships reported)

Despite guidelines on the benefits of physical activity on improved quality of life and reduced levels of stress, an increasing number of adults do not meet the guidelines of at least 150-minutes of moderate physical activity per week. This may be a contributing factor relating to a growing population of military personnel who are unable to pass the Army Physical Fitness Test (APFT). **PURPOSE:** With this challenge in mind, we aimed to determine how attitudes, motivation, and knowledge of general health and wellness influenced a soldier's ability to successfully pass the APFT. **METHODS:** Thirty-six national guard reservist men and women (age = 27 ± 5 yrs; weight = 91.2 ± 17.4 kg; height=1.7 ± 0.1 m) attended a 16-day course on health, wellness, and physical training. During the course, subjects had their body composition assessed via bioelectrical impedance. The APFT was completed five times over the course of four months with the first test occurring at the beginning of the course. At the start of the course and the final APFT, participants completed three questionnaires (BLOCK Fat Dietary Screener, Paffenbarger Physical Activity Questionnaire, and a modified Sports Motivation Scale-II). **RESULTS:** Passing rate in the APFT increased from 8.3% at the first test to a 22.7% passing rate after four months with the 2-mile run having the highest failure rate of the three events (push-ups, sit-ups, 2-mile run). On average, subjects lost 2.6 ± 3.9 kg which was statistically significant ($p < 0.05$) and saw a mean reduction of 1.6 ± 2% body fat percentage. There was no change in BLOCK Fat Dietary scores (31.8 ± 11.4 vs. 31.2 ± 12.5, $p > 0.05$) or the Paffenbarger physical activity index (2,184 ± 1548 vs. 2890 ± 1938 kcal/week, $p > 0.05$). Intrinsic motivation significantly increased pre to post-testing (12.9 ± 3.4 vs 16.6 ± 4.6, $p < 0.001$). **CONCLUSION:** The educational course was successful in increasing the passing rate of the APFT. More importantly, an increase in intrinsic motivation suggests a greater interest in the variety of training methods included in the curriculum which would decrease the monotony of the training and encourage their improvement in the APFT. Future studies need to explore the challenges of improving the two-mile run.

1434 Board #28 May 28 9:30 AM - 11:00 AM

Association Of Caloric Intake With Physical Fitness And Low Back Pain In Firefighters

Brittany V.B. Johnson, John M. Mayer, FACSM. *US Spine and Sport Foundation, San Diego, CA.*
Email: brittanyj@usssf.com

(No relevant relationships reported)

Firefighters are at high risk of developing numerous health conditions, such as obesity, cardiovascular disorders, and low back pain (LBP), which negatively impact physical fitness, job performance, and quality of life. The influence of caloric intake on physical fitness and injury prevention has not been fully assessed in firefighters.**PURPOSE**: To assess the association of caloric intake with physical fitness and LBP in firefighters. **METHODS**: A cross-sectional study was conducted in career firefighters (n = 134 males) from 12 departments in southern California who presented for baseline assessments for a regional wellness initiative. A 3-day food record was collected to determine caloric intake using the percent of the Harris-Benedict estimated energy requirement. LBP history, LBP current status, and job function (Firefighter Functional Task Questionnaire, FFTQ) were assessed with questionnaires. Back and core muscular endurance was assessed with the Ito and Plank tests. Movement quality was assessed with the Functional Movement Screen. Relationships between caloric intake and the dependent variables were explored using Pearson's correlation and analysis of variance. **RESULTS**: Significant (p <= 0.05) correlations were noted between caloric intake and core endurance (r = 0.20), FMS (r = 0.22), and FFTQ (r = 0.17). Firefighters without a history of low back pain consumed more calories than those with a history of low back pain (87.1% +/- 25.7% vs 74.8% +/- 21.9%, respectively, p = 0.02). No significant relationships were observed between caloric intake with back endurance or current LBP. **CONCLUSION**: This preliminary suggests that adequate caloric intake is associated with physical fitness, job performance, and LBP in firefighters. Prospective trials are needed to confirm these relationships and assess the effectiveness of nutrition interventions in firefighters.

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: raqueldlanger@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:** a) 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±0.7yrs) were evaluated before (M1) and after (M2) 6-mo of military training. PhA (º) was calculated by bioelectric impedance parameters. Dual-energy absorptiometry evaluated android fat in kg (A_F), in % ($A_{\%F}$), gynoid fat in kg (G_F) and % ($G_{\%F}$). PF was accessed with specific military test, in which participant must run 3000m distance as fast as he can. The PF test was measured in the day after the body composition measures, both in M1 and M2. Bivariate correlation was used to verify the association between PF and PhA, A_F, $A_{\%F}$, G_F, and $G_{\%F}$, in M1 and M2. Wilcoxon test was used to compare variables between M1 and M2. Linear regression analysis was used to verify if changes (Δ) on independent variables influenced the PF changes among participants. **RESULTS:** In M1, PF was associated ($p<0.001$) with PhA (r=-0.16), A_F (r=0.39), $A_{\%F}$ (r=0.41), G_F (r=0.45), and $G_{\%F}$ (r=0.46). In M2, PF was associated ($p<0.001$) with A_F (r=0.36), $A_{\%F}$ (r=0.37), G_F (r=0.41), and $G_{\%F}$ (r=0.40), but not with PhA (r=-0.10, p=0.057). The PhA (Δ=0.3º) and $G_{\%F}$ (Δ=0.2%) increased ($p<0.001$), and $A_{\%F}$ (Δ=-0.3%) decreased ($p<0.05$) compared to M1. In addition, male army cadets improved ($p<0.001$) the PF test (Δ=-1.1min) compare to M1. The PF improvement was associated ($p<0.001$) with $\Delta A_{\%F}$ (r=0.38), ΔA_F (r=0.36), $\Delta G_{\%F}$ (r=0.42), and ΔG_F (r=0.40), but not with ΔPhA (r=-0.06, p=0.209). Linear regression of the ΔPF had an effect ($p<0.001$) of $\Delta A_{\%F}$ (β=0.39), ΔA_F (β=0.38), ΔG_F (β=0.41), and $\Delta G_{\%F}$ (β=0.42), but not of ΔPhA (β=-0.07, p=0.179). **CONCLUSION:** PF was associated with PhA, A_F and G_F. The improvement on PF seems to be more influenced by ΔA_F and ΔG_F, but not by ΔPhA 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

Paula Y. S. Poh[1], Pinata H. Sessoms[2], Daniel W. Trone[2]. [1]*Leidos, Inc., Naval Health Research Center, San Diego, CA.* [2]*Naval Health Research Center, San Diego, CA.*
Email: paula.ys.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: Male MCRD recruits (N = 407; mean ± SD: 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 strain, delaying graduation 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 (HS; $F(1,400) = 4.314$, $p = 0.038$) 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 (5.5 ± 4.7 cm vs 3.3 ± 2.8 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: MCRD 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.

1437 Board #31 May 28 9:30 AM - 11:00 AM

Physiological Differences Of Us Army Cadets Comparing A Loaded And Unloaded 6-mile Ruck March

Gregory Palevo, Don Walsh, Michael Polascik, Jake Slaton. *University of North Georgia, Dahlonega, GA.*
Email: gpalevo@ung.edu
(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the differences between a loaded 6-mile ruck march (LRM) versus an unloaded 6-mile ruck march (ULRM).
METHODS: Nine cadets (8 male, 1 female) from the Leadership Development Program participated in this study. The two ruck marches studied occurred in the early morning hours ten days apart with the first ruck being a LRM, followed by the ULRM on the same course ten days afterwards. The 6-mile course consisted of three 2-mile paved loops of rolling hills on the campus of UNG. The subjects wore a TICKR X (Wahoo Inc.) which is a wearable device with advanced motion analytics using an accelerometer and heart rate monitor connected via Bluetooth to an iPhone application.
RESULTS: The average finish time for the weighed 6-mile LRM was 1 hr 15 min, 14 s ± 7 min, 7 s and for the ULRM was 56 min, 18 s ± 8 min and 13 s. These results were statistically significant at a $p < .000$, average HR for the LRM was 181.17 ± 13.32 bpm and 169.67 ± 10.35 for the ULRM, maximal HR for the LRM was 196.83 ± 7.33 bpm and 187.67 for the ULRM, total caloric expenditure for the LRM was 1341.3 cal ± 204.5 and for the ULRM was 922.0 ± 181.4 cal, average cadence for the LRM was 135.0 ± 7.4 steps per minute and 157.0 ± 11.7 steps per minute, maximal cadence for the LRM was 202.8 ± 16.8 steps per minute and the ULRM was 193.0 ± 16.8 steps per minute, average smoothness score for the LRM was 98.17 ± 22.59 and 94.83 ± 24.23 for the ULRM, oscillation score for the LRM was 3.425 ± 1.49 and 3.45 ± .31 for the ULRM and RPE for the LRM was 15.0 ± 1.7 and 11.78 ± 2.0 for the ULRM. The principle findings from our study was that six of the nine metrics demonstrated significant differences between the LRM and the ULRM.
CONCLUSIONS: These results give us a better understanding of the cardiovascular and physical demands of the LRM versus the ULRM.

1438 Board #32 May 28 9:30 AM - 11:00 AM

Functional Movement Profiles Of Police Officers From A Rural U.S. Based Law Enforcement Agency

Quincy Johnson. *Oklahoma State University, Stillwater, OK.*
Email: quincy.johnson@okstate.edu
(No relevant relationships reported)

Police officers may be required to perform dynamic movements such as running, jumping, and lunging as part of their duties. Early identification of poor movement patterns in this population may mitigate injury risks associated with these dynamic movements. **PURPOSE:** To profile movement patterns in a police force and identify specific movement patterns associated with injury risk. **METHODS:** Thirty-eight (n=38; age = 39.4 ± 7.9 years; Height= 180.3 ± 8.1 cm; Weight = 101.3 ± 20.2 kg; Body mass index = 30.5 ± 5.1 kg.m^2) full-time police officers volunteered to participate in this study. Participant movement ability was assessed using a screening tool which incorporated seven movement patterns: overhead squat, hurdle step, in-line lunge, active-straight leg raise, trunk-stability push-up, and rotary stability. Each movement is scored from '0' to '3' for a total of 21 points. A score of '0' was given if there was pain during the movement or corresponding clearing test. A score of '1' indicated inability to complete the movement, '2' completed the movement with compensation, and '3' completed the movement correctly. Frequency and descriptive analysis were used for each of the dependent variables (i.e., each movement). Previous research has suggested that a total score of <14 points may indicate an increased risk for sustaining an injury, so this benchmark was noted. **RESULTS:** Overall, 89.7% (n=38) of officers scored below 14 points on their assessment. Greater than 85% (n=33) of participants were unable to perform movement patterns, performed them with compensation, or had pain throughout the movement for six out of the seven movement assessments.
CONCLUSION: Specific movement patterns that may contribute to an increased injury risk within this police population include functional mobility of the hips, knees, ankles, and shoulder. Specific mobility and strength and conditioning programs may reduce injury risk by improving movement quality.

1439 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: dwood006@odu.edu
(No relevant relationships reported)

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 capacities 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 population.
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 yr; 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 yr; 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 most physical tests. Strength and conditioning programming for this population should take into consideration the combined mass of combat load and climbing gear for testing and training purposes and should also assess climbing-specific strength and endurance. The views and opinions expressed are the authors' and do not reflect those of Naval Special Warfare Command, the US Navy or the Department of Defense.

1440 Board #34 May 28 9:30 AM - 11:00 AM

Assessing Value Of Physical Training For Tactical Athletes

Kimbo E. Yee[1], Justin B. Moore, FACSM[2], George Grieve[1], Kasee Hucks[1], Daniel Bornstein[1]. [1]*The Citadel, Charleston, SC.* [2]*Wake Forest School of Medicine, Winston-Salem, NC.*
Email: kyee@citadel.edu
(No relevant relationships reported)

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 d/wk. The sample was split into two sub samples for the purpose of establishing and confirming the psychometric properties of the scale. In sample one, coefficient alpha was calculated for six a priori subscales and a

confirmatory factor analysis was conducted using maximum likelihood estimation with missing variables. Modification indices were consulted following estimation. Analyses were repeated with sample two. All analyses were conducted in Stata 15.1.
RESULTS: In sample one, all six subscales indicated acceptable internal consistency (alpha = .69-.89) and the initial measurement model was a good fit for the data (Chi-square=558.15 (215), RMSE=0.060, CFI=0.947, TLI=0.937). Modification indices suggested adding two additional covariances, which resulted in a superior fit to the data (Chi-square=445.63 (213), RMSE=0.050, CFI=0.964, TLI=0.957). In sample two, all subscales indicated acceptable internal consistency (alpha = .69-.86) and the final measurement model was a good fit for the data (Chi-square= 395.83 (213), RMSE=0.044, CFI=0.968, TLI=0.962).
CONCLUSIONS: The current data provide support for the factorial validity and internal consistency of the instrument. Thus, this instrument can be employed as an objective assessment of PT programs within 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. Heileson, LesLee 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 can have profound 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: euhydration <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 euhydrated; 31.2% (n=29) were mildly hypohydrated; 40.9% (n=38) were hypohydrated; 9.7% (n=9) were severely hypohydrated.
CONCLUSIONS: Despite the Military's emphasis on appropriate hydration strategies, just over half of the SM cohort were hypohydrated, while approximately 10% were severely hypohydrated. Future studies need to explore these findings. Although this evidence is preliminary, TB MED 507 may need to be updated to provide specific and clear guidance on strategies for hydration assessment and fluid replenishment prior to participation in operational training events or combat.

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

Tyler L. Danielson[1], Robin Orr[2], Robert Lockie[3], Kiyoshi Goad[2], Ben Schram[2], Charlie Kornhauser[4], Ryan Holmes[4], Bert Jacobson[1], Jay Dawes[1]. [1]*Oklahoma State University, Stillwater, OK.* [2]*Bond University, Gold Coast, Australia.* [3]*California State University Fullerton, Fullerton, CA.* [4]*Colorado State Patrol, Golden, CO.*

(No relevant relationships reported)

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 VO_{2max}. 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. When divided into respective LEAs only differences in age remained between cadets and officers. When comparing fitness measures, cadets achieved higher PU, SU, VJ, and VO_{2max} 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 VO_{2max} (p<0.001 respectively) were significantly higher in LEA 1 with no differences in VJ between cadets and incumbent officers. **CONCLUSIONS:** Cadets were 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.

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 Nicks. *Columbus State University, Columbus, GA.*

(No relevant relationships reported)

To prepare 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 Army leadership is often not assessed, especially in periods where PRT is not mandated. **PURPOSE:** To observe body composition and fitness in United States Army Captains after 5 months of non-mandated PRT. **METHODS:** Twenty-two captains volunteered to participate (age; 27±1y, height; 1.8±0.6m, and weight; 83.1±11.1kg). Eleven participants remained in active units with mandated training (PRT) while 11 participants were in positions where training was not mandated (NMT). Both groups logged exercise performed during the intervention. Body composition, cardiorespiratory fitness, anaerobic power, and muscular endurance were measured before and after the intervention period (18±2 weeks). **RESULTS:** At pre-intervention, PRT and NMT were not different in body fat percent (22.0±4.6 vs. 20.3±4.4%), peak aerobic capacity (VO_{2peak}; 45.7±2.4 vs. 48.8±3.8ml·kg^{-1}·min^{-1}), mean power output (566±47 vs. 542±91W), sit-ups (72±5 vs. 77±11reps) or push-ups (59±6 vs. 60±15reps) (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). VO_{2peak} (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.

1444 Board #38 May 28 9:30 AM - 11:00 AM

Associations Between Physical Fitness Characteristics And The Candidate Physical Ability Test (CPAT)

Reilly Girardot[1], Jake Beiting[1], Elizabeth Nagle, FACSM[2], Jacquelyn Zera[1]. [1]*John Carroll University, University Hts, OH.* [2]*University of Pittsburgh, Pittsburgh, PA.* (Sponsor: Elizabeth Nagle, FACSM)
Email: rgirardot20@jcu.edu

(No relevant relationships reported)

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; VO_{2max} (ml·kg·min^{-1}) = 42.1 ± 6.9) completed a fitness assessment which included: 1) a graded exercise test (*GXT*), 2) measures of body composition (*height, weight, bioelectrical impedance analysis, circumferences*), 3) muscular fitness (*pushup test, curl up test, hand grip strength*), and 4) flexibility (*sit and reach, back scratch*). Additionally, each firefighter completed a CPAT, comprised of eight events *(stair climb, hose drag, equipment carry, ladder raise and extension, forcible entry,*

search, rescue, ceiling breach and pull) with total time (sec) as a primary outcome. Pearson correlations were used to determine the associations between CPAT time (sec) and physical fitness characteristics. **RESULTS:** Data revealed significant moderate correlations between CPAT time (sec) and waist to hip ratio (WHR) (r=0.668; *p*= 0.049), and the pushup (r=-0.647; *p*=0.043). Additionally, the association between CPAT time (sec) and %BF (r=0.608; *p*=0.082), and the sit and reach (r=-0.625; *p*=0.053) approached significance. **CONCLUSION:** Results of the current study suggest that increased upper body strength and decreased body composition are associated with improved performance on the CPAT. Although the current study was limited by a small sample size, the results highlight the potential importance of these fitness characteristics in these occupation specific tasks. Future research should investigate these relationships in a larger and more diverse population, and between physiological responses observed during CPAT and physical fitness.

C-35 Free Communication/Poster - **Soccer**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1445 Board #39 May 28 9:30 AM - 11:00 AM

IN-GAME PHYSIOLOGIC RESPONSES OF A DIVISION I COLLEGIATE MASCOT COMPARED TO VARSITY SOCCER ATHLETES

Emily N. Werner, Alyssa J. Guadagni, Ashley N. Triplett, Sue Petrisin, James M. Pivarnik, FACSM. *Michigan State University, East Lansing, MI.* (Sponsor: James M. Pivarnik, FACSM)
Email: enwerner34@gmail.com
(No relevant relationships reported)

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 (~47 min); however there was a significant difference between groups for distance traveled (p<0.001), with the mascot traveling less distance (35±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.

1446 Board #40 May 28 9:30 AM - 11:00 AM

Analysis Of Intense Actions Are Dependent Of Tactical Function In Soccer Players

Ricardo Cesar Alves-Ferreira[1], Jefferson Eduardo Hespanhol[2], Neri Caldeira Junior[3], Wendel Simoes Fernandes[1], Sergio Cesar Ferreira[1], Rodolfo Paula Vieira[1]. [1]*Federal University of Sao Paulo (UNIFESP), Santos, Brazil.* [2]*University of Campinas (UNICAMP), Campinas, Brazil.* [3]*Desportivo Brazil Club, Porto Feliz, Brazil.*
Email: ricardocalves@hotmail.com
(No relevant relationships reported)

PURPOSE: A determining factor during a soccer game is the intense action, which can be perceived by the number of sprints, accelerations, decelerations. One possible hypothesis is that there are differences between the tactical functions during the soccer match. Thus, this study examined the differences between the indicators of the intense actions by tactical functions. **METHODS:** 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=53.52; 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=75.17; p<0.01), sprints (H=58.07; 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 than 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.

1447 Board #41 May 28 9:30 AM - 11:00 AM

Pre-season Training Loads Of Elite NCAA Division 3 Female Soccer Players: A Descriptive Study

Sean Collins, Hannah Olds, Alyssa Kopsidas, Jake Kilmer, Natalie Deacon, Todd Olsen. *University of Lynchburg, Lynchburg, VA.*
Email: collins.s@lynchburg.edu
(No relevant relationships reported)

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 preseason training accentuates the need to determine the training loads of these practices.
Purpose: The purpose of the descriptive study was to examine the external training loads of elite NCAA Division III soccer players during preseason training.
Methods: 17 NCAA female Division III soccer players (20.41±1.12 years; 64.44±6.76 kg; 166.06±4.74cm) wore a portable GPS device, operating at 10Hz and incorporated with a 100Hz triaxial accelerometer, prior to every practice (n = 8) and scrimmage (n=1) during the preseason (Aug 19 - Aug 27) in central Virginia. To start the preseason, VO_{2max} was estimated via the YOYO test. GPS collected total distance (km), work rate (m/min), hard running (&gt4.5 m/s; m), zone 6 running (&gt6 m/s; m), top speed (km/h), and intensity during practices and scrimmages during the Division III preseason.
Results: Estimated VO_{2max} was reported to be 44.90±1.90 $ml \cdot kg^{-1} \cdot min^{-1}$. During practices, athletes covered 4.35±2.04 km, had a work rate of 42.31±10.05 m/min, covered 157.38±143.38 m of hard running, ran 33.19±56.70m in Zone 6, had a top speed of 24.54±4.59 km/h, and had an intensity of 26.66±14.13. During the scrimmage, athletes covered 6.33±2.24 km, had a work rate of 38.13±13.72 m/min, covered 227.80±194.841 m of hard running, ran 28.47±45.17 m in Zone 6, had a top speed of 25.96±4.15 km/h, and had an intensity of 40.33±17.69.
Conclusion: The external loads of elite Division III female soccer players were found to be similar to previously reported in-season loads of Division I and Division II athletes. The short preseason training period and high external loads present a number of concerns for Division III athletes as it pertains to preseason conditioning needs and the potential for overload injury risks.

1448 Board #42 May 28 9:30 AM - 11:00 AM

Speed Comparisons Between Match Outcomes By Position In NCAA Women's Soccer

Erin Dierickx, Ryan Curtis, Yasuki Sekiguchi, Courteney Benjamin, Robert Huggins, Douglas Casa, FACSM. *University of Connecticut, Storrs, CT.* (Sponsor: Douglas Casa, FACSM)
Email: erin.dierickx@uconn.edu
(No relevant relationships reported)

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

women's soccer season. **METHODS:** Average speed [km·hr^{-1}] was monitored in 89 female soccer athletes across 5 NCAA Division 1 teams (mean ± SD; age, 19.8 ± 1.1 y; body mass, 81.57 ± 32.66 kg; height 158.78, ± 20.34 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). This was assessed post-hoc with a Tukey HSD, with alpha set at 0.05 for all analysis. **RESULTS:** Average speed across all positions was 3.35 ± 1.17 km·hr^{-1} in wins, 3.06 ± 1.05 km·hr^{-1} in ties, and 3.5 ± 1.31 km·hr^{-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·hr^{-1}; ES=0.63, p=0.003; MIDs=1.18[0.62,1.74] km·hr^{-1}; ES=0.82, p<0.001; DEFs=0.82[0.38,1.26] km·hr^{-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]; FWDs=0.50[0.03,0.98] km·hr^{-1}; ES=0.45, p=0.034, MIDs=0.78[0.23,1.32] km·hr^{-1}; ES=0.62, p=0.003, DEFs=0.58[0.16,1.00] km·hr^{-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·hr^{-1}; ES=0.29, p=0.011 and not for FWDs (p=0.25) and DEFs (p=0.06). It should also be noted that the effect sizes between wins and losses were 0.17 (FWDs), 0.29 (MIDs), and 0.20 (DEFs). **CONCLUSION:** 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.

1449 Board #43 May 28 9:30 AM - 11:00 AM

An Intermittent Cardiorespiratory Fitness Protocol For Soccer Players

Claudia Jaime. *University of Puerto Rico Río Piedras, San Juan, Puerto Rico.*
Email: claudia.jaime@upr.edu

(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is important for soccer players who need to sustain intervals of high and low intensity during a match. However, there are few intermittent graded exercise testing protocols integrating high and low intensity intervals to determine CRF. **PURPOSE**: To evaluate a new intermittent treadmill protocol developed to test CRF (maximum oxygen consumption or VO_2max) and recovery in soccer players. **METHODS**: The intermittent CRF protocol consisted of multiple stages of progressively high intensity 2-min intervals interspersed with low intensity 1-min intervals. High intensity intervals were kept at 6.5 mph, with inclination starting at 2.5% with increments of 2.5% with each stage. Low intensity intervals were kept at 4 mph with no inclination. Average $VO_2$and heart rate (HR) were determined during the final 15 seconds of the high and low intensity interval of the last 3 stages completed by all participants. Descriptive statistics (mean, standard deviation, proportions) were obtained for all study variables. **RESULTS**: A group of 11 soccer players training and competing in local teams under the Puerto Rico Soccer Federation (Age= 23.0±3.7 yrs) completed the intermittent VO_2max protocol until volitional fatigue. Maximal duration during the intermittent protocol ranged from 13-19 min. Maximal values for VO_2, HR, and respiratory exchange ratio (RER) were 51.1±6.5 ml kg min, 186.6±6.6 bpm, and 1.3±0.2 respectively. In the last high intensity intervals, mean $VO_2$was 41.2±3.8, 44.9±4.9, and 48.6±4.5 ml kg min; and mean HR was 161.5±11.4, 171.5±9.2, and 178.1±8.6 bpm. During the last low intensity intervals, mean $VO_2$was 35.3±3.2 (, 37.8±4.4, and 41.6±3.5 ml kg min; and mean HR was 147.2±13.3, 159.6±12.4, and 170.5±9.7 bpm. Recovery intervals represented approximately 85% of VO_2max, and 93% of HRmax. **CONCLUSIONS**: The newly developed intermittent exercise protocol allowed the achievement of $VO_2$was while providing information about the capacity to recover between high intensity intervals, an important aspect for optimal performance during intermittent events of relatively long duration such as soccer.

1450 Board #44 May 28 9:30 AM - 11:00 AM

Multi-Year Physiological And Performance Profile Of An NCAA Division I Women's Soccer Team

Mikaela Gabler[1], Kaylin Hoomaian[2], Gavin Connolly[3], Shane F. O'Riordan[4], Tomas Barrett[2], Paul L. O'Connor[2]. [1]*Indiana University, Bloomington, MI.* [2]*Central Michigan University, Mount Pleasant, MI.* [3]*Purdue University, West Lafayette, IN.* [4]*Australian Institute of Sport, Canberra, Australia.* (Sponsor: Robert Chapman, FACSM)

(No relevant relationships reported)

The physiological profile of men's soccer players has been well documented; however, there are limited data on women. Therefore, the physiological and performance differences between playing positions within a collegiate women's team is not fully understood. **PURPOSE:** To compare physiological and performance characteristics between the four main soccer positions in a cohort of women. **METHODS:** 53 Division I women soccer players (18.5 ± 1.2 yrs., 168.6 ± 5.3 cm, 64.6 ± 7.4 kg) across four seasons were included in the study, and classified into the following groups; Goalkeepers (*GK*, n = 6), Defenders (*D*, n = 17), Midfielders (*M*, n = 17), and Forwards (*F*, n = 13). Physiological assessments were performed on the first day of preseason each year and included anthropometric and performance measures (10, 20, and 30m sprint, agility (arrowhead), lower-body power (countermovement jump), aerobic capacity (Yo-Yo IR1 test), and repeated sprint ability). **RESULTS:** Goalkeepers (18.8 ± 1.7 yrs., 172.1 ± 7.3 cm, 68.4 ± 9.0 kg, 20.5 ± 6.4% body fat), defenders (18.4 ± 1.0 yrs., 168.1 ± 3.4 cm, 65.9 ± 8.5 kg, 23.5 ± 7.2% body fat), midfielders (18.9 ± 1.3 yrs., 167.3 ± 5.5 cm, 63.1 ± 5.5 kg, 22.0 ± 4.4% body fat), and forwards (17.9 ± 0.8 yrs., 169.2 ± 5.8 cm, 62.8 ± 7.1 kg, 19.4 ± 3.6% body fat) had similar body composition. There were no significant differences in performance measures based on position; vertical jump (*GK* 34.9 ± 7.9, *D* 31.7 ± 4.5, *M* 32.1 ± 4.0, *F* 30.8 ± 3.9 cm), 30m speed (*GK* 4.668 ± 0.232, *D* 4.669 ± 0.180, *M* 4.714 ± 0.224, *F* 4.573 ± 0.149 s), repeated sprint ability (*GK* 0.973 ± 0.329, *D* 0.747 ± 0.318, *M* 0.738 ± 0.516, *F* 0.616 ± 0.246 s), and aerobic capacity (*GK* 1070 ± 369, *D* 1101 ± 311, *M* 1179 ± 312, *F* 1142 ± 391 m) (p > .05). **CONCLUSION:** The lack of differences in performance measurements across playing position could be due to team-based training methods selected by the coaches.

1451 Board #45 May 28 9:30 AM - 11:00 AM

Effects Of High-carbohydrate Versus Mixed-macronutrient Meals On Soccer Physiology And Performance

Jaison Lee Wynne. *Liberty University, Lynchburg, VA.*
Email: jlwynne@liberty.edu

(No relevant relationships reported)

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, RPE, 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 ± 0.25 for HCHO and 3.18 ± 0.18 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, in comparison to 416 ± 159 m for MM. The values for the second half were 385 ± 211 and 330 ± 141 m, respectively. A within-subjects ANOVA showed a time effect ($F = 6.93$, $p = 0.023$) but no condition effect ($F = 0.59$; $p = 0.459$) or condition x time interaction ($F = 1.47$; $p = 0.251$) for HSR. No significant differences were found between conditions for HR, RPE, ROF, and gut symptoms during scrimmages. Significant time effects were found for hunger, fullness, and satiety, but there were no condition or condition x time interactions. **CONCLUSION:** This study provides evidence that a MM meal consumed 4 hours prior to soccer competition does not lead to more gut symptoms and can be equally as ergogenic for performance and perceptual responses as a high-carbohydrate meal.

1452 Board #46 May 28 9:30 AM - 11:00 AM

Analysis Of 180 Degree Turn Strategies In Elite Soccer Players

Frantisek Zahalka[1], Tomas Maly[1], Kevin Ford, FACSM[2], Dai Sugimoto[3], Arnold Baca[4], Lucia Mala[1], Mikulas Hank[1], David Bujnovsky[1], Lee Cabell[5]. [1]*Charles University, FPES, Prague, Czech Republic.* [2]*High Point University, High Point, NC.* [3]*Harvard Medical School, Boston, MA.* [4]*Centre for Sport Science and University Sports, University of Vienna, Vienna, Austria.* [5]*Texas State University, San Marcon, TX.* (Sponsor: Prof. Kevin R. Ford, FACSM)
Email: zahalka@ftvs.cuni.cz

(No relevant relationships reported)

BACKGROUND: Ability to accerrelate, deccelerate, and change directions among soccer players are not well studied, especially at elite level. **PURPOSE**: To analyse speed and agility among elite soccer players, especially acceleration, deceleration and change directions at 180 degree turn by each leg, dominant leg (DL) and non-dominant leg (NL).

METHODS:A cross-sectional study was performed. The study participants consisted of 35 soccer playes (age = 20.2 ± 0.9 years, height = 187.0 ± 6.5, body mass = 82.1 ± 3.3 kg) who play at top leage 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 (vd3), in the second step before the turn (vd2) and the first step before the turn (vd1), and acceleration speed after the turn in the first step (va1), second step (va2) 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=.00), va2 (r=-.38, p=.03), va3 (r=-.42, p=.01), vd2 (r=-.40, p=.02), vd3 (r=-.50, p=.00) and v2 (r=-.61, p=.00). Conversely, no significant correlation was found for the remaining variables. However, we found significant correlations between va2 vs vd2 (r=.69, p=.00) and va3 vs vd3 (r=.37, p=.03) when DL was used. Interestingly, higher correlations were detected on NL: va1 vs vd1 (r=.60, p=.00), va2 vs vd2 (r=.69, p=.00) and va3 vs vd3 (r=.61, p=.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 GACR 19-12150S, UNCE HUM32

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.*
Email: borg11@uwindsor.ca
(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 array of symptoms that also includes changes in mood, sleep disturbances, stress, and more generalized fatigue. **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.

1454 Board #48 May 28 9:30 AM - 11:00 AM

DIFFERENCES IN HEIGHT AND PERFORMANCE AMONG PLAYERS IN THE 2019 FIFA WORLD CUP

Ciara N. Manning[1], Yasuki Sekiguchi[1], Courteney L. Benjamin[1], Erin E. Dierickx[1], McKenna R. Spaulding[2], Jayson R. Spaulding[3], Dayshia M. Davenport[4], Jillian R. Picard-Busky[5], Douglas J. Casa, FACSM[1]. [1]*Korey Stringer Institute, University of Connecticut, Storrs, CT.* [2]*Dickinson College, Carlisle, PA.* [3]*Ithaca College, Ithaca, NY.* [4]*Louisiana State University, Baton Rouge, LA.* [5]*Sacred Heart University, Fairfield, CT.* (Sponsor: Douglas J. Casa, FACSM)
Email: ciara.manning@uconn.edu
(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. Proclaiming 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, number of assists, 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, a priori. **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. Among number of goals made by players <165cm, 58.33% were by forwards and 41.67% by midfielders. Among number of assists made by players <165cm, 42.86% were by forwards, 28.57% by midfielders, and 28.57% 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, 0.17[-0.21,0.54], p=0.908; defenders, 0.03[-0.19,0.24], p=0.589. A statistically significant difference was found in the number of goals scored among forwards of the two height groups (MD [95%CI], 0.41[-1.02,0.20], p=0.012). Among midfielders in the two height groups, a significant difference was found in the number of assists and the number of goals made (MD [95%CI], number of assists, -0.44[-0.76,-0.11], p=0.005; number of goals -0.35[-0.69,-0.01], p=0.000). **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 by players <165cm.

1455 Board #49 May 28 9:30 AM - 11:00 AM

Height Is Not Predictive Of Starting Nor Playing Time In FIFA World Cup Female Athletes

McKenna R. Spaulding[1], Yasuki Sekiguchi[2], Courteney L. Benjamin[2], Erin E. Dierickx[2], Ciara N. Manning[2], Jayson M. Spaulding[3], Dayshia M. Davenport[4], Jillian R. Picard-Busky[5], Douglas J. Casa, FACSM[2]. [1]*Dickinson College, Carlisle, PA.* [2]*University of Connecticut, Storrs, CT.* [3]*Ithaca College, Ithaca, NY.* [4]*Louisiana State University, Baton Rouge, LA.* [5]*Sacred Heart University, Fairfield, CT.* (Sponsor: Douglas J Casa, FACSM)
Email: spauldim@dickinson.edu
(No relevant relationships reported)

PURPOSE: At the present time, adolescent female athletes are being fed with misinformation on minimal height expectations for attaining elite level soccer success. This is particularly concerning because most adolescent athletes are yet to fully physically mature, and believing the validity of statements on minimal height expectations for elite level success without evidence to substantiate these claims may negatively affect future aspirations of many adolescent females. This study determined if the minimal height criterion of 165cm (5'4"), referenced from Next College Student Athlete (NCSA), is an important part of the female phenotype for playing soccer at the elite level.
METHODS: Descriptive data were collected on the heights, matches played, and minutes played for 552 female 2019 World Cup athletes across 24 team rosters. The data were categorized into those below and those at or above the 165cm height criterion. Odds ratios were calculated to determine if differences existed in the likelihood of being a starter for those players on the team <165cm tall and those on the team ≥ 165cm tall.
RESULTS: On average, 32.25% of players on the 2019 World Cup team rosters were <165cm, ranging from China with 4.35% to Thailand with 60.87%. Of the starters, 30.05% were under 165cm. For players on the team rosters, the odds of starting if they were <165cm (47.43%) were equivalent to the odds of starting if they were ≥ 165cm (47.58%), or .996:1. There were no differences in the number of matches

played (MD=-0.09, ES=-.05; p=0.59), minutes played (MD=-15.60, ES=0.09; p=0.29), average minutes per game entered (MD=2.01, 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 minutes played. The findings indicate that the 165cm minimal height standard is an ill-informed, biased criterion which has the potential to inhibit successful recruitment efforts for future female elite soccer players.

1456 Board #50 May 28 9:30 AM - 11:00 AM

Energy Availability In Association With Biomarkers During A Division I Soccer Season In Female Athletes

Bridget A. McFadden[1], Brittany N. Bozzini[1], Michelle A. Arent[1], Alan J. Walker[2], Harry P. Cintineo[1], Alexa Chandler[1], Shawn M. Arent, FACSM[1]. [1]*University of South Carolina, Columbia, SC.* [2]*Lebanon Valley College, Annville, PA.*

(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 & 12, female collegiate soccer players (N=11) underwent blood draws to assess thyroid hormones, leptin (LEP), growth hormone (GH), IGF-1, total cortisol (TC) 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_{AVG}-EEE_{AVG}/FFM for each time block. RM-MANOVAs with univariate follow-ups assessed change in energy status, BC and EEE. 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<0.1. **RESULTS**: Time main effects were seen for all macronutrients, EA, EI and EEE, with the highest values seen during preseason (P<.05). Time main effects were seen with increases in FFM and declines in %BF (P<.05). EA correlated with FFM (r=-67), GH (r=.63), PRL (r=.65) and $FreeT_4$ (r=.69). %BF correlated with TC (r=.70) and LEP (r=.71), with a trend for T_4 (r=.55). FFM correlated with PRO (r=-.65), with trends for FAT (r=-.57), IGF-1 (r=.58), $FreeT_4$ (r=-.53) and CORT (r=-.57). PRO correlated with GH (r=.73), PRL (r=.75) and $FreeT_3$ (r=.61), with a trend for EEE (r=.53). FAT correlated with GH (r=.65), PRL (r=.76) and $FreeT_4$ (r=.60), with a trend for IGF-1 (r=-.57). CHO correlated with LEP (r=.60) and PRL (r=.62). EEE correlated with LEP (r=-.63) and trended with PRL (r=.56). **CONCLUSIONS**: EA was reportedly highest in preseason and declined as the season progressed, despite increases in FFM. Adherence and accuracy challenges with self-reported EI limits the feasibility of this method in teams. Associations between BC, EEE and markers of stress/metabolism point to the efficacy of biomarker monitoring as a method to assess metabolic status and recovery in athletes, thus enabling in-season adjustments to training and nutrition. Funding by Quest Diagnostics

1457 Board #51 May 28 9:30 AM - 11:00 AM

The Relationship Between Time-lagged Acute:Chronic Work Ratios And Physical Performance In Collegiate Soccer Players

Travis Anderson, William M. Adams, Nathaniel T. Berry, Stacey L. Walton, Eleni M. Karras, Laurie Wideman, FACSM. *University of North Carolina at Greensboro, Greensboro, NC.*
(Sponsor: Laurie Wideman, FACSM)
Email: t_ander2@uncg.edu

(No relevant relationships reported)

Acute:chronic work ratios (ACWR) reflect the balance between fitness and fatigue. To allow for athlete recovery and preparation for match play, training load tends to decrease prior to a match. Training load and ACWR has been related to injury risk in elite athletes, but the relation with physical performance is not well defined. **PURPOSE:** To assess the relation between training load trends and ACWR in the three days prior to competitive matches and match-related physical performance. **METHODS:** Male (n=26) collegiate soccer players (Mean±SD; 20±1y; 75.83±5.90kg; 178.5±6.8cm) wore GPS enabled heart rate monitors during training and match days over two collegiate seasons. Exponentially weighted moving averages were calculated from training load (TL) where acute (7 d), chronic (28 d), and ACWR (7/28 d) parameters were computed. ACWR was time-lagged by -1 ($ACWR_1$), -2 ($ACWR_2$), and -3 ($ACWR_3$) days relative to each match. The linear trend of training load (TL_{trend}) in the three days prior to a match was calculated for each player. Physical performance was assessed by total distance (TD), and number of sprints (SP), maximal accelerations (AC), and maximal decelerations (DC). Conditional growth models assessed the relations between match performance and ACWR at each lag and TL_{trend}. **RESULTS:** $ACWR_3$ produced the most robust relations with physical performance. One SD above a given player's mean $ACWR_3$ resulted in increased performance in the match relative to their mean within-match performance, with an additional 948m (p<0.001) of TD, 2.27 (p<0.01) additional SP, and 1.77 (p<0.01) more AC. TL_{trend} was independently and negatively associated with TD (p<0.001), SP (p<0.001), and AC (p<0.001). On average, players decreased training load by 17.80±64.90 units per day leading into a match. When applying this average, model results suggest players would complete 265.75m additional TD (p<0.001), 0.71 additional SP (p<0.01), and 0.53 additional AC (p<0.001) 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.

1458 Board #52 May 28 9:30 AM - 11:00 AM

Monitoring Recovery Via Salivary Testosterone And Cortisol Changes In Collegiate Soccer Athletes

Takudzwa A. Madzima, Madeleine August, Eric E. Hall, FACSM, Svetlana Nepocatych. *Elon University, Elon, NC.*
(Sponsor: Eric E. Hall, FACSM)
Email: tmadzima@elon.edu

(No relevant relationships reported)

Changes in testosterone and cortisol have been evaluated as physiological markers of the physical demands of a competitive event. The testosterone to cortisol ratio (T:C) ratio has been used as indicator of anabolic-catabolic imbalances, with a high T:C representing a positive anabolic state whereas a decline in T:C serving as a marker of overtraining. **PURPOSE:** To evaluate changes in salivary testosterone and cortisol immediately prior to pre-season training (PS), before (PreGame) and after (PostGame) a competitive game and at 12 (Recovery12hr) and 36 hours (Recovery36hr) following the competitive event in Division 1 men's soccer athletes. **METHODS:** 19 male soccer athletes (age: 18±1yrs; body fat: 11.0±3.1%). PS salivary samples were collected in August. PreGame and PostGame salivary samples were collected an hour before the start of the fourth game of the season and within 15 minutes after the game's completion. Recovery12hr samples were collected 12 hours later, prior to next morning practice and Recovery36hr were collected prior to the subsequent day's practice. Salivary samples were analyzed via ELISA to measure testosterone, cortisol and the T:C. ANOVAs were used for analysis with significance accepted at $p<0.05$. **RESULTS:** PostGame testosterone levels (244±108pg/mL) were similar to PreGame levels (174±69pg/mL; $p=0.056$). Recovery12h (410±92pg/mL) and Recovery36hr (398±147pg/mL) were both significantly greater than PreGame (174±69pg/mL) and PostGame (244±108pg/mL) levels ($p<0.001$). When compared to PreGame levels (0.204±0.10 μg/dL), cortisol was significantly greater at PostGame (0.704±0.51μg/dL), Recovery12h (0.510±0.21μg/dL), and Recovery36hr (0.484±0.21μg/dL) ($p<0.05$). There were no differences in cortisol levels between PostGame, Recovery12h, and Recovery36hr. The T:C was significantly lower at PS than all other timepoints ($p<0.001$). T:C significantly declined from PreGame to PostGame (-501±140; $p=0.028$), but returned to PreGame levels at Recovery12h, and Recovery36hr. **CONCLUSIONS:** The PreGame to PostGame decline in T:C suggests that the demands of the game placed the athletes in a catabolic state. However the rise in T:C back to PreGame levels at Recovery12h, and Recovery36hr indicates the athletes were able to optimally recover in the days following competition.

1459 Board #53 May 28 9:30 AM - 11:00 AM

Fat Mass Index Is Associated With Lower Anaerobic Power In Professional Soccer Players

Juan Ricardo Lopez-Taylor, Alejandro Gaytan-Gonzalez, Roberto Gabriel Gonzalez-Mendoza, Juan Antonio Jimenez-Alvarado, Marisol Villegas-Balcazar, Francisco Torres-Naranjo, Edtna Jauregui-Ulloa, Eduardo Pinedo-Ruan. *Universidad de Guadalajara, Guadalajara, Mexico.*

(No relevant relationships reported)

PURPOSE: To analyze the association between fat mass index (kg/m2) and anaerobic power.
METHODS: We evaluated 24 professional male soccer players aged 18 to 35 y. We assessed their fat content with a whole-body dual-energy x-ray absorptiometry (DXA) scan, and then we adjusted the fat mass (kg) by squared height in meters (m2) to calculate the fat mass index for the whole body, legs, and trunk. Anaerobic power was assessed with a 30s Wingate test to obtain three variables: peak power, average power, and power drop. All adjusted for body mass. The association between the fat mass index and anaerobic power was analyzed with linear regression. Descriptive statistics were reported as median (25th - 75th percentiles).
RESULTS: Fat mas index for the whole body, legs, and trunk were 2.9 (2.6 - 3.7), 1.1 (1.0 - 1.5), and 1.4 (1.2 - 1.9), respectively. For peak power, average power, and power drop, the participants showed 12.2 (11.6 - 13.2) W/kg, 9.2 (8.8 - 9.7) W/kg, and 0.21 (0.18 - 0.24) W/kg/s, respectively. The fat mass index was not significantly

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	R^2	SEE	p
Whole body	Peak power (W/kg)	-0.81	15.3	0.09	2.23	0.15
	Average power (W/kg)	-0.52	10.8	0.41	0.55	<0.001
	Power drop (W/kg/s)	0.005	0.198	0.01	0.055	0.71
Legs	Peak power (W/kg)	-2.32	15.5	0.11	2.21	0.12
	Average power (W/kg)	-1.09	10.5	0.25	0.61	0.012
	Power drop (W/kg/s)	0.002	0.211	0.01	0.055	0.94
Trunk	Peak power (W/kg)	-1.07	14.4	0.05	2.28	0.29
	Average power (W/kg)	-0.96	10.7	0.44	0.23	<0.001
	Power drop (W/kg/s)	0.016	0.189	0.02	0.055	0.051

1460 Board #54 May 28 9:30 AM - 11:00 AM

Implications Of Accurate Maximal Heart Rate Parameters In Soccer Players Using Team Monitoring System

Alicja Stannard, Jessica Trapp, Matther Moran, Julie Nolan.
Sacred Heart University, Fairfield, CT.

(No relevant relationships reported)

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 i6preseason and post-season graded treadmill maximal exercise protocols (GXT). Time spent in ≥80% and ≥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 ≥80% and ≥90% of HR_{max} was calculated for each player and reported in percentages of the entire training session. Alpha was set at <0.05.
RESULTS: HR values from pre and post season GXT testing were significantly different (192±7.7 bpm vs 198 ±5.9 bpm respectively, p=0.02). Mean time spent in ≥90% was 21.5±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.

C-36 Free Communication/Poster - **Winter Sports**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1461 Board #55 May 28 9:30 AM - 11:00 AM

The Effect Of Age On Finish Time In The American Birkebeiner

David W. Armstrong, III, FACSM[1], James Coors, Emeritus[2], Liam Johnston, MS[2]. [1]*None, Silver Spring, MD.* [2]*University of Wisconsin, Madison, WI.*
Email: dave_20905_98@yahoo.com

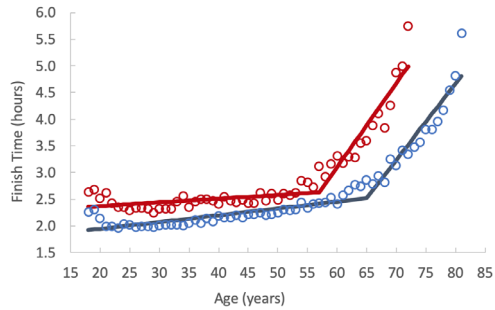
(No relevant relationships reported)

The American Birkebeiner (AB) is the largest annual Nordic ski event in the United States showcasing the long-course competitions of the 50K freestyle and 55K classic technique. **Purpose:** The purpose of this investigation is to describe the effect of aging on the finish times of skiers who have completed at least one AB race from 1999 to 2019 inclusive.
Methods: We followed 22,004 (3.3 men:1 women) individual skiers ≥18yo using publically available data. Finish times were standardized to 50K for freestyle and 55K for classic. A subset of the top 3 finish times at each year of age was selected and mean (N=3) finish times were fit to multivariate adaptive regression splines (MARS) in R for sex and technique. A single knot was iteratively fit to the model with the lowest mean square error (MSE) to show the age at which finish times increase significantly (Table 1). **Results:** Freestyle finish times for women are significantly higher compared to men at each year of age becoming progressively more pronounced at age 57 compared to age 65 in men (Fig. 1). Similarly, women skiing classic style (Fig. 2) reach an earlier breakpoint at age 61 compared to men at age 70. **Conclusion:** Overall, women's AB finish times are higher than men and begin a sharp increase in finish time 8-9 years before men.

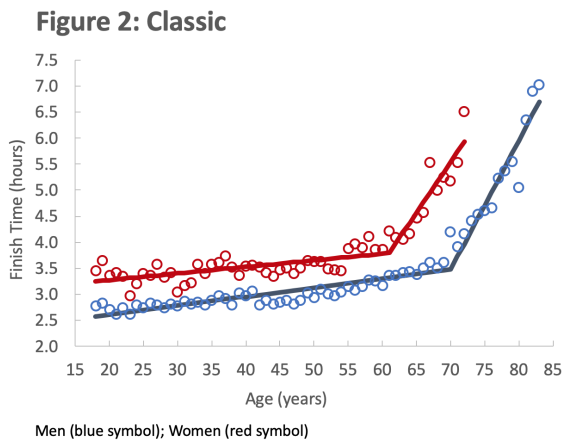
Table 1: MARS analysis

Technique	Sex	Age_Span	Slope	R^2
Freestyle	Men	18-65	0.013	0.95
		65-81	0.143	
	Women	18-57	0.007	0.93
		57-71	0.157	
Classic	Men	18-70	0.017	0.96
		70-83	0.248	
	Women	18-61	0.013	0.90
		61-72	0.196	

Figure 1: Freestyle



Men (blue symbol); Women (red symbol)



1462 Board #56 May 28 9:30 AM - 11:00 AM

Biometric And Performance Data In American Junior Nordic Combined And Ski Jumping Athletes

Brian Sutterer, Jonathan T. Finnoff, FACSM, John H. Hollman. *Mayo Clinic, Rochester, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)
Email: sutterer.brian@mayo.edu

(No relevant relationships reported)

Nordic Combined (NC) and Ski Jumping (SJ) require particular athletic abilities and physical attributes for optimal performance. For instance, SJ requires particular focus on jumping technique and explosiveness, whereas the cross country ski portion of NC involves aerobic energy delivery, skiing efficiency, and power generation. Coaches and athletes monitor various performance metrics throughout the year to determine response to training and, hopefully, predict future performance. Normative data for these metrics has been analyzed in elite SJ and NC athletes but there is limited information regarding junior athletes.**PURPOSE**: Present normative biometric and performance testing data of American junior NC and SJ athletes and compare differences between age and sex.
METHODS: A retrospective cohort study was completed evaluating data collected on 299 NC and SJ athletes ages 7-19 tested as part of USA Nordic's normal preseason evaluations between 2012-2018. Body mass index, static standing jump and countermovement jump height, various broad jump distances, timed agility testing, and 20 meter sprint times were collected and analyzed for differences between age and sex.**RESULTS**: Body mass index was greater in females than males. The interaction between age and sex was significant for static jump height, all broad jump metrics, time agility testing, and 20 meter sprint time. Jump power was greater in females than males. No difference was found between sex or across age in countermovement jump height.
CONCLUSIONS: This was the first study to report biometric and performance data in junior American NC and SJ athletes. Our findings provide valuable normative information and identified several age and sex related differences in these athletes. These findings can be used by other junior athletes and their coaches for comparison purposes and when developing training programs.

1463 Board #57 May 28 9:30 AM - 11:00 AM

Physiological Demand Of Ice Hockey Officiating Across Competition Levels And Officiating Systems

Paul N. Whitehead[1], Ryan T. Conners[1], Jeremy M. Elliott[1], Matthew E. Darnell[2]. [1]*The University of Alabama in Huntsville, Huntsville, AL.* [2]*University of Pittsburgh, Pittsburgh, PA.* (Sponsor: Don Morgan, FACSM)
Email: pnw0003@uah.edu

(No relevant relationships reported)

Ice hockey is an intense sport that requires a combination of anaerobic power and aerobic capacity. Traditionally, research has focused on the athletes, but on-ice officials are also subjected to a large physical demand during games. Across all hockey competition age levels, officials serve in various configurations (two-, three-, and four-official systems) and perform roles as a referee (REF) or linesman (LIN). Different systems and roles lead to varying physiological demands and responsibilities. Currently, no previous study has examined the demand placed on hockey officials 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 used to record 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 all 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 ($p \leq .001$). Mean values for each variable increased as competition level increased. Across officiating systems, distance, training load, and CE significantly increased ($p \leq .010$) from two- to three-official systems. However, the four-official system had significantly lower values for average HR and CE ($p \leq .030$). **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 = .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.

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Practice And Game Internal Demands Of Men And Women Varsity Ice Hockey Players

Jessica L. Bigg, Alexander S.D. Gamble, Lawrence L. Spriet, FACSM. *University of Guelph, Guelph, ON, Canada.* (Sponsor: Dr. Lawrence Spriet, FACSM)
Email: jbigg@uoguelph.ca

(No relevant relationships reported)

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, 181.3 ± 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

Alexander SD Gamble, Jessica L. Bigg, Lawrence L. Spriet, FACSM. *University of Guelph, Guelph, ON, Canada.* (Sponsor: Lawrence Spriet, FACSM)
Email: agambl01@uoguelph.ca

(No relevant relationships reported)

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, 181.3 ± 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 between 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 ± 0.7 vs. 3.6 ± 0.5 m/s^2; p=0.586) or males (4.2 ± 0.5 vs. 4.3 ± 0.8 m/s^2; 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 ± 1127.7 vs. 5332.6 ± 1614.5 m; p=0.084) or males (6439.8 ± 1456.0 vs. 7485.3 ± 2495.2 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 (32.6 ± 3.6 vs. 30.8 ± 4.1 m/s; p=0.128), average P 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.

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Comparison Of Off-ice And On-ice Performance Tests In Collegiate Ice Hockey Players

Jonathan Hamil, Ashley Triplett, Michael Vorkapich, James Pivarnik, FACSM. *Michigan State University, East Lansing, MI.* (Sponsor: James Pivarnik, FACSM)

(No relevant relationships reported)

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±0.05m, wt=84.9±4.74 kg) were assessed off-ice using a discontinuous, incremental treadmill (TM) test. 3-min run stages were 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. Corrrelations revealed no relationship between TM time and FDI (r=0.301, ns). Average HRmax during the TM tests was 192±6 $b \cdot min^{-1}$ versus highest achieved HR of 175±9 $b \cdot min^{-1}$ (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, Stage4 LAC and HRrecovery averaged 13.3±1.9mmol and reduction to 74±4%HRmax. Stage4 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. Moderate 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.

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Collegiate Club Figure Skater Lower Extremity Performance Assessment Bilaterally In And Out Of Skates

Andrew Cannon, Kaylyn Stewart, Jessica Peacock. *Merrimack College, north andover, MA.* (Sponsor: Kevin Finn, FACSM)
Email: cannona@merrimack.edu

(No relevant relationships reported)

Prior research has demonstrated that the most prominent injury among all figure skaters involved the ankle. This finding is surprising in that the skate boot itself is quite stiff with lateral rigidity meant to offer medial-lateral support to the ankle joint. A clinical literature review suggested that there should be emphasis placed on properly fitting skate boots, intrinsic foot and ankle strengthening, and lower extremity flexibility. 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 Figure Skating 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 reported for DF, YB, or SL between skate type (no skate vs. skate) and leg dominance (dominant vs. non dominant), (p >.05). DF, YB, and SL were significantly higher when subjects were in no skates (MDF-NOSK = 28.8; MYB-NOSK = 93.61; MSL-NOSK = 123.45) compared to when in skates (MDF-SK = 11.15; MYB-SK = 85.89; MSL-SK = 101.51), (p = .00). SL was also higher on the dominant leg (MSL-DOM = 114.21) compared to the non-dominant leg (MDF-NONDOM =110.75) (p = .01). DF and YB were not statistically different between the dominant and non-dominant leg. CONCLUSION: The results suggest with lower extremity performance 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, it 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.

1468 Board #62 May 28 9:30 AM - 11:00 AM

Differences In Absolute And Relative On-ice Workload Metrics Among National Junior Ice-hockey Teams

Michael VanHoeven, Davor Stojanov, Aaron Pilotti-Riley, Dakota Burke, Stephen J. McGregor. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Mark Peterson, FACSM)
Email: mvanhoev@emich.edu

(No relevant relationships reported)

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 during practices and games.
METHODS: 90 total members of two teams (U17, n= 45 and U18, n= 45) of the National Team Development Program (16.6±2.1y, 17.5±2.7y) 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 (DTL) for a single session was derived from the IF and the session duration. DTL 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 (α=.05).
RESULTS: **:** For G, duration was not different between teams. However, 30 minute and session DYNAs, as well as DTL 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, 0.928±0.092; p<0.05). In P, duration was higher in U18 (1.93+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, DTL was higher for U18 (114.4±35.9) than U17(109.8±38.6; p<0.05). Overall, for P and G, duration was longer for U18 than for U17 (2.35±0.79, 2.21±0.83; p<.05). IF and IHS were lower for U18 (0.757±0.111, 0.895±0.119) than U17 (0.783±0.094, 0.907±0.100; p<0.05). CTL and ATL were higher for U18 (69.9±14.8, 85.1±24.4) than U17 (63.5±17.3, 77.2±25.3).
CONCLUSIONS: 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.

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Comparative Analysis Of Major Junior Hockey Athletes During Pre-season Off-ice Performance Assessments

Justin Tavormina, Jeremy Knous, Haley McVannel, Christopher Winter, Brandon Fjerstad. *Saginaw Valley State University, University Center, MI.*

(No relevant relationships reported)

Ice hockey is a physiological challenge; stressing the metabolic systems, power, speed, agility, strength, and endurance. These components are commonly assessed with off-ice performance evaluations featured at the National Hockey League (NHL) combine. **Purpose:** Evaluate preseason, off-ice combine assessments in major junior

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, timed 20m dash, timed pro-agility run, timed 300m shuttle, timed 2-mile run, hand-grip dynamometer, pull-up repetitions, and 135lbs 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 offense and defense with goalies removed due to position specificity and small sample size. Descriptive statistics and comparative analysis, mixed methods regressions, were performed using SPSS (version 24.0) with significance at $p \leq 0.05$. **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±0.23 sec. right, 4.75±0.23 sec. left; only left was significantly different (F=5.473, P=0.022), and had greater grip strength values (59±10 kgs right, 61±9 kgs left; only left was significantly different; F=5.489, P=0.022) than athletes dismissed (n=26; 11±7 rep, 8±3 rep, 4.89±0.22 secs. right, 4.88±0.25 secs. left, 55±9 kgs right, 56±11 kgs left). Further, athletes selected were older (17.8±1.4 yrs.; F=13.904, P=0.000), and achieved greater broad jump values (103.2±6.7 ins., F=20.699, P=0.000) than athletes dismissed (16.6±1.0 yrs., 96.4±5.1 ins.). Defensive athletes were taller (73.2±2.2 in.; F=4.283, P=0.040) and had greater left (67±8 kgs.; F=13.915, P=0.001) and right (67±8 kgs.; F=16.027, P=0.000) grip strength values than offensive athletes (70.9±2.7 in., 58±8 kgs. Left, 55±10 kgs. Right). **Conclusion:** Selected athletes were older and exhibited superior power output, muscular endurance, and muscular strength. Defensive athletes were taller, and exceled in areas of muscular strength, endurance, and power.

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On-ice Energy Cost And Lactate Production During An All-out Anaerobic Test In Ice Hockey Players

Maxime Allisse[1], Hung Tien Bui[2], Patrick Desjardins[1], Alain Steve Comtois[3], Mario Leone[1]. *[1]University of Quebec in Chicoutimi, Chicoutimi, QC, Canada. [2]University of Sherbrooke, Sherbrooke, QC, Canada. [3]University of Quebec in Montreal, Montreal, QC, Canada.*
Email: Maxime1_Allisse@uqac.ca

(No relevant relationships reported)

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 O_2 energy expenditure, and 2) the maximum lactate concentration following an all-out on-ice skating effort. **METHODS**: Twenty male elite ice hockey players participated in this study (age=15.7±1.0 year). The maximal anaerobic skating test (MAST) consisted of skating back and forth on an 18.2m course at maximal speed with abrupt stops at each end for a total of 12 shuttles (average time=52.0±2.0s). The O_2 energy cost was measured using a portable metabolic analyzer (Cosmed $K4_b^2$) and the maximum post-exercise lactate concentration at 1, 3, 5, 15, and 20 min was measured with a Lactate Pro analyzer. The independent variables used to estimate O_2 consumption were body mass, time, heart rate, and the number of skating strides and skating stride index both measured at the 2nd shuttle. For the lactate concentration estimation, the independent variables used were time, heart rate, and the number of skating strides and skating stride index both measured at the 6th shuttle. **RESULTS**: Correlation coefficients for both equations were r=0.87 and standard error of estimate (SEE) were 6.2% and 6.8% respectively for O_2 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% thus 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 O_2 cost and lactate concentration in a purely anaerobic test. Thus, using simple and easy-to-measure variables, coaches will be able to monitor more effectively their players' progress in an effort to optimize their individual on-ice anaerobic performance.

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Analysis Of Test Battery For Elite Ice Hockey Players

Pierre-Marc Ferland, Sébastien Lagrange, Philippe Roy, Alain Steve Comtois. *UQAM, Montreal, QC, Canada.*
Email: pm.ferland@hotmail.com

(No relevant relationships reported)

PURPOSE: The purpose was to conduct a test battery on elite ice-hockey players to better understand the relationships between the different assessments. **METHODS:** Subject's (n=41) physical characteristics were measured prior to testing session. Countermovement Jump (CMJ) height was estimated with a Bosco mat. Stationary Broad Jump (BJ) distance was measured from toes (starting line) to the closest heel. The best of 2 completed attempts was retained for both jump tests. On-ice repeated sprints' time was measured with photo cells timing gates (TCi Smart Start, Brower Timing System, Utah, USA). Protocol consisted of 9 sprints of 40 m with 3 seconds of recovery between sprints that permitted subjects to turn around and return to the finish line which now became the starting line for the next sprint. Heart rate was measured with a heart rate (HR) monitor (RS400, Polar, FI). Local muscle oxygenation (SmO2) was measured on vastus lateralis with a muscle oxygen monitor (MOXY, Minnesota, USA). Blood lactate ([La^+]) was measured with a lactate analyzer (Lactate Pro, Akray, Japan). Rated Perceived Exertion (RPE) was measured with a Borg Scale (6-20). Correlations were calculated (SPSS Ver 25) using a 2-tailed Pearson correlation analysis. Significance was set at $p<0.05$. Subjects characteristics are presented as means and standard deviations. **SUMMARY OF RESULTS:** Multiple significant ($p<0.05$) relationships were observed (r=-0.47-0.81). Findings show that age (r=-0.53-0.51), years of experience in resistance training (r=-0.32-0.48), weight (r=-0.33-0.47) and lean body mass (-0.38-0.46) were significantly correlated with jump and on ice sprint performance (Speed, Time, [La^+] and RPE). The CMJ seems to be more important than the BJ for on ice sprint performance (r=-0.53-0.40 vs -0.19-0.28). Maximal HR is significantly correlated with fatigue index (r=0.41). The Borg scale seems to be a good tool to see if hockey players gave a maximal effort as it presents multiple significant correlations with sprint performance (r=-0.37-0.34). SmO2 was significantly correlated with [La^+] (r=-0.35). **CONCLUSION:** Results of the present study should be utilised by ice-hockey strength and conditioning coaches to improve their testing battery. Further research should include resistance training exercises in their analysis.

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Ice Hockey Repeated Sprint Ability: The Relationship Between Peak Oxygen Consumption, Skating Speed And Fatigue

Philippe Roy[1], Stéphanie Bergeron[2], Gerald Parent[2], Colombe Bélaise[2], Mathieu Andrieux[2], Pierre-Marc Ferland[1], Alain-Steve Comtois[1]. *[1]Université du Québec à Montréal, Montréal, QC, Canada. [2]Centre collégial de transfert de technologie du Cégep régional de Lanaudière à Terrebonne, Terrebone, QC, Canada.*
Email: roy.philippe@hotmail.ca

(No relevant relationships reported)

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: 20.20±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 occured at 120 seconds intervals, which represented approximatively 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-breath analysis was performed in order to measure peak oxygen consumption (VO2 peak) and heart rate was monitored (K4B2, 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 ranged from 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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Validation Of The Alpine Ski Racing 90 Seconds Box Jump Field Test

vincent carey, Pierre-Marc Ferland, Jérémie Charron, Viviane Marcotte L'Heureux, Yannick Hogue-Tremblay, Philippe Roy, Alain Steve Comtois. *Université du Québec à Montréal, Montreal, QC, Canada.*
Email: careyvincent90@gmail.com

(No relevant relationships reported)

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 90s box jump test was conducted on a foam plyo

box of 0.45m x 0.75m x 0.9m (14 kg Plyosoft box from Escape Fitness). Subjects started at one side of the box and had to do a side jump and make contact with the top of the box and then jump back down to the other side back and forth. Final score being the total number of hits in 90 s. The Wingate test was conducted on a cycle ergometer (Ergomedic 894 E Monark). Subjects had to pedal with no resistance until they reached maximum RPM (about 5-10 s). The load (7.5% of bodyweight) was then manually dropped and subjects had to pedal at a maximal effort for 90 s. Wingate peak and mean power was measured in W and W/kg of bodyweight. Both tests were performed in a random order. Correlations between the different test results were calculated with a 2-tailed Pearson correlation analysis. Statistical significance was set at $p<0.05$. Subject characteristics are presented as means and standard deviations.
RESULTS: Results present significant ($p<0.05$) correlations between the total number of hits on the 90 s box jump and Wingate peak W (r=0.73), peak W/kg (r=0.68), mean W (r=0.77) and mean W/kg (r=0.79). Results also present significant correlations with the number of hits between the following time slots: 0-15 s mean W (r=0.49), 0-15 s mean W/kg (r=0.72), 15-30 s mean W (r=0.66), 15-30 s mean W/kg (r=0.71), 30-45 s mean W (r=0.59), 30-45 s mean W/kg (r=0.66), 45-60 s mean W (r=0.82), 45-60 s mean W/kg (r=0.77), 60-75 s mean W (r=0.83), 60-75 s mean W/kg (r=0.65), 75-90 s mean W (r=0.75) and 75-90 s mean W/kg (r=0.71). A predictive regression equation using the total hits during the 90s Box Jump Test was established, where mean W/kg = 0.055*Total Hits + 1.080 (r=0.79, $p<0.01$; Total Hits with mean W/kg).
CONCLUSIONS: The 90s box jump test is well correlated to the power output obtained with the Wingate test. Nonetheless, further research should include subjects at the national and international level in order to update the formula.

C-37 Free Communication/Poster - Cerebrovascular

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1474 Board #68 May 28 10:30 AM - 12:00 PM

Physical Activity, Autonomic Function And Cerebral Pulsatility In Young Women

Alaina C. Glasgow, Jacob P. DeBlois, Kevin S. Heffernan. *Syracuse University, Syracuse, NY.* (Sponsor: Bo Fernhall, FACSM)

(No relevant relationships reported)

Cerebral pulsatility increases stress on the microvasculature of the brain causing damage. Age-related increases in arterial stiffness augment cerebral pulsatility via effects on large artery buffering capacity. Autonomic nervous system function also affect cerebral pulsatility by altering vascular tone. Physical activity (PA) may have a favorable effect on both vascular and autonomic function, and in turn, cerebral pulsatility. **PURPOSE**: 1) Determine the relationship between aortic stiffness and autonomic function with cerebral pulsatility index (PI) in young women. 2) Explore the role of PA as a potential correlate. **METHODS**: Eighty-two women (21±4 years) participated in this study. Moderate-to-vigorous physical activity (MVPA) was measured for 7 days using an accelerometer. Body composition was assessed using air displacement plethysmography. Middle cerebral artery PI was determined via transcranial Doppler. Aortic stiffness was measured via carotid-femoral pulse wave velocity (cf-PWV) using applanation tonometry. Autonomic function was assessed via heart rate variability (HRV). Low frequency (LF) power of HRV was used as a measure of sympathetic activity, while high frequency (HF) power of HRV was used as a measure of parasympathetic activity. **RESULTS**: PI was not significantly correlated with cf-PWV (r=-0.03, p=0.82) or lnHF (r=0.25, p=0.06). There was a significant, positive association between lnLF and PI (r=0.39, p=0.002). MVPA was not associated with cf-PWV (r=-0.18, p=0.13), lnLF (r=0.01, p=0.95) or PI (r=-0.04, p=0.79).
CONCLUSION: Sympathetic activity is a more prominent correlate of cerebral pulsatility than large artery stiffness in young women. Sympathetic tone may increase vasoconstriction of the cerebral vasculature resulting in augmentation of cerebral pulsatility. Physical activity was not associated with vascular or autonomic correlates of cerebral pulsatility in young women.
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1475 Board #69 May 28 10:30 AM - 12:00 PM

Interpretive Complications Underlying Cerebrovascular Response To Hypercapnia; Significance Of The Central Respiratory Chemoreflex Transient

Kazuki Tamiya[1], Takuro Washio[1], Tadayoshi Miyamoto[2], Damian Bailey[3], Shigehiko Ogoh, FACSM[1]. *[1]Toyo University, Kawagoe-Shi, Japan. [2]Osaka Sangyo University, Daito-Shi, Japan. [3]University of South Wales, Pontypridd, United Kingdom.*
Email: tamichan.0615@gmail.com

(No relevant relationships reported)

Cerebral blood flow (CBF) is sensitive to changes in the arterial partial pressure of carbon dioxide (CO_2) 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 CO_2 influences CBF response.
METHOD: We measured CBF response to hypercapnia (F_ICO_2 = 5%) in five healthy participants for 10 min in the supine position. End-tidal partial pressures of CO_2 ($P_{ET}CO_2$), minute ventilation (V_E), 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 V_E larger 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 $P_{ET}CO_2$ (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 $P_{ET}CO_2$ at late phase was lower than that of early phase (1.1 ± 1 %/mmHg *vs*. 1.7 ± 1 %/mmHg, P=0.07).
CONCLUSION: These findings highlight the importance of considering the central respiratory chemoreflex transient during the clinical assessment of cerebrovascular reactivity.

1476 Board #70 May 28 10:30 AM - 12:00 PM

Traumatic Brain Injury (tbi) Attenuates Arterial Smooth Muscle Vasorelaxation In Pressurized Cerebral Arteries

Jacob A. Goldsmith, Cathy W. Levenson, Kirk W. Evanson. *Florida State University, TALLAHASSEE, FL.* (Sponsor: Dr. Lynn Panton, FACSM)

(No relevant relationships reported)

Traumatic Brain Injury (TBI) Attenuates Arterial Smooth Muscle Vasorelaxation in Pressurized Cerebral Arteries
Jacob A. Goldsmith, Cathy W. Levenson, and Kirk W. Evanson. Florida State University, Tallahassee, FL
Maintenance of cerebral blood flow (CBF) is impaired following traumatic brain injury (TBI), increasing the incidence of both ischemic and hemorrhagic events. Vascular tone is controlled by neurogenic, endothelial, and myogenic responses. **PURPOSE:** This work was designed to specifically determine the extent to which the myogenic response of vascular smooth muscle in the middle cerebral artery (MCA) is altered following TBI. **METHODS:** TBI was induced by controlled cortical impact (CCI) in 2-month-old male Sprague-Dawley rats. Twenty-four hours following injury or sham surgery, pressurized arterial myography was performed on endothelium-denuded MCA to examine the effect of TBI on smooth muscle-specific vasorelaxation using pharmacologic activators of the adenylyl cyclase (AC)-cAMP-PKA/PKG pathway (10^{-9}M to 10^{-5}M, n=6 at each dose). **RESULTS:** Myogenic tone was attenuated following TBI (25±1.1% vs. 18±1.2%, n=12; *$p<0.001$*). The mean change in myogenic tone in response to activators (10^{-6}M) was reduced to 35% (AC), 33% (PKA), and 30% (PKG) in TBI as compared to sham controls. **CONCLUSION:** Attenuation of smooth muscle myogenic tone and resulting vasorelaxation following TBI may serve as a compensatory mechanism to protect sensitive brain tissue from cerebral ischemia. Future work will be needed to elucidate the role of pathways that could serve as potential targets for therapeutic intervention to reduce damaging vascular events.
Supported by The Florida State University Graduate School Dissertation Award Grant.

1477 Board #71 May 28 10:30 AM - 12:00 PM

Mechanisms Of Akap150 In Aerobic Exercise-induced Improvement Of Cerebral Arterial Function In Essential Hypertension

Yanyan Zhang, Yu Chen, Yang Zhou, Lijun Shi. *Beijing Sport University, Beijing, China.*
Email: 15210574247@163.com

(No relevant relationships reported)

A-kinase anchoring protein AKAP150, facilitating transduction events by binding protein kinase Cα (PKCα) to specific cellular microdomains, plays a central role in

voltage-gated L-type Ca^{2+} channel (LTCC) remodeling in vascular smooth muscle during hypertension. Emerging evidence have demonstrated the beneficial effects of regular exercise on reducing blood pressure and improving arterial function in hypertension, however, less is known regarding the cellular mechanisms underlying the vascular changes with exercise.**PURPOSE**: To investigate the mechanism of AKAP150/PKCα signaling pathway in exercise-mediated LTCC function of cerebral arteries during hypertension. **METHODS**: 12-week-old male spontaneously hypertensive rats (SHR) and Wistar-Kyoto (WKY) rats were randomly assigned to sedentary (WKY-SED, SHR-SED) and exercise training (WKY-EX, SHR-EX) groups. Exercise groups were performed a moderate-intensity treadmill running (about 55-65% VO_{2max}, 20 m/min, 0 grade, 60 min, 5 days/week). After 12 weeks, artery contraction myography, patch-clamp electrophysiology, Ca^{2+} image, Western blot and immunofluorescence were used to detect cerebral vascular tone, LTCC whole-cell and single channel currents, Ca^{2+} sparklets, and AKAP150/PKCα signaling pathway. **RESULTS**: Exercise attenuated LTCC contribution to cerebral vascular tone regulation (39.0±1.3 vs. 27.5±2.0 $\%K_{max}$) and LTCC currents in cerebral arterial myocytes of SHR (−13.2±1.7 vs. −9.6±1.5 pA/pF, both $P<0.05$). The LTCC channel open probability (nP_o) and persistent Ca^{2+} sparklet activity (nP_s) of cerebral arterial myocytes were significantly reduced in SHR-EX as compared with SHR-SED (nP_o: 0.08±0.01 vs. 0.12±0.01; nP_s: 0.65±0.15 vs. 0.82±0.10; both $P<0.05$). The protein expression of AKAP150 in cerebral artery was significantly up-regulated in SHR-SED (4.9±0.6), while down-regulated in SHR-EX (1.4±0.2, $P<0.05$). The colocalization rate of AKAP150 and PKCα at the sarcolemma were lower in cerebral arterial myocytes from SHR-EX than those from SHR-SED (20.1±1.1 vs. 30.0±1.6%, $P<0.05$). **CONCLUSIONS**: Chronic exercise inhibits LTCC channel activity and persistent Ca^{2+} sparklets in vascular smooth muscle via suppression of AKAP150/PKCα signaling pathway, and ameliorates the dysfunction of cerebral arteries during hypertension.

1478 Board #72 May 28 10:30 AM - 12:00 PM

Peripheral And Cerebral Vascular Function With Advancing Age: Evidence Of A Link

Catherine L. Jarrett, Katherine L. Shields, Angela V. Bisconti, Ryan M. Broxterman, Jesse C. Craig, Soung Hun Park, Russell S. Richardson. *University of Utah, Salt Lake City, UT.*
Email: catherine.jarrett1@gmail.com

(No relevant relationships reported)

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 (BHAI) 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±83 vs. 424±118 ml, p=0.001; PLM Δ peak: 378±124 vs. 950±64 ml/min, p<0.001). Cerebral vascular function tended to be lower in the old compared to the young with a large effect size (BHAI: 1.36 ±67 vs. 2.4±1.4; *d*=0.95, p=0.132). However, even with a relatively limited sample size, there was a significant positive relationship between PLM AUC and BHAI (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 toward a better understanding of the global mechanisms of aging on the vasculature and likely age-related dementia.

1479 Board #73 May 28 10:30 AM - 12:00 PM

Handgrip Exercise Modulates Cerebrovascular Response To Hypercapnia In The Anterior And Posterior Circulation

Takuro Washio, Hironori Watanabe, Kazuya Suzuki, Kazuki Tamiya, Shotaro Saito, Shigehiko Ogoh, FACSM. *Toyo university, Kawagoe, Japan.*
Email: t.wasshie@gmail.com

(No relevant relationships reported)

The response of posterior cerebral blood flow (CBF) to exercise is different from that of anterior cerebral circulation; however, its physiological mechanism remains poorly understood. Regarding this unresolved question, we hypothesized that the cerebrovascular response to carbon dioxide (CO_2), which is one of CBF regulatory mechanism, in the posterior cerebral circulation is different from that of the anterior cerebral circulation during exercise. **PURPOSE**: To test our hypothesis, we examined the cerebrovascular response to CO_2 in the anterior and posterior circulation during isometric handgrip (IHG) exercise. **METHODS**: The cerebrovascular response to CO_2 was evaluated in seven young healthy males via the two levels of hypercapnic stimulus (target end-tidal partial pressure of CO_2, +5 and +10 mmHg from individual baseline values) at rest and during a 2-min IHG exercise at 30% of maximum voluntary contraction. Middle and posterior cerebral artery blood velocities (MCAv and PCAv) were measured using a transcranial Doppler continuously throughout the experiment. **RESULTS**: During IHG exercise, PCAv increased (10.3 ± 9.0 %, $P = 0.023$) but MCAv remained unchanged (6.9 ± 4.5 %, $P = 0.18$). Interestingly, the cerebrovascular response to CO_2 in both cerebral arteries increased during IHG exercise ($P = 0.06$) but there was no difference in the cerebrovascular response to CO_2 between MCA and PCA ($P = 0.733$). **CONCLUSIONS**: These findings suggest that cerebrovascular response to CO_2 may not contribute to the heterogeneous CBF response to exercise between anterior and posterior circulation.

1480 Board #74 May 28 10:30 AM - 12:00 PM

Impact Of 6-month Exercise Training On Cerebrovascular Function In Persons With Spinal Cord Injury

Khara A. James[1], Stacey Aaron[1], Erin D. Ozturk[1], Matthew Lapointe[1], Dong-Il Kim[2], Jason W. Hamner[1], Can Ozan Tan[1]. [1]*Harvard Medical School, Cambridge, MA.* [2]*Gachon University, Gyeonggi-do, Korea, Republic of.*

(No relevant relationships reported)

Impact of 6-Month Exercise Training on Cerebrovascular Function in Persons with Spinal Cord Injury

Persons with spinal cord injury (SCI) have a four-fold greater risk for cerebrovascular disease, suggesting that they cannot maintain steady 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, CO_2) and cerebral blood flow (CBF) responses to oscillations in arterial blood pressure via low-resistance breathing (i.e. autoregulation) and progressive increases in arterial CO_2 via rebreathing (i.e. vasoreactivity) were measured in 16 able-bodied controls 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 VO_2max 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 VO_2max was related to increased vasoreactivity (R^2=0.45, p<0.01) at baseline. Overall, VO_2max 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 VO_2max and vasoreactivity in exercise "responders," defined as those with >10% change in VO_2max; n=8. In responders, an increase in VO_2max was strongly associated with an increase in vasoreactivity (R^2=0.72, p<.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.

1481 Board #75 May 28 10:30 AM - 12:00 PM

Aerobic Exercise Acutely Improves Dynamic Cerebral Autoregulation During Brain Activation

Hayato Tsukamoto, Thomas A. Calverley, Benjamin S. Stacey, Angelo Iannetelli, Thomas S. Owens, Jessica Morris, Daniel Hope, Christopher J. Marley, Damian M. Bailey. *University of South Wales, Pontypridd, United Kingdom.*
Email: h-tsuka@fc.ritsumei.ac.jp

(No relevant relationships reported)

PURPOSE: Cognitive function is temporarily improved by acute aerobic exercise, especially clinical high-intensity interval exercise (cHIIE; four 4 min bouts of high-intensity exercise) (Tsukamoto et al. 2016). Meanwhile, dynamic cerebral autoregulation (dCA) is an important cerebrovascular mechanism to maintain relatively constant cerebral blood flow (CBF) against the rapid fluctuations in perfusion pressure, but it is impaired during cognitive tasks (causing brain activation) due to cerebral vasodilation (Ogoh et al. 2018). Although it has been demonstrated that dCA is not changed by aerobic exercise (Tsukamoto et al. 2019), which improves cognitive function (Tsukamoto et al. 2016), the impact of aerobic exercise on the brain activation-induced dCA impairment remains unclear. The purpose of the present study was to investigate the changes in dCA during a cognitive task prior to following different types of aerobic exercise. **METHODS**: Nine healthy male subjects performed three trials in a randomized crossover order; moderate-intensity continuous exercise (for 40 min), low-volume HIIE (lvHIIE; ten 1 min bouts of high-intensity exercise), and cHIIE protocols. The participants performed a 5 min color-word Stroop

task (cognitive task) before, immediately after, and 30 min after each exercise bout. Middle cerebral artery blood flow velocity (Transcranial doppler ultrasonography) and arterial pressure (Finger photosplethysmography) 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. However, VLF phase during the 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.

1482 Board #76 May 28 10:30 AM - 12:00 PM

Cardiorespiratory Fitness And The Cerebrovascular Response To A Metabolic Stimulus Following Cyclooxygenase Inhibition

Andrew G. Pearson[1], Kathleen B. Miller[1], Anna J. Howery[1], Adam T. Corkery[1], Marlowe W. Eldridge[2], Awni M. Al-Subu[2], Jill N. Barnes, FACSM[1]. *[1]University of Wisconsin - Madison, Madison, WI. [2]University of Wisconsin School of Medicine and Public Health, Madison, WI.*
Email: agpearson2@wisc.edu
(No relevant relationships reported)

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 VO_2max (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 (PI) 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 PI 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 PI increased (Low CRF: 22 ± 3%, High CRF: 17 ± 3%; p < 0.01). During INDO, MCAv at rest was not different between groups; however, PI 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 PI in response to the metabolic stimulus did not differ between groups. **CONCLUSION:** In older adults, elevated levels of CRF may lead to a lower PI at rest and in response to a metabolic stimulus. Additionally, COX inhibition did not alter the cerebrovascular response to a metabolic stimulus.
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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

Jade Blackwell[1], Katie Burnet[1], Elizabeth Kelsch[1], Erik Hanson[1], Simon Fryer[2], Daniel Credeur[3], Keeron Stone[2], Lee Stoner, FACSM[1]. *[1]University of North Carolina, Chapel Hill, Chapel Hill, NC. [2]University of Gloucestershire, Gloucester, United Kingdom. [3]University of Southern Mississippi, Hattiesburg, MS.* (Sponsor: Lee Stoner, FACSM)
(No relevant relationships reported)

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 exacerbates 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] y, 33% F, 24.3 [3.7] kg/m^2) 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

Jun Sugawara, Takashi Tarumi, Tsubasa Tomoto, Evan Pasha, Rong Zhang. *Texas Health Presbyterian Hospital Dallas, Dallas, TX.*
Email: jun.sugawara@aist.go.jp
(No relevant relationships reported)

Cerebrovascular hypoperfusion 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 study arm, cerebrovascular impedance was evaluated in randomly-assigned 37 aMCI patients who completed 1-year endurance (n=17) or stretching exercise (n=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, Z_1) 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.
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1485 Board #79 May 28 10:30 AM - 12:00 PM

The Relation Between Cardiorespiratory Fitness And Cerebral Blood Flow Regulation

Kamila U. Migdal, Austin T. Robinson, Ronald McMillan, Joseph C. Watso, Matthew C. Babcock, Jorge M. Serrador, William B. Farquhar, FACSM. *University of Delaware, Newark, DE.* (Sponsor: William B. Farquhar, FACSM)
Email: kmigdal@udel.edu
(No relevant relationships reported)

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 cerebrovascular reactivity to CO_2 and to dynamic cerebral autoregulation. **METHODS:** Twenty-three healthy, normotensive adults (13M/10F; age: 26±4 yrs; BMI: 24±5 kg/m^2; BP: 105±9/58±6 mmHg, mean±SD) participated in this study. Mean VO_2 max was 40.0±9.7 ml/kg/min (range, 17.9-62.3 ml/kg/min). Each participant completed a maximal graded exercise test on a treadmill until volitional fatigue. Heart rate was measured using a heart rate monitor (Polar H7, Polar, USA). Oxygen consumption and CO_2 production were measured and averaged in 15-second intervals using indirect calorimetry via an automated open circuit system (Parvo Medics, Sandy, UT) throughout the exercise test. Transcranial Doppler of the right middle cerebral artery was measured. We measured cerebrovascular reactivity to two minutes of hypercapnia (via 8% CO_2, 21% oxygen, balance nitrogen). We assessed dynamic cerebral autoregulation during eight minutes of supine rest. The relation between cerebral blood flow regulation and cardiorespiratory fitness were analyzed using Pearson's correlations. **RESULTS:** Cerebrovascular reactivity to hypercapnia was not significantly correlated with cardiorespiratory fitness (r=0.35, P=0.10). There

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.

1486 Board #80 May 28 10:30 AM - 12:00 PM

Effect Of Different Exercise Modes On Cerebrovascular Shear In Humans

Shigehiko Ogoh, FACSM[1], Takuro Washio[1], Kazuya Suzuki[1], Motoyuki Iemitsu[2], Takeshi Hashimoto, FACSM[1], Erika Iwamoto[3], Damian Bailey[4]. *[1]Toyo University, Kawagoe, Japan. [2]Ritsumeikan University, Minami Kusatsu, Japan. [3]Sapporo Medial University, Sapporo, Japan. [4]University of South Walse, Pontypridd, United Kingdom.*
Email: ogoh@toyo.jp

(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±75 vs. 330±61 /s, P=0.038) and the elevation was maintained throughout recovery (327±86 vs. 290±56 /s, P=0.014). **CONCLUSION:** 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

Jacob P. DeBlois, Allison P. Keller, Kevin S. Heffernan. *Syracuse University, Syracuse, NY.*

(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 cerebral aging; MVPA 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; *n* = 53 women) underwent ABPM every 20 min between 0700 - 2200 hr and every 30 min from 2200 - 0700 hr. Transcranial Doppler measured MCA pulsatility at rest and during 3 min of cognitive stress (Stroop). MVPA was assessed over 9 days via accelerometry. Pearson correlations were run for PP, PP variability, 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 MVPA. **RESULTS:** Nighttime systolic dipping was inversely associated (r = -0.25, *p* = 0.049) and there was a trend for diastolic dipping to be inversely associated with resting pulsatility (r = -0.23, *p* = 0.06). No other ABPM measures were related with resting MCA pulsatility. MCA pulsatility during cognitive stress was associated with daytime systolic pressure (r = 0.38, *p* < 0.01), average daily PP (r = 0.33, *p* = 0.01), and systolic and diastolic dipping (r = -0.34, *p* = 0.01 and r = -0.25, *p* = 0.04, respectively). Accuracy during the cognitive stress task was not associated with any ABPM measure (*p* ≥ 0.09). **CONCLUSION:** These data suggest that nighttime BP dipping may be related to reduced cerebrovascular pulsatility at rest and during cognitive stress. Additionally, greater daytime systolic BP and PP may be associated with increased MCA pulsatility during cognitive stress. ABPM is associated with cerebral pulsatility but not cognitive performance in young adults.

1488 Board #82 May 28 10:30 AM - 12:00 PM

Effect Of Breath Holding On Cerebral Blood Flow Response To Isometric Exercise

Hironori Watanabe, Takuro Washio, Koki Kimura, Shigehiko Ogoh, FACSM. *Toyo University, Kawagoe, Japan.*

(No relevant relationships reported)

For resistance training, breath holding is prohibited to prevent an increase in arterial blood pressure (ABP) and consequently cerebral hyper-perfusion. However, it is unclear how breath holding during resistance exercise affects arterial blood pressure or cerebral blood flow. **PURPOSE**: The purpose of this study was to examine the effect of breath holding on the responses of ABP and cerebral blood flow (CBF) to isometric exercise. **METHODS**: Six young male adults performed 30-s isometric handgrip exercise at 40% of maximum voluntary contraction during normal breathing (control) or breath-holding condition (BH). ABP was measured using Finapres, and CBFs at internal carotid and vertebral arteries (ICA and VA, respectively) were continuously measured using Doppler ultrasonography at rest and during exercise.
RESULTS: The change in MAP from rest to exercise was larger in BH compared with that in control ($P < 0.05$). The relative response of ICA blood flow to exercise was larger in BH (18.9 ± 14.6%) compared with that in control (8.1 ± 17.2%, $P < 0.05$), whereas the relative response of VA blood flow to exercise did not differ between both BH (3.1 ± 5.8%) and control (0.9 ± 10.9%, $P > 0.05$).
CONCLUSIONS: 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.

C-38 Free Communication/Poster - **Respiratory**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

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

Monira Ibrahim Aldhahi[1], Lisa M.K. Chin[2], Andrew Guccione[3], Randall E. Keyser, FACSM[3]. *[1]Princess Nourah Bint Abdulrahman University, Riyadh, Saudi Arabia. [2]National Institutes of Health, Bethesda, MD. [3]George Mason University, Fairfax, VA.* (Sponsor: Randall E, Keyser, FACSM)

(No relevant relationships reported)

PURPOSE: The influence of alterations in the ventilatory response and work of breathing (WOB) on cardiac output (Qt) 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 (icSCI: 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 icSCI (30 watts). Both MIP (69.0±17.8mmH_2O vs. 89.7±15.4mmH_2O, p=0.020) and MEP (59.6±16.4 mmH_2O vs. 83.4±14.8mmH_2O, p=0.008)were significantly lower in icSCI compared to CON. Minute ventilation (32±3.4L/min vs. 23±5.5L/min, p=0.001) and WOB (2.8±0.5 vs.1.6±6.8kg/m/min, p=0.001) were significantly higher in icSCIcompared to CON, respectively.A significant difference in tidal volume (icSCI: 1.03±0.3L vs. CON:1.2±0.3L, p=0.800) was not observed. Qtwas lower in those with icSCI compared to CON (8±3L/min vs. 11±1L/min, p=0.003), and correlated significantly with WOB in icSCI (r^2=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 icSCI, a potential moderating effect of WOB may partially explain the decline in Qt during arm exercise.

1490 Board #84 May 28 10:30 AM - 12:00 PM

Expiratory Pressure Generation In Adult Survivors Of Preterm Birth

Denise A. Ocampo, Elizabeth A. Gideon, Joseph W. Duke. *Northern Arizona University, Flagstaff, AZ.*

(No relevant relationships reported)

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 exhaled exhale 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 (-130.6 ± 29.3 vs. -106.5 ± 36.1 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 no effect of birth status on the ability to generate expiratory pressure during forced expiration. Likewise, results suggest that the lower pulmonary function in PRE is not the result of a lesser driving pressure, but instead may be the result of excessive airflow resistance. Support: Hooper Undergraduate Research Award from NAU.

1491 Board #85 May 28 10:30 AM - 12:00 PM

Exhaled Volatile Organic Compounds In Ultra-endurance Runners

Eli F. Kelley[1], Glenn M. Stewart[1], Courtney M. Wheatley-Guy[2], Jesse C. Schwartz[2], Briana L. Ziegler[1], Caitlin C. Jorgenson[1], Bruce D. Johnson[1]. [1]*Mayo Clinic, Rochester, MN.* [2]*Mayo Clinic, Phoenix, AZ.*
Email: Kelley.Eli@mayo.edu

(No relevant relationships reported)

PURPOSE: Volatile organic compounds (VOCs) measured in exhaled breath can provide a metric of various physiologic and metabolic processes, such as airway inflammation from environmental contaminants (e.g., 3-methylfuran) or pathological lung conditions (e.g., 3-methylhexane). To date, limited studies have examined exhaled VOC profiles in response to a physiologic stressor such as ultra-endurance exercise. Accordingly, this study evaluated VOC production in exhaled breath in response to running an ultramarathon.
METHODS: Breath samples were collected from 20 ultra-endurance runners before and after participating in either the 2018 Ultra-Trail du Mont-Blanc (171km) or the 2018 Courmayeur-Champex-Chamonix (100km) ultramarathon. Unfortunately, 30 of the 40 samples were saturated and therefore the relative abundance of VOC's in these samples were estimated by extrapolating the rate at which the signal decayed. A Wilcoxon signed-rank test was performed to evaluate changes in the intra-participant exhaled VOCs between the pre- and post-race breath samples.
RESULTS: Participants completed the ultra-marathons in 27.2±12 hours. In total, 203 unique VOCs were identified and studied for differences between the pre- and post-race participant breath samples, with 68 having significant ($P<0.05$) changes pre to post-race (e.g., Propanal: pre $7.8x10^6 \pm 2.3x10^6$ vs post $1.1x10^7 \pm 2.9x10^6$, $P=0.002$). The exhaled VOCs displaying a significant *increase* in post-race abundance were determined to be structurally related to each other, with 21 of these arising from probable biological origins. These VOCs were predominately comprised of methyl- and ethyl- (n=15) and decane (n=4) containing compounds, which possibly relate to inflammation of the lungs (e.g., 3-Methylhexane: pre $9.1x10^6 \pm 9.7x10^6$ vs post $3.9x10^7 \pm 3.1x10^6$, $P=0.0005$) or bowels (e.g., Ethyl acetate: pre $9.2x10^5 \pm 6.4x10^5$ vs post $2.1\ x10^6 \pm 1.2x10^6$, $P=0.0006$).
CONCLUSIONS: These data suggest exhaled VOCs are affected by ultra-endurance exercise and may serve as biomarkers/indicators of exercise induced inflammation/stress. Given the exploratory nature of this study and the number of saturated samples, additional studies are needed to determine normal detection limits and the relevance of VOCs in response to ultra-endurance exercise.

1492 Board #86 May 28 10:30 AM - 12:00 PM

Reduced Lung Function And Respiratory Muscle Fatigue After Prolonged Endurance Performance

Julie Stang, Elena Nyborg, Trine Stensrud. *Norwegian School of Sport Sciences, Oslo, Norway.*
Email: julie.stang@nih.no

(No relevant relationships reported)

PURPOSE: Exercise-induced bronchoconstriction (EIB) is frequently reported in healthy triathletes immediately after high intensity exercise of prolonged duration, but the recovery time is unknown. The aims of the present study were to investigate 1) changes in lung function from before to 2 hours and 15 hours post a triathlon race, 2) if respiratory muscle fatigue could explain the diminished flow rates observed and 3) its effect on performance. **METHODS**: We recruited 34 healthy athletes (3 female), aged 25-55 years, participating in Norseman Xtreme triathlon (3.8 km open water swim, 180 km cycling and 42 km running). Measurements of lung function, by maximal expiratory flow volume loops, and maximal voluntary ventilation (MVV) were performed before, 2 hours and 15 hours after the race. Associations between lung function, MVV and race time were assessed using linear regression. **RESULTS**: Forced expiratory volume in 1 second (FEV_1) was reduced by >10% from baseline in 10 athletes (29%) 2 hours post race and in 3 athletes (8%) 15 hours post race. Mean MVV was reduced from baseline (177 L ±29) to 2 hours (161 L ±35) post race ($p<0.01$), and recovered by 15 hours (174 L ±34) post race. Mean race time was 14,3 hours ranging from 10-19 hours. Change in FEV_1 was associated with change in MVV (β .01 [95%CI .004], p=.001), but not race time. **CONCLUSIONS**: Reduced lung function was frequent in healthy triathletes 2 hours post race and associated to respiratory muscle fatigue, but not performance. Both MVV and lung function was normalized in most athletes 15 hours post race.

1493 Board #87 May 28 10:30 AM - 12:00 PM

Abstract Withdrawn

1494 Board #88 May 28 10:30 AM - 12:00 PM

Influence Of Immersion In Water On Respiratory Impedance Measured By Forced Oscillation Technique

Daisuke Hoshi, Koichi Watanabe. *University of Tsukuba, Ibaraki, Japan.*

(No relevant relationships reported)

Immersion in water decreases lung volume and maximal inspiratory muscle pressure. Previous studies have showed that hydrostatic pressure causes increased venous return from lower limbs and cranial displacement of the diaphragm, which leads to a decrease in lung compliance and increased closing volume. However, there is no research to investigate respiratory impedance during immersion in water. **PURPOSE**: Accordingly, the aim of this study was to evaluate respiratory impedance measured by forced oscillation technique during immersion in water in healthy adults. **METHODS**: Eleven healthy males participated in this cross-sectional study. We measured respiratory impedance and respiratory function before and during immersion. To compare the influence of water depths, we carried out one dry land (DL) trial and two water level trials: clavicle level (CL) and xiphoid appendix level (XA). The order of trials between DL, CL and XA was randomized and performed with at least three days rest between trials. **RESULTS**: Respiratory impedance: during immersion, CL (2.8 ± 0.9) and XA (2.5 ± 0.7) showed a significantly higher R5 compared to DL (1.9 ± 0.6) (p=0.005, p=0.024). CL (2.8 ± 0.7) also showed a significantly higher R20 compared to DL (2.1 ± 0.5) (p=0.003). CL (-0.5 ± 0.4) and XA (-0.3 ± 0.2) showed a significantly lower X5 than DL (-0.1 ± 0.2)(p=0.015, p=0.021). CL (9.7 ± 3.6) and XA (8.2 ± 2.4) showed a significantly higher Frequency of resonance compared to DL (5.3 ± 2.9) (p=0.007, p=0.001). Respiratory function: during immersion, Forced vital capacity (FVC) showed significantly lower values at CL (4.1 ± 0.4) compared to DL (4.4 ± 0.4) (p=0.029) and also forced expiratory volume in the first second ($FEV_{1.0}$) showed a significantly lower value at CL (3.5 ± 0.5) compared to DL (3.8 ± 0.1) (p=0.01). **CONCLUSIONS**: Our results suggested that immersion in water, especially at the clavicle level, influences respiratory impedance and respiratory function.

1495 Board #89 May 28 10:30 AM - 12:00 PM

Leptin, Adiponectin And Exercise-Induced Bronchoconstriction In Non-asthmatic Children

Louise A. Turner[1], Benjamin P. Green[2], Penny L.S. Rumbold[3]. *[1]Sheffield Hallam University, Sheffield, United Kingdom. [2]Nutricia Advanced Medical Nutrition, Trowbridge, United Kingdom. [3]Northumbria University, Newcastle-upon-Tyne, United Kingdom.*

(No relevant relationships reported)

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-adipocyte hormones 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 yr) completed pulmonary function tests (FEV_1, FVC, $FEF_{25-75\%}$) pre- and post-exercise. Each participant completed an incremental, cycle-ergometer exercise test to exhaustion (VO_{2peak}). The maximum percentage fall in FEV_1 and $FEF_{25-75\%}$ from pre- to post- exercise was calculated, participants were subsequently classified as EIB positive (EIB+) with drop in $FEV_1 \geq 10\%$. 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 FEV_1 and $FEF_{25-75\%}$ plotted against time for 15 min (AUC_{0-15}), using trapezoidal integration. Serum leptin and adiponectin levels were determined from a fingertip capillary blood sample taken before exercise. **Results:** BMI was significantly correlated with leptin ($r = 0.473$, $p<0.05$), but not adiponectin in the overall group (n=25). There was also no significant correlation between leptin or adiponectin and any pulmonary function measure for the overall group. When participants were categorized as EIB+ or EIB-, there was a significant correlation between: leptin and %drop in FEV_1 ($r = -0.917$, $p < 0.05$) and FEV_1 AUC_{0-15} ($r = -0.780$, $p < 0.05$); and adiponectin and %drop in $FEF_{25-75\%}$ ($r = 0.780$, $p < 0.05$) and $FEF_{25-75\%}$ AUC_{0-15} ($r = 0.803$, $p < 0.05$) for the EIB+ group. In the EIB- group, there was 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.

1496 Board #90 May 28 10:30 AM - 12:00 PM

Swimming And Respiratory System: Impact Of Exercise On Pro-oxidants Production And Lung Function

Felipe Andrés Contreras Briceño[1], Ginés Viscor[2], Oscar Florencio Araneda[3]. *[1]Pontificia Universidad Católica de Chile, Santiago, Chile. [2]Universitat de Barcelona, Barcelona, Spain. [3]Universidad de Los Andes, Santiago, Chile.*

Email: klgo.fcontreras@gmail.com

(No relevant relationships reported)

Scientific Abstract (ACSM World Congress 2020)
Swimming and Respiratory System: Impact of Exercise on Pro-oxidants Production and Lung Function.
The respiratory redox state of swimmers can be affected by the increase of minute ventilation (VE) during exercise and/or by chronic exposure to chlorine used to sanitize the water of swimming pools. However, in indoor-pools, the high-humidity and warm-water temperature are recognized as respiratory protecting factors. 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 species (nitrite [NO_2^-], hydrogen peroxide [H_2O_2]), while spirometry the lung function (FEV_1, FEV_1/FVC, $FEF_{25-75\%}$).
PURPOSE: To assess the impact of a high-intensity and prolonged-time exercise on the production of $[H_2O_2]_{EBC}$, $[NO_2^-]_{EBC}$, pH_{EBC} and lung function in swimmers.
METHODS: Longitudinal quasi-experimental study. 18 competitive swimmers (8 female) (22±2 years; 53.1±3.5 mL·kg^{-1}·min^{-1} VO_2-máx.) completed 3.500-m of swim in indoor pool treated by chlorine (intensity of 80.2±3.1% of HR_{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). The *p*-value<0.05 was considered for differences.
RESULTS: The $[H_2O_2]_{EBC}$ (0.35±0.15 vs 0.28±0.12 vs 0.20±0.10 (umol·L^{-1})) and $[NO_2^-]_{EBC}$ (1.79±0.21 vs 1.37±0.15 vs 1.03±0.16 (umol·L^{-1})) decreased significantly at 24-hr post-exercise. The pH_{EBC} (p=0.23 and 0.32) and FEV_1, FEV_1/FVC, $FEF_{25-75\%}$ do not changed significantly between stages.
CONCLUSION: A acute 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 involucrated in the formation of respiratory pro-oxidants during exercise in athletes chronically exposed to respiratory irritants.

1497 Board #91 May 28 10:30 AM - 12:00 PM

Abstract Withdrawn

1498 Board #92 May 28 10:30 AM - 12:00 PM

Inhaled Albuterol Increases Forced Mid-expiratory Flows In Non-asthmatic Children With And Without Obesity

Daniel P. Wilhite[1], Dharini M. Bhammar[2], Ashley Peck[1], Marcus Payne[1], Tanya Martinez-Fernandez[3], Tony G. Babb, FACSM[1]. *[1]Texas Health Presbyterian Hospital Dallas, Dallas, TX. [2]University of Nevada - Las Vegas, Las Vegas, NV. [3]University of Texas Southwestern Medical Center, Dallas, TX.* (Sponsor: Tony G. Babb, FACSM)

Email: DanielWilhite@texashealth.org

(No relevant relationships reported)

PURPOSE: The effect of albuterol on β_2-adrenoceptor activation is usually assessed by a significant increase in forced expiratory volume in one second (FEV_1). However, even without a significant increase in FEV_1, an increase in isovolume forced expiratory flow between 25% and 75% ($isoFEF_{25-75}$) of forced vital capacity (FVC) would allow for greater exercise tidal flow rates thus increasing ventilatory capacity ($\dot{V}_{Ecap}$). This could be particularly important in children with obesity, who breathe at low lung volumes and have limited expiratory reserves. We examined if $isoFEF_{25-75}$ and $\dot{V}_{Ecap}$ increase with albuterol in non-asthmatic prepubescent children with and without obesity.
METHODS: A total of 46 obese (n=29 boys) and 29 nonobese (n=14 boys) children, ages 8-12yr, performed spirometry according to the American Thoracic Society guidelines before and after 360µg of albuterol. Subjects who displayed ≥12% and ≥200mL increase in FEV_1 after albuterol were excluded. For each individual, $\dot{V}_{Ecap}$ was determined using an estimated tidal volume at maximal exercise ('V_{Tmax}' = FVC/2) and forced expiratory time between 25% and 75% of FVC (FET_{25-75}) to estimate an individualized maximum breathing frequency (f_{bmax}), where $\dot{V}_{Ecap} = V_{Tmax} * f_{bmax}$. A two-way ANOVA with repeated measures (obese x nonobese; pre- x post-inhaler) was conducted.
RESULTS: No significant group by treatment interaction was detected. No significant differences were detected in spirometry parameters between children with and those without obesity. From pre- to post-inhaler in the total cohort of children (n=75), FVC significantly decreased (-0.70%, $p = 0.04$). While there was a statistically significant increase in peak expiratory flow (+3.0%, $p = 0.02$), FEV1 (+2.6%, $p < 0.01$) and FEV1/FVC (+3.0%, $p < 0.01$), there were more meaningful increases in isoFEF25-75 (+17.1%, $p < 0.01$) and $\dot{V}$Ecap (+15.5%, $p < 0.01$).**CONCLUSIONS**: Administration of albuterol can increase $isoFEF_{25-75}$ despite a relatively small nonclinical increase in FEV_1. The remarkable increase in flow rates along the effort-independent portion of a forced expiration yields a large increase in $\dot{V}_{Ecap}$, which could potentially change breathing mechanics and ventilatory output during heavy exercise in non-asthmatic prepubescent children with and without obesity.

1499 Board #93 May 28 10:30 AM - 12:00 PM

Influence Of Body Fat On Pulmonary Function And Exercise Capacity In Heart Failure Patients

Joshua R. Smith, Nico Villarraga, Jessica D. Berg, Katlyn E. Koepp, Thomas P. Olson, FACSM. *Mayo Clinic, Rochester, MN.* (Sponsor: Thomas Olson, FACSM)

Email: smith.joshua1@mayo.edu

(No relevant relationships reported)

Heart failure patients with reduced ejection fraction (HFrEF) often exhibit abnormal pulmonary function and reduced exercise capacity. A common comorbidity in HFrEF is obesity, which is independently associated with altered pulmonary function and reduced exercise capacity. However, it is unknown if body composition is significantly related to pulmonary function and exercise capacity in patients with HFrEF.
PURPOSE: To determine if body composition is related to pulmonary function and exercise capacity in patients with HFrEF. We hypothesized that HFrEF patients, compared to healthy controls (CTL) would exhibit reduced pulmonary function and exercise capacity, which will be negatively related to percent body fat (% BF).
METHODS: Patients with HFrEF (n=19; LV EF: 30±10%) and healthy CTL (n=19) were recruited for this study (Age: HFrEF: 62±8 vs. CTL: 60±14 yrs; Height: HFrEF: 176±9 vs. CTL: 173±9 cm) (both, $p>0.05$). Participants performed standard pulmonary function testing and an incremental cycling test to volitional fatigue for determination of peak oxygen uptake (VO_2peak). Percent body fat (% BF) was measured via dual energy x-ray absorptiometry.

RESULTS: HFrEF patients, compared to CTL had greater % BF (HFrEF: 36±7 vs. CTL: 29±7 %) and body mass index (HFrEF: 31±4 vs. CTL: 26±4 kg/m^2) and lower VO_2peak (HFrEF: 21±6 vs. CTL: 27±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 in 1 sec (FEV_1), forced expiratory flow rates between 25 and 75% of FVC (FEF_{25-75}), residual volume (RV), or total lung capacity (TLC) (all, p>0.05); however, HFrEF had smaller expiratory reserve volume (ERV) than CTL (HFrEF: 0.8±0.4 vs. CTL: 1.1±0.8 L, p<0.05). In HFrEF, % BF was significantly related to FVC (r= -0.60), FEV_1 (r= -0.59), ERV (r= -0.72), and TLC (r= -0.54) (all, p<0.05). In CTL, % BF was significantly related to FEV_1 (r= -0.45) and FEF_{25-75} (r= -0.45) (both, p≤0.05). Lastly, % BF was significantly related to VO_2peak 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 FEV_1 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.

1500 Board #94 May 28 10:30 AM - 12:00 PM

Target Workload For Exercise Challenge Tests Exceeds Achievable Workload In Children With Mild Asthma

Victoria I. De La Hoya[1], Ya-Yin Hu[1], Michael W. H. Wong[1], Nicholas A. Ross[1], Ani L. Kechkarian[1], Donna J. Gould[1], Craig Nakamura[2], Dharini M. Bhammar[1]. [1]*University of Nevada Las Vegas, Las Vegas, NV.* [2]*Childrens Lung Specialists, Las Vegas, NV.* (Sponsor: Tony G. Babb, FACSM)
Email: delahoya@unlv.nevada.edu
(No relevant relationships reported)

PURPOSE: Exercise challenge tests are bronchoprovocation tests used to diagnose exercise induced bronchoconstriction. The American Thoracic Society (ATS) recommends calculating the target workload for exercise challenge tests using predicted forced expiratory volume in 1s (FEV_1). The goal is for patients to achieve a minute ventilation between 40 to 60% of predicted maximum voluntary ventilation (PMVV) during the exercise challenge test. The purpose of this study was to compare predicted workload with actual workload achieved during an exercise challenge test in 8 to 12-year-old children with mild asthma.
METHODS: Eleven children (3 girls, 10.3 ± 0.9 yr, 142.6 ± 8.1 cm, 40.7 ± 9.6 kg) completed pulmonary function testing and also completed maximal exercise tests and exercise challenge tests on a stationary bike. PMVV was calculated as 35 x measured FEV_1. The test was completed at a target workload calculated using measured FEV_1 (53.76 x measured FEV_1 - 11.07). Our goal was to increase workload every minute as follows: 60%, 75%, 90%, and 100% target. However, if the child was unable to maintain cadence or expressed inability to complete 6 minutes of cycling, the workload was maintained or reduced to an achievable workload.
RESULTS: 27% of children were below 40% PMVV, 36% were between 40 - 60% of PMVV, and 36% exceeded 60% of PMVV during the fifth minute of the exercise challenge test. After excluding the 3 children who did not achieve minute ventilation of at least 40% of PMVV, measured workload during the exercise challenge test (64 ± 18W; 66 ± 9%, Range: 49 - 78% of predicted target workload) was significantly lower than predicted target workload (96 ± 18W; P<0.001). Workload during the exercise challenge test was 67 ± 8% (Range: 60 - 80%) of maximum workload from the maximal exercise test. In the current project, we used measured FEV_1 to calculate target workload for exercise challenge tests. However, even when predicted FEV_1 was used to calculate target workload, measured workload during the exercise challenge test was below target and ranged from 43 - 112% (66 ± 22%) of target workload.
CONCLUSIONS: The predicted workload for exercise challenge tests based on ATS guidelines may be difficult to achieve for children with mild asthma. However, target ventilation can be achieved at a workload that is between 60 - 80% of maximum workload.

1501 Board #95 May 28 10:30 AM - 12:00 PM

Inspiratory Muscle Fatigue Is Not Different In Response To Long Vs. Short-duration High-intensity Exercise

Matt R. Chadwick, Tim A. Hardy, Bryan J. Taylor, Carrie Ferguson. *University of Leeds, Leeds, United Kingdom.*
(No relevant relationships reported)

Maximal isokinetic power (P_{ISO}) at the limit of short duration (<6 min) high-intensity constant-power exercise ($Tlim_{SHORT}$) is not different from task power. Conversely, P_{ISO} at the limit of long duration (>7 min) high-intensity constant-power exercise ($Tlim_{LONG}$) exceeds task power. This suggests that while $Tlim_{SHORT}$ is predominantly limited by locomotor neuromuscular fatigue, other physiological mechanisms contribute to exercise limitation in $Tlim_{LONG}$. One possibility for this difference in the mechanism of exercise intolerance is that the severity of exercise-induced inspiratory muscle fatigue is greater in $Tlim_{LONG}$ vs. $Tlim_{SHORT}$ due to a larger cumulative work of breathing in the longer-duration task. **PURPOSE:** To determine whether the magnitude of exercise-induced inspiratory muscle fatigue is greater in $Tlim_{LONG}$ vs. $Tlim_{SHORT}$. **METHODS:** Ten healthy adults (3 females; 25 ± 3 yr) completed a maximal ramp-sprint test (RIT) to determine critical power (CP), $\dot{V}O_{2peak}$ and peak ramp power (RIT_{peak}). Maximal constant-power exercise was then performed at 1) 50% ($Tlim_{SHORT}$), and 2) 25 % ($Tlim_{LONG}$) of the difference between CP and RIT_{peak}. P_{ISO} (6 s effort at 80 r/min) was measured at intolerance. Inspiratory muscle fatigue was assessed as the pre- to post-test reduction in magnetically evoked transdiaphragmatic (Pdi_{tw}) twitch pressure. **RESULTS:** $Tlim_{LONG}$ was longer than $Tlim_{SHORT}$ (10.3 ± 2.6 vs. 5.2 ± 1.1 min; $P < 0.001$), but $\dot{V}O_{2peak}$ was not different between tests (3.7 ± 0.8 vs. 3.7 ± 0.8 L/min; $P > 0.05$). P_{ISO} at intolerance was not different from task power in $Tlim_{SHORT}$ (294 ± 101 vs. 241 ± 58 W; $P = 0.11$). Conversely, P_{ISO} at intolerance was greater than task power in $Tlim_{LONG}$ (341 ± 106 vs. 215 ± 53 W; $P = 0.008$). Cumulative diaphragm pressure-time product was higher in $Tlim_{LONG}$ vs. $Tlim_{SHORT}$ (5945 ± 1956 vs. 2729 ± 1004 cmH_2O/s; $P < 0.001$). Both $Tlim_{LONG}$ and $Tlim_{SHORT}$ induced a reduction in Pdi_{tw} (-15 ± 13% vs. -19 ± 13%, respectively; $P < 0.05$). However, the magnitude of exercise-induced inspiratory muscle fatigue was not different between tests ($P > 0.05$). **CONCLUSIONS:** Despite P_{ISO} at intolerance being greater than task power in $Tlim_{LONG}$ but not $Tlim_{SHORT}$, inspiratory muscle fatigue was not different between tests and therefore may not contribute to differences in exercise limitation in $Tlim_{LONG}$ vs. $Tlim_{SHORT}$.

1502 Board #96 May 28 10:30 AM - 12:00 PM

Abstract Withdrawn

1503 Board #97 May 28 10:30 AM - 12:00 PM

Near-infrared Spectroscopy Measures Of Sternocleidomastoid Blood Flow During Exercise And Hyperpnea

Andrew H. Ramsook, Carli M. Peters, Michael G. Leahy, Bruno Archiza, Reid A. Mitchell, Tin Jasinovic, Michael S. Koehle, Jordan A. Guenette, A. William Sheel, FACSM. *University of British Columbia, Vancouver, BC, Canada.* (Sponsor: A. WIlliam Sheel, FACSM)
Email: andrew.ramsook@gmail.com
(No relevant relationships reported)

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 ($\dot{V}_E$) during whole-body exercise. **Methods:** Blood-flow index (BFI) of the vastus lateralis (VL), sternocleidomastoid (SCM), and 7th 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 (HYP) 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, $\dot{V}O_{2max}$: 56 ± 9 mL· kg^{-1}· min^{-1}). $\dot{V}_E$ was matched well between EX and HYP (EX-30%: 53 ± 10 vs. HYP-30%: 56 ± 14; EX-60%: 86 ± 14 vs. HYP-60%: 87 ± 18; EX-90%: 159 ± 31 vs. HYP-90%: 142 ± 40 L· min^{-1}, all p > 0.05). BFI-VL increased from 0.15 ± 0.09 μM·second^{-1} at rest to 2.57 ± 1.10 μM·second^{-1} during the EX-30% trial and 0.44 ± 0.23 μM·second^{-1} during the HYP-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 HYP trials (p < 0.05). BFI-SCM increased slightly from 0.87 ± 0.48 μM·second^{-1} to 1.01 ± 0.54 and 1.67 ± 1.54 μM·second^{-1} in the EX-30% and HYP-30% trials respectively. We observed no effects of condition or intensity when measuring BFI-SCM (p > 0.05). At rest BFI-7IC was 0.84±0.59 μM·second^{-1} and in the EX-30% and HYP-30% trials increased to 1.20 ± 0.75 and 1.26 ± 0.60 μM·second^{-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

C-39 Free Communication/Poster - **Exercise and Aging**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1504 Board #98 May 28 9:30 AM - 11:00 AM

Potential Mechanisms Of Inflammation-induced Attenuated Muscle Hypertrophy Following 3-d/wk High-intensity Resistance Training Among Aged Individuals

Samia M. O'Bryan, S. Craig Tuggle, Samuel T. Windham, Marcas Bamman, FACSM. *University of Alabama at Birmingham, Birmingham, AL.*
Email: sobryan@uab.edu

(No relevant relationships reported)

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 TNFR1 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 one low-intensity, concentric only day (HLH, n = 18) or 3 d/wk high-intensity training regimen (HHH, n = 18). Skeletal muscle biopsies were collected before and after 35 weeks of training in either HLH 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-NFkB, 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.

1505 Board #99 May 28 9:30 AM - 11:00 AM

Age-related Differences In Rapid Neuromuscular Parameters Of The Plantar Flexors And Correlations With Physical Function

Phuong L. Ha, Alex A. Olmos, Matthew T. Stratton, Trisha A. VanDusseldorp, Alyssa R. Bailly, Yuri Feito, FACSM, Gerald T. Mangine, Benjamin E. Dalton, Tyler M. Smith, Garrett M. Hester. *Kennesaw State University, Kennesaw, GA.* (Sponsor: Yuri Feito, FACSM)

(No relevant relationships reported)

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, and examine correlates of physical functioning. **METHODS:**Twenty-nine healthy, MM (n=14; 45.3±2.6 yrs) and OM (n=15; 65.3±3.2 yrs) performed fast, isotonic (IT) contractions with a load of 0.5 Nm and slow, isokinetic (IK; $60°\cdot s^{-1}$) concentric 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_{IT}), and rate of electromyography rise (RER) were obtained from IT trials. During the IK trials, time to peak torque (TPT) and rate of velocity development (RVD_{IK}) were acquired. 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:**$RVD_{IT}$was lower (MM=5202.83±510.23 vs. OM=4630.29±854.23$°\cdot s^{-2}$; p=0.037), and 5CR time greater (16%; p=0.022) in OM.RER was only correlated (r=0.431; p=0.026) with RVD_{IT}. Only PV (r=0.396; p=0.033) and RVD_{IT}(r=0.480;p=0.008) were correlated with MWV, while only TPT was correlated with 5CR time (r=0.451; p=0.014). **CONCLUSIONS:**Our findings suggest that rapid neuromuscular measures may be differentially influenced by age, and only particular parameters are associated with physical function.

1506 Board #100 May 28 9:30 AM - 11:00 AM

Poor Handgrip Strength And Risk Of Falls In Older Women

Silvia Neri[1], Ricardo Lima[1], André Gadelha[2], Baruch Vainshelboim[3]. [1]*University of Brasilia, Brasilia, Brazil.* [2]*Federal Institute Goiano, Urutaí, Brazil.* [3]*Stanford University, Palo Alto, CA.*
Email: silvia_grn@hotmail.com

(No relevant relationships reported)

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) (<0.56) 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.
CONCLUSIONS: 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.

1507 Board #101 May 28 9:30 AM - 11:00 AM

Regular Exercise Training Decreases Circulating Myostatin In Older Overweight Women At Rest And In Response To Acute Exercise

Melissa M. Markofski[1], Rachel M. Graff[1], Maria A. Cardenas[2], Michael Levitt[2], Carmen Cook[2], Kristofer Jennings[3], Melody D. Phillips, FACSM[2]. [1]*University of Houston, Houston, TX.* [2]*Texas Christian University, Fort Worth, TX.* [3]*University of Texas Medical Branch, Galveston, TX.*
Email: mmarkofs@central.uh.edu

(No relevant relationships reported)

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 $kg\bullet m^{-2}$; 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: BMI did not change (p>0.05). GDF8 was higher (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.

1508 Board #102 May 28 9:30 AM - 11:00 AM

Associations Among Physical Activity, Protein Intake, And Clinical Indicators Of Sarcopenia

Courtney P. Kemper, Daniel J. Canter, Benjamin N. Miller, Kelsie O. Newton, M Elizabeth Miller, Kyle L. Timmerman, FACSM. *Miami University, Oxford, OH.*

(No relevant relationships reported)

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 (wSMI), 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±6years) gait speed, grip strength (dynamometer), body composition (bioelectrical impedance), and habitual physical activity (7-day accelerometry) were measured. wSMI [skeletal muscle mass (SMM)÷body mass (BM)] 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 utlized to examine the relationships among variables of interest. Significance was set to $\alpha < 0.05$. **RESULTS:** Mean values were SMM: 28±6 kg; wSMI: 0.4±0.1; GRIP: 28±9 kg; 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 protein/kg body mass. MOD PA was significantly ($p < 0.05$) correlated with wSMI ($r = 0.28$), PBF ($r = -0.25$), 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 wSMI ($r = 0.29$, $p = 0.11$). GAIT was significantly correlated with activity counts per minute ($r = 0.23$), PBF ($r = -0.47$), wSMI ($r = 0.45$). GRIP was significantly correlated with SMM ($r = 0.40$). **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.

1509 Board #103 May 28 9:30 AM - 11:00 AM

Skeletal Muscle Fiber Type In Older Patients Receiving Maintenance Hemodialysis Treatment

Donny F. Gregg[1], James R. Bagley[1], Steven B. Machek[1], Khin N. Chan[2], Yiming Lit[2], Yu Chen[2], Irene Tobias[3], Andrew J. Galpin[3], Jonathan N. Myers[2], Ralph Rabkin[2]. [1]*San Francisco State University, San Francisco, CA.* [2]*VA Palo Alto Health Care System/Stanford University, Palo Alto, CA.* [3]*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, IIa/IIx, I/IIa/IIx, and I/IIx) which display unique functional/metabolic properties associated with disease and inactivity. Previous investigations have utilized ATPase 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 MHD 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% I/IIa/IIx, 2% I/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% I/IIa/IIx, 2% I/IIx, and 11% IIx. Rarely identified MyHC I/IIx fibers were found in two MHD patients.

1510 Board #104 May 28 9:30 AM - 11:00 AM

Muscle Power Mediates The Relationship Between Physical Activity And Functional Fitness In Older Women

Vera Zymbal[1], Luis Carrasco[2], Borja Sañudo[2], Diana Luís[1], Filomena Carnide[1], Fátima Baptista[1]. [1]*University of Lisbon, Lisbon, Portugal.* [2]*University of Seville, Seville, Spain.*
Email: verazymbal@fmh.ulisboa.pt

(No relevant relationships reported)

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 73.5±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 ($\beta = 0.040$ 95% CI [0.010, 0.099]) and in each of the functional fitness parameters: lower body strength ($\beta = 0.048$, 95% CI [0.013, 0.117]), agility/dynamic ($\beta = -0.009$, 95% CI [-0.024, - 0.002]) and aerobic endurance ($\beta = 0.656$, 95% CI [0.146, 1.694]). 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.

1511 Board #105 May 28 9:30 AM - 11:00 AM

Early Life Muscle Disuse Causes Premature Dynapenia In Adulthood

Paul T. Reidy[1], Emory Perlman[1], Ryan Schmidt[1], Abbas Doctor[1], Jackie Monnig[1], Ziad Mahmassani[2], Dennis Fix[2], Alec McKenzie[2], Jonathan Petrocelli[2], Naomi de Hart[2], Micah Drummond[2]. [1]*Miami University, Oxford, OH.* [2]*University 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 skeletal 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. Pooled 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 dynopenia (muscle weakness) as a result of early life muscle disuse are concerning. Supported by NIA R01AG AG050781

1512 Board #106 May 28 9:30 AM - 11:00 AM

Statin Therapy Does Not Limit Improvements In Mitochondrial Function And Cardiorespiratory Fitness Following Moderate Exercise

Jill M. Slade, FACSM, David M. Hurley, George S. Abela, Ronald A. Meyer. *Michigan State University, East Lansing, MI.*
Email: jslade@msu.edu

(No relevant relationships reported)

INTRODUCTION: Statin medications are widely used to reduce major cardiovascular risk factors and events, but have also been reported to reduce cardiorespiratory 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 randomized graded treadmill walking intervention (EX) with roughly half the group on statin therapy (+statin). ^{31}P 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 (VO_2 peak) was measured during a modified Balke exercise stress test. Repeated measures ANOVA was used to assess changes in muscle oxidative capacity and VO_2 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% (Pre: 40.3±29.6s; Post: 29.6±10.4s) for EX compared to CON (Pre: 35.5±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 a 25.3% for EX-statin. VO_2 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.

1513 Board #107 May 28 9:30 AM - 11:00 AM

Sex, But Not Age, Associates With Whole Muscle Carnosine Content Of Trained Men And Women

Eimear Dolan[1], Paul A. Swinton[2], Luana Farias de Oliveira[1], Nathalia Saffioti Rezende[1], Bruna Caruso Mazzolani[1], Giulia Cazetta Bestetti[1], Fabiana Infante Smaira[1], Alina Dumas[1], Pedro Perim[1], Luiz Riani[1], Bruno Gualano[1], Bryan Saunders[1]. [1]*University of Sao Paulo, Sao Paulo, Brazil.* [2]*Robert Gordon University, Aberdeen, United Kingdom.*
Email: eimeardol@gmail.com

(No relevant relationships reported)

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 percentage inclusion in 10000 bootstrap samples. **RESULTS:** Sex (91% of models) and sum of skinfolds (69% of models), but not age (52% of models), training habits (13-30% of models), nor exercise test performance (4-45% of models), predicted MCarn. The LASSO model estimated women to have a median reduction of ~two units compared to men (-1.8, 95%CrI: -5.2 – 0)), while each 2SD increase in the sum of skinfolds resulted in an MCarn decrease of approximately 1 unit (-0.8; 95%CrI: -5.6 – 0). Repeating the model with men only identified no relevant associations (≤37% of models) on MCarn. **CONCLUSION:** Sex and body composition, but not age nor performance outcomes, had very small associations with whole muscle MCarn in a group of trained cyclists. These results imply that habitual training may reduce previously reported impacts of age on MCarn content (at least across the 4 decades investigated in this study). In contrast, women had lower MCarn content than men, even though their type and volume of training was similar.

C-40 Free Communication/Poster - **Assessment of Physical Activity and Sedentary Behavior**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

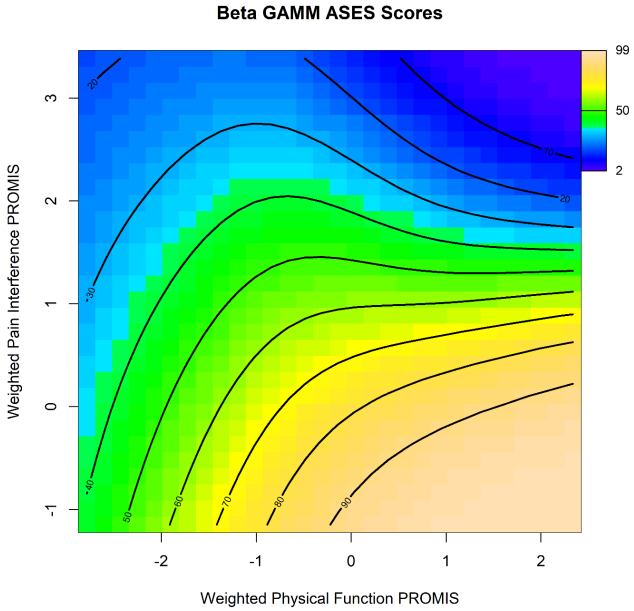
1514 Board #108 May 28 10:30 AM - 12:00 PM

Nonlinear Models And Computer Adaptive Testing Can Decrease Orthopedic Patient Survey Burden

Matthew S. Tenan, FACSM[1], Timothy Mauntel[2], Jonathan Dickens[2]. [1]*Optimum Performance Analytics Associates, Apex, NC.* [2]*Walter Reed National Military Medical Center, Bethesda, MD.*
Email: matt@optimumanalytics.org

(No relevant relationships reported)

The National Institutes of Health Patient Reported Outcomes Measurement Information System (PROMIS) computer adaptive tests (CATs) assess patient symptom level in fewer questions than legacy patient reported outcomes (PRO). While there are benefits to CATs, clinicians commonly desire legacy PROs where they have an existing knowledge base. The American Shoulder & Elbow Surgeons score (ASES) is commonly used to assess shoulder function; it is unknown if PROMIS measures can predict ASES scores.
PURPOSE: Design a nonlinear model using PROMIS CATs to predict ASES scores. **METHODS:** Military Health System beneficiaries who underwent a shoulder surgery and consented to allow their clinical data be used for research (n=897) completed the ASES, PROMIS Physical Function, and PROMIS Pain Interference at varying time points, providing 1,471 complete observations. PROMIS Physical Function and Pain Interference surveys were modeled as these are the theoretical constructs the ASES evaluates. For the prediction models, PROMIS CAT scores were re-weighted based on the standard error of the score, reflecting the confidence in the score, via inverse-variance reweighting. A beta distribution Generalized Additive Mixed Model (GAMM) accounted for multiple observations while incorporating nonlinear 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 R^2 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, R^2 = 0.55-0.58, and RMSE = 13.4-14.2. **CONCLUSIONS:** PROMIS CATs, in conjunction with nonlinear predictive modeling, can reliably predict legacy PRO scores. PROMIS CATs reduce patient question burden and can provide clinicians the information they are accustomed to receiving from legacy PROs.



1515 Board #109 May 28 10:30 AM - 12:00 PM

Comparison Of Parent Self-reported Physical Activity And Accelerometry Among Racially/ethnically Diverse Young Children

Junia N. de Brito[1], Allan Tate[2], Katie A. Loth[1], Jerica M. Berge[1]. [1]*University of Minnesota, Minneapolis, MN.* [2]*University of Georgia, Athens, GA.* (Sponsor: Matthew Buman, FACSM)
Email: nogue013@umn.edu

(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 accelerometry (ActiGraph GT1M) 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 accelerometry, 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 accelerometry were 3, 2.8, 2.3, and 30±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 0.03, 0.25, and 0.22, respectively. The relationship between self-reported and objective PA were similar between girls and boys (all *P*-interaction > 0.1). Accelerometer-measured MVPA revealed 23.8% of children met the U.S. PA guidelines.
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 survey tool, and the sporadic nature of PA behaviors in young children might explain these findings. When accelerometry 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.

1516 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. *Texas 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 participants (age = 26.7±5.9 yrs, ht = 169.9±10.4 cm, wt = 77.0±17.8 kg) wore a chest-strap heart rate (HR) monitor (CS), five wrist activity monitors (GV, AL, and PL on the right wrist, FH and MF on the left wrist), and a pedometer (HJ) on the right waist. Participants 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 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 (294.0±22.4), p<0.05, with error greatest in the PL (13.7%) and AL (14.5%), and least in GV (5.5%) and HJ (6.9%). Ascending counts: PL (73.2±32.4 counts) and AL (92.1±18.8 counts) were significantly lower than AC (106.2±5.0 counts), p<0.05, with error greatest in the PL (34%) and AL (13%) and least in GV (7.5%) and MF (7.8%). Descending counts: MF (97±5.0 counts) and PL (67.9±33.9 counts) were significantly lower than AC (101.8±2.9 counts), p<0.05, with error greatest in the PL (39.5%) and GV (7.7%), and least in MF (3.5%) and HJ (5.0%). Heart Rate: GV (116.1±13.4 b/min) was significantly greater than CS (107.0±19.8 b/min) while walking (p<0.05), GV (130.5±18.5 b/min) and FH (137.1±18.6 b/min) was significantly lower than CS (143.7±18.7 b/min) while ascending (p<0.05), and GV (117.9±15.6 b/min) was significantly greater than CS (110.8±19.7 b/min) while descending (p<0.05). **CONCLUSION**: The HJ and GV provides the most accurate step count across conditions, and MF provides the most accurate HR across conditions. One should account for type and intensity of activity when considering use of wrist-worn activity monitors.

1517 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[2], Hannah Sophia Vasconcelos Bezerra Silva[1], Allana Mendonça Martins Santos[1], Marcos Antonio Almeida-Santos[1]. [1]*Tiradentes University, Aracaju, Brazil.* [2]*Federal University of Sergipe, Aracaju, Brazil.*
Email: lucas1324@gmail.com

(No relevant relationships reported)

Nowadays, running as a hobby and component of exercise routines has become increasingly popular due to its proven health effects. Therefore, the number of injuries caused by this exercise method has increased substantially amongst recreational and professional runners. Medial tibial stress syndrome (MTSS)is among the most commonly noted injuries, after excluding pains of ischemic origin and stress fractures as a source of posteromedial tibial pain. **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. Kinovea® software was used to analyse the videos. An FPX25 digital algometer (Greenwich, USA)was used to measure the pre- and post-race pain areas. The data gathered were structured into a statistical mixed prediction model of runner speed alteration based on multiple fixed variables. **RESULTS:** Runners with MTSS had an average running speed 0.55 km/h ±0.27 (p<0.01)lesser than that of runners with MTSS. Moreover, the strength of the quadriceps femoris (average less 61,7 Kgf; p<0.01)and hip external rotators (average less 61,6 Kgf; p<0.03)muscular groups was lower among the runners with MTSS. **CONCLUSION:** The average speed of the runners with MTSS is lesser than that of the healthy runners. The strength of the quadriceps femoris and hip external rotators is reduced in runners with this syndrome, suggesting that focused treatment of the weakened muscles could be one way of accelerating recovery.

TABLE: Prediction model of runner speed alteration based on multiple fixed variables.

	Speed	Std. Error	t	p-Value	95% conf. interval
V2*	+2.94 Km/h	±0.14	21.41	0.00	2.67 to 3.22
V3*	+5.91 Km/h	±0.25	23.78	0.00	5.42 to 6.41
MTSS group†	-0.55 Km/h	±0.27	-2.07	0.005	-1.09 to -0.1
Baecke's scores†	+0.24 Km/h	±0.08	2.90	0.005	0.07 to 0.41
Age†	+0.02 Km/h	±0.01	1.42	0.16	-0.01 to 0.04
Male ‖	+0.33 Km/h	±0.27	1.24	0.22	-0.20 to 0.87

* reference: V1; † reference: Control Group; ‖ Reference: Female.

1518 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]. [1]*The Ohio State University, Columbus, OH.* [2]*Nationwide 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 MVPA" and "On average, how many minutes per day did you participate in MVPA". 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 of was 13.91±2.49 years, average BMI percentile was 65.50±27.74, 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 MVPA was 4.31±1.68. Approximately 5% of patients reported 0 days of MVPA/week, whereas only 6% of patients reported daily MVPA. Females reported .48 less days of MVPA per week (p<.001). Those with a history of depression reported .59 less days of MVPA than those without a history of depression (p<.001). Those with a history of ADHD reported .23 days less of MVPA when compared to those without ADHD (p<.001). Older children completed more days of MVPA (p<.001). **Discussion:** The current MVPA recommendations require 60 minutes of daily MVPA for all school aged children. The vast majority of children in our study were not participating in MVPA 7 days per week. All children should be screened for MVPA to identify and counsel those who are not active daily

to ensure that they gain all the benefits from physical activity. Assessment of total weekly activity should be compared to daily activity to evaluate which factor is more important for reaping the benefits of children's physical activity.

1519 Board #113 May 28 10:30 AM - 12:00 PM

Validity Of Optical Heart Rate Measurement In Commercially Available Wearable Fitness Devices

Jason Wesley Thomas, Patrick Doyle, Phung Tran, Robert Tippett, Jr, Shreya Kulkarni, Joshua Rogers, J. Andrew Doyle. *Georgia State University, Atlanta, GA.*
Email: jthomas31@student.gsu.edu
(No relevant relationships reported)

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 (Wlk), 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, Wlk, and Run were all 7-minute protocols with 1 minute of standing, 5 minutes of prescribed intensity, and 1 final minute of standing. The Dyn protocol was a 12-minute protocol with 1 minute of standing, 10 minutes of variable intensity walking and running, and 1 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 ± .12 m, weight = 73.0 ± 14.3kg, BMI = 25.1 ± 2.8 kg/m^2 and body fat 22.6 ± 11.2%. Mean Absolute Deviation (MAD), and Mean Average Percentage Error (MAPE) 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 (Beats Per Minute)			Mean Absolute Percentage Error (%)		
	OH1	FR945	AW4	OH1	FR945	AW4
Sedentary	1.56	2.29	1.48	2.00	3.02	2.02
Walk	2.95	4.74	2.00	3.15	4.96	2.24
Run	4.41	7.48	5.64	3.31	5.19	3.99
Dynamic	2.58	7.59	3.15	1.92	5.17	2.39

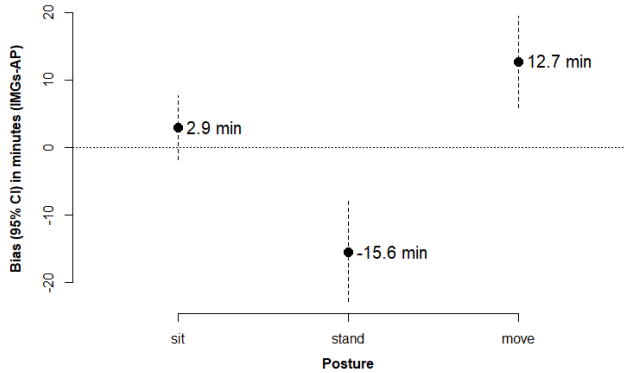
1520 Board #114 May 28 10:30 AM - 12:00 PM

Comparing Posture Classifications From Wearable Camera Still-images To Accelerometry

Julian Martinez[1], Autumn E. Decker[1], Chris C. Cho[1], Ann M. Swartz, FACSM[1], John Staudenmayer[2], Scott J. Strath, FACSM[1]. [1]*University of Wisconsin-Milwaukee, Milwaukee, WI.* [2]*University of Massachusetts-Amherst, Amherst, MA.*
Email: marti994@uwm.edu
(No relevant relationships reported)

Purpose: 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) wore an AP monitor at the right anterior-mid-thigh and an Autographer wearable camera (WC) above the xiphoid process during two or three, 2hr visits. WC was set to capture IMGs every 5-60 sec. IMGs were annotated with the Oxford Image Browser software for 3 postures that matched AP classifications: sitting, standing and movement. 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 1375 min. Mean overall percent agreement including events and transitions was 72%, while mean event percent agreement was 80%. Fig.1 shows bias and mean event posture min from AP, where bias was low for sitting but IMGs tended to underestimate standing and overestimate movement. From confusion matrices, IMGs misclassify standing as movement 46% of the time. **Conclusion:** Within events, IMGs annotated with the novel schema can differentiate sitting and upright postures. Future work is warranted to both improve posture classification and examine IMG accuracy and precision in assessing activity behavior. Supported by NIH 1R01CA215318

Fig.1. IMGs bias compared to AP mean posture times within events



* Mean posture min from AP for sitting=54.8', standing=26.9', and movement=24.0' *

1521 Board #115 May 28 10:30 AM - 12:00 PM

A Comparison Of Two Qualitative MVPA Scoring Protocols: Youth Met$_Y$ Cut-points Require Further Exploration

Eydie N. Kostecka, Daheia J. Barr-Anderson, FACSM. *University of Minnesota, Minneapolis, MN.* (Sponsor: Daheia J. Barr-Anderson, PhD, FACSM)
Email: krame640@umn.edu
(No relevant relationships reported)

Qualitative measures of activity have been traditionally described utilizing MET 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$_y$ 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$_y$ (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/MET$_y$ metrics 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.

1522 Board #116 May 28 10:30 AM - 12:00 PM

Paffenbarger Physical Activity Questionnaire (ppaq) For Chinese College Students: A Cross-validation Study

Panpan Chen[1], Hongjun Yu[1], Weimo Zhu, FACSM[2]. [1]*Tsinghua Univisity, Beijing, China.* [2]*University of Illinois, Urbana-Champaign, IL.*
Email: a1992chenpanpan@163.com

(No relevant relationships reported)

Purpose: To cross-validate PPAQ, a valididated 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 students' 7-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' 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.

1523 Board #117 May 28 10:30 AM - 12:00 PM

Accelerometer-derived Physical Activity Estimates And Daily Wear Time In Children

Wendy Y. Huang[1], Ruirui Xing[1], Stephen H.S. Wong, FACSM[2]. [1]*Hong Kong Baptist University, Hong Kong, China.* [2]*The Chinese University of Hong Kong, Hong Kong, China.*
Email: wendyhuang@hkbu.edu.hk

(No relevant relationships reported)

Most of the studies applying the accelerometers to quantify physical activity (PA) and sedentary time (ST) require participants to wear the devices during waking hours only. There is no consensus on how many wearing hours are enough to reflect daily activity behavior in free-living conditions. Whether wear time has substantial impact on accelerometer-based estimates remains unclear. **PURPOSE**: To examine whether accelerometer-derived metrics were dependent on daily wear time. **METHODS**: Baseline data from 120 children (24.2% boys) aged 8 to 11 years who participated in the longitudinal study on active travel were analyzed. They were instructed to wear an ActiGraph wGT3x accelerometry on the waist for 7 to 10 consecutive days, only removing it while swimming and bathing. Accelerometer-derived metrics included daily wear time, total activity counts (TAC), ST, light-intensity PA (LPA), moderate-intensity PA (MPA), vigorous-intensity PA (VPA), moderate-to-vigorous PA (MVPA), moderate-to-vigorous PA (MVPA) bouts ≥ 10 minutes (MVPA-10), and proportion of VPA within MVPA (%VPA). Linear mixed models were performed to examine the relationships of these metrics with daily wear time which was categorized into quarters. **RESULTS**: Majority of the children (96%) provided at least 3 valid accelerometer wear days (defined as ≥ 480 minutes of valid wear time per day), with a total of 797 valid wear days included in analyses. After adjustment for age, sex, and body mass index, none of the PA metrics was completely independent on wear time. A linear relationship was found between wear time and four PA metrics including TAC, MPA, LPA, and ST. However, MVPA estimates were comparable between the first (8 to 11 hours per day) and second quarters (11 to 13 hours per day) of wear time (mean ± standard error: 31.4 ± 1.8 vs 35.7 ± 1.8 minutes, NS). Similar results were found for MVPA-10, VPA, and %VPA. **CONCLUSIONS**: Accelerometer-derived PA metrics were largely dependent on wear time. MVPA minutes seem to be comparable across wear time of 13 hours per day or less. Comparisons of accelerometer-derived PA estimates between studies need to be cautious and taken into account of differences in wear duration.

1524 Board #118 May 28 10:30 AM - 12:00 PM

Attitudes And Perceptions Concerning Physical Activity Vary According To FITNESSGRAM BMI Classification In Youth

Anthony J. Clapp[1], John L. Walker, FACSM[2], Kevin W. McCurdy[2]. [1]*Augsburg University, Minneapolis, MN.* [2]*Texas State University, San Marcos, TX.*
Email: clapp@augsburg.edu

(No relevant relationships reported)

FITNESSGRAM has established criterion standards for body composition and body mass index (BMI) according to gender and age in children. Aerobic fitness has been shown to differ based on these classifications. **PURPOSE**: The purpose of this study was to determine the variation in attitudes, motivation, and barriers toward physical activity according to FITNESSGRAM BMI classification in youth. **METHODS**: Subjects were 1,643 boys and girls, ages 11-17 years, participated in the 2014 FLASHE Study, a national epidemiological survey of various health behaviors. BMI was calculated based on reported weight and height, and FITNESSGRAM classification was determined according to gender and age. Participants' responses regarding attitudes, motivation, and barriers toward activity were compared across FITNESSGRAM BMI classifications, categorized as either Very Lean or within Health Fitness Zone (HFZ) versus those participants in the Needs Improvement (NI) category. **RESULTS**: Participants classified as NI for BMI reported significantly less support from friends in being physically active (p = .04), greater dislike for sweating (p = .002), greater dislike for exercise (p = .008), greater dislike among family members regarding exercise (p < .001), lower self-perception of being athletic (p < .001), lower perception that physical activity would make them more attractive (p = .004), lower confidence in ability to exercise regularly (p < .001), lower perception that they were a healthy weight (p < .001), higher perception that they were being teased about their weight (p < .001), higher feelings of being left out (p < .001), and higher feelings of being isolated (p < .001) than participants classified as either Very Lean or within HFZ. **CONCLUSIONS**: Previous research has not investigated variations across FITNESSGRAM BMI classifications. These data suggest that youth classified as NI according to FITNESSGRAM BMI standards are less motivated, have less family support, and perceive copious barriers for being physically active than those classified as Very Lean or within HFZ. These findings are consistent with FITNESSGRAM classifications for aerobic capacity. Addressing the psychosocial aspects related to being physically active may be important for preventing and reversing the trending overweight and obesity among youth.

1525 Board #119 May 28 10:30 AM - 12:00 PM

Years Spent In Secondary Physical Education And Levels Of Physical Activity In College Students And Adults

Katherine A. Dockter, Ana B. Freire Ribeiro. *Augsburg University, Minneapolis, MN.* (Sponsor: Dr. Mark Blegen, FACSM)

(No relevant relationships reported)

Physical education requirements in the United States vary and are often left to local districts in each state to decide. Considering the relationship between physical activity and obesity and physical fitness with mortality, requirements relating to national recommendations appear important. Long term implications of participation in physical education are contradictory at best with the limited studies performed concluding conflicting results. **Purpose**: To examine the relationship between years of participation in physical education at a high school level and levels of physical activity and fitness in college students and adults. **Methods**: Forty-one participants ranging in age from 18-65 (mean age 33.6) were recruited utilizing an inter-collegiate mailing system. Participants completed a self-administered IPAQ long-form questionnaire as well as additional physical education related questions. Participants also completed a YMCA Step Test. **Results**: When comparing participant results to national recommendations for physical activity 6 of 41 met vigorous physical activity guidelines (14.6%), and 0 met guidelines for moderate physical activity. When adding in vigorous outdoor housework those meeting vigorous guidelines went up to 11 of 41 participants (26.8%), and when adding in moderate outdoor and indoor housework those meeting moderate guidelines went up to 4 of 41 (9.7%). Mean score of 4.5 on the YMCA Step Test for all participants was between below average and poor with a standard deviation of nearly two scoring levels. No significant relationships were found when comparing time spent in physical education classes (required or total) to recalled moderate physical activity and fitness levels in college students and adults, while a significant relationship was seen when comparing the time spent in physical education classes (required and total) to recalled vigorous physical activity and fitness levels in college students and adults (p=0.02). **Conclusion**: Further study to examine the relationship between physical education and long-term physical activity is needed with particular attention being paid to physical education requirements and their variances.

1526 Board #120 May 28 10:30 AM - 12:00 PM

Impact Of Online Time And Physical Activity Participation On Waist-to-hip Ratio Of College Students

Zhigang Yang[1], Weimo Zhu, FACSM[2]. [1]*Fudan University, Shanghai, China.* [2]*UIUC, Champaign, IL.*
Email: yangzhigang@fudan.edu.cn

(No relevant relationships reported)

Purpose: Internet has become an important part of college students' life, through which they learn, chat, read, write, and shop etc. As a result, they spent little time doing physical activity (PA), but lots of sitting in front of their laptops or smartphones. Yet, the relationship among their online time, PA time and waist-to-hip ratio (WHR), a commonly used health risk measure, has not been determined. The purpose of this study was to examine these relationships.
Methods: A total of 1,144 college students (M±SD of Age: 20.57±3.42 yr.; Males = 53.8%) from a major Chinese university were recruited for the study and their waist circumference (WC) and hip circumference (HC) were measured. In addition, daily online time (DOT), weekly online time (WOT), weekly PA frequency (WPAF), daily PA time (DPAT), weekly PA time (WPAT) were measured by a self-report survey. WHR was computed and its relationship with online and physical activity time was analyzed using the Spearman's correlation analyses.
Results: The relationships among WC, HC, WHR, DOT, WOT, WPAF, DPAT, and WPAT were summarized below:

	DOT	WOT	WPAF	DPAT	WPAT	WC	HC
DOT							
WOT	1.000**						
WPAF	-.646**	-.646**					
DPAT	-.403**	-.403**	.538**				
WPAT	-.609**	-.609**	.902**	.829**			
WC	.618**	.618**	-.677**	-.454**	-.641**		
HC	.013	.013	-.173**	-.042	-.115**	.578**	
WHR	.754**	.754**	-.696**	-.511**	-.686**	.825**	.048

**= Correlation is statistically significant at p <0.01; WOT=DOT×7, WPAT=DPAT×WPAF
Conclusion: College students' WC and WHR were positively related to WOT and DOT and negatively related to their DPAT, WPAF and WPAT. Their WOT and DOT were negatively related to WPAF, DPAT and WPAT. Thus, it is very important and urgent to develop interventions to reduce their online time and increase their PA time.

1527 Board #121 May 28 10:30 AM - 12:00 PM

Comparing Sleep Pattern Estimates Of Different Monitor Methods

Karen K. Yagi, Alex Tolas, Rachel Barnett, Sarah Keadle. *California Polytechnic State University, San Luis Obispo, CA, San Luis Obispo, CA.* (Sponsor: Todd A. Hagobian, FACSM)
Email: kyagi@calpoly.edu

(No relevant relationships reported)

PURPOSE: Sleep quality and quantity are associated with an increased risk for chronic diseases, but many studies rely on self-report logs to assess sleep. Wearable devices estimate sleep quantity and quality, but it is not clear how these device estimates of sleep compare to self-report logs. The purpose of this study was to 1) compare sleep estimates collected by the devices and the self-report logs and 2) determine if estimates of sleep duration are different between individuals classified as "good" and "poor" sleepers. **METHODS**: In this cross-sectional observational study, participants (n=26, average age=30, 16 females) simultaneously wore devices on the wrist and thigh for seven consecutive days and tracked their wake and sleep times using a daily sleep log (SL). At the end of the 7-days, they completed the Pittsburgh Sleep Quality Index (PSQI) questionnaire, which classified their sleep quality as "good" or "poor." Repeated measures ANOVA and Pearson correlations were used to compare average sleep duration across monitors and an independent t-test was used to compare the sleep duration estimates between "good" and "poor" sleepers. **RESULTS**: There was a significant difference between the sleep duration estimates collected by the sensors (THIGH=557.8±78.5 min; WRIST=564.4±53.2 min) and the self-report logs (SL=492.2±43 min; PSQI=472±55.2 min) (p<0.0001). There was a strong significant positive correlation of 0.6 between the sleep duration estimates collected by the PSQI and the sleep log. Between "good" and "poor" sleepers, there was no significant difference in sleep pattern estimates. **CONCLUSIONS**: Sleep duration estimates collected by the sensors tended to be higher than self-report estimates. This difference may be due to bias in self-reporting sleep, or misclassification of lying time (e.g., watching TV) that is classified as sleep time by devices. Sleep duration estimates did 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.

1528 Board #122 May 28 10:30 AM - 12:00 PM

Energy Cost Of Selected Supine, Sitting, And Standing Sedentary Behaviors In Adults

Jiajia Liu, Yiyan Li, Minghui Quan, Jie Zhuang, Zhen-bo Cao, Zheng Zhu, Yongming Li, Barbara Ainsworth, FACSM. *Shanghai University of Sport, Shanghai, China.* (Sponsor: Barbara E Ainsworth, FACSM)
Email: hsdliujiajia@163.com

(No relevant relationships reported)

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 $ml \cdot kg^{-1} \cdot min^{-1}$ and heart rate in $b \cdot min^{-1}$ 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 positions (doing nothing, watching TV, reading, writing, texting, typing, fidgeting) for 5 min with a 2 min rest between behaviors. Mean ± SD were computed with data presented as mean METs computed as VO_2 $ml \cdot kg^{-1} \cdot min^{-1}$ / 3.5 $ml \cdot kg^{-1} \cdot min^{-1}$. Terminal digits for MET values were rounded to 0, 3, 5, or 8 to comply with format of the Compendium. **RESULTS**: Mean MET values are 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: 1.0); Writing (recline: 1.5, sit: 1.3, stand: 1.3); Texting (recline: 1.3, sit: 1.0, stand: 1.0); Fidgeting (sit hands only: 1.5, sit feet only: 1.8, stand hands & feet: 2.0); Typing (stand: 1.3). Of the measured MET values, seven were the same as the Compendium, four were lower (on the order of 0.3 to 0.8 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; Stand: write, text). Supported by the Shanghai University of Sport

1529 Board #123 May 28 10:30 AM - 12:00 PM

Classification Accuracy Of Wrist-worn Physical Activity Monitors Relative To Free-living Heart Rate

Simon Higgins, Emerson Bennett, Richard Blackmon. *Elon University, Elon, NC.* (Sponsor: Eric Hall, FACSM)
Email: shiggins8@elon.edu

(No relevant relationships reported)

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 milligravitational (mg) cut points of light <100.6, moderate 100.6 - <428.8, vigorous ≥428.8, and MVPA ≥100.6, and 2) activity counts across 1-, 15-, and 60-second epochs with count per minute (cpm) cut points of light 1514 - <2199, moderate 2199 - <4712, vigorous ≥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), 708.9 ± 914.7% (271.0 ± 113.9 mins), and 798.9 ± 1170.7% (280.3 ± 131.7 mins), for 1-, 15-, and 60-second epochs, respectively. **Conclusions:** Data processing utilizing raw triaxial data and ENMO appears to offer the most accurate PA intensity classification. However, all methods substantially misclassify activity relative to free-living HRR.

1530 Board #124 May 28 10:30 AM - 12:00 PM

Energy Cost Of Selected Household Physical Activities In Adults

Yiyan Li, Jiajia Liu, Minghui Quan, Jie Zhuang, Zhen-bo Cao, Zheng Zhu, Yongming Li, Barbara Ainsworth, FACSM. *Shanghai University of Sport, Shanghai, China.* (Sponsor: Barbara E. Ainsworth, FACSM)
Email: liyiyan0216@163.com

(No relevant relationships reported)

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 (PAs) in adults. **METHODS**: The energy costs of six meal-related, five household cleaning, and two other care PAs 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 VO_2 (ml/kg/min) and heart rate (beats/min) were measured with a Cosmed K4b^2 portable indirect calorimetry system. METs were computed as VO_2 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 up or down to reflect terminal digit values as presented in the 2011 Compendium (0, 3, 5, 8). 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 (2.3), clearing the table and washing dishes (2.0), folding and putting away laundry (2.0), putting away household items (3.0), major cleaning (3.0), sweeping sidewalk (3.0), watering 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**: Measured 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

1531 Board #125 May 28 10:30 AM - 12:00 PM

Validity And Reliability Of Two Brief Physical Activity Questionnaires In Adults With Obstructive Sleep Apnea

Anthony S. Kaleth, FACSM, Max W. Adolphs. *Indiana University-Purdue University Indianapolis, Indianapolis, IN.*

(No relevant relationships reported)

Efforts to encourage the medical community to prescribe exercise for disease prevention and management have increased significantly in recent years. In patients with obstructive sleep apnea (OSA), it is encouraging that exercise has been shown to improve sleep efficiency, daytime sleepiness, and disease severity. However, in order to better understand the dose-response relationship between exercise and OSA-related outcomes, accurate and reliable methods for assessing physical activity habits are needed. **PURPOSE**: To determine the validity and reliability of two self-report physical activity questionnaires [Physical Activity Vital Sign (PAVS); International Physical Activity Questionnaire-Short Form (IPAQ-SF)] in an OSA population. **METHODS**: 39 adults diagnosed with moderate-to-severe OSA [64% female; mean age (SD)=51.5 (9.5) yr; body mass index (BMI)= 39.1 (8.8) kg/m^2; apnea hypopnea index (AHI)=40.4 (29.4)] wore an accelerometer for 7 consecutive days and completed the PAVS and IPAQ-SF twice within 10 days. Criterion validity was evaluated using Pearson (r) correlation coefficients comparing the total number of min/wk of moderate-vigorous physical activity (MVPA) from PAVS and IPAQ-SF to accelerometry. Spearman rank correlation coefficients (ρ) were calculated to determine construct validity against self-reported measures (quality of life, daytime sleepiness, and treatment adherence) and BMI. **RESULTS**: PAVS and IPAQ-SF scores were reported as total min/wk of moderate-vigorous physical activity (MVPA). Test-retest reliability for MVPA was excellent for PAVS (ICC=0.98, p<0.01) and good for IPAQ-SF (ICC=0.77, p<0.01). Levels of MVPA from accelerometry strongly correlated with PAVS (r = 0.80; p<0.001) and moderately with IPAQ-SF (r = 0.57; p<0.001). Both PAVS (ρ = -0.273; p=0.05) and IPAQ-SF (ρ = -0.268; p=0.05) were significantly related to BMI, but no other variables. **CONCLUSIONS**: This study provides preliminary evidence that the PAVS and IPAQ-SF questionnaires have acceptable reliability and validity to assess physical activity levels in adults with OSA.

1532 Board #126 May 28 10:30 AM - 12:00 PM

Validity Of Accelerometry In Ambulatory Children And Young Adults With Cerebral Palsy

Ruirui Xing[1], Wendy Y. Huang[1], Ka Ho Lai[1], Cindy H. Sit[2]. [1]*Hong Kong Baptist University, Hong Kong, China.* [2]*The Chinese University of Hong Kong, Hong Kong, China.* (Sponsor: Stephen H.S. Wong, FACSM)
Email: rainiexing@hkbu.edu.hk

(No relevant relationships reported)

PURPOSE: This study aimed to validate five published ActiGraph (AG) cut-off points for the measurements of physical activity (PA) and sedentary time (ST) in ambulatory children and young adults with cerebral palsy (CP). Additionally, four energy expenditure (EE) prediction equations based on AG counts and activPAL (AP) steps were examined in this population, using oxygen uptake (VO_2) as the criterion. **METHODS:** Four male and six female participants with CP (GMFCS levels I-III, ages 9-21 years) completed seven activities while simultaneously wearing an AG, AP monitor and indirect calorimetry unit. VO_2 was measured on a breath-by-breath basis using the indirect calorimetry and was converted into EE using metabolic equivalents. AG counts were classified as sedentary, light PA (LPA) or moderate-to-vigorous PA (MVPA) using five cut-off points: Puyau, Evenson, Romanzini, Clanchy and Baque. The predicted EE was computed using three AG-based equations (Freedson, Trost and Treuth) and an AP step-based equation. The classification accuracies of the five AG cut-off points were assessed using Spearman correlation (r) and kappa (κ) coefficients. Agreements between measured and predicted EE values were assessed using paired-t tests, mean differences (95% confidence interval) and Bland-Altman plots. **RESULTS:** Of the five AG cut-off points, Baque (r = 0.896, κ = 0.773) and Clanchy (r = 0.935, κ = 0.721) classified PA and ST most accurately. All the equations overestimated EE during sitting activities and underestimated EE during rapid walking. Across all activities, the mean bias and 95% limits of agreement for the Freedson, Trost, Treuth and AP prediction equations were -0.05 METs (-2.15, 2.05), -0.28 kcal·min^{-1} (-2.18, 2.74), -0.54 METs (-2.37, 1.29) and 0.04 METs (-2.60, 2.68), respectively. The Freedson, Treuth and AP equations exhibited systematic bias during rapid walking, as their differences from the criterion measure increased progressively with increasing activity intensity. **CONCLUSION:** The AG accurately classified PA and ST when the Baque and Clanchy cut-off points were used. However, none of the available AG or AP equations accurately predicted the EE during PA and ST in children and young adults with CP. Further development is needed to ensure that both devices can estimate EE accurately in this population.

1533 Board #127 May 28 10:30 AM - 12:00 PM

Posture And Metabolic Syndrome Among Law Enforcement Officers

Marquell J. Johnson, Saori Braun, Michelle Hecimovich, Katrina Schultz. *University of Wisconsin - Eau Claire, Eau Claire, WI.* (Sponsor: David R. Bassett, Jr, FACSM)
Email: johnmarq@uwec.edu

(No relevant relationships reported)

Law enforcement officers job duties require high physical demands but also place them at greater metabolic syndrome risk due to frequent bouts of on-duty sedentary behavior. **PURPOSE**: To examine posture and metabolic syndrome risk among law enforcement officers. **METHODS**: Thirty-one participants aged 33.10 ± 9.78 years participated in the study. Law enforcement officers were asked to wear activity monitoring devices for 7-consecutive days during on-duty and off-duty times while also maintaining an activity log. At the end of monitoring period, participants had their metabolic risk factors measured using a finger-prick test after fasting for at least 10 hours prior. Metabolic syndrome was determined if participants had 3 of the 5 following criteria: waist circumference measurement > 89 centimeters for women or > 102 centimeters for men; serum triglycerides > 150mg/dL; high-density lipoprotein < 50mg/dL for women and 40mg/dL for men; blood pressure ≥ 130/≥85mmHg; and fasting glucose ≥ 100mg/dL. The ActivPal device measured posture for 18 participants who adhered to wearing the device for at least four days of the seven consecutive-day monitoring period. Descriptive statistics were used to determine means for all metabolic risk factors and to determine time spent in postural positions (sitting, standing, and stepping). **RESULTS**: 16.1% (n = 5) had three or more metabolic risk factors and 35.5% (n = 11) had two or more metabolic risk factors. Average on-duty sitting time was 6.77 ± 1.29 hours compared to off-duty sitting time of 5.20 ± 2.64 hours. Average on-duty standing time was 2.02 ± 0.70 hours compared to off-duty standing time of 1.65 ± 0.76 hours. **CONCLUSIONS**: Law enforcement officers may be at risk of developing metabolic syndrome and have unfavorable posture during a typical day.

1534 Board #128 May 28 10:30 AM - 12:00 PM

Predicting Oxygen Uptake From Accelerometer Output In Adults With Down Syndrome: Vector Magnitude Vs. Vertical Axis

Caleb Scott McCreary, Slater Richardson, Poram Choi, Supreete Ghosh, Anthony T. Allred, Stamatis Agiovlasitis, FACSM. *Mississippi State University, Starvkille, MS.* (Sponsor: Dr. Stamatis Agiovlasitis, FACSM)

(No relevant relationships reported)

Adults with Down syndrome (DS) have altered movement patterns. Especially during walking, their altered mediolateral and anteroposterior body motion predicts their elevated energy cost. Triaxial accelerometers provide a metric of three-dimensional acceleration—Vector Magnitude (VM) counts—which may better estimate the rate of oxygen uptake (VO_2) during physical activities and sedentary behaviors than the traditionally used Vertical Axis (VA) counts. **PURPOSE:** To examine if VM counts are more accurate than VA counts in estimating VO_2 across different physical activities and sedentary behaviors in adults with DS. **METHODS:** Sixteen 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 $m \cdot s^{-1}$. We measured VO_2 with a spirometer ($K4b^2$, 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 VO_2 from VA or VM. We evaluated the fit of models with the R^2, and accuracy with Bland-Altman plots and absolute percent error which was compared between models across tasks using within-subject (method-by-task) ANOVA and follow-up paired-samples t-tests. **RESULTS:** Both VM and VA significantly predicted VO_2 in separate models (p <0.001; R^2 = 0.74 and 0.65, respectively). Across all tasks combined, absolute percent error was lower for the VM than the VA model (23.7 ± 26.2 and 33.6 ± 35.9, respectively). 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 ($p \leq 0.004$), 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 $ml \cdot kg^{-1} \cdot min^{-1}$, respectively). **CONCLUSION:** Both VA and VM counts predict VO_2 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 R15HD098660

1535 Board #129 May 28 10:30 AM - 12:00 PM

Comparison Of Total MVPA Versus MVPA In Bout Of At Least 10 Minutes In Adults With Obesity.

Ronald E. Jackson, Renee J. Rogers, FACSM, Nalingna Yuan, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John M Jakicic, FACSM)
Email: rjackson0410@yahoo.com

(No relevant relationships reported)

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 of ≥10 minutes.
Methods: Baseline data from 377 adults with obesity (age=45.5±8.0 years; BMI=32.2±3.8 kg/m^2) 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 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.
Results: Median minutes of total MVPA was 244 (25th, 75th percentiles: 118.0, 458.0) min/week. Median minutes of MVPA in bouts ≥10 minutes was 103 (25th, 75th percentiles: 27.5, 232.5) min/week. Both total MVPA (-0.327, p<0.001) and MVPA in bouts ≥10 minutes (-0.275m p<0.001) were correlated with BMI using the Spearman Rank Order procedure. The proportion of adults engaging in ≥150 min/week meeting was 67.4% when total minutes of MVPA was considered and 39.8% when minutes of MVPA in bouts ≥10 minutes was considered.
Conclusion: The proportion of adults with overweight or obesity meeting the recommended 150 minutes per week of MVPA will vary based on whether total MVPA or MVPA in bouts ≥10 minutes is used to determine engagement. However, both total MVPA and MVPA resulting from bout ≥10 minutes may contribute to a lower BMI. These findings may have implications for evaluation of and recommendations for MVPA that may impact body weight regulation.

1536 Board #130 May 28 10:30 AM - 12:00 PM

Comparison Of Physical Activity Scale For Individuals With Physical Disabilities And Accelerometry In Arthritic Individuals

Autumn E. Decker, Julian Martinez, Chris C. Cho, Ann M. Swartz, FACSM, Scott J. Strath, FACSM. *University of Wisconsin-Milwaukee, Milwaukee, WI.*
Email: aedecker@uwm.edu

(No relevant relationships reported)

Purpose: To compare physical activity (PA) estimates from the PA Scale for Individuals with Physical Disabilities (PASIPD) to accelerometer data in individuals with arthritis. **Methods:** Adults aged 64-88y, a sub-sample recruited for a larger protocol, and self-reported with arthritis 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 PALstudio (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 PAISPD 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=.014.* AP LPA and PASIPD LPA, and AP MVPA and PASIPD MVPA were significantly correlated, Spearman's rho of .436; *p=.012,* and .435; *p=.012,* respectively. On average, PASIPD underestimated AP LPA by 1.38 hours (p=.024) and overestimated AP MVPA by 1.34 hours (p<.0001). **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 1R21HD080828 and NIH 1R01CA215318

1537 Board #131 May 28 10:30 AM - 12:00 PM

Objectively Measured Association Between Air Pollution And Physical Activity In College Students In Beijing

Hongjun Yu[1], Yin Wu[1], Miao Yu[2], Weimo Zhu, FACSM[3]. [1]*Tsinghua University, Beijing, China.* [2]*Renmin University of China Libraries, Beijing, China.* [3]*University of Illinois at Urbana-Champaign, Urbana, IL.* (Sponsor: weimo zhu, FACSM)
Email: yuhj12@mail.tsinghua.edu.cn

(No relevant relationships reported)

PURPOSE: To examine the association between hourly air pollution on hourly physical activity (PA) among college students in Beijing, China.
METHODS: A total of 340 participants (70.58% male) were recruited from the Tsinghua University, in Beijing, China. Accelerometers provided PA measures, including moderate-to-vigorous physical activity (MVPA), walking steps, energy expenditure for 7 consecutive days. Corresponding air pollution data by the Beijing Municipal Ecological Environment Bureau in the closed site (Wan Liu site) in Tsinghua University were collected including average hourly air quality index (AQI) and PM2.5 ($\mu g/m^3$). Associations were estimated using linear individual fixed-effect regressions.
RESULTS: A one level increase in hourly air quality index (AQI) was associated with an reduction in one-hour PA by 0.083 (95% confidence interval [CI] =-0.137, -0.029) minutes of MVPA, 8.822 (95% CI = -15.028, -2.617) walking steps, 0.653 (95% CI =-1.033, -0.273) kcals of energy expenditure. A 10$\mu g/m^3$ increase in air pollution concentration in hourly PM2.5 was associated with a reduction in one-hour PA by 0.021 (95% confidence interval [CI] =-0.033, -0.010) minutes of MVPA, 2.232 (95% CI = -3.548, -0.916) walking steps, 0.170 (95% CI =-0.250, -0.089) kcals of energy expenditure.
CONCLUSIONS: Although there is a negative trend between air pollution and PA, their impact on college students in Beijing seems limited.

1538 Board #132 May 28 10:30 AM - 12:00 PM

Lower Physical Activity Following Days Of Supervised Training Sessions In Both Obese And Post-bariatric Participants

David L. Wenos, Kristen A. Byrne, Brittany L. Rood, Elizabeth S. Edwards, FACSM, Jeremy D. Akers, Trent Hargens, FACSM. *James Madison University, Harrisonburg, VA.*
Email: wenosdl@jmu.edu

(No relevant relationships reported)

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 ± 6.5] 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 activPALs 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.

1539 Board #133 May 28 10:30 AM - 12:00 PM

Does Reactivity To Accelerometry Occur In A Single Swimming Trial? A Randomized, Crossover Study

Cosme Franklim Buzzachera[1], Luca Correale[1], Mariangela Valentina Puci[1], Carlo Ferri Marini[2], Marco Del Bianco[1], Giulia Liberali[1], Erwan Codrons[1], Vittoria Carnevale Pellino[1], Andrea Gomes Bernardes[3], Matteo Vandoni[1]. *[1]University of Pavia, Pavia, Italy. [2]University of Urbino Carlo Bo, Urbino, Italy. [3]North University of Paraná, Londrina, Brazil.* (Sponsor: Laura Guidetti, FACSM)
Email: cosme@hoquei.com.br

(No relevant relationships reported)

PURPOSE: Recent research has suggested that awareness of being monitored can influence the habitual physical activity behaviour of participants. This reactivity effect appears to also occur in single bouts of physical activity. However, it is presently unknown whether this acute reactivity effect exists in aquatic environments. The purpose of this study was, therefore, to test the hypothesis that reactivity would also occur in water-based studies. **METHODS**: Fifty-six healthy, recreational swimmers (31 men, age 22 ± 2 yr; 25 women, age 22 ± 1 yr) volunteered to participate in this ethically approved study. On two separate occasions, the participants randomly completed a 20-min swimming bout at a self-selected pace wearing (A) or not wearing (NA) a head-mounted accelerometer. Evidence of reactivity was defined as a statistically significant change in swimming distance covered (in m) in the A condition compared with the NA condition. Situational motivation, perceived performance, and perceived exertion were also assessed in both A and NA conditions. **RESULTS**: Swimming distance covered was longer (829 ± 202 vs. 811 ± 204 m) and perceived exertion was more strenuous (13.0 ± 2.4 vs. 12.2 ± 2.1) during the A condition compared with the NA condition ($P < 0.05$). Perceived performance and situational motivation were not significantly different between conditions ($P > 0.05$). **CONCLUSIONS**: These results indicate that the acute reactivity effect is likely to be present in aquatic environments and may threaten the internal validity of physical activity assessments in water-based studies.

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A Tailored Multiple Imputation Approach To Handle Arbitrarily-Missing Accelerometer Data In A Randomized Controlled Trial

Diego J. Arguello, Gregory Cloutier, Dinesh John. *Northeastern University, Boston, MA.*

(No relevant relationships reported)

Common applications of Multiple Imputation (MI) are too generic, yielding highly variable and nonreplicable results. **PURPOSE**: Evaluate a tailored MI approach for handling missing physical behavior (PB) outcome summaries (e.g., sitting time) due to accelerometer non-wear in an RCT and its impact in estimating time spent in PBs. **METHODS**: A missing data simulation was conducted from a complete subsample (N=39) of accelerometer data collected for 7-days at the start and end of a yearlong RCT. Data from 3 PB variables (sitting, standing and stepping time) were randomly deleted for 3 study groups at each timepoint to generate 10 datasets per group × timepoint with arbitrarily missing data (8-77%) in increments of 8%. A tailored MI approach was used for missing data where: i) each variable was imputed separately using unique correlated auxiliary variables, and ii) the number of imputations necessary to produce replicable and stable parameter estimates and standard errors were computed for each imputation model. Statistical differences in parameter estimates from univariate timepoint and repeated measures mixed model analyses between imputed and complete datasets were tested with paired sample T-tests and two-tailed Z scores, respectively. Errors (%) in parameter estimates relative to the complete dataset were calculated to quantify the magnitude and variability of the bias. **RESULTS**: The tailored MI approach produced unbiased parameter estimates and standard errors in both univariate timepoint and change analyses in sample sizes as small as N=13 with up to 54% missing data. Error and variability in parameter estimates increased exponentially above the 54% threshold in both univariate (mean % error ± SD: *above threshold* = 31 ± 10%, *below threshold* = 11 ± 4%) and change analyses (mean % error ± SD: *above threshold* =465 ± 98%, *below threshold* = 175 ± 55%). **CONCLUSIONS**: To our knowledge, this tailored approach is the most robust MI methodology to date for imputing incrementally missing accelerometer-based summary PB data in an RCT. Prior PB MI simulations yielded lower acceptable missing data thresholds (≤ 30%) in larger sample sizes (N ≥ 20), and did not test the impact on analyzing change between repeated measures. Tailoring MI to restore lost statistical power may prevent conservative estimates of the treatment effects in PB RCTs.

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Validity Of Physical Activity Measured By Proxy-response Questionnaire In Adults With Intellectual Disability

Poram Choi[1], Robert W. Motl[2], Stamatis Agiovlasitis, FACSM[1]. *[1]Mississippi State University, Mississippi State, MS. [2]University of Alabama at Birmingham, Birmingham, AL.* (Sponsor: Stamatis Agiovlasitis, FACSM)
Email: pc839@msstate.edu

(No relevant relationships reported)

Proxy-response questionnaires are widely used to measure physical activity (PA) and sedentary behaviors in adults with intellectual disability (ID). However, there are limited studies documenting the validity of this measurement approach in adults with ID.
PURPOSE: This study examined the validity of physical activity and sedentary behavior measured by a proxy-response questionnaire against accelerometry in adults with ID.
METHODS: Sixty adults with ID (30 men and 30 women; age 44 ± 14 years) wore an accelerometer (ActiGraph, wGTX-BT) for 7 consecutive days. Caregivers or family members of participants completed the International Physical Activity Questionnaire-Short Form (IPAQ-SF) regarding PA and sedentary behavior for the last 7 days. Spearman's correlation coefficient estimated the degree of association between IPAQ-SF and accelerometer measurements. The level of agreement between measurements was compared with absolute error and using Bland-Altman plots.
RESULTS: There was no significant correlation for moderate PA, vigorous PA and sedentary time between two methods (r = 0.01 - 0.23, p >.05). The Bland-Altman plots indicatd that caregivers and family members reported less sedentary time (-107 min day^{-1}) and more moderate (+36 min day^{-1}) and vigorous PA time (+26 min day^{-1}) compared with the accelerometer measurement. Caregivers and family members underestimated moderate PA days (-1 days week^{-1}) and overestimated vigorous PA days (+0.75 days week^{-1}). The absolute error estimates for moderate PA, vigorous PA, and sedentary time were 48.2 ± 75.1%; 26.5 ± 32.6%; and 237.5 ± 127.2%, respectively. The 95% limits of agreement for moderate PA were −124.2 to 197 min day^{-1} and for vigorous PA - 46.6 to 81.3 min day^{-1}. The 95% limits of agreement for sedentary time were - 599 min day^{-1} to 378.3 min day^{-1}.

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.

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Physical Activity And Sedentary Time In Adults With Down Syndrome Estimated By Different Cut Points

Natalie L. King, Amber G. Cook, Supreete Gosh, Poram Choi, Stamatis Agiovlasitis, FACSM. *Mississippi State University, Mississippi State, MS.* (Sponsor: Dr. Stamatis Agiovlasitis, FACSM)
Email: nk504@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^{-1}, respectively; $p \leq 0.04$); (b) light PA did not differ between methods (345 ± 37, 336 ± 85, and 346 ± 73 min·day^{-1}, 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^{-1}, 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^{-1}, respectively; $p \leq 0.007$). 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

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Accelerometer Cut Points For Adults With Down Syndrome

Amber G. Cook[1], Natalie L. King[1], Poram Choi[1], Supreete Ghosh[1], Fabio Bertapelli[2], Stamatis Agiovlasitis, FACSM[1]. [1]*Mississippi State University, Mississippi State, MS.* [2]*University of Campinas, Sao Paulo, Brazil.* (Sponsor: Dr. Stamatis Agiovlasitis, FACSM)
Email: agc315@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 each lasting 6 min: sitting; playing app on tablet; drawing; folding clothes; sweeping; fitness circuit; moving a box; basketball; standing; and walking at the preferred speed and at 0.8 and 1.4 m·s^{-1}. We measured the rate of oxygen uptake with portable indirect calorimetry (K4b^2, Cosmed) and expressed it in Metabolic Equivalents (METs). Output from a triaxial accelerometer (wGT3X-BT, Actigraph) worn on the non-dominant hip was determined as Vector Magnitude. Receiver Operating Characteristic (ROC) curves were used to identify Vector Magnitude cut points for sedentary behavior and moderate (3.0 - 5.99 METs) and vigorous (≥6 METs) intensity physical activity. Overall performance of classification models was assessed with the area under the ROC curve. Optimal cut points maximizing sensitivity and specificity were selected based on Youden's index. **RESULTS:** Area under the ROC curve was high for all models: (a) sedentary behavior (0.96; 95% CI: 0.93 - 0.98); (b) moderate intensity physical activity (0.92; 95% CI: 0.88 - 0.96); and (c) vigorous intensity physical activity (0.92; 95% CI: 0.85 - 0.99). The optimal Vector Magnitude cut points were: (a) sedentary behavior ≤236 counts·min^{-1} (sensitivity 0.98; specificity 0.90; Youden's index 0.88); (b) moderate-intensity physical activity ≤2167 counts·min^{-1} (sensitivity 0.99; specificity 0.82; Youden's index 0.81); and (c) vigorous-intensity physical activity ≥4200 counts·min^{-1} (sensitivity 1.00; specificity 0.84; Youden's index 0.84). **CONCLUSION:** This study offers the first DS-specific accelerometer output cut-points for classifying sedentary behavior and intensity of physical activity in adults with DS. Overall classification accuracy was excellent. Supported by NIH Grant R15HD098660

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Sedentary Behavior Levels And Patterns In Men And Women With Intellectual Disability

Supreete Ghosh[1], Poram Choi[1], Stanley P. Brown[1], Robert W. Motl[2], Stamatis Agiovlasitis, FACSM[1]. [1]*Mississippi State University, Mississippi State, MS.* [2]*University 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. 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. **RESULTS:** Total sedentary time did not differ between men and women (533 ± 139 and 496 ± 140 min·day^{-1}, respectively; $p = 0.35$; for both sexes combined, 514 ± 139 min·day^{-1}). Men and women with ID accumulated sedentary time mostly in short bouts <10 min in duration. There were no significant differences between men and women, except for duration of sedentary bouts ≥1 min which was longer for men than women for weekdays (6.45 ± 2.58 and 5.18 ± 1.09 min, respectively; $p = 0.027$) and for all days of the week combined (6.71 ± 2.62 and 5.29 ± 1.11 min, respectively; $p = 0.017$). Most variables did not differ between week and weekend days, except for: duration of sedentary bouts ≥1 min was longer during weekend than weekdays in women (5.5 ± 1.8 and 5.18 ± 1.07 min, respectively; $p = 0.048$); duration of sedentary bouts ≥60 min was longer during week than weekend days in men (56 ± 42 and 47 ± 44 min, respectively; $p = 0.037$); number of sedentary bouts ≥1 min was greater during weekdays than weekend days in men (87 ± 21 and 83 ± 25 bouts·day^{-1}, respectively; $p = 0.045$); and duration of breaks was greater during the weekdays than weekend days in men (138 ± 126 and 81 ± 67 min, respectively; $p < 0.001$). **CONCLUSION:** U.S. adults with ID spend a large portion of the day in sedentary behavior primarily of short bouts. There are small differences between sexes and between days of the week, suggesting near-uniform sedentary behavior levels and patterns for men and women with ID throughout the week.

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Validation Of Previous-day Recalls Of Screen-based Sedentary Behavior In Young Male Adults

Stephen H.S. Wong, FACSM[1], Chen Zheng[1], Wendy Y. Huang[2]. [1]*The Chinese University of Hong Kong, Hong Kong, China.* [2]*Hong Kong Baptist University, Hong Kong, China.*
Email: hsswong@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, watching TV/video, and play computer games) were recorded to the nearest 15 minutes. Participants wore an activPAL over 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

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.

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Identification Of Actigraph Wgt3x-bt Device Non-wear In Infants

Samuel R. LaMunion[1], Scott E. Crouter, FACSM[1], Nicholas T. Broskey[2], Abby D. Altazan[2], Leanne M. Redman[2]. [1]*University of Tennessee, Knoxville, TN.* [2]*Pennington Biomedical Research Center, Baton Rouge, LA.*
Email: slamunio@vols.utk.edu
(No relevant relationships reported)

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 min 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.

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Examination Of Consumer Level Activity Monitors When Compared To Gold Standard Assessments Of Steps, Energy Expenditure And Heart Rate

Debra A. Stroiney, Navid Ghoddosi, Lauren Biscardi, Christian Garcia. *George Mason University, Fairfax, VA.*
(No relevant relationships reported)

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. Subjects were also connected to a metabolic cart and ECG. Kilocalories (kcals), steps and heart rate (HR) was recorded from the watch, metabolic cart, and ECG every 3 minutes for the duration of the walk. Video recording was used to determine steps taken. HR data was averaged over the 1-mile walk. Total steps and kcals for the 1-mile walk were used for analyses. A Pearson Product-Moment correlation examined the relationship between the activity monitor and gold standard measure for HR, kcals, and step count. A paired samples t-test was used to determine differences between the watches for the 3 variables (p = .05). **RESULTS:** A strong positive correlation was found for ECG and both monitors (GV: r = .83; A370: r = .95; $p < .05$), with a percent difference of 6.6% (GV) and 2.9% (A370). The GV and A370 kcals were moderately correlated with the metabolic cart (GV: r = .59, A370: r = .52; $p < .05$), with a percent difference of 11.7% (GV) and 19.2% (A370). Watch step counts were strongly correlated with manual step counts (GV: r = .74, A370: r = .77; p < .05). Percent differences for step counts were 11.6% (GV) and 3.9% (A370). 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 significantly different for kcals. 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.

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Comparison Between Fitbit Flex And Flex 2: Measures Of Sedentary And Physical Activity In Free-living

Sunku Kwon, Wonwoo Byun. *The University of Utah, Salt Lake City, UT.*
Email: sunkukwon@gmail.com
(No relevant relationships reported)

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 FF and FF2 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 ± 24.6 kg/m^2) wore the FF and FF2 on non-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 SED estimate ($p < 0.01$) when compared with FF. MAPEs were relatively lower for both SED (0.8 ± 0.8%) and MVPA (9.1 ± 9.9%). BA plots showed no apparent bias for the agreement and variance between the estimates from two devices; SED (limits of agreement: - 9.9 ~ 27.1 min/day, Pitman's test: r = - 0.14, $P = 1.51$) and MVPA (- 5.7 ~ 5.8 min/day, r = -0.36, $P = 1.94$) estimates. **Conclusion**: Findings from this study showed that 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.

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The Play Study: Perception Is Everything. Physical Literacy And Reported MVPA In Children.

Eric Nohelty[1], Dai Sugimoto[1], Rebecca Zwicker[1], Greggory Kobelski[1], Edie Weller[1], Laura Berbert[1], Avery Faigenbaum[2], Gregory Myer[3], Andrea Stracciolini[1]. [1]*Boston Children's Hospital, Boston, MA.* [2]*The College of New Jersey, Ewing, NJ.* [3]*Cincinnati Children's Hospital, Cincinnati, OH.*
(No relevant relationships reported)

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 study questionnaire, a two part questionnaire, with the first section completed by parents, and the second section by the child along with parents. Each child attested yes or no to participating in the current recommendation of 60 minutes of MVPA/day. The questionnaire targets elements of physical literacy including family and child knowledge/understanding, daily behavior, confidence and motivation, surrounding physical activity. Correlation analysis was performed between questionnaire answers and six tests of physical literacy; sit-and-reach, grip strength, y-balance, vertical jump, obstacle course time and points. To quantify *physical literacy*, principal components analysis was used to generate a linear combination of six physical assessment scores. The first weighted component was divided at the median, with scores ≥ to the median deemed *physically literate,* and scores less than this value deemed *not physically literate*. Fischer analysis was used for comparison statistics. **RESULTS**: Eighty-nine children participated in the study; mean age 7.2 ±2.3 years, 53% (N=47) female. Seventy percent (N=62) answered yes to the question "Do you get 60 minutes of

MVPA/day?" while 29% (N=26) answered no. Only 51% (N=45) 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.

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Accuracy Of Motionsense Hrv For Assessing Sedentary Behavior And Physical Activity

Wonwoo Byun, Sunku Kwon, Neng Wan. *University of Utah, Salt Lake City, UT.*

(No relevant relationships reported)

MotionSense HRV (MS-HRV) is a wrist-worn accelerometery-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 utilized 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·m^2) 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 GGIR 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 and agreement 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 (Pitman's test: r = -0.16, P = 0.95), but significantly different variance in MVPA (r = -0.91, P = .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.

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Validity Of Step Counting By Commercially Available Wearable Fitness Devices

Patrick Doyle, Jason W. Thomas, Phung Tran, Robert Tippett, Jr., Shreya Kulkarni, Joshua Rogers, J Andrew Doyle. *Georgia State University, Atlanta, GA.*
Email: pdoyle2@gsu.edu

(No relevant relationships reported)

Wearable 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 (Wlk), 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 Wlk, Run, and Dyn protocols, which involved 5 minutes of steady-state walking, 5 minutes of steady-state running, and 10 minutes of walking 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/m^2, bodyfat = 22.6 ± 11.2 %. Mean Absolute Deviation (MAD) for Wlk, Run, and Dyn for the FR945 was 3.5, 4.8, and 6.6 steps, respectively. MAD for Wlk, Run, and Dyn for the AP4 was 4.6, 4.4, and 14.0 steps, respectively. The Mean Absolute Percent Error (MAPE) for Wlk, Run, and Dyn for the FR945 was 0.66 %, 0.59 %, and 0.45 %, respectively. MAPE for Wlk, 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 ANSI/CTA Standard (2016) for physical activity monitoring devices. Supported by the Dr. David E. Martin Sport Science Research Fund and the Atlanta Track Club.

1552 Board #146 May 28 10:30 AM - 12:00 PM

DIFFERENCES IN BODY COMPOSITION AND PHYSICAL ACTIVITY LEVEL ACCORDING TO SELF-PERCEPTION HEALTH IN CHILDREN SCHOOL

MARCOS ANDRE C. BARBOSA. *Center of Studies of the Physical Fitness Research Laboratory from São Caetano do Sul (CELAFISCS), São Caetano do Sul, Brazil.*
Email: marcosbarbosampc@gmail.com

(No relevant relationships reported)

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 Ilhabela Mixed-Longitudinal Growth, Development and Physical Fitness Project coordinated by Center of studies physical fitness research laboratory from São Caetano do Sul (CELAFISCS) in São Paulo. Body composition measurements were analyzed according to the CELAFISCS standard, physical activity level and sedentary time objectively determined by accelerometer (actiGraph GT3X analyzed with Freedson 1998). For the perception of health, the Likert scale Diet and Lifestyle questionnaire was used. **Statistical analysis:** ANOVA One Way, Post-hoc Bonferroni, the significance level adopted was p <0.05. **Results:** There were significant differences in body composition in body weight, BMI, waist circumference and X3DC according to self-perception health. This phenomenon was not found in regards to physical activity and sedentary behavior. **Conclusion**: According to students 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.

1553 Board #147 May 28 10:30 AM - 12:00 PM

Physiological Demands Of Snowboarding: A Field Study

Brandon Roberts, Richard F. Armenta, Sean C. Newcomer, Matthew M. Schubert. *California State University, San Marcos, San Marcos, CA.*

(No relevant relationships reported)

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 (HR_{MAX}) (light ≤ 64% HR_{MAX}; moderate 64–76% HR_{MAX}; vigorous ≥76% HR_{MAX}). Based on this information, the amount of time in each HR_{ZONE} was calculated. Data were processed and analyzed using R and SPSS. **RESULTS**: Participants snowboarded an average duration of ~6 hours, covering ~38 kilometers. Average heart rate over the entire session was 63.3±9.5% of HR_{MAX} (122±19 BPM); during actual snowboarding, average heart rates were ~72% of HR_{MAX} (140±10 BPM). Participants spent a significantly greater amount of time in light and moderate intensity activity during non-snowboarding activity (NS) compared to snowboarding (SN) (p < 0.001 for both),but amount of time in vigorous intensity was not different between conditions (NS: 31.05 ± 35.78 vs SN: 39.36 ± 33.67 minutes, p = 0.478). Total MVPA during SN was 62.33 ± 32.90 minutes compared to 82.86 ± 68.41 minutes for NS, which was not significantly different (p = 0.262). **CONCLUSION**: The present data suggest that snowboarding can meet ACSM guidelines for moderate-vigorous intensity exercise of at least 30 minutes a day.

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

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

James Lee Farnsworth, II, Dana Lynn Mefferd. *Texas State University, San Marcos, TX.*
Email: farnsworth@txstate.edu

(No relevant relationships reported)

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 if 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 GT9X 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 discretional 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 ($ICC_{3,1}$) 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

1555 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 Sílvia Grubert Campbell[1], Alisson Luiz Aquino da Silva[1], Jessica Mycaelle da Silva Barbosa[1], Suliane Beatriz Rauber[2]. [1]*Catholic University of Brasilia, Taguatinga, Brazil.* [2]*UDF 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 olds; BMI >85th) attended the KIDS for seven days. Educational, social and recreational activities were carried out at KIDS by a multidisciplinary team (physical education, nutrition, psychology, and pedagogy). Anthropometric parameters (Body weight - BW; Body mass index - BMI), skinfold thickness (tricipital + subscapular - ΣST), % body fat (%BF), resting metabolic rate (RMR), triglycerides (TG), LDL, basal insulin (BI), HOMA IR, HOMA B, and VO_2max 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* 51.85±9.76kg; 25.23±2.35 *vs* 24.93±2.24kg/m^2; 64.85±14.97 *vs* 58.53±12.28mm; 45.11±8.18 *vs* 41.66±6.71%BF; 1,579.22±347.23 *vs* 1,805.11±312.23kcal; 130.31±96.01 *vs* 50.05±19.86mg/dL; 93.22±26.36 *vs* 68.94±22.23mg/dL; 14.56±7.26 *vs* 8.59±2.18µUI/mL; 2.81±1.36 *vs* 1.55±0.58µUI/mL; 327.09±197.84 *vs* 211.47±83.22; p<0.05). However, no change was observed in VO_2max when compared pre and post KIDS respectively (38.74±2.56 *vs* 38.72±2.61mL.kg^{-1}min^{-1}). 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.

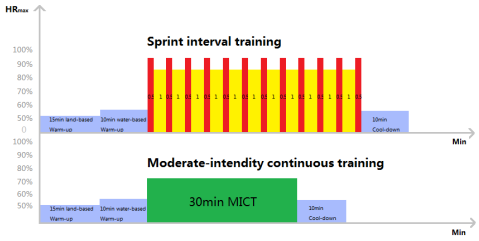
1556 Board #150 May 28 10:30 AM - 12:00 PM

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

tang songxin, wang sheng, hu min. *Guangzhou sport university, GuangZhou, China.*
Email: gztsx1995@gmail.com

(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 human
METHODS: A randomized, controlled trial of middle-aged with inactive recipients 6 weeks of sprint interval training (SIT) or 6 weeks of moderate-intensity continued 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 AIX@75 (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 VO_{2max} 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.



1557 Board #151 May 28 10:30 AM - 12:00 PM

Intrinsic Facilitators And Barriers, And Recurrent Negative Thoughts Of Physical Activity In Uk Children.

Fiona Chun M. Ling[1], Jonathan Simmons[1], Mike C. Horton[2]. [1]*Northumbria University, Newcastle Upon Tyne, United Kingdom.* [2]*University of Leeds, Leeds, United Kingdom.*
(Sponsor: Glyn Howaston, FACSM)
Email: f.ling@northumbria.ac.uk

(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 Rumination 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), sex and pedometry-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

382 children (aged 6-11 years). **RESULTS:** For Study 1, four overarching themes were identified for the intrinsic facilitators - sense of competence/accomplishments, cognitive motivator, 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, FACSM[1], Mitch J. Duncan[2], Corneel Vandelanotte[3], Richard R. Rosenkranz, FACSM[4], Anthony J. Maeder[5], Trevor N. Savage[6], Rhys Tague[1], Anetta van Italie[3], W Kerry Mummery[7], Cristina M. Caperchione[8]. *[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.*
Email: g.kolt@westernsydney.edu.au
(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 interactivity 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 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=.02), but that the effect diminished over time, despite higher engagement of the Web 2.0 group. The RET showed that the Web 2.0 intervention was more effective in improving PA (p=.005), and that while the Web 2.0 website was visited significantly more (p=.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

Jared D. Ramer, Maria Enid Santiago-Rodriguez, Eduardo E. Bustamante, FACSM. *University of Illinois at Chicago, Chicago, IL.* (Sponsor: Dr. Eduardo E. Bustamante, FACSM)
Email: jramer2@uic.edu
(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 (83.33%). 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 technology-based 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. *East Carolina University, Greenville, NC.* (Sponsor: Bhibha Das, FACSM)
Email: sartorem@ecu.edu
(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.
Research identifies the positive effects of dog walking for both dogs and humans. Shelter dogs, in particular, benefit from this physical activity because of their stressful surroundings and need for physical and psychological activity.
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 pedometers 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 ± .16 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.

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Abstract Withdrawn

1562 Board #156 May 28 10:30 AM - 12:00 PM

Utilizing A Clinical Research Registry As A Recruitment Tool For Exercise Trials

Liezl B. Fos, Leslie S. Kelly, Leanna M. Ross, Julie D. Counts, William E. Kraus, FACSM. *Duke University Medical Center, Durham, NC.*

(No relevant relationships reported)

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 diagnosis (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.

1563 Board #157 May 28 10:30 AM - 12:00 PM

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

Hannah Sutton[1], Kim Heontea[2], Mary Malaska[1], Bridget Miller[1], Ho Han[1], Wei Sun[1]. [1]*Oklahoma State University, Stillwater, OK.* [2]*Univeristy of Mississippi, Oxford, MS.*
Email: hasutto@okstate.edu

(No relevant relationships reported)

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 wrist-based running watches were used, respectively. After completion of the walking trials, preference for the prescriptions was assessed by three domains including: (1) easy-to-understand the prescription, (2) easy-to-perform the prescribed activity, and (3) easy-to-maintain the prescribed intensity for a given duration. Descriptive statistics were conducted to calculate the compliance rate and mean values as well as for the comparison for preferences of the two methods. **RESULTS:** Higher compliance rates were found when utilizing RC compared to HR for both moderate (92.1% v. 76.9%) and vigorous (94.9% v. 69.2%) intensities. For both intensities, a combination of walking and running was mainly used to comply with HR prescription, whereas walking was a dominant type of activity when utilizing RC. Lastly, the prescription using RC was more preferred over HR in all the three domains (70%, 72%, and 75%, respectively). **CONCLUSION:** The utilization of RC can help researchers and practitioners yield higher compliance rates, but further efforts are still needed on the improvement in compliance rate of the device-based intensity prescriptions.

1564 Board #158 May 28 10:30 AM - 12:00 PM

Sedentary Behavior And Parental Perceptions And Intentions Toward Physical Activity Of Puerto Rican Children

Mario A. Muñoz[1], Laurie Milliken, FACSM[1], María Enid Santiago-Rodríguez[2]. [1]*University of Massachusetts Boston, Boston, MA.* [2]*University of Illinois at Chicago, Chicago, IL.*
(Sponsor: Laurie Milliken, FACSM)
Email: mario.munoz@umb.edu

(No relevant relationships reported)

PURPOSE: To describe parental perceptions of their children physical activity (PA) and intentions to change behaviors related to PA and device-measured of time in sedentary behaviors (SBT) of Puerto Rican children. **METHODS**: Seventy-three children (mean±SD; age, 8.9±1.3 yrs; BMI 33.1±10.4 $kg \cdot m^{-2}$) wore an ActiGraph GT3X accelerometer on their right hip 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", "3-5 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 their answers were categorized into "I will probably will try", "I probably will not try" and "I already do this", 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^2RM) 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 PI in PA and/or SBT interventions, particularly when minimizing sedentary time among children.

1565 Board #159 May 28 10:30 AM - 12:00 PM

Does The Quality Of Dietary Intake Improve With Regular Exercise?

Sarah Houle[1], Simrat Soni[1], Benoît Lamarche[2], Robert Ross, FACSM[1]. [1]*Queen's University, Kingston, ON, Canada.* [2]*Laval University, Quebec, QC, Canada.*

(No relevant relationships reported)

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 influences diet quality in previously sedentary adults.**METHODS**: Participants were 129 obese (BMI: 33.0 ± 4.5 kg/m^2), 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 (LALI) (180 and 300 kcal/ session for women and men, respectively, at 50% of VO_2peak) (n=36), iii) high-amount, low-intensity exercise (HALI) (360 and 600 kcal/session, respectively, at 50% of VO_2peak) (n=40), iv) high-amount, high-intensity exercise (HAHI) (360 and 600 kcal/session, respectively, at 75% of VO_2peak) (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

intensity (p=0.5). Collapsed across all groups, the mean change in C-HEI at 24 weeks was (3.9 ± 16.0).**CONCLUSION**: The diet quality of the participants, as reflected by the C-HEI, was poor at baseline and was not improved consequent to the adoption of exercise consistent with consensus recommendations. Contrary to expectations, engaging in a structured exercise program is not paralleled by favorable changes in dietary behaviour.

1566 Board #160 May 28 10:30 AM - 12:00 PM

<HIIT As An Effective Method To Reduce Visceral Fat Area In Short Term>

Luis M. Gómez-Miranda, Guadalupe Martínez-Raya, America E. Espinosa-Lezama, Diego A. Padilla-Moncada, Juan J. Calleja-Nuñez, Jorge A. Aburto-Corona. *Universidad Autónoma de Baja California, Tijuana, Mexico.*

(No relevant relationships reported)

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) (30.1 ± 6.9kg), body fat percentage (BFP) (33.2 ± 4.3%) and visceral fat area (VFA) (126.3 ± 39.5 cm2) were measured. An initial measurement (M1), after session eight (M2) and 16 (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 Intermittent 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; η 2 = .123), MM (% Δ = 1.3; p = .142; η 2 = .162) BFP (% Δ = -1.2; p = .444; η 2 = .071) among the three measurements. Differences in VFA (126.3 ± 39.5cm 2 and 117.0 ± 40.8cm 2; p = 0.002; η 2 = .472) were found between M1 and M3, 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.

1567 Board #161 May 28 10:30 AM - 12:00 PM

Validity & Reliability Of A Self-Report Modified Sitting Time And Physical Activity Questionnaire

P. Brian Kiessling II. *Indiana University, Bloomington, IN.* (Sponsor: Carol Kennedy-Armbruster, FACSM)
Email: pbkiessl@indiana.edu

(No relevant relationships reported)

Self-report questionnaires are important tools for public health because of their ability to reach large populations at relatively low costs. Given recent scientific findings which highlight the risks of too much sitting time as well as the importance of physical activity throughout the entire day, new self-report instrumentation is needed which can effectively measure both sitting time and physical activity throughout the entire day. **PURPOSE**: To determine the validity and reliability of a modified physical activity (PA) and sitting time (ST) questionnaire during work-time (WT) and leisure-time (LT). **METHODS**: Full-time workers aged at least eighteen years (n=26) kept time logs and wore Actical Physical Activity accelerometers during the workweek for 4 days during work-time and leisure-time, while simultaneously completing a modified Occupational Sitting and Physical Activity Questionnaire (OSPAQ) two times 7-10 days apart. **RESULTS**: Using intraclass correlation coefficient calculations, test-retest reliability ranged from 0.661-0.901, with WT Sedentary Time (0.901), WT PA (0.869), and LT Sedentary Time (0.818) showing excellent test-retest reliability. LT PA also showed good test-retest reliability (0.661). For validity, spearman's rho correlation coefficients were calculated, resulting in two categories of the modified OSPAQ with significant p-values, WT Sedentary (p=0.001) and LT PA (p=0.04). Self-report WT sedentary time showed a moderate correlation (r=0.583) to accelerometer data, while self-report LT PA showed a small correlation (r=0.394). Neither WT PA nor LT Sedentary showed significance.
CONCLUSIONS: The modified OSPAQ instrument showed excellent to good test-retest reliability and moderate to small correlation of WT sedentary time and LT PA with accelerometry. The modified OSPAQ instrument could be used as a public health tool to measure both PA and ST behaviors throughout the entire day.

1568 Board #162 May 28 10:30 AM - 12:00 PM

Retention Strategies For Incentive-free Exercise Interventions: Importance Of Enrollment Timing

Shabnam Behin[1], Courtney D. Jensen[1], Paul D. Vosti[2], Kim Paustenbach[3], Cynthia Villalobos[1]. [1]*University of the Pacific, Stockton, CA.* [2]*Saint Joseph's Medical Center, Stockton, CA.* [3]*Saint Joseph's Hospital, Stockton, CA.*

(No relevant relationships reported)

Nearly half of all US adults have a chronic disease diagnosis; these individuals are more likely to be sedentary than age-matched controls. When exercise programs incentivize their participation, attrition may be reduced for the duration of the trial, but the results lack applicability outside of the clinic. Thus, there remains a need to identify cost-free predictors of exercise adherence among sufferers of chronic diseases. **PURPOSE**: To determine the effect of enrollment timing on retention in an incentive-free, community exercise program. **METHODS**: 224 previously inactive patients with chronic diseases (cancer, diabetes, pulmonary and cardiovascular disease) were enrolled in an intervention involving 10 weeks of aerobic, resistance, and flexibility training. Independent-samples t-tests and chi-squared tests compared the profiles of patients who did and did not complete the trial. Logistic regression tested the effect of enrollment timing on program completion holding constant potential confounders. **RESULTS**: Across 62 continuous months of admission, 43.3% of patients completed the trial. Retention differed throughout the year with the highest rate occurring in January and February; 55.8% of participants enrolled in those months were retained compared to 39.5% during later months (p=0.038). Patients exhibited no differences in health history, cardiometabolic risk factors, anthropometric measurements, functional assessments, or quality of life scores between months of enrollment. Holding constant sex, age, and diagnosis, initiating training during the first 2 months of the year predicted a 2.1-fold increase in program completion (p=0.023; 95% CI of OR: 1.107-4.053). **CONCLUSIONS**: Incentive-free exercise interventions for patients with chronic diseases have high attrition. Fewer than half of our patients were retained for 10 weeks. However, those who enrolled at the start of the year were more likely to complete the program, indicating possible value seasonal recruitment.

1569 Board #163 May 28 10:30 AM - 12:00 PM

Qualitative Study On The Perceived Barriers Of A Physical Activity Program In Toddlers: Classroom Teacher Perspective

Luke M. Sudarsky, Melanna Cox, Christine St. Laurent, Sarah Burkart, Sofiya Alhassan, FACSM. *University of Massachusetts Amherst, Amherst, MA.* (Sponsor: Sofiya Alhassan, FACSM)

(No relevant relationships reported)

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/m^2). 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.

1570 Board #164 May 28 10:30 AM - 12:00 PM

Physical Fitness, Neurocognitive Performance, And Apolipoprotein E Genotype In Familial Alzheimer'S Disease

Chia-Liang Tsai[1], Ming C. Pai[1], Hsiao F. Sun[1], Yu M. Kuo[1], Chien Y. Pan[2]. [1]*National Cheng Kung University, Tainan, Taiwan.* [2]*National Kaohsiung Normal University, Kaohsiung, Taiwan.*
Email: andytsai@mail.ncku.edu.tw

(No relevant relationships reported)

Cognitively normal older carriers of the Apolipoprotein E-ε4 (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 two conditions, the ApoE-4 relative to non-ApoE-4 group showed significantly lower accuracy rates (ARs) (72.15±11.39% vs. 78.72±6.60%, p=.011) and smaller ERP P3 amplitudes (4.02±1.50μV vs. 6.41±2.70μV, p<.001) only in the high working-memory load condition. Cardiorespiratory fitness was significantly correlated with the neuropsychological performance (i.e., ARs) in the ApoE-4 group (r=0.52, p=.014). **CONCLUSION:** ADFH individuals with the ApoE-4 genotype only showed poorer neurocognitive performance (i.e., ARs & ERP P3 amplitudes) when performing a cognitive task with high working memory load. The potential neurophysiological mechanism could be attributed to poorer cognitive processes associated with the updating of the contents of working memory. Regular physical exercise aimed at enhancing cardiorespiratory endurance may ameliorate the negative impact of visuospatial working memory declines and further delay the onset of Alzheimer's disease in ADFH individuals with the ApoE-4 genotype.
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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

Kimberly Moira Ashdown, Ben J. Lee, Stephen D. Myers. *University of Chichester, Chichester, United Kingdom.*
Email: k.ashdown@chi.ac.uk

(No relevant relationships reported)

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 (VO_2) 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/m^2) completed 3 exercise trials separated by 7 days. Trials were performed on a recumbent cycle ergometer and in a normobaric hypoxic chamber (F_IO_2 0.135). After determination of hypoxic ventilatory threshold (VT) and maximal power output (Wmax), participants completed one 20 min 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 by 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 ± 00 s vs INT: 1421 ± 441 s, p = 0.14). INT elicited a 30% higher VO_2 (SS: 1779.46 ± 320.19 L; INT: 2553.77 ± 1097.65 L) and EE than SS [0.89 ± 0.38 MJ (212.81 ± 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

Nicholas Nicholson[1], Karen Myrick[2], Jessica Lapinski[1], Matthew Williams[1], Laszlow Nemeth[1], Richard Feinn[1]. [1]*Quinnipiac University, Hamden, CT.* [2]*University of Saint Joseph, Connecticut, West Hartford, CT.*

(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 d reported as an effect size. **RESULTS:** There was a statistically significant improvement in scalpular retraction (d=1.25, p=.005), sit and reach (d=1.26, p=.005), spine rotation (d=1.39, p=.003), and modified Thompson test (d=1.58, p=.001). Reported pain decreased (d=0.74, p=.015). **CONCLUSIONS**: The Painless Flexibility is an effective program to increase flexibility and reduce lower back pain.

1573 Board #167 May 28 10:30 AM - 12:00 PM

Barriers, Facilitators, Needs And Goals Of Exercise For People With Osteoporosis

Christina Ziebart[1], Joy MacDermid[1], Mike Szekeres[2], Nina Suh[2], Aliya Khan[3]. [1]*Western University, London, ON, Canada.* [2]*St. Joesph's Health Centre, London, ON, Canada.* [3]*McMaster University, Hamilton, ON, Canada.*
Email: cziebart@uwo.ca

(No relevant relationships reported)

Although the literature clearly demonstrates that exercise benefits people with osteoporosis, it is a challenge to initiate and adhere to an exercise program for most individuals. Currently there is little evidence on exercise preferences of people with osteoporosis yet these factors may contribute to reduced exercise adherence. **Purpose**: Therefore, this project surveyed patients with osteoporosis in a physician's clinic to understand their exercise preferences, barriers, needs, and goals. **Methods**: The Personalized Exercise Questionnaire (PEQ) was used to gain insight into the barriers, facilitators, and goals related to exercise. Participants were recruited from a subspecialty metabolic bone disorder clinic with a large population of osteoporotic patients. **Results**: Data on a total of 287 surveys were collected. The sample was 90% female with a mean age of 67 (SD: 10.7) years. Most participants preferred to exercise in the morning (n=208, 75%), on their own time (n=180, 65%), with exercise that were easy to perform (n=151, 55%), slow paced (n=133, 48%), and easy to remember (n=117, 43%). Home (n=171, 62%) was the most preferred location to exercise. Related to feedback, participants wanted to receive feedback by email (n=106, 60%) about proper exercise technique (n=138, 78%), exercise progress (n=124, 70%), and receive that feedback monthly (n=96, 54%). The most important goal for the participants was to improve strength (n=241, 84%) and the least important goal was to reduce falls (n=129, 45%,). A higher proportion of men (64%) said that they had barriers that stopped them from exercising compared to 54% of women. Time was the most common barrier reported in 30% of participants and pain was the second most common barrier in 23% of the participants. **Conclusion**: This study provides insight into participant preferences for exercise. Future studies should take these results into account when designing an exercise program for people with osteoporosis.

1574 Board #168 May 28 10:30 AM - 12:00 PM

Randomized Face-to-face Vs. Remote Exercise Interventions In Overweight And Obese Subjects

Bowen li[1], Yunqing Liu[2], Haiyan Zhu[2], Ruifang Gao[2], Lian Xue[1], Lining Yang[1]. [1]*Nanjing Sport Institute, Nanjing, China.* [2]*Changzhou Research Institute of Medical Treatment, Changzhou, China.* (Sponsor: Zhengzhen Wang, FACSM)
Email: libowen_sy@sina.com

(No relevant relationships reported)

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: (43.81±9.75) yrs; body mass index: (27.29±2.61) kg/cm^2; 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%VO_{2max},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 TC changed significantly only in the face-to-face group (decreased by 32.32±19.38%,4.47±19.48%, respectively) . The changes of neck circumference (-1.77±2.92 vs.-0.87±5.09 cm) and waist circumference (-3.76±5.52 vs. -0.39± 4.37 cm) were more significant in the face-to-face intervention group than in the remote intervention group. **CONCLUSIONS**: 12 weeks of face-to-face and wearable activity tracker-based remote intervention can improve the 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 (BE2018752),Science and Technology Support Plan (Social Development) of Changzhou(CE20195046).

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Act-Belong-Commit Framework For A Mentally Healthy College Campus: Campus Recreation And Exercise Science Partnership

Caroline J. Ketcham[1], Emily Beamon[2], Scarlett Rupert[2], Larry Mellinger[1], Eric E. Hall, FACSM[1]. [1]*Elon University, Elon, NC.* [2]*University of North Carolina Greensboro, Greensboro, NC.* (Sponsor: Eric E. Hall, FACSM)
Email: cketcham@elon.edu

(No relevant relationships reported)

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±2.5yrs; 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 ($p<0.05$) with many positive mental health outcomes: SWL (r=.62); Resilience (r=.39); Meaning of Life (r=.34); Depression Subscale (r=-.56); Anxiety Subscale (r=-.34); Stress (r= -0.35). High perceived social support and positive mental health were also seen in people high on ACT (Social Support r=.32; resilience r=.37, depression r=-.32, anxiety r=-.26, and stress r=-.36) and BELONG (SWL r=.35, resilience r=.39, depression r=-.29, stress r=-.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.

1576 Board #170 May 28 10:30 AM - 12:00 PM

Autonomy Increases Children'S Enjoyment Of High-intensity Interval Training During Physical Education.

Katie G. Burford. *University of Texas at Austin, Austin, TX.* (Sponsor: John B. Bartholomew, FACSM)
Email: katiegburford@utexas.edu

(No relevant relationships reported)

PURPOSE: This study explored enjoyment of HIIT within a self-determination framework (autonomy and competence) in elementary school physical education (PE) classes. The use of this framework may make school-based, HIIT interventions more accepted by children.
METHODS: Participants were 2nd- 5th grade children (n=382) from central Texas (48.7% female, 53.8% white). HIIT was a 7 min warm-up structured as high-intensity body weight exercises for 30 seconds with 10 seconds rest completed twice weekly. Each PE class completed both a teacher-led (non-autonomy) and a student-led (autonomy) condition. Student enjoyment, competency, and perceived effort of HIIT was assessed with one item for each variable on a 5-point likert scale (5 = "I enjoyed it a lot," 5 ="I did really well," "5 = very hard") paired with images to illustrate each level of the scale. In addition, enjoyment, competency, and perceived effort were assessed for each of the specific activities performed during the HIIT warm-up.
RESULTS: Enjoyment was significantly higher for the autonomous, (M=4.5, SD=0.88), than the non-autonomous, (M=4.1, SD=1.1) condition, F (1,374) = 64.21, p<.001. Within each condition, enjoyment was significantly correlated with competence across the HIIT conditions: autonomous, r=.45, p<0.001; non-autonomous, r=.48, p<0.001. Perceived effort was only significantly correlated with competency for the autonomous condition, r=0.11, p<0.05. With regard to specific activities, children enjoyed full-body aerobic activities more than strength activities. Specifically, with the exception of high knees (M=3.74, SD=1.19), enjoyment for aerobic-focused activities were all over 4 on the 5 point scale: jumping jacks (M=4.48, SD=0.83), star jacks (M=4.0, SD=1.14) and jogging in place (M=4.30, SD=0.96). In contrast, activities that emphasized strength were all rated under 4 on the same, 5 point scale: push-ups (M=3.68, SD=1.26), sit-ups (M=3.88, SD=1.30), mountain climbers (M=3.74, SD=1.19).
CONCLUSION: Children across grades tended to enjoy more aerobic-focused HIIT activities. In addition, the inclusion of choice to provide a sense of autonomy increased enjoyment, which was associated with perceived competence. These data can be used to inform the design of school-based, HIIT interventions.

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Using Fruits And Vegetables To Motivate Adherence To Walk With Ease, An Arthritis Focused Walking Program, In Low-income African American Women

Winfred Cameron Parnell, Abdullah Mamun, Andrea Harris, Heather Kitzman-Carmichael, Donald Wesson. *Baylor Scott & White, Dallas, TX.*
Email: winfredparnell@gmail.com

(No relevant relationships reported)

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 = 152) 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%). **CONCLUSIONS**: The data offers a novel approach to community health: that possibly offering fruits and vegetables incentives may increase physical activity

participation. This approach may improve dose of WWE delivered in low-income, African American communities, while simultaneously encouraging better dietary habits.

1578 Board #172 May 28 10:30 AM - 12:00 PM

Differences Between Predicted And Measured $V0_2$ During Level And Uphill Walking

Tyler Standifird[1], Lauren Williams[2], Bryson Carrier[3], Andrew Creer[1]. [1]*Utah Valley University, Orem, UT.* [2]*Brigham Young University, Provo, UT.* [3]*University of Nevada at Las Vegas, Las Vegas, NV.*
Email: tyler.standifird@uvu.edu

(No relevant relationships reported)

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 VO_2 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 $VO_{2\ in}$ a population of untrained college age individuals. **Methods:** 21 healthy untrained college age individuals with an average BMI of 29.1 kg/m^2, completed 3 x 3 minute treadmill walking tasks. These consisted of walking at 1.5 m/s at both 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 VO_2 (14.4±1.1 mlO_2/kg/min) was 14.5% greater (p<0.001) than predicted (12.5 mlO_2/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 VO_2 (15.3±1.2 mlO_2/kg/min) was 7% different (p=0.001) than predicted (16.1±0.3 mlO_2/kg/min) from the ACSM equation. Of the 21 participants, 16 of them had measured VO_2 values that were smaller than predicted. During the 5% incline at the pace of 1.5 m/s, measured VO_2 (19.9±1.2 mlO_2/kg/min) was 5.7% different (p=0.01) than predicted (20.6 mlO_2/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.

C-42 Free Communication/Poster - **Physical Activity and Health**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1579 Board #173 May 28 10:30 AM - 12:00 PM

CONTINUOUS METABOLIC SYNDROME SCORE AND PHYSICAL ACTIVITY AMONG METABOLIC SYNDROME POSITIVE INDIVIDUALS

Robert Booker, Megan E. Holmes. *Mississippi State University, Mississippi State, MS.* (Sponsor: Rebecca A. Battista, FACSM)

(No relevant relationships reported)

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 (381.41±212.18 minutes; p=0.287) and vigorous PA (11.04±35.03 minutes; p=0.374). The lower tertile (n=237) reported the greatest 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 it predict severity of MetS. This may be due to PA being self-reported and/or the exclusion of non-MetS individuals. Future research may be able to elucidate a relation using a more sensitive, objective measure of PA to better understand its relation with MetS.

1580 Board #174 May 28 10:30 AM - 12:00 PM

Abstract Withdrawn

1581 Board #175 May 28 10:30 AM - 12:00 PM

UNDERSTANDING PHYSICAL ACTIVITY BEHAVIOUR IN CANADIANS LIVING WITH CHRONIC DISEASE: A RETROSPECTIVE COHORT STUDY

David McHugh, Piotr Wilk, Saverio Stranges, Harry Prapavessis, Marc Mitchell. *Western University, London, ON, Canada.*

(No relevant relationships reported)

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 survey, 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=3858.32), 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.

1582 Board #176 May 28 10:30 AM - 12:00 PM

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

Robert A. Sloan[1], Youngdeok Kim[2], Susumu S. Sawada, FACSM[3], Xuemei Sui, FACSM[4], I-Min Lee, FACSM[5], Steven N. Blair, FACSM[4]. [1]*Kagoshima University Graduate Medical School, Kagoshima, Japan.* [2]*Virginia Commonwealth University, Richmond, VA.* [3]*Waseda University, Tokyo, Japan.* [4]*University of South Carolina, Columbia, SC.* [5]*Harvard University, Boston, MA.* (Sponsor: Steven N Blair, FACSM)

(No relevant relationships reported)

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-height ratio, WHtR) 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 with no history of major chronic diseases at 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/m^{2}vs. ≥25 kg/m^2), and WHtR (<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 WHtR 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

higher risk for those in the unfit/BMI < 25 (HR = 1.54 CI =1.07, 2.20) and unfit/WHtR < .50 (HR = 1.48, 95% CI.06, 2.08) categories. Being unfit did not further increase the risk of incident prediabetes in those with higher levels of general or central adiposity.
CONCLUSIONS: Fitness not fatness was associated with incident prediabetes in women. Public health efforts should especially emphasize promoting exercise and physical activity to improve CRF for the prevention of prediabetes in women.
Supported by JSPS KAKENHI Grant 19K19437

1583 Board #177 May 28 10:30 AM - 12:00 PM

Accuracy Of Classifying Prediabetes Predicted By Grip Strength In Obese Adults Utilizing Machine Learning

Jaemyung Kim[1], Kwanghee Lee[1], Su-Hong Kim[1], Eunju Hong[1], Ji-Yeob Choi[2], Hyo Lee[3], Miyoung Lee[1]. *[1]Kookmin University, Seoul, Korea, Republic of. [2]Seoul National University, Seoul, Korea, Republic of. [3]Sangmyung University, Seoul, Korea, Republic of.*
Email: jaemyung3102@gmail.com
(No relevant relationships reported)

PURPOSE: To compare the accuracy of classifying prediabetes, include type 2 diabetes, predicted by hand-grip strength employing machine learning (ML) techniques in Korean obese adults.
METHODS: The data of 1230 Korean obese adults (51.5% males, 19-65yrs) was retrieved from the Korean National Health and Nutrition Examination Survey (KNHANES) 2014-2015. Obesity was identified by the Korean standard BMI (BMI ≥ 25kg/m^2) 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). Three 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 RSNNS package in R, were applied to classify the prediabetes predicted by 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, separated 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 GSW 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=78.6%, 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.

1584 Board #178 May 28 10:30 AM - 12:00 PM

Daily Step Count And Prevalence Of Perceived Occupational Stress: A Cross-sectional Study Among Japanese Workers

Sakura Koriyama[1], Susumu S. Sawada, FACSM[1], Noriko Takeda[2], Dong Wang[1], Ryoko Kawakami[1], Keizo Hamaya[3], Hitoshi Matsuba[3], Teruichi Shimomitsu[4]. *[1]Waseda University, Saitama, Japan. [2]Kogakuin University, Tokyo, Japan. [3]Japan Industrial Safety and Health Association, Tokyo, Japan. [4]Japan Health Promotion and fitness foundation, Tokyo, Japan.*
(No relevant relationships reported)

PURPOSE: We conducted a cross-sectional study to investigate the relationship between daily step counts and the prevalence of perceived occupational stress among Japanese workers.
METHODS: Participants were 4,768 Japanese men [median (inter quartile range) age 45 (36−56) years] and 1,137 women [median (inter quartile range) age 42 (33−50) years] who completed a self-administered questionnaire on their health habits, including daily step counts (<6,000 steps/day, 6,000−7,999 steps/day, 8,000−9,999 steps/day, and ≥10,000 steps/day) in 2017. Participants were classified into 4 groups based on their daily step counts. The prevalence of perceived occupational stress was obtained using the Brief Job Stress Questionnaire. Multivariable-adjusted odds ratios and 95% confidence intervals for the prevalence of occupational stress were obtained using logistic regression models while adjusting for age (continuous variable), sex (men, women), smoking (current-smoker, former-smoker, and never-smoker), drinking (never, < 3 times/week, 3−5 times/week, and ≥ 6 times/week), sleep time (≥ 6 hour and < 6 hour), and some non-communicable diseases (yes, no).
RESULTS: 999 participants had perceived occupational stress. Using the lowest daily step count group (<6,000 steps/day) as reference the multivariable-odds ratios and 95% confidence intervals were 0.77 (0.63−0.94) for 6,000−7,999 steps/day group, 0.91 (0.70−1.18) for 8,000−9,999 steps/day group, and 0.94 (0.69−1.29) for ≥10,000 steps/day group, respectively.
CONCLUSIONS: In this cross-sectional analysis, the results suggest that there is a J-curve relationship between daily step counts and the prevalence of perceived occupational stress among Japanese workers.

1585 Board #179 May 28 10:30 AM - 12:00 PM

A Prospective Cohort Study Of Physical Fitness And Incident Hearing Loss: The Niigata Wellness Study

Ryoko Kawakami[1], Susumu S. Sawada, FACSM[1], Kiminori Kato[2], Yuko Gando[3], Haruki Momma[4], Hideaki Oike[5], Motohiko Miyachi[3], I-Min Lee, FACSM[6], Steven N. Blair, FACSM[7], Minoru Tashiro[8], Hirohito Sone[2]. *[1]Waseda University, Tokorozawa, Japan. [2]Niigata University, Niigata, Japan. [3]National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [4]Tohoku University, Sendai, Japan. [5]National Agriculture and Food Research Organization, Tsukuba, Japan. [6]Harvard Medical School, Boston, MA. [7]University of South Carolina, Columbia, SC. [8]Niigata Medical Association of Occupational Health, Niigata, Japan.*
(No relevant relationships reported)

There is limited evidence examining the association between physical fitness and hearing loss. Although the precise mechanisms are not fully understood, it may include beneficial changes to cochlear blood circulation, central nervous system, and oxidative stress.
PURPOSE: To investigate the association between muscular and performance fitness (MPF) and the incidence of hearing loss among Japanese people in the Niigata Wellness Study.
METHODS: Participants included 21,907 people (13,992 men) [median (interquartile range) age 49 (43-54) years] free of hearing loss who underwent physical fitness tests in 2001. MPF index was calculated using a summed z-score by sex and age from grip strength, vertical jump, single-leg balance with eyes closed, forward bending, and whole-body reaction time. The participants were divided into quartiles according to the MPF index and each physical fitness test. During 2002-2007, participants were followed for development of hearing loss, which was defined as > 30 dB at 1 kHz and/or > 40 dB at 4 kHz in the worse ear on pure-tone audiometry. Hazard ratios (HRs) and 95% confidence intervals (95% CIs) for the incidence of hearing loss were estimated using Cox proportional hazards models after adjusting for age, age^2, sex, body mass index, cigarette smoking, alcohol intake, hypertension, dyslipidemia, and diabetes.
RESULTS: During the follow-up, 2,765 participants developed hearing loss. The HRs (95% CIs) for developing hearing loss across quartiles of MPF index (lowest to highest) were 1.00 (reference), 0.88 (0.79-0.97), 0.83 (0.75-0.93), and 0.79 (0.71-0.88) (P for trend < 0.001). Vertical jump, single-leg balance, and whole-body reaction time were significantly inversely associated with incident hearing loss (P for trend < 0.001, < 0.001, and 0.043, respectively).
CONCLUSIONS: MPF may be associated with lower risk of incident hearing loss. Further studies are required to consider other confounding factors such as noise exposure.

1586 Board #180 May 28 10:30 AM - 12:00 PM

Association Among Length Of Residence, Physical Activity, And Obesity In Us Immigrants

Myungjin Jung, Heontae Kim, Minsoo Kang, FACSM. *University of Mississippi, University, MS.* (Sponsor: Minsoo Kang, FACSM)
(No relevant relationships reported)

PURPOSE: The proportion of immigrants in the US population continues to grow. The failure of adaptation to a new culture has negative effects on lifestyle behaviors, thereby leading to increased risk of obesity. Physical activity (PA), particularly, may function as a mediator of the relationship between length of residence and obesity. The purpose of this study was to examine whether objectively measured PA mediated the length of residence-obesity association among US immigrants. **METHODS**: Data from the 2003 to 2006 National Health and Nutrition Examination Survey (NHANES) was used for this study. Participants (≥ 18 years) who were born outside the US were included in this analysis (n = 989). The participants were categorized into two groups (e.g., living in US more than 10 years vs. less than 10 years). PA time was measured by Actigraph accelerometer. Valid days in PA were defined as the device being worn for at least 10 hours and a minimum of 4 days, which included at least one weekend day. Obesity was defined as body fat percentage measured by dual-energy X-ray absorptiometry. Mediation analysis was used to test whether PA mediated the

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 to account for the complex-sampling 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; $\beta = 3.01$, $p < .001$), and less likely to spend time participating in PA (a; $\beta = -6.6$, $p < .05$), compared to those who living in the US for less than 10 years. Also, the relationship between PA and obesity was significant (b; $\beta = -.07$, $p < .001$). 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

Ali E. Wolpern[1], Tyler R. Bardsley[2], Timothy A. Brusseau[1], Wonwoo Byun[1], Marlene J. Egger[3], Ingrid E. Nygaard[3], Jiqiang Wu[3], Janet M. Shaw, FACSM[1]. [1]*University of Utah, Salt Lake City, UT.* [2]*University of Utah Health Center for Clinical and Translational, Salt Lake City, UT.* [3]*University of Utah School of Medicine, Salt Lake City, UT.* (Sponsor: Janet M. Shaw, FACSM)
Email: ali.wolpern@westernalum.org
(No relevant relationships reported)

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 completing an activity checklist (N (%)) by questionnaire at T1 and T2. Median (IQR) was calculated for minutes/day of light, moderate, and vigorous PA and MVPA 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:** 577 of 645 eligible women after delivery (age: 28.3 (SD: 5.1)) with valid accelerometry at either T1 or T2 provided descriptive data and 405 (age: 28.7 (SD: 5)) 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 (256.3-331.8), 54.3 (39.4-72.4), 0.4 (0.2-0.8), and 55.1 (40-74.1), 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 (0-5.4) and 0 (0-3.7) at T1 and 2.6 (0-8.6) and 0 (0-5.2) at T2. At T1, 75% (406/541) and at T2, 72.4% (397/548) of women reported doing non-impact activities. Less than 4% of women at T1 and 13% of women at T2 reported doing activities with impact or straining. Amongst women with valid accelerometry data at both T1 and T2, minutes/day of MVPA was greater at T2 than T1 by all methods of reporting ($p < 0.001$ for all): total: median (IQR) = 64.7 (47-84.6) vs 56.5 (41-75) minutes; 5-minute bouts: median (IQR) 3 (0-9.8) vs 1.7 (0-5.6) minutes; and 10-minute bouts: 1.3 (0-6) vs 0 (0-3.8) minutes. **Conclusion:** Early postpartum women are active based upon total minutes of MVPA, but sustained MVPA in bouts was consistently low. Significant increases in MVPA from T1 to T2 were small and few postpartum women reported doing activities with impact or straining. Women may experience challenges when returning to sustained and/or higher intensity activities during postpartum.

1588 Board #182 May 28 10:30 AM - 12:00 PM

Discordance Between Ldl Cholesterol Versus Particle Concentration And The Cardiovascular Risk Factor Profile

Jonathan Joseph Ruiz-Ramie[1], Abbi D. Lane-Cordova[1], John T. Wilkins[2], Claude Bouchard, FACSM[3], Mark A. Sarzynski, FACSM[1]. [1]*University of South Carolina, Columbia, SC.* [2]*Northwestern University Feinberg School of Medicine, Chicago, IL.* [3]*LSU-Pennington Biomedical Research Center, Baton Rouge, LA.* (Sponsor: Mark A. Sarzynski, FACSM)
Email: ruizramj@email.sc.edu
(No relevant relationships reported)

Although low-density lipoprotein cholesterol (LDL-C) levels have been associated with cardiovascular disease (CVD) risk, subjects with well controlled LDL-C are still at considerable residual risk for CVD. Alternative measures such as particle concentration of LDL (LDL-P) may be clinically useful for fully characterizing LDL associated risk.
PURPOSE: To compare CVD risk factor profiles among groups of people with discordant levels of LDL-C versus LDL-P concentration in the HERITAGE Family Study.
METHODS: Standard lipid panels and lipoprotein subclass profiles via nuclear magnetic resonance (NMR) spectroscopy were measured among 715 participants (34% Black, 55% Female). LDL-C and LDL-P values ≥ the median value were considered high and values < median were considered low. Four exclusive LDL-C/LDL-P groups were identified for LDL from these base categories: 1) low/low (< median for both LDL-C and LDL-P), 2) low/high (< median for LDL-C, ≥ median for LDL-P), 3) high/low, and 4) high/high. Cross-sectional associations between baseline LDL discordance group and CVD risk factors were assessed via multivariable linear regression. All models were adjusted for age, race, and sex.
RESULTS: Sixty four (9.0%) participants were discordant with high LDL-C/low LDL-P, while 61 (8.5%) were discordant with low LDL-C/high LDL-P. 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 general, low LDL-P levels were associated with favorable CVD risk factor profiles regardless of LDL-C levels.

Table 1. CVD risk factor profiles among participants with discordant/concordant levels of LDL-C compared to LDL-P

	Low LDL-C/ Low LDL-P N=295 (41.3%)	Low LDL-C/ High LDL-P N=61 (8.5%)	High LDL-C/ Low LDL-P N=64 (9.0%)	High LDL-C/ High LDL-P N=295 (41.3%)	P-value
Demographics					
% Male	39.32	54.10	25.00	53.22	<.0001
% White	64.07	50.82	54.69	72.54	0.0012
Cholesterol Measurements, (mg/dL)					
Triglycerides	90.32 (3.58)[b,d]	138.48 (7.29)[a,c]	84.17 (7.21)[b,d]	128.91 (3.5877)[a,c]	<.0001
HDL-C	42.26 (0.60)*	36.00 (1.23)[a,c]	45.76 (1.21)*	38.48 (0.60)[a,c]	<.0001
LDL-C	87.40 (1.08)*	103.37 (2.20)*	122.79 (2.18)*	140.34 (1.08)*	<.0001
Lipoprotein Particle Size (nm)					
HDL-P size	9.30 (0.03)*	8.94 (0.05)[a,c]	9.44 (0.05)*	8.95 (0.03)[a,c]	<.0001
LDL-P size	20.86 (0.03)[b,c]	20.52 (0.07)*	21.37 (0.07)*	20.86 (0.03)[b,c]	<.0001
Lipoprotein particle concentrations (HDL: µmol/L; LDL: n mol/L)					
HDL-P	29.14 (0.30)	30.56 (0.61)	29.16 (0.60)	29.34 (0.30)	0.209
Small HDL-P	14.68 (0.25)[b,d]	16.55 (0.52)[a,c]	13.62 (0.51)[b,d]	15.76 (0.26)[a,c]	<.0001
Medium HDL-P	9.20 (0.28)	10.36 (0.57)	9.65 (0.56)	9.78 (0.28)	0.2396
Large HDL-P	5.26 (0.13)*	3.64 (0.27)[a,c]	5.90 (0.27)*	3.81 (0.13)[a,c]	<.0001
LDL-P	711.40 (11.23)*	1078.00 (22.91)*	850.02 (22.66)*	1256.42 (11.27)*	<.0001
Small LDL-P	379.51 (13.76)*	671.51 (28.07)*	311.12 (27.77)*	663.04 (13.81)[a,c]	<.0001
Large LDL-P	230.63 (9.69)*	274.63 (19.77)*	383.85 (19.56)[a,b]	409.25 (9.73)[a,b]	<.0001
Anthropometrics					
BMI (kg/m^2)	25.14 (0.30)[b,d]	28.47 (0.60)[a,c]	25.87 (0.60)[b,d]	28.47 (0.30)[a,c]	<.0001
Body Fat (%)	25.30 (0.50)[b,d]	30.48 (1.06)[a,c]	26.19 (1.04)[b,d]	30.78 (0.50)[a,c]	<.0001
Cardiorespiratory Fitness (ml/kg/min)					
VO_{2max}	32.61 (0.33)[b,d]	30.10 (0.68)[a]	31.84 (0.67)[d]	29.15 (0.33)[a,c]	<.0001
Blood Pressure (mmHg)					
Systolic blood pressure	120.22 (0.68)	120.66 (1.38)	117.98 (1.38)	120.93 (0.68)	0.2815
Diastolic blood pressure	69.33 (0.47)	69.49 (0.95)	69.15 (0.96)	70.25 (0.47)	0.5056
Carbohydrate/Lipid Metabolism					
Glucose (mmol/L)	5.06 (0.05)	5.26 (0.11)	5.06 (0.11)	5.08 (0.06)	0.4429
Insulin (pmol/L)	66.00 (3.18)[b,d]	86.33 (6.42)[a,c]	60.43 (6.35)[b,d]	81.74 (3.18)[a,c]	0.0002
Hepatic Lipase (nmol/mL/min)	186.46 (3.89)	187.42 (7.84)	184.67 (8.01)	182.19 (3.93)	0.87
Lipoprotein Lipase (nmol/mL/min)	60.65 (1.92)[c]	56.69 (3.87)[c]	76.48 (3.95)*	63.09 (1.94)[c]	0.0014
Sex Hormones (nmol/L)					
Progesterone	1.63 (0.12)	2.26 (0.25)	1.68 (0.25)	1.50 (0.12)	0.0544
Testosterone	8.99 (0.24)[b,d]	7.05 (0.49)[a,c]	8.78 (0.49)[b,d]	7.60 (0.24)[a,c]	<.0001
Inflammatory Markers					
GlycA (µmol/L)	309.18 (3.25)[b,d]	349.48 (6.62)[a,c]	309.21 (6.55)[b,d]	341.04 (3.27)[a,c]	<.0001
C-Reactive Protein (mg/dL)	0.21 (0.03)[b,d]	0.43 (0.06)[a,c]	0.25 (0.06)[b]	0.34 (0.03)[a]	0.0011

[a] P<0.05 between low HDL-C/low HDL-p, [b] P<0.05 between low HDL-C/high HDL-p, [c] P<0.05 between high HDL-C/low HDL-p, [d] P<0.05 between high HDL-C/high HDL-p, * P<0.05 between all other groups

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Changes In Health Behaviors And Anxiety Prevalence Among College Students: 2012-2017

Karissa L. Peyer, Burch Oglesby, Charlene E. Schmidt. *University of Tennessee at Chattanooga, Chattanooga, TN.* (Sponsor: Gregory W. Heath, FACSM)
Email: karissa-peyer@utc.edu
(No relevant relationships reported)

College presents unique challenges, including independent development and control of healthy behaviors (ie. nutritious diet, physical activity (PA), and mental health practices). **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 = 798) and 2017 (n = 402)). No individual student identifiers were collected. It is unlikely that any student participated in both years given the five year spacing between administrations. Moderate (Mod), vigorous (Vig), and strength training exercise (ST); fruit and vegetable (F&V) consumption; and anxiety within the last 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 and for Anxiety based on PA.

RESULTS: Students were at lesser odds of reporting 3+ servings of F&V per day in 2017 (20.1%) than in 2012 (31.7%) (OR: 0.54, 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 is 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 (51.8%) (OR: 0.61, CI: 0.48-0.78). 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 guidelines 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 - 0.94).
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.

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Associations Of Objectively-measured Floor Climbing With Type 2 Diabetes

Joey M. Saavedra, Angelique Brellenthin, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
Email: joeysav@iastate.edu
(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 climbers (middle/upper FC tertiles) 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).

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Abstract Withdrawn

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Relationship Between Cardiorespiratory Fitness Level And Hypertension In Japanese Olympic Athletes In Tokyo 1964; A Cohort Study.

Yuko Nagasaka[1], Susumu S. Sawada, FACSM[1], Ryoko Kawakami[1], Dong Wang[1], Sakura Koriyama[1], Koichiro Oka[1], Shizuo Sakamoto[1], Junichiro Okada[1], Mitsuru Higuchi, FACSM[1], Hiroshi Aono[2], Soya Ishizuka[2], Sachiko Yamada[2], Takashi Kawahara[3]. *[1]Waseda University, Saitama, Japan. [2]Japan Sport Association, Tokyo, Japan. [3]Japanese Society of Clinical Sports Medicine, Tokyo, Japan.*
Email: yu-nagasaka@fuji.waseda.jp
(No relevant relationships reported)

INTRODUCTION: Few cohort studies have assessed the relationship between cardiorespiratory fitness and incidence of hypertension among top athletes.
PURPOSE: To examine the relationship between cardiorespiratory fitness level and the incidence of hypertension in Japanese Olympic athletes in Tokyo 1964.
METHODS: This was a retrospective cohort study of Japanese Olympic athletes. The participants were 156 Olympic athletes who took physical fitness tests in 1964 and followed up until 2016. A cardiorespiratory fitness level was evaluated by the Harvard Step Test (tertile). We determined the incidence of hypertension in self-reported questionnaires in 2005, 2008, 2012 and 2016. Odds ratios and 95% confidence intervals (95%CI) for the incidence of hypertension were obtained using logistic regression models while adjusting for age, sex, and body mass index. In addition, a trend test was conducted to examine the relationship between cardiorespiratory fitness level and hypertension. **RESULTS:** There were 156 participants (135 men, 21 women) with a median age of 23 years old (range: 15-33 years) in 1964. During the follow-up period, 68 participants developed hypertension. Using the lowest cardiorespiratory fitness (1st tertile) group as a reference, odds ratios and 95% CIs for the 2nd and 3rd tertiles were 0.75 (0.34-1.67) and 0.59 (0.27-1.31), respectively(p for trend = 0.19).
CONCLUSION: These results suggest that a low cardiorespiratory fitness level is a risk factor for the incidence of hypertension in Japanese Olympic Athletes.

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Pre-participation Evaluations And The Relative Risk Of Injuries In Ugandan Sports

Timothy Makubuya[1], Samuel K. Lubega[2], Lukia Kalibbala[1]. *[1]University of Missouri- St. Louis, St. Louis, MO. [2]University of Cape Town, Cape Town, South Africa.* (Sponsor: Jill Kanaley, FACSM)
Email: makubuyat@umsl.edu
(No relevant relationships reported)

PURPOSE: The aim of this study was to examine the relative risk of sports injuries based on pre-participation evaluation among Uganda athletes. **METHODS**: This cohort included 546 athletes, > or = 18 years old, who were free from injury at the beginning of the study. This investigation focused on the relative risk of injuries from 4 main sports (football/soccer n= 161, track and field, n= 106, basketball, n = 120 and rugby, n= 159). **RESULTS**: After a one year follow up, seventy- five lost-time injuries (n= 75) in both male and female athletes who sustained abrasions, concussion, contusion, dislocations, laceration, fainting, fractures, sprains and strain injuries were reported. There was an increased risk of sports injuries among athletes who didn't undergo pre-participation evaluation compared to those who did. The relative risk for sports injuries in athletes without pre-participation evaluation was greater in rugby (relative risk, 21.8, 95% CI, 13.6 - 33.88), followed by football/soccer (relative risk, 21.6, 95% CI, 3.1 - 33.78), followed by track and field (relative risk, 14.1, 95% CI, 9.0-23.17) and basketball (relative risk, 12.2, 95% CI, 7.56 to 19.63). **CONCLUSION**: Pre-participation evaluation is an important risk factor in sports injury acquisition. Our findings reveal gaps in practice among personnel involved in the prevention of sports-related injuries in Uganda, thus warranting specific sports regulations.

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Translating The Moderate-to-vigorous Physical Activity Recommendation To Steps Per Day: Influence Of The Cut-point Method

Maribel Parra-Saldias[1], Daniel Mayorga-Vega[2], Jesús Viciana[3], Farah Ramírez-Marrero, FACSM[4]. *[1]Pontifical Catholic University of Valparaíso., Viña del Mar, Chile. [2]University of Jaen, Jaen, Spain. [3]University of Granada, Granada, Spain. [4]University of University of Puerto Rico, Rio Piedras, Puerto Rico.* (Sponsor: Farah A. Ramírez-Marrero, FACSM)
Email: mparrasaldias@gmail.com
(No relevant relationships reported)

The Organization recommends adolescents to engage in at least 60 minutes/day in moderate to vigorous physical activity (MVPA). However, this recommendation is not easily understood by both adolescents and their parents. Although a more practical steps/day recommendation is available, empirical studies examining total daily steps translation of the MVPA recommendation in adolescents are scarce and inconsistent, offering a wide range from 7,500 to 14,000 steps/day. Variation between instruments, methods, and statistical considerations may also contribute to the variability in daily steps thresholds. To our knowledge there are not previous studies examining the influence of the optical cut-point method to translate MVPA recommendation into steps/day. **PURPOSE:** To examine the influence of the optical cut-point method on the translation of the 60 minutes of MVPA recommendation to steps/day in adolescents.
METHODS: 126 Chilean adolescents (70 males and 56 females) aged 12-15 years old wore ActiGraph GT3X accelerometers for eight consecutive days. Activity counts/min ≥ 2,296 were used to determine MVPA. ROC analyses (daily MVPA as reference standard: < 60 min/day and ≥ 60 min/day; and daily total steps as index test) with the 34 available optical cut-point methods were performed using the web-tool easyROC version 1.3.1. **RESULTS:** A small percentage (10.3%) of adolescent participants achieved ≥60 min/day of MVPA. ROC analyses showed an excellent accuracy (AUC = 0.95, 0.90-1.00) for translating the MVPA recommendation to steps per day. The daily

step-based recommendation greatly varied between the 34 examined optical cut-point methods (mean = 10,318; median = 9,898; minimum = 3,262; maximum = 14,899; P_{25} = 8,656; P_{75} = 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.

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Effectiveness Of Virtual Reality On Individuals' Physiological, Psychological, And Rehabilitative Outcomes: A Systematic Review

Jiali Qian, Daniel J. McDonough, Zan Gao, FACSM. *University of Minnesota, minneapolis, MN.* (Sponsor: Zan Gao, FACSM)
Email: qian0133@umn.edu

(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) interventions using VR devices; 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.

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The Relationship Of Habitual Physical Activity With All-cause Mortality Among Obese Adults In US.

Carlos J. Crespo, FACSM[1], Natalia Garcia[2], Ellen Smit[3]. [1]*Portland State University, Portland, OR.* [2]*Santa Clara University, Santa Clara, CA.* [3]*Oregon State University, Corvallis, OR.*
Email: ccrespo@pdx.edu

(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/m^2) $\geq$ 30. Self-reported participation in leisure time physical activity was used to classify participants as inactive (0 times/wk), 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 22.23%. We then studied the relationship between frequency of physical activity and all-cause mortality among obese persons. Obese 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.

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Differences In Physical Activity, Calcium And Vitamin D Intakes In Caucasian, East-asian, And South-asian Women

JAPNEET KAUR, RYAN MILLER, EDUARDO FREITAS, DEBRA BEMBEN, FACSM, MICHAEL BEMBEN, FACSM. *UNIVERSITY OF OKLAHOMA, NORMAN, OK.* (Sponsor: Michael G. Bemben, FACSM)
Email: Japneet.Kaur-1@ou.edu

(No relevant relationships reported)

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: 60.62 ± 7.79 vs. EA: 30.51 ± 9.31, SA: 22.76 ± 5.25; p=0.004; η_p^2=0.103) and total (Cau: 33.13 ± 4.17 vs. EA: 17.13 ± 4.94, SA: 13.67 ± 2.67; p=0.005; η_p^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: 21.90 ± 1.98 vs. SA: 12.21 ± 1.41; p=0.001; η_p^2=0.136). Moreover, daily calcium intake (mg/day) was higher in Caucasians and South-Asians compared to East-Asians (Cau: 893.07 ± 52.95, SA: 964.21 ± 110.20 vs. EA: 608.15 ± 52.65; p=0.002; η_p^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.

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Effectiveness Ofhealth Risk Behavioron Physical Activity And Mental Health In Chinese Adolescents: A Cross-sectional Study

Xiangren Yi[1], Zongyu Liu[1], Nuo Yi[2], Jinjun Li[1], Peng Pi[1], Lei Zhang[1], Wenxin Chen[1], You Fu[3], Peng Zhang[4], Yong "Tai" Wang, FACSM[5]. [1]*Shandong University, Jinan, China.* [2]*University of Wisconsin-Milwaukee, Milwaukee, WI.* [3]*University of Nevada, Reno, NV.* [4]*East Stroudsburg University, East Stroudsburg, PA.* [5]*The University of Texas at Tyler, Tyler, TX.* (Sponsor: Yong "Tai" Wang, FACSM)

(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 exam 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 16.2±1.03, femal16.3±1.56. 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 (α=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. Symptom Checklist 90 (SCL-90) was used to investigate the mental health status for Chinese adolescent.

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, cluster 4, respectively. In the hostility, compared with cluster 3 in factor 5, the odds ratios (ORs) and 95% confidence intervals (CIs) were1.16(1.00-1.33), 1.12(0.98-1.29), 1.06(0.90-1.24) for clusters 1, 2 and 4. The result found that physical activity affects significantly sedentary 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.

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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 body 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. Resting heart rate, systolic 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 [TOT-C, HDL-C, LDL-C]), triglycerides (TG), insulin (INS), and glucose (GLU) were measured. Quantitative insulin sensitivity check index (QUICKI) and TOT-C: HDL-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 = 167.4 ± 8.0 cm, BMI = 28.6 ± 7.5 $kg \cdot m^{-2}$) 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 $kg \cdot m^{-2}$) participated. STEPS expressed in absolute terms ($STEPS \cdot day^{-1}$) was not associated with any CMR factors. STEPS expressed relative to body mass ($STEPS \cdot kg^{-1} \cdot day^{-1}$) was correlated with %BF (-0.44), MAP (-0.48), HDL-C (0.41), TG (-0.33), TOT-C:HDL-C ratio (-0.36), INS (-0.56), and QUICKI (0.59). STEPS relative to FM ($STEPS \cdot kgFM^{-1} \cdot day^{-1}$) was correlated with %BF (-0.72), MAP (-0.32), HDL-C (0.38), TOT-C:HDL-C ratio (-0.42), GLU (-0.39), INS (-0.37), and QUICKI (0.47). STEPS expressed relative to FFM ($STEPS \cdot kgFFM^{-1} \cdot day^{-1}$) was correlated with INS (-0.32). Power regression analysis showed that $STEPS \cdot kgFM^{-1} \cdot day^{-1}$ was the best predictor of %BF ($r^2 = 0.85$), QUICKI ($r^2 = 0.47$) and TOT-C:HDL-C ratio ($r^2 = 0.29$).
CONCLUSIONS: These findings suggest that STEPS expressed relative to FM are strongly associated with CMR factors, and that prescribing STEPS relative to FM may be efficacious for improving CMR profiles in adults.

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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 associations among these variables are not well-defined in this population.
METHODS: 7553 healthy women received a comprehensive preventive examination between 2007 and 2018. Measures included self-reported physical activity (PA), body mass index (BMI), waist circumference (WC), waist:height ratio (W:HT), percent body fat (%Fat), and 25(OH)D. Participants were divided into 4 categories of PA based on current guidelines: <500 (not meeting guidelines), 500-1000 (meeting guidelines), 1000-2500 (1 to 2.5 times guidelines), and >2500 (>2.5 times guidelines) MET-minutes/week, respectively, and were also classified by clinical cut points for adiposity measures and 25(OH)D. We examined trends of PA and adiposity exposures across 25(OH)D categories, as well as trends of 25(OH)D and adiposity exposures across PA categories. We calculated odds ratios (OR) of vitamin D deficiency across categories of each adiposity exposure adjusted for age, menopausal status, ethnicity, smoking status, exam season, and PA.
RESULTS: A positive trend was observed for PA across ordered 25(OH)D categories, as well as for 25(OH)D across ordered PA categories (p<.001 for both). Using normal weight women as the referent, OR for 25(OH)D deficiency were significantly higher for women in the upper category of each adiposity measure. When examining joint associations, 25(OH)D was higher across ordered PA groups within each stratum of BMI, WC, W:HT, and %Fat (p trend <.007 for all). When utilizing PA and BMI as continuous variables, OR for vitamin D deficiency were 0.95 (95% CI:0.93-0.96) per 250 MET-minutes/week increment in PA and 1.20 (95% CI:1.17-1.23) per 2 kg/m^2 increment in BMI.
CONCLUSIONS: 25(OH)D levels are positively associated with PA and negatively associated with various measures of adiposity. 25(OH)D levels are also positively associated with PA within each category of each adiposity exposure. Prospective studies are needed in order to further examine the associations among these variables.

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Identifying Threshold Of Daily Sedentary Behavior Time For Prevention Of Obesity

Heontae Kim, Seungho Ryu, Minsoo Kang, FACSM. *The University of Mississippi, University, MS.* (Sponsor: Minsoo Kang, FACSM)
Email: hkim35@olemiss.edu
(No relevant relationships reported)

PURPOSE: Sedentary behavior (SB) has been related to the prevalence of obesity. The need for establishing SB guidelines is being recognized; however, there 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 wore an accelerometer (Actigraph AM-7164) for a minimum of 4 valid days (which included at least three week 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 59 minutes], 7 hours, 8 hours, ≥ 9 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 ≥ 9 hours 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.

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Role Of Leisure Centers Supporting Active Living: Data Shows Impact And A Significant Gender Challenge

Alfonso Jimenez[1], Maria Ayuso[1], Alejandro Lopez-Valenciano[1], Xian Mayo[2], Gary Liguori, FACSM[3]. *[1]GO fit LAB, Alcobendas, Spain. [2]King Juan Carlos University, Fuenlabrada, Spain. [3]University of Rhode Island, Kingston, RI.*
Email: alfonso.jimenez@ingesport.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 reported by paying members of Spain's 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

comparison with the general Spanish population (34%) for the whole sample (Z-score: 13.88; p-value < 0.001) and women (17.4%, 37.2%; Z-score: 10.06; p-value < 0.001) and men (12.1%, 30.0%; Z-score: 9.42; p-value < 0.001), separately. Additionally, higher prevalences were observed in in women in comparison with men in both samples (GO fit: Z-score: 4.77; p-value < 0.001; Spanish population: Z-score: 2.39; p-value = 0.0017), but these differences were lower in GO fit (+5.3 percentual points) than in the Spanish sample (+7.2 percentual points).
CONCLUSIONS: GO fit members showed a lower prevalence of physical inactivity for both women and men and higher levels of PA in comparison with the general Spanish population. These findings indicate the suitability of Spanish leisure centers in promoting an active lifestyle, so policymakers should consider leisure centers when searching for effective partners tackling physical inactivity tide introducing specific actions to support women active behaviors during leisure time.

1603 Board #197 May 28 10:30 AM - 12:00 PM

The Mediating Effect Of Physical Activity On Relationship Between Sleep And Weight Status

Seungho Ryu, Heontae Kim, Paul Loprinzi, Minsoo Kang, FACSM. *University of Mississippi, University, MS.* (Sponsor: Minsoo Kang, FACSM)

(No relevant relationships reported)

PURPOSE: The relationship between sleep and weight status is well known. However, the extent to which physical activity (PA) may act as a mediator in this relationship is uncertain. Therefore, it is crucial to investigate whether PA mediates the influence of sleep on weight status. The purpose of this study was to examine the association between sleep and weight status and determine the potential mediational role of PA on this relationship.
METHODS: Data from a total of 3,214 adults who participated in the National Health and Nutrition Examination Survey (NHANES) from 2005 to 2006 were analyzed for this study. PA was measured via accelerometry (Actigraph AM-7164) for a minimum of 4 valid days (which included at least three weekdays and one weekend day), and at least 10 hours of wear time were required to be considered a valid day. Weight status was measured via Body Mass Index (BMI) while utilizing established cut-points to determine normal weight, overweight and obesity. Sleep was measured using an NHANES validated question, namely "How often do you have trouble falling asleep?" Sleep quality was categorized into three levels: (1) Never; (2) 1-15 times a month; (3) 16-30 times a month. The analysis was conducted using SPSS (v. 25). The Hayes SPSS macro was utilized for the mediational analysis. The bootstrapping method was employed with 5,000 bootstrap samples to evaluate indirect effects.
RESULTS: For the overall sample, sleep (Never vs. 16-30 times a month) was positively related to PA (a = 0.596, p < .001). PA was negatively predicted weight status while controlling for sleep (b = -0.003, p < .001). A bootstrap confidence interval for indirect effect of sleep (ab) was 0.015 to 0.233, meaning that there was evidence of an indirect effect of sleep on weight status through PA. The direct effect of sleep on weigh status of c' = 0.536 was not statistically significant (p = .267).
CONCLUSIONS: Our findings demonstrate that the indirect relationship between sleep quality and weight status which is mediated via PA. Longitudinal studies are warranted to further conform this study finding.

1604 Board #198 May 28 10:30 AM - 12:00 PM

Association Of Physical Activity With Physical Functioning In Adults With Intellectual Disability

Stamatis Agiovlasitis, FACSM[1], Jian Xu[1], Poram Choi[1], Robert W. Motl[2]. [1]*Mississippi State University, Mississippi State, MS.* [2]*University of Alabama at Birmingham, Birmingham, AL.*
Email: sagiovlasitis@colled.msstate.edu

(No relevant relationships reported)

Adults with intellectual disability (ID) have very low levels of physical functioning. They also have low levels of physical activity (PA), high levels of sedentariness, and high rates of obesity; together with age, these factors may account for the low physical functioning levels of adults with ID. **PURPOSE**: This research examined if PA and sedentariness levels, age, and body mass index (BMI) are associated with physical functioning in adults with ID. **METHODS**: The sample included 58 adults with ID (29 women & 29 men; age 44 ± 14 years; BMI 34.2 ± 8.4 kg·m^{-2}). We measured physical functioning with the Short Physical Performance Battery (SPPB) and PA and sedentary time with an accelerometer (wGT3X-BT; Actigraph) worn on the dominant hip for 7 days. We determined time in light, moderate, and vigorous, PA, and sedentary behavior. We explored bivariate associations among these variables with Pearson's correlation coefficients. We entered variables significantly associated with the SPPB score into a hierarchical regression model; order of entry was based on the magnitude of correlations. **RESULTS**: Mean ± SD for measured variables were: SPPB score 7.7 ± 2.4; sedentary time 492.8 ± 130.1 min·day^{-1}; light PA 351.8 ± 105.1 min·day^{-1}; moderate PA 18.8 ± 21.0 min·day^{-1}; and vigorous PA 0.2 ± 0.6 min·day^{-1}. Moderate PA and age were significantly associated with the SPPB score (r = 0.39 and 0.34, respectively; p <0.01). Sedentary time, light PA, vigorous PA, and BMI had non-significant associations with the SPPB score. In the hierarchical regression model, moderate PA significantly predicted SPPB (p <0.001; R^2 = 0.153). Adding age to the model did not contribute significantly (p = 0.123; R^2 = 0.189; R^2 change = 0.036), but moderate PA remained a significant predictor (p = 0.027). **CONCLUSIONS**: Moderate PA predicts SPPB score even after accounting 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

George A. Kelley, FACSM, Kristi Sharpe Kelley. *West Virginia University, Morgantown, WV.*
Email: gkelley@hsc.wvu.edu

(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% compatibility intervals (CI). Small-study effects were examined using the Doi plot and Luis Furuya-Kanamori (LFK) index. 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 = 2.23) but not HRQOL (LFK = 0.27). Overall strength of evidence was considered "high" for HRQOL and "moderate" for MWB. **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[2], Yamileth Chacón-Araya[2], Peter W. Grandjean, FACSM[3], José Moncada-Jiménez[2]. [1]*Auburn University at Montgomery, Montgomery, AL.* [2]*University of Costa Rica, Costa Rica, Costa Rica.* [3]*University of Mississippi, Oxford, MS.* (Sponsor: George A. Kelley, DA, FACSM, FACSM)
Email: jtaylor@aum.edu

(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 English and Spanish languages using 16 electronic databases and the keywords "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^2) 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 0.34, p>0.05), heterogeneous (Q = 17.22, p=0.05), moderately inconsistent (I^2 = 48%), with minor asymmetry (LFK index = 1.34). The chronic effects of exercise on PON1 concentration were also trivial and non-significant (ES = -0.04, 95%CI = -0.53 to 0.45, p>0.05), homogenous (Q = 0.85, p=0.65), displayed low inconsistency (I^2 = 0%), and minor asymmetry (LFK index = -1.14). The acute effects of exercise on PON1 activity were trivial and non-significant (ES = 0.11, 95%CI = -0.02 to 0.24, p>0.05), homogenous (Q = 18.58, p=0.85), showed low inconsistency (I^2 = 0%), and no asymmetry (LFK index = 0.82). The chronic effects of exercise on PON1 activity were small but significant (ES = 0.39, 95%CI =

0.01 to 0.77, p<0.05), homogenous (Q = 6.43, p = 0.17), moderately inconsistent (I^2 = 38%), with no asymmetry (LFK 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.

1607 Board #201 May 28 10:30 AM - 12:00 PM

The Economic And Social Impact Of Leisure Centre Membership Across Spain: A Preliminary Analysis

Xian Mayo[1], Jesus J. De Soto-Cardenal[2], Pablo Bascones-Ilundain[2], Maria Ayuso[3], Alejandro Lopez-Valenciano[3], Gary Liguori, FACSM[4], Alfonso Jimenez[3]. *[1]King Juan Carlos University, Madrid, Spain. [2]PwC Spain, Madrid, Spain. [3]GO fit LAB, Alcobendas, Spain. [4]University of Rhode Island, Kingston, RI.*
Email: xian.mayo@urjc.es
(No relevant relationships reported)

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 spending savings ($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 as a better quality of life as a 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.

1608 Board #202 May 28 10:30 AM - 12:00 PM

The AHA'S 7 Health Metrics And Chronic Disease Mortality In Patients With CHD, Stroke, And Cancer

Chong-Do Lee, FACSM[1], Samuel Lee[2]. *[1]Arizona State University, Phoenix, AZ. [2]Arizona State University, Tempe, AZ.*
(No relevant relationships reported)

PURPOSE: The impact of the AHA's 7 health metrics on mortality risks from chronic disease in patients with CHD, stroke, and cancer remains less explored. We investigated the association between AHA's 7 health metrics and chronic disease mortality in patients with CHD, stroke, and cancer.
METHODS: We followed 8,021 men and women, aged 20 to 85 years, who participated in the National Health and Nutrition Examination Survey (1988-1994 and 1999-2014). All participants completed baseline health factors, lifestyle behavior questionnaires, and a personal history of CHD, stroke, or cancer at baseline. The AHA's 7 ideal health metrics were defined as untreated blood pressure, untreated total cholesterol, untreated fasting glucose, physically active, never smoked, a healthy diet, and normal body weight. We further categorized these variables as having 0, 1, 2, 3, 4, or 5 or greater combined ideal health metrics. We also categorized patients as having 1, 2, or 3 combined history of CHD, stroke, and cancer at baseline. Cox proportional hazards regression was used to investigate the associations of a combined number of 7 health metrics and combined personal history of CHD, stroke, and cancer with chronic disease mortality.
RESULTS: During an average of 6.6 years of follow-up (53,179 person-years), there was a total of 1,420 chronic disease deaths. After adjustment for multiple risk factors, the hazard ratios (95% CI) across 0 (reference), 1, 2, 3, 4, or 5 or greater combined ideal health metrics were 0.72 (0.60, 0.86), 0.52 (0.43, 0.62), 0.44 (0.36, 0.53), 0.37 (0.28, 0.47), and 0.27 (0.17, 0.43) (p for trend <0.001). Men and women with all 5 or greater combined ideal health metrics had a 73% (95% CI: 57% to 83%) lower risk of chronic disease mortality compared with men and women with zero ideal health metrics. Men and women with 2 or 3 combined CHD, stroke, or cancer at baseline had 1.48 (1.30, 1.68) and 2.08 (1.57, 2.75) times the risk of chronic disease mortality compared with men and women with 1 combined CHD, stroke, and cancer at baseline (p for trend <0.001).
CONCLUSIONS: 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.

1609 Board #203 May 28 10:30 AM - 12:00 PM

Cardiometabolic Characterization Of People Living With HIV Seeking Treatment In The South Texas Region

Norberto Quiles[1], Alexis Ortiz, FACSM[2], Christian Lira[3], Helen Fleck[3]. *[1]Queens College of the City University of New York, Flushing, NY. [2]University of The Incarnate Word, San Antonio, TX. [3]University of Texas Health San Antonio, San Antonio, TX.*
(Sponsor: Alexis Ortiz, FACSM)
Email: norberto.quilesgonzalez@qc.cuny.edu
(No relevant relationships reported)

PURPOSE: To characterize the cardiometabolic profile of people living with HIV (PLWH). We hypothesized that a majority of PLWH would have 3 or more cardiometabolic risk markers. **METHODS**: A large dataset from electronic medical records (EMR) of PLWH seeking care at several public health care institutions was used for this investigation. 200 PLWH from the South Texas Region were included. 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 yrs; 179.1 ± 44.3 lbs; 67.4 ± 3.8 in, respectively. %CD4 and viral load were 20.8 ± 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.

1610 Board #204 May 28 10:30 AM - 12:00 PM

Effect Of Traditional And Non-traditional Pre-sporting Activities On Perceived And Actual Motor Competence

Pamela Salazar-Cruz[1], Judith Jiménez-Díaz[1], María Morera-Castro[2], Manrique Rodríguez-Campos[1]. *[1]Universidad de Costa Rica, Mercedes, Montes de Oca, San José, Costa Rica. [2]Universidad Nacional de Costa Rica, Heredia, Costa Rica.*
(Sponsor: Luis Fernando Aragón-Vargas, FACSM, FACSM)
Email: pamela.sc07@hotmail.com
(No relevant relationships reported)

Previous research has analyzed the effect of motor interventions (MI) on perceived motor competence (PMC) and actual motor competence (AMC) on children and adolescents. No research had focused on pre-sporting activities (PSA) as part of MI. **PURPOSE:** To analyze the effect of traditional and non-traditional PSA on PMC skills (perceived locomotion [PL], perceived object control [POC], perceived gross motor [PGM], and global PMC [GPMC]) and AMC skills (locomotion [L], object control [OC], gross motor [GM]) on elementary boys and girls. **METHODS:** 72 children from fourth grade of elementary school (mean age 9.6 ± 0.6 yrs. old) had their parents' authorization and volunteered to participate in the study. Four treatments were randomly assigned to four intact classes: traditional PSA (T), non-traditional PSA (NT), combined PSA (C), and control group (CG). The intervention consisted of 7 sessions of 80 minutes each, once per week. T group (n=18) received track and field and gymnastics PSA; NT group (n=21) received goalball and field hockey PSA; C group (n=15) received PSA of the four sports, and CG (n=18) had no physical education. PMC was assessed with the Pictorial Scale for Perceived Movement Skill Competence for Young Children; while AMC was assessed with the Test of Gross

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, C: 2.99±0.6, CG: 3.1±0.4] and posttest [T: 3.3±0.5, NT: 3.2±0.5, C: 3.2±0.4, CG:3.2±0.4]) nor PGM (M±SD values for pretest [T: 3.1±0.4, NT: 3.1±0.4, C: 3.0±0.5, CG: 3.0±0.3] and posttest [T: 3.2±0.5, NT: 3.2±0.3, C: 2.99±0.4, CG: 3.1±0.3]. PL, GPMC, L, OC, 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±1.8, NT: 3.5±2.0, C: 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, C:4.4±1.9, CG:2.3±1.3), GM (T: 8.6±1.9, NT: 7.8±3.3, C: 9.0±3.3, CG: 3.5±1.4), PL (T: 3.2±0.6, NT: 3.1±0.5, C: 3.0±0.5, CG:3.2±0.4), and GPMC (T: 3.0±0.5, NT: 3.0±0.3, C:3.0±0.4, CG:3.0±0.3). **CONCLUSION:** Traditional and non-traditional PSA can be used to enhance OC in fourth graders.

1611 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 Ding[1], Xue Li[2], Cuilan Wei[2], Yu Jin[2]. [1]*Chengdu Sport University, Chengdu, China.* [2]*Chengdu sport institute, Chengdu, China.*

(No relevant relationships reported)

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 seprately 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 regulatio.

1612 Board #206 May 28 10:30 AM - 12:00 PM

Accelerometer-derived Physical Activity Intensities And Its Correlation With Cardiovascular Disease Risk In Factory Workers

Philippe J. Gradidge, Margarida Da Silva. *University of the Witwatersrand, Johannesburg, South Africa.*
Email: philippe.gradidge@wits.ac.za

(No relevant relationships reported)

PURPOSE: Physical activity (PA) is known to be associated with the prevention of cardiovascular disease (CVD), yet there data describing the objective measurement and correlates of this lifestyle behaviour in low-to-middle-income countries are limited. The aim of this present study was to describe accelerometer-derived PA patterns and determine the correlation of PA intensity with indicators of CVD risk in adult factory workers
METHODS: Valid PA and cardiometabolic disease data were obtained from a sample of 87 adult workers (age (mean ± SD) 39.4 ± 10.1 years; body mass index (BMI) 29.6 ± 6.64; waist circumference 91.7 ± 12.5 cm; 59% female). Axivity AX3 wrist worn data were analysed using the R-package GGIR version 1.10-7 and characterized into four PA intensities (1: inactivity, 2: light, 3: moderate, 4: vigorous). Ten-year CVD risk and vascular age were determined using the Framingham algorithm. Correlates with PA intensities were determined using univariate analysis.
RESULTS: More males (33%) than females (19%) were in the highest quartile of moderate-vigorous PA (MVPA). Females had lower MVPA (106 ± 52.6 min/day) than males (129 ± 49.6 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.

1613 Board #207 May 28 10:30 AM - 12:00 PM

Implementation Of Physical Activity Prescription For People With Non-communicable Diseases In Ile-de-France

Nicolas Forstmann, Julien Schipman, Joana Ungureanu, Jean-François Toussaint. *INSEP, Paris, France.*
Email: nicolas.forstmann@insep.fr

(No relevant relationships reported)

Purpose: Recognized by law in 2016, the prescription of PA for people with NCDs is promoted and implemented by the regional state sports and health offices. The "Prescri'forme" plan aims to increase the use of PA as non-drug therapy for NCDs. Based on the implementation of the Ile-de-France program and its surrounding context, the objective of this evaluation was to identify the obstacles and benefits related to the integration of PA into the healthcare system of patients with NCDs.
Methods: Through the review of the scientific literature, institutional reports, and grey literature on the recognition and development of PA within public health policy, 21 semi-directed interviews identified challenges and difficulties in the implementation of the "Prescri'forme" plan. Particular attention was given to the changes currently happening within the organisation of the healthcare system, in order to propose a method to integrate PA into the healthcare system for patients with NCDs.
Results: The deployment of the plan is still in progress, with its advances varying based on location, affected largely by the maturity of the PA prescription-practice systems already in place and the strength of the links established between the actors. For example, a program to provide support and guidance for the prescription and supervision of adapted PA. In Ile-de-France, local coordination is gradually being established. At a regional level, there is a lack of support for steering the system, particularly to gather data from patient follow-up visits in order to demonstrate more robustly the value of integrating PA into the care of these patients. In addition, a regional level of coordination would provide a space for exchange between actors involved with promoting PA as part of the healthcare system.
Conclusion: To strengthen the legitimacy of PA in the care of patients suffering from NCDs, it is necessary to link PA prescription systems with organizational changes already in progress in the healthcare system. The desire to provide a flat-rate coverage for NCDs represents an opportunity to propose models of a healthcare system that integrates PA. These models must demonstrate the benefits of these programs in terms of public health, medicine, and economics, whilst also responding to the challenges around prescription pricing and PA dispensation.

1614 Board #208 May 28 10:30 AM - 12:00 PM

Sedentary Behavior, Insulin Resistance, And Arterial Stiffness In Individuals Meeting Physical Activity Guidelines

Jacquelyn Jeanne Rickson[1], Elizabeth M. Mullin[1], Xanne Janssen[2], Hai Kinal[1], Samuel A. Headley, FACSM[1]. [1]*Springfield College, Springfield, MA.* [2]*University of Strathclyde, Glasgow, Scotland, United Kingdom.* (Sponsor: Samuel A. E. Headley, FACSM)

(No relevant relationships reported)

PURPOSE: To examine the association between the average amount of sedentary behavior (SB) per day and insulin resistance (IR), along with sedentary behavior and arterial stiffness (AS) in those who meet physical activity (PA) guidelines. **SUBJECTS:** N = 59, 37 females and 22 males, age, 43 ± 7.5 years, height, 167.8 ± 10.2 cm, weight, 77.9 ± 9.7 kg, body fat, 24.4 ± 9.7 % , resting heart rate 56.9 ± 9.5 bpm, 122.9 ±14.6 mmHg, 75.1 ± 8.7 mmHg, resting SBP and DBP respectively. **METHODS:** Subjects were pre-screened using the International Physical Activity Questionnaire to subjectively confirm they met PA guidelines. ActivPal accelerometers were placed on the thighs of subjects for 7 full days to monitor time spent in sedentary behaviors including sitting and lying in a reclined position. At the completion of 7 day wear time, measurements of pulse wave velocity (PWV; Sphygmacor XCEL), an estimation of AS, were completed to record AS, along with a 10mL fasting blood draw to analyze for glucose (mg/dL) and insulin (μIU/mL)

concentrations. Glucose concentrations were measured with the colormetric 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, $F(1, 57) = .949$, $p > 0.05$, $R^2 = 0.018$, nor PWV, $F(1, 57) = 2.597$, $p > 0.05$, $R^2 = 0.044$. **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.
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1615 Board #209 May 28 10:30 AM - 12:00 PM

Predictors Of Physical Activity Level Among Brazilian Military Law Enforcement Personnel

Luiz Guilherme G. Porto[1], Wélere G B Silveira[2], Guilherme E. Molina[3], Edgard MKVK Soares[4], Daniel R. Saint Martin[4], Costas A. Christophi[5], Stefanos N. Kales[6]. *[1]Faculdade de Educação Física - Universidade de Brasília - GEAFS - Laboratório de Fisiologia do Exercício; Department of Environmental Health - Harvard T. H. Chan School of Public Health - EOME Program, Brasilia, Brazil. [2]Polícia Militar do Estado do Tocantins e Faculdade de Educação Física - GEAFS - Universidade de Brasília, Brasilia, Brazil. [3]Faculdade de Educação Física - Universidade de Brasília - Grupo de Estudos em Fisiologia e Epidemiologia do Exercício e da Atividade Física - GEAFS; Laboratório de Fisiologia do Exercício da UnB, Brasilia, Brazil. [4]Faculdade de Educação Física - Universidade de Brasília - GEAFS - Laboratório de Fisiologia do Exercício, Brasilia, Brazil. [5]Department of Environmental Health - Harvard T. H. Chan School of Public Health, Boston, MA, USA; Cyprus International Institute for Environmental and Public Health, Cyprus University of Technology, Limassol, Cyprus, Limassol, Cyprus. [6]Department of Environmental Health - Harvard T. H. Chan School of Public Health, Boston, MA, USA, Boston, MA.*
Email: luizggporto@gmail.com
(No relevant relationships reported)

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 evaluate 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 Brazil. 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 26.5 ± 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). Each 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.

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

	β	SE	*p*
Age	6.7	9.9	0.50
BMI (kg/m²)	-56.2	17.6	0.001
Gender	251.9	191.4	0.19
Role	-53.0	126.8	0.68
Rank	83.6	149.7	0.58
Educational level	381.1	134.7	0.005
QoL Physical domain	7.2	5.1	0.15
QoL Psychological domain	-5.7	5.8	0.33
QoL Environmental domain	12.8	5.6	0.02

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

1616 Board #210 May 28 10:30 AM - 12:00 PM

60 Min Daily Vs Average Of 60 Min/day, Are There Differences In Health Status?

Gianpietro Jose Elias Revolledo, Tiago V. Barreira. *Syracuse University, syracuse, NY.*
Email: geliasre@syr.edu
(No relevant relationships reported)

The physical activity (PA) guidelines for Americans 2nd Ed. recommend children and adolescents (6-17 years old) to engage in at least 60 min/day of moderate-to-vigorous PA (MVPA). However, it is common to report that participants meet guidelines when they average 60 min/day of MVPA instead of 60 min daily as recommended. **PURPOSE:** To determine if there were differences in health status (high-density lipoprotein cholesterol (HDL), total cholesterol (TC), triglyceride (TRG), BMI, and diastolic and systolic blood pressure (DBP, SBP)) between children and adolescents that engage in MVPA for an average of 60 min/day (group 1) or 60 min daily (group 2). **METHODS:** Data from 724 (Group 1 =371, Group 2 = 353) children and adolescents (aged 6–17 yrs) that had 6+ valid days of accelerometer data from the 2003-2006 National Health and Nutrition Examination Survey (NHANES) were included in this analysis. One-Way ANOVA was used to compare mean values between the 2 groups for all measures and ANCOVA was used to control for covariates. **RESULTS**: Mean MVPA (82±20 and 128±37 min/day), age (10±3 and 8±2 years) and BMI (19±4 and 17±3 Kg/m²) were significantly different between groups (p<.001). However, HDL (57±12 and 59±13 mg/dL, p=.10), TC (165±30 and 162±29 mg/dL, p=.23), TRG (77±38 and 78±47 mg/dL, p=.89), SBP (103±10 and 101±10 mmHg, p=.08), and DBP (53±14 and 53±14 mmHg, p=.70) were not different. When variables were adjusted for age and gender, no significant mean differences were found for BMI (p=.21), and other health measures. **CONCLUSION**: Although there were mean differences in MVPA between children and adolescents that engage in MVPA an average of 60 min/day or 60 min daily, there were no significant health differences. More studies are needed to confirm these initial findings leading to a possible change in the wording of the guidelines.

1617 Board #211 May 28 10:30 AM - 12:00 PM

Physical Activity And Anxiety In Gamers And Non-gamers

Bryan Dowdell, Peter Gates, Jacob Barkley. *Kent State University, Kent, OH.*
(No relevant relationships reported)

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*=337, 20.92±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, 908±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 ($p\leq0.042$) 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

Sae Young Jae[1], Hyun Jeong Kim[1], Min Jeong Cho[1], Ja Kyoung Yoon[2], Song-Ho Kim[2]. [1]*Department of Sport Science, University of Seoul, Seoul, Korea, Republic of.* [2]*Department of Pediatrics, Sejong General Hospital, Bucheon, Korea, Republic of.*
Email: syjae@uos.ac.kr

(No relevant relationships reported)

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/m^2) 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 (VO2peak) (ρ=.31, p=.024) and HRQOL (ρ=.21, p=.048). When both variables were entered into the same regression models, EC, but not objectively measured MVPA (β=.088, p=.535), was independently associated with HRQOL (β=.348, p=.016). In the mediation analysis, exercise capacity showed a mediating effect in the association between objectively measured MVPA and HRQoL (z=1.973, p=.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 Codogno[1], Bruna Turi-Lynch[2], Romulo Araujo Fernandes[1], Henrique Luiz Monteiro[3]. [1]*Sao Paulo State University, Presidente Prudente, Brazil.* [2]*Lander University, Greenwood, SC.* [3]*Sao Paulo State University, Bauru, 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 questionnaire (Baecke 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). 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 their peers non-engaged 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.

Belinda J. Parmenter[1], Lauren A. Gardner[2], Katrina E. Champion[2], Cath Chapman[2], Louise Thornton[2], Nyanda McBride[3], Matthew Sunderland[2], Nicola C. Newton[2]. [1]*University of NSW, Sydney, NSW, Australia.* [2]*University of Sydney, Sydney, NSW, Australia.* [3]*Curtin University, Perth, WA, Australia.*
Email: b.parmenter@unsw.edu.au

(No relevant relationships reported)

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 behaviors 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. Alarmingly, on average participants reported spending 8.6±4.2 hours/day watching a screen and sat for 8.4±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

María Fernanda Sanhueza[1], Rocío Nuche[1], Bárbara Munizaga[2], Jaime Leppe[2], Sandra Mahecha-Matsudo[3]. [1]*Universidad Mayor, Santiago, Chile.* [2]*School of Physical Therapy, Facultad de Medicina Clínica Alemana, Universidad del Desarrollo, Santiago, Chile.* [3]*Universidad Mayor and Clínica MEDS, Santiago, Chile.*
Email: mfernanda.ss@gmail.com

(No relevant relationships reported)

PURPOSE: to identify personal and environmental barriers for physical activity practice and the stage of change in residents of communes 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 (P_{25} = 37-P_{75} = 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 among all communes, 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 = 0.025 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.

1623 Board #217 May 28 10:30 AM - 12:00 PM

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

Tyler D. Quinn[1], Patrick L. Yorio[1], Peter Smith[2], Yongsuk Seo[1], Geoffrey Whitfield[1], Bethany Barone Gibbs[3]. [1]*Centers for Disease Control and Prevention, Pittsburgh, PA.* [2]*University of Toronto, Toronto, ON, Canada.* [3]*University of Pittsburgh, Pittsburgh, PA.*
Email: yhh7@cdc.gov

(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.

1624 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

Georgie Bruinvels[1], Esther Goldsmith[1], Richard Blagrove[2], Andrew Simpkin[3], Nathan Lewis[1], Katie Morton[4], Suppiah Ara[5], John Newell[3], Charles R. Pedlar[1]. [1]*St Mary's University, Twickenham, United Kingdom.* [2]*Loughborough University, Loughborough, United Kingdom.* [3]*NUI Galway, Galway, Ireland.* [4]*Orreco, Galway, Ireland.* [5]*University of Central Florida, Orlando, FL.*
Email: Georgie.bruinvels@orreco.com

(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 they have on both exercise and work behaviours. **METHODS**: 6,812 women using an exercise tracking app of a reproductive age who were not using combined hormonal contraception from 7 geographical regions (Brazil, n=1,288; France, n=1,911; Germany, n=1,178; Spain, n=1,204; UK & Ireland, n=2,311; and USA, n=2,479) completed a 39-part questionnaire, translated and localised to each geographical region. The questionnaire captured current and previous exercise behaviours; current menstrual status; the presence of, and frequency of symptoms; use of medication for symptoms; effects of the menstrual cycle on exercise and work behaviours; and hormonal contraception use. A menstrual cycle symptom score (MCSS) was defined based on the presence and frequency of 18 commonly reported symptoms.
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<0.0005) and work/academic absenteeism (r=0.31; p=0.001).
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-pharmacological treatment options.

1625 Board #219 May 28 10:30 AM - 12:00 PM

Gender As A Determinate Of Exercise Type Preference

Alyssa L. Thorman. *University of Utah, Salt Lake City, UT.*

(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. Garber 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 abide by either aerobic or weight training regimes. **Purpose:** 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 $p = 5.13 \times 10^{-8}$ **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.

1626 Board #220 May 28 10:30 AM - 12:00 PM

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

Ryan D. Burns[1], Yang Bai[1], You Fu[2], Timothy A. Brusseau[1]. [1]*University of Utah, Salt Lake City, UT.* [2]*University of Nevada Reno, Reno, NV.*
Email: ryan.d.burns@utah.edu

(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 2017 US 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 10th percentile, more precise parameter estimates were observed at higher percentiles. Across the interquartile range, physical activity associated with lower BMI% at the 50th and 75th percentiles (b_{range}= -2.27% to -5.24%, p<0.05), television watching associated with higher BMI% at the 25th to 75th percentiles (b_{range}=2.29% 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_{range}=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_{range}=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 BMI% in adolescents. Estimates of association were more precise within higher quantiles.

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 their 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 relation 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 were comparable among faculty and staff members (vigor: p=0.44; 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

Stephanie M. McCoy[1], Kristie Rupp[2]. [1]*University of Southern Mississippi, Hattiesburg, MS.* [2]*Southern Connecticut State University, New Haven, CT.*

(No relevant relationships reported)

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 (56% male) adolescents classified as overweight or obese, ages 10-17 years (mean 13.6 ± 2.3 years), from the 2016-17 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's <0.05). 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's <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

Bruna C T Lynch[1], Jamile S. Codogno[2], Romulo A. Fernandes[2], Henrique L. Monteiro[3]. [1]*Lander University, Greenwood, SC.* [2]*Sao Paulo State University - UNESP, Presidente Prudente, Brazil.* [3]*Sao Paulo State University - UNESP, Bauru, Brazil.*
Email: blynch@lander.edu

(No relevant relationships reported)

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 (Baecke 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/m^2) was used as diagnosis of obesity (BMI ≥30). Sports participation and obesity were combined and participants were stratified as follow: Obese/Non-sport (n= 230), Obese/Sport (n= 33), Non-obese/Non-sport (n= 291) and Non-obese/Sport (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 <5%. **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.
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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 Skelly[1], Brona Furlong[2], Lisa Loughney[3], Noel McCaffrey[3], Kieran Dowd[4], Leslie Daly[5], Catherine Woods[6], Andrew McCarren[1], Niall Moyna[1]. [1]*Dublin City University, Dublin, Ireland.* [2]*Waterford Institute of Technology, Waterford, Ireland.* [3]*Exwell Medical, Dublin, Ireland.* [4]*Athlone Institute of Technology, Westmeath, Ireland.* [5]*University College Dublin, Dublin, Ireland.* [6]*University of Limerick, Limerick, Ireland.*
Email: fiona.skelly2@mail.dcu.ie

(No relevant relationships reported)

INTRODUCTION: The overall health status of individual's with chronic disease (CD) are positively and negatively affected by 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) 62.2±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). 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^3 micro accelerometer. QoL was assessed using the EQ5D VAS 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 the variance in PA and SB. There was a significant main effect for PSB on LDL-C (F (1,189) = 9.06) and PHQ8 scores (F(1,162) = 6.82). There was a significant main effect for PA on BMI (F(1,99) = 14.48), WHR (F(1,99) = 5.77), STS (F(1,222) =77.08), 6 MTT (F(1,222) = 77.08), EQ5D VAS (F(1,162) = 14.13), triglycerides (F(1,188) = 4.95), CRP (F(1,155) = 4.28), and systolic BP (F(1,99) = 4.94). There was a significant main effect for BSB 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

1631 Board #225 May 28 10:30 AM - 12:00 PM

Personal Social Capital And Health: Exploring The Role Of Physical Activity And Socioeconomic Status

Tim Schneider[1], Eric Faß[1], Marc Lochbaum[2], Youngdeok Kim[3]. [1]*Ruhr-University Bochum, Bochum, Germany.* [2]*Texas Tech University, Lubbock, TX.* [3]*Virginia Commonwealth University, Richmond, VA.*
Email: Tim.Schneider-v6p@rub.de
(No relevant relationships reported)

Personal social capital (PSC), which refers to the scope and quality of individual's social networks within a community, has received an increasing attention as a potential sociological factor associated with better individual health; yet, the mechanism relating PSC to health is still poorly understood. **PURPOSE**: This study examined the associations between PSC and self-rated health (SRH) while exploring the mediating and/or moderating roles of leisure time physical activity (LTPA) and socioeconomic status (SES) among middle-aged and older adults. **METHODS**: Cross-sectional data were collected from 677 adults aged ≥40 years old using the Qualtrics survey panel. PSC scale was used to measure bonding and bridging SC and SRH was assessed by a single item with a 5-point Likert scale. The International Physical Activity Questionnaire was used to assess LTPA levels by categorizing individuals into no-, low-, and high-LTPA groups. SES variables included education level (EL), household income (HI), and home ownership (HO). Hierarchical multiple logistic regression models were established in which a set of independent variables was sequentially added in order to examine the independent, mediating and moderating effects of PSC, LTPA, and SES. Odds ratio (OR) predicting the likelihood of reporting good SRH was reported along with 95% confidence interval (CI). **RESULTS**: Overall, a greater bonding score was significantly associated with greater odds for reporting good SRH before and after controlling for LTPA and other covariates (OR=1.14; 95% CI = 1.05, 1.24). The inclusion of HI and HO attenuated the association of PSC with SRH, implying modest evidence for mediation effects; yet, no such effect was found for EL. However, LTPA was still independently associated with SRH in the full model. The additional moderation analyses indicated varying mediation effects according to EL (i.e., part mediation was found among low- and medium-level of education groups, whereas no mediation appeared among upper-level of education group). **CONCLUSIONS**: Findings suggest that PSC and LTPA are associated with better SRH. However, depending on the EL, the beneficial influences of PSC are partly mediated by HI and HO. Hence, health policymakers can address both SC and PA for enhancing health but may need to consider SES background.

1632 Board #226 May 28 10:30 AM - 12:00 PM

Sustainability Strategies Of A 3-week Preventive Measure In Patients With Knee Osteoarthritis

Aki Pietsch[1], Jan Schroeder[2], Rüdiger Reer[2], Helge Riepenhof[1]. [1]*BG Trauma Hospital Hamburg, Hamburg, Germany.* [2]*University of Hamburg, Hamburg, Germany.*
(No relevant relationships reported)

Knee osteoarthritis as a degenerative joint disease is particularly relevant for occupational groups whose activities are associated with high loads or unfavorable postures over long periods of time. In the sense of effective secondary prevention, the BG Trauma Hospital of Hamburg uses a multimodal therapy concept, the so-called Kniekolleg. Data are now available for a two-year follow-up so that not only acute effects of the three-week start-up intervention, but also sustainability effects for long-term exercise adherence after two refresher courses, each after 12 month, can be reported.
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 after one year (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 instruction (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≤0.05, 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.

- **G1:** KK + 12 month fitness studio + 1.Rf + 12 m.f.s. + 2.Rf
- **G2:** KK + individuel home training program + 1.Rf + i.h.t.p. + 2.Rf
- **G3:** KK + no sport + 1.Rf + no sport + 2.Rf

C-43 Free Communication/Poster - **Physical Activity Interventions I**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1633 Board #227 May 28 10:30 AM - 12:00 PM

Just How Credible Is Online Physical Activity Advice? Investigating Kinesiology Knowledge Translation In Lay Resources

Jafra D. Thomas[1], Bradley J. Cardinal, FACSM[2]. [1]*California Polytechnic State University, San Luis Obispo, CA.* [2]*Oregon State University, Corvallis, OR.* (Sponsor: Bradley J. Cardinal, FACSM)
Email: jthoma84@calpoly.edu
(No relevant relationships reported)

PURPOSE: In the U.S. and globally, adults independently seek out online advice to support their personal health and fitness goals. In this study, we examined web articles specific to physical activity promotion. Our objectives were to determine the rate that web articles *at least once* provided advice consistent with national physical activity guidelines (PAGs) and determine if consistency with PAGs varied on the basis of production source (i.e., commercial, governmental, professional association, or voluntary health agency). **METHODS**: The Google search engine was used to locate free-to-access web articles focused on physical activity promotion, written in English, and used text as the main communication medium. Valid lay search strategies independently reviewed by three experts were used. The *2008 Physical Activity Guidelines for Americans* 18 to 64 years of age were used to appraise the credibility of messages. Seventeen potential PAGs were referenced. **RESULTS**: A sample of 72 web articles published or updated between 2008 and 2018 was obtained (M = 2016.34, SD = 2.02). All web articles that comprised the sample presented PAG-related messages. The percent of the sample that lacked *at least one* consistent message ranged from 61.1% to 100% across the 17 PAGs. The level of inconsistency was significant for 15 PAGs, all $p < .05$. Production source was associated with consistency for five PAGs, all related to aerobic (endurance) physical activity, $p \leq .05$, Cramer's $V \geq .30$. For the remaining 12 PAGs, the rate of consistency was equivalent across the production source groups, $p > .05$, Cramer's $V = .11$-$.26$. Message consistency was lowest with guidelines for adults who have sedentary or modestly active lifestyles, $M \approx 3\%$ of the study sample. **CONCLUSION**: Knowledge translation of physical activity guidelines is low in free online resources that lay adults may independently locate. This observation was irrespective of production source. The implications of this study's results will be discussed, including ways that they pertain to ACSM's *National Roadmap to Improve Equity in Physical Activity Participation*. In consideration of this study's findings, as well as broader knowledge translation issues that have been raised by others, including in other countries (e.g., Canada), recommendations for future research will be provided.

1634 Board #228 May 28 10:30 AM - 12:00 PM

Does Current Activity Status Impact Goal Recommendation Adherence In A Worksite Walking Intervention?

Annalise G. Czerwinski[1], Anna I. Rinaldi-Miles[1], Bhibha M. Das, FACSM[2]. [1]*Illinois State University, Normal, IL.* [2]*East Carolina University, Greenville, NC.* (Sponsor: Bhibha M. Das, FACSM)
Email: aimiles@ilstu.edu
(No relevant relationships reported)

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. **PURPOSE:** To examine if adherence to goal setting recommendations differ between active versus inactive individuals. **METHODS:** Adult participants (N=38) enrolled in a four-week worksite walking intervention completed a demographic and stage of change questionnaires. Active (n=14) and inactive (n=24) participants wore blinded 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 between subjects 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 $p \leq .05$ 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 inactive participants (M = 701.74, 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 recommendation. 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.

1635 Board #229 May 28 10:30 AM - 12:00 PM

Effects Of A Multi-ingredient Dietary Supplement And Tai Chi On Physical Function In Adults

Mingchia Yeh, Alex Klemp, Do-Houn Kim, Bahram H. Arjmandi, Lynn B. Panton, FACSM, Michael J. Ormsbee, FACSM, Robert J. Contreras, Bruce P. Daggy, Laurel A. Fisher, Jeong-Su Kim, FACSM. *Florida State University, Tallahassee, FL.*
Email: yehmingchia@gmail.com
(No relevant relationships reported)

PURPOSE: To examine the effects of a 12-week multi-ingredient dietary supplementation (MIDS) or Tai Chi training on physical function compared to a placebo in middle-aged and older adults.
METHODS: In a randomized, double-blind, placebo-controlled design, seventy-five men and postmenopausal women aged 45-75 years were randomly assigned to one of three experimental groups: 1) MIDS (n= 30), 2) placebo tablet (PL, n= 30), or 3) Tai Chi training (EX, n= 15). The supplementation groups took one tablet daily (MIDS or PL), while the EX group performed a 24-form Yang Tai Chi exercise program (1hr/session, 3x/week) for 12 weeks. Physical function was assessed using Tandem Romberg test, single leg stance (SLS) test, dynamic balance test via Biodex Balance System (BBS), timed up and go test (TUG), and functional reach test (FRT) pre- and post-intervention. Data were analyzed with a 3×2 mixed ANOVA and Bonferroni pair-wise comparisons. Significance was accepted $p \leq .05$.
RESULTS: In TUG test, there was a significant group x time interaction, as the EX group improved significantly more than the PL group (EX: 8.07±1.18 to 7.08±0.80 s vs. PL: 8.19 ± 1.32 to 8.16 ± 1.36 s). There were significant main time effects in both BBS dynamic test level 2 anterior/posterior scores (EX: 7.94±4.78 to 3.31±1.51 AU, +58.43%), and TUG test (EX: 8.07±1.18 to 7.08±0.80 s, -14%). In addition, the EX group showed significant improvements in SLS from pre- to post-intervention (7.57±7.31 to 13.31±14.25 s, +43.13%). Both the MIDS and EX groups had a significant main time effect in physical health scores in the SF-36 survey (MIDS: 81.6±13.0 to 85.7±10.7, +5%, EX: 79.0±18.6 to 86.1±13.3, +9%) after the interventions. The PL group remained unchanged in aforementioned physical function tests.
CONCLUSIONS: In middle-aged and older adults, 12 weeks of Tai Chi exercise improved both static and dynamic balance ability, which is essential in reducing the risk of falls. Tai Chi exercise also significantly improved TUG scores, which indicates advantageous effects on gait and strength. Both the MIDS and Tai Chi interventions improved self-perception of health status, suggesting beneficial effects on the quality of life. Overall, both MIDS and Tai Chi can be beneficial to physical function and quality of life in older adults.
Supported by Shaklee Corporation Research Grant.

1636 Board #230 May 28 10:30 AM - 12:00 PM

Short-term Run Sit Improves Cardiovascular Health But Does Not Affect Body Composition In Undergraduate Students

Alberto Jiménez Maldonado[1], Patricia Concepción García Suárez[1], Ivan Rentería[1], Priscilla Garcia Wong Aviles[1], Fernanda Franco Redona[1], Luis Mario Gómez Miranda[2], Jorge Alberto Aburto Corona[2], Eric P. Plaisance, FACSM[3]. [1]*Universidad Autónoma de Baja California, Ensenada, Baja California, Mexico.* [2]*Universidad Autónoma de Baja California, Tijuana, Baja California, Mexico.* [3]*University of Alabama at Birmingham, Birmingham, Alabama, AL.*
Email: patricia.garcia@uabc.edu.mx
(No relevant relationships reported)

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 show 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 show 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 ±2 yrs; weight:67±6.3 kg; height: 1.7±0.07 m) participated in this study. They were randomly assigned to control (CON) (n =9) or SIT (n =10). After baseline parameters (systolic and diastolic blood pressure -SBP and DBP-, resting heart rate (HR_{rest}), resting double product (DP)) and body composition measurements were obtained, both groups performed a graded exercise test to determine VO_{2max} and the running speed associated with their VO_{2max} ($_sVO_{2peak}$). The exercise protocol consisted of 12 sessions (For sessions 1-3, participants ran at 100% $_sVO_{2peak}$ with recovery periods at 40% sVO2peak, with interval ratios of 2:2 min for a total of three intervals; For sessions 4-7, the interval ratio was 2:1 min 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_{rest} 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.

1637 Board #231 May 28 10:30 AM - 12:00 PM

The Energy Cost Of Successive Match Play Events For The Singaporean Men's Walking Football Team

Dee Dee A. Salle[1], Robert U. Newton[1], Daniel P. Heil, FACSM[2]. [1]*Edith Cowan University, Perth, WA, Australia.* [2]*Montana State University, Bozeman, MT.*
Email: deedeefitness@gmail.com
(No relevant relationships reported)

Competitive walking football, an international sport that is less than 10 years old, has great potential to help address the international problems of sedentarism and obesity as a unique form of team-based competitive exercise. While recent research has documented the energy cost of women engaged in match play walking football (Heil et al. IJPEFS 2017), no such data yet exists for men's teams. PURPOSE: This study sought to characterize the metabolic intensity of match play walking football for one men's team during successive matches at the 2019 International Walking Football Federation World Cup competition. It was hypothesized that metabolic intensity (i.e., metabolic equivalents, or METs) during match play would meet or exceed the established thresholds for improving physical health and disease risk (≥3.0 METs). METHODS: The Singaporean men's team (Mean±SD: 58±6 yrs age; 26.6±5.4 kg/m^2 BMI; n=9) was monitored during a semi-structured warm-up (WU) and then during 7 successive 15-min competitive matches (M1-M7), all of which happened during a single day. All matches were played at the Leyton Orient outdoor football stadium (East London, England) that was split into four regulation mid-sized fields (40 m x 20 m) under warm and mildly humid ambient conditions (79-81° F; 38-43%). Predicted METs were derived from accelerometry-based activity monitors (AM) that were worn by each player within a neoprene waist pack. The AM data were later downloaded,

transformed 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: 4.3±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 women's walking football that the metabolic intensity 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 An Urban Midwestern University

Morgan Lange, Ana B. Freire Ribeiro. *Augsburg University, Minneapolis, MN.* (Sponsor: Dr. Mark Blegen, FACSM)
Email: langem@augsburg.edu

(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 increases, respectively. At week 6, only 9 individuals from CLBP continued and scored a mean of 32.2 cm (SD=10.8), representing a 6.85% 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=1.6) - 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 43%. 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.*
Email: ack72@pitt.edu

(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/m^2) were randomized into 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=0.0337). 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 promotion 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 Yan[1], Sha Rui Xiang[2], Xu Shou Sheng[1], Wang Zheng Zhen[1]. [1]*Beijing Sport University, Beijing, China.* [2]*Kunshan Experimental Primary School, Kunshan, China.* (Sponsor: Zhengzhen Wang, FACSM)
Email: wyweiwei@126.com

(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(CSL,CSM,CSH group and nCSL,nCSM,nCSH group) depending on their individual daily light, moderate or heavy physical activity. The subjects numbers of each group(CSL,CSM,CSH group and nCSL,nCSM,nCSH group) in turn were 45, 69, 74 and 38, 92, 102 respectively. The peak Vo_2max were measured by GXT protocol on cycle ergometer.
RESULTS: (1)Cardiopulmonary endurance of the smokers were lower than that of the nonsmokers significantly(25.94±6.11ml/kg/min VS 27.87±7.17ml/kg/min,P=0.003),and smoke index(Number of daily smoking multiply years of smoking) had negative relation 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 nCSH group showed significantly different with nCSM or nCSL group(P<0.05,p<0.01),but statistical difference were not found between nCSM group and nCSL 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).

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Effect Of Post-meal Individualized Exercise Timing On Postprandial Glycaemia In Insufficiently Active Overweight/Obese Young Males

Xiaoyuan Zhang, Sinead Sheridan, Waris Wongpipit, Stephen H.S. Wong, FACSM. *The Chinese University of Hong Kong, Hong Kong, Hong Kong.*
Email: 1155115922@link.cuhk.edu.hk

(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·m^{-2}) completed three 4-hour trials in a randomized order: 1) SIT: Sitting for 4 hours; 2) iP: Walking initiated at individual PPG peak time; 3) 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% VO_2max for 30 minutes in iP and 20iP trials. PPG peak time was determined by continuous glucose monitoring

(CGM) during preliminary testing. White bread was provided to participants upon arrival and venous blood was collected every 15 minutes for the first 2 hours and every 30 minutes during the 2-4 hours after the meal to measure plasma glucose. Generalized estimating equations were used for comparison between trials. **RESULTS:** Compared to SIT, the 2 hour - total area under the curve (tAUC) for glucose was reduced in iP (-0.7, 95%CI [-1.7, 0.3] mmol·L $^{-1}$*h, p=0.027), whereas 2 hour - incremental area under the curve (iAUC) (p=0.036 in iP and p=0.035 in 20iP) and 4 hour - iAUC (p=0.04 in iP and p=0.036 in 20iP) for glucose were reduced in both iP and 20iP respectively. Mean, coefficient of variance (CV), and peak value glucose were not affected by both walking trials (all p > 0.05 vs. SIT). **CONCLUSION:** Post-meal brisk walking for 30 minutes initiated at individualized PPG peak time is more effective in blunting PPG response than that initiated at 20 minutes prior to individualized peak time when compared to sitting in overweight/obese young males.

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Comparison Of Urban Adolescents' Physical Activity And Psychosocial Outcomes During Small-Group And Full-Class Exergaming

Daniel J. McDonough, Wenxi Liu, Xiwen Su, Zan Gao, FACSM. *University of Minnesota - Twin Cities, Minneapolis, MN.* (Sponsor: Dr. Zan Gao, FACSM)
Email: mcdo0785@umn.edu

(No relevant relationships reported)

PURPOSE: This study examined differences in urban middle school students' physical activity (PA), enjoyment, and self-efficacy during small-group and full-class exergaming sessions.
METHODS: Forty-seven urban middle school students (83% African American; 25 females; $\bar{X}_{BMI}$ = 24.3 ± 3.1 kg/m^2) completed two separate 15-minute exergaming sessions: (1) Xbox One Kinect Just Dance in small groups (*n* = 3-4); and (2) Xbox One Kinect Just Dance as a full-class (*n* = 23-24). Participants' time in sedentary behavior, light PA (LPA), and moderate-to-vigorous PA (MVPA) and steps were retrieved from ActiGraph GT3X+ accelerometers worn at the right hip, with enjoyment and self-efficacy assessed immediately after each exergaming session via validated Enjoyment and Self-efficacy Surveys. A dependent *t*-test examined mean differences for all outcomes between the two exergaming sessions with the significance level set at $p < 0.05$. Lastly, effect sizes were calculated using Cohen's *d*.
RESULTS: Significant differences between the two exergaming sessions were observed for time in sedentary behavior and MVPA, steps, and enjoyment (t = 3.9-7.4). In detail, participants spent significantly more time in sedentary behavior during the full-class session compared to the small-group session (5.9 ± 5.2 minutes; 3.5 ± 2.7 minutes, respectively: $p < 0.001$, $d = 0.57$) and significantly more time in MVPA during small-group session compared to full-class session (5.5 ± 2.2 minutes; 2.1 ± 2.8 minutes, respectively: $p < 0.001$, $d = 0.85$). Moreover, the small-group session resulted in significantly higher steps than the full-class session (504.2 ± 132.1; 387.8 ± 122.1, respectively: $p = 0.01$, $d = 0.50$). Lastly, participants reported significantly greater enjoyment during the small-group session compared to the full-class session (3.5 ± 1.1; 3.2 ± 1.0, respectively: $p = 0.02$, $d = 0.37$). There were no statistically significant differences between sessions for time in LPA and self-efficacy ($p > 0.05$).
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 full-class exergaming, suggesting small-group exergaming to be ideal for promoting enjoyable exercise at higher intensities and lower sedentary time in urban adolescents.

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Does Exercise Choice Matter For Cardiorespiratory Fitness Improvements?

Elena Ivanova, Jonathan Little, FACSM, Mary Jung. *University of British Columbia, Kelowna, BC, Canada.* (Sponsor: Jonathan Little, FACSM)
Email: elena.ivanova@ubc.ca

(No relevant relationships reported)

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*individuals to HIIT or MICT haveestablished 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 HIITor MICT for 6-months (CHOICE) leads to greater changes in CRF (absolute and relative VO_2peak) at 6-months when compared to IMposed HIIT (IM-HIIT)or IMposed MICT (IM-MICT) in adults with prediabetes. **METHODS**: In this single-site randomized trial, 68 low-active adults (56.8±6.6 yrs, 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 VO_2peak. 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 VO_2peak (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, $F_{2,64}$=1.99, P=.14), with similar findings for relative VO_2peak ($F_{2,67}$=0.32, P=.73). Within group changes over time indicated small effect sizes (Hedge's g) for increases in absolute (CHOICE= 0.00; HIIT = 0.26; and MICT=0.01) and relative VO_2peak over time (CHOICE = 0.11; HIIT = 0.33; and MICT=0.15). **CONCLUSION:**Changes in CRF between groups randomized to perform HIIT or MICT, or given the choice of HIIT or MICT, 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*.

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Perceptual Responses To Reduced Exertion High Intensity Interval Training (REHIT) In Adults Differing In Cardiorespiratory Fitness

Rasmus Dahl Clausen, Joel Marroquin, Baliegh Arthur, Kevin Stiles, Todd A. Astorino, FACSM. *California State University San Marcos, San Marcos, CA.*

(No relevant relationships reported)

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 level. **METHODS:** 85 healthy non-obese subjects participated in the study. Baseline testing consisted of incremental cycling to assess 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 < 0.001), but there was no significant group X time interaction (p = 0.41). Affective valence decreased but remained positive in both groups (p < 0.001), and there was no significant difference between groups (p = 0.86). Enjoyment was high in both groups (93.2 ± 20.8 vs. 91.1 ± 16.4 in above and below average CRF, respectively), and there was no significant difference between groups (p = 0.64). BLa increased 9-fold during REHIT (p = 0.001); however, there was no significant difference between groups (p = 0.64). **CONCLUSION:** There was no effect of CRF on perceptual changes in response to REHIT, indicating that low-volume SIT may be suitable for individuals with below average CRF.

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The Effects Of Visual Feedback On Physiological And Perceptual Responses During A Virtual Cycling Class

Lauren G. Killen, Tara G. Boy, Jake C. Davis, Kortney D. Mallard. *University of North Alabama, Florence, AL.* (Sponsor: Matt Green, FACSM)
Email: lkillen1@una.edu

(No relevant relationships reported)

BACKGROUND: Virtual cycling classes offer riders a unique exercise experience through cycling feedback of cadence, resistance and total work output on multi-touch counsels; however, despite popularity, little is known regarding physiological and perceptual responses when cycling with performance feedback in comparison to a typical Spin bike which lacks feedback. PURPOSE: This study compared intensity selection and perceptual responses between receiving cycling feedback vs. no feedback when completing a virtual Spin class. METHODS: Individuals (N = 14) of varying aerobic fitness (VO_2 max 41.0 ± 8.0 ml/kg/min) completed a VO_2 max trial and two cycling sessions. Each session, completed on a Peloton bike, consisted of a preselected 30-minute Spin class; one session was completed with cycling feedback (VIS) of cadence, resistance, and total work output, and the other with no feedback (NOF). Following each bout, session RPE (SRPE) was estimated and a Physical Activity Enjoyment Scale (PACES) was completed. Paired t-tests were used to compare

cadence, resistance, and total work of the warm-up, workout, and cool-down of each session. Perceptual measures of SRPE and PACES were also compared between sessions using paired t-test. RESULTS: Warm-up cadence was significantly higher ($p < 0.01$) for VIS (93.3 ± 6.7) vs. NOF (85.3 ± 12.3); whereas, cool-down resistance was significantly lower ($p < 0.01$) for VIS (30.2 ± 3.4) vs. NOF (36.0 ± 6.0) with no significant differences for workout portion. Perceptual measures were not significantly different, except for accomplishment approaching significance ($p = 0.09$) with a greater response for VIS vs. NOF. Lastly, the majority (93%) of participants preferred VIS over NOF. CONCLUSION: Results suggest cycling feedback could assist exercisers in achieving instructor suggested intensity during warm-up and cool-down. Additionally, with greater preference and sense of accomplishment with cycling feedback there is the potential to increase exercise adherence.

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Is High-intensity Stair Climbing An Effective Alternative To Traditional Cardiac Rehabilitation Exercise?

Emily C. Dunford[1], Sydney E. Valentino[1], Jonathan Dubberley[2], Sara Y. Oikawa[1], Christopher McGlory[1], Eva Lonn[2], Mary E. Jung[3], Martin J. Gibala[1], Stuart M. Phillips, FACSM[1], Maureen J. MacDonald[1]. [1]*McMaster University, Hamilton, ON, Canada.* [2]*Hamilton Health Sciences, Hamilton, ON, Canada.* [3]*University of British Columbia, Okanagan, BC, Canada.*
Email: dunforde@mcmaster.ca

(No relevant relationships reported)

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). VO_2peak 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 $\%HR_{peak}$ (TRAD) or 3 bouts of 6 flights of 12 stairs at a self-selected vigorous intensity (~90s/bout) separated by recovery periods of walking (~90s) (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±13bpm (p=0.002, means±SD), and exercise intensity 106±11 *vs.*89±1$\%HR_{peak}$, across a shorter time 3.1±0.8 *vs.* 36.7±5.5 min (p<0.001). Peak VO_2 increased in both TRAD and STAIR, (23±3 to 25±4 and 21±5 to 24±6 mL/kg/min) respectively (p=0.03). Additional unsupervised training (2mo), the STAIR group achieved a higher peak HR, 126±13 *vs.*111±9 bpm (p=0.018) and less time at prescribed intensity 6.5±3.9 *vs.* 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 $\%HR_{peak}$ (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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Functional Fitness Is An Effective Training Modality In Firefighters

Annmarie Chizewski[1], Allyson G. Box[2], Steven J. Petruzzello, FACSM[2]. [1]*Benedictine University, Lisle, IL.* [2]*University of Illinois Urbana-Champaign, Urbana, IL.* (Sponsor: Dr. Steven J Petruzzello, FACSM)
Email: chizews2@gmail.com

(No relevant relationships reported)

Firefighting is a physical profession requiring at least adequate levels of fitness for performance of necessary activities. Providing firefighters (FFs) with a safe and effective fitness program is essential for optimal performance on the fire ground. **PURPOSE:** To examine changes in various parameters of physical fitness and FF ability following a 7-week high intensity functional training (HIFT) program instituted as part of a Basic FF Academy. **METHODS:** Participants were FF recruits (*N*=89; age=27.1±4.2 yrs, 100% male) enrolled in a Midwest Basic FF Academy during Spring 2018, Fall 2018, and Spring 2019. Fitness (weight, cardiovascular fitness, muscular endurance, power, and flexibility) and FF ability (assessed via the Academy FF Challenge (AFC)) were assessed at Weeks 1 and 7 of the Academy. The AFC consisted of six tasks done sequentially: simulated forcible entry; victim search; dummy drag; hose advance; equipment-carry; and ladder raise. Total completion time was recorded, as well as the time to complete each of the six tasks. HIFT training was done for 60 minutes each day during the 7-week Academy. The HIFT program gradually incorporated movements and equipment commonly used during fire-ground activities (e.g., hoses, sledgehammers, tires, stairs, weighted objects), while also utilizing interval training, group runs, and partner workouts. **RESULTS:** Significant improvements were seen in parameters of physical fitness and FF ability following a 7-week HIFT program. Specifically, fitness (weight, cardiovascular fitness, muscular endurance) yielded significant improvements from Week 1 to Week 7 [Hotelling's T^2= 8.96 $F(5, 84)$= 150.57, P<0.001, η^2_p= 0.90]. Overall FF ability improved significantly as well [Hotelling's $T2$= 3.95, $F(7, 82)$= 46.26, P< .001, η^2_p = 0.80]. **CONCLUSION**: A 7-week Basic FF Academy that included daily HIFT resulted in significant improvements in physical fitness and FF ability. This suggests that HIFT, in conjunction with the 7-week Basic FF Academy, appears to be an effective means of improving fitness and FF ability in recruit FFs. Further research is needed to examine the effects of HIFT training on fitness and FF ability in FFs who are not simultaneously enrolled in a physically demanding FF Academy.

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Boxing Training Effects On Cardiorespiratory Fitness In Individuals With Prehypertension

Janeth Berenice Juarez Aguilera, Rosa E. Lara Fuentes, Francisco Morales-Acuna, Karla Irigoyen, Manuel Gomez, Alvaro Gurovich, FACSM. *University of Texas at El Paso, El Paso, TX.* (Sponsor: Alvaro N. Gurovich, FACSM)
Email: jbjuarez@miners.utep.edu

(No relevant relationships reported)

Purpose: Boxing training is a type of exercise that involves high cardiovascular demands in an enjoyable environment. Previously, boxing training has shown to have excellent cardiovascular outcomes in obese population, however, research regarding the effects of boxing training on cardiovascular health in individuals with high blood pressure is scarce. The purpose of this study was to determine the effects of a boxing training intervention on maximum oxygen uptake (VO_2max), power output, and lactate and ventilatory thresholds in individuals suffering from prehypertension.
Methods: A total of 14 subjects with prehypertensive were randomly assigned to a boxing intervention group or a control group. The intervention had a duration of 6 weeks, meeting 3 sessions weekly. Each boxing session consisted on 10 rounds of 3 minutes and 1 minute rest in between. From those 10 rounds, 3 were set at 95%VO_2max and 7 at 60% VO_2max. Before and at the end of the intervention, all subjects completed a graded maximal exercise test on an arm-crank ergometer in which VO2max, power output, and lactate and ventilatory thresholds were obtain.
Results: At the end of the intervention, there were significant improvements on power output (p=0.002), ventilatory threshold (p=0.002), and lactate threshold (p=0.001) in the boxing group compared to the control group. Additionally, there was a significant reduction on VO2max in the control group (*p=0.04*).
Conclusion:
Individuals with prehypertension who underwent 6 weeks of boxing training improve the peripheral component of their cardiovascular fitness based on a significant enhancement in their lactate thresholds and ventilatory thresholds, which in turn produces power output increments. Boxing training may be a suitable exercise alternative to be prescribed in high blood pressure population.

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Effect Of Ethnicity On Changes In Cardiorespiratory Fitness In Response To High Intensity Interval Training

Jamie DeRevere[1], Rasmus Clausen[1], Sean Walsh, FACSM[2], Todd Astorino, FACSM[1]. [1]*California State University San Marcos, San Marcos, CA.* [2]*Central Connecticut State University, New Britain, CT.*

(No relevant relationships reported)

Prior data show that ethnicity does not mediate responsiveness to moderate intensity continuous training (Skinner et al. 2001; Slentz et al. 2004), although populations used in these studies were primary Caucasian (C) and African-American. It is unknown if Hispanics (H), who face elevated health risks and are reported to be less active than C (CDC 2017), exhibit a similar response to exercise training versus other populations. **PURPOSE:** To determine if ethnicity alters physiological responses to short-term HIIT in sedentary C versus H women. **METHODS:** Eleven C and seven H women ages 18 - 35 yr who were healthy, non-obese, and inactive (< 150 min/wk of physical activity in the last 12 mo) participated in the present study. Over a 3 week period, they completed nine sessions of progressive HIIT on a cycle ergometer at work rate equal to 85 %PPO. Maximal oxygen uptake (VO_2max) was measured twice at baseline using incremental exercise followed by verification testing. Participants cycled for 2 min at 15 or 20 W followed by 15 - 20 W/min increases in power output until fatigue, during which an impedance cardiograph device was used to evaluate measures of hemodynamic function including stroke volume (SV) and cardiac output (CO). Habitual physical activity was assessed during the study using accelerometry. **RESULTS:** Training elicited a heart rate equal to 84 % HRmax, and 99.4% of sessions

were completed. Results showed a significant main effect of training for VO_2max in C and H (30.7 ± 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 cardiorespiratory and hemodynamic response to HIIT, although longer studies in similar populations are needed to verify this result.

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Can Financial Incentives Promote Exercise Adherence Amongst Cardiac Rehabilitation Graduates? A 24-week Pilot Randomized Controlled Trial

Madison S. Hiemstra[1], Sean K. Spilsbury[1], Marc S. Mitchell[1], Paul Oh[2]. [1]*Western University, London, ON, Canada.* [2]*University Health Network, Toronto, ON, Canada.* (Sponsor: Dr. Michelle Mottola, FACSM)

(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 trial.

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Psychosocial Effects Of A Community-based And Mentored Mountain Biking Group In Adolescents

Dana L. Bolduc[1], Erich Petushek[2], Connor Ryan[1], Scott N. Drum, FACSM[1]. [1]*Northern Michigan University, Marquette, MI.* [2]*Michigan Technological University, Houghton, MI.* (Sponsor: Phil Watts, FACSM)
Email: dlaituri@nmu.edu

(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 cohesiveness 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 yrs), returning members (RM, n = 15, age = 15.9 ± 2.3 yrs), and combined (NM + RM) members (CM, n = 30, age = 14.7 ± 2.4 yrs) 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^{-1} starting late spring and into late summer. Indoor physical conditioning and bike maintenance + skills classes were implemented the initial 4-wks with mentored, 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 SC from pre- to post-program (36.70 ± 11.25 vs. 43.10 ± 6.95). Interestingly, CM from pre- to post-program, respectively, indicated 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 ($P > 0.05$) for SE from pre- to post-program were observed for CM. Lastly, composite scores were compiled for the included three surveys, from pre- to post-program, respectively, with significance found for NM (60.11 ± 17.86 vs. 73.44 ± 12.20, $P = 0.038$) and CM (68.52 ± 16.82 vs. 75.43 ± 13.26, $P = 0.021$). **CONCLUSION:** We demonstrated that adolescent physical activity paired with mentored relationships has positive impact on depression, social connectedness, and self-esteem.

1652 Board #246 May 28 10:30 AM - 12:00 PM

The Effect Of An 8-week Yoga Intervention On Inflammation And Perceived Stress: A Pilot Study

Bethany Forseth[1], Janis Eells[1], Jeri-Anne Lyons[1], Stacy Hunter[2], Michele Polfuss[1]. [1]*University of Wisconsin - Milwaukee, Milwaukee, WI.* [2]*Texas State University, San Marcos, TX.* (Sponsor: Paula Papanek, FACSM)

(No relevant relationships reported)

There is conflicting research regarding the impact of yoga on cardiovascular disease (CVD). Research supports that inflammation and stress may be involved in the pathology of CVD. Yoga is purported to improve stress, but there is no clear indication of the relationship between yoga and inflammation. **PURPOSE**: To investigate the feasibility and impact of an 8-week yoga intervention on stress and inflammation, to provide insight on the relationship between yoga and the pathology of CVD. This study tested the hypothesis that an 8-week yoga intervention would be feasible and would improve markers of stress and inflammation.
METHODS: The study included healthy yoga-naïve adults, 18-44 years. Participants had no recent mental health diagnosis, CVD, or limitations to performing yoga. The study design was a single-arm 8-week intervention with pre and post intervention data collection. During the visits participants were asked to complete the Perceived Stress Scale, collecting information on their level of stress, and to also provide a small blood sample to assess inflammation via erythrocyte sedimentation rate (ESR). Between the visits, participants were asked to attend two 60-minute flow style yoga classes each week. To be deemed feasible, ≥85% of participants had attend ≥75% (12 of the 16) of the yoga classes.
RESULTS: A total of 32 individuals were screened and 14 were eligible for the study. Of those eligible, nine participants were enrolled in the study (25±4.8 years; 78% female). Eight of the nine participants completed the study; one participant dropped out due to a surgery not related to the study. Six participants (67%) attended ≥75% of the classes. Wilcoxon Signed Rank Tests showed that ESR was significantly reduced after the intervention (27.0±18.1mm to 17.4±17.8mm; $p < 0.05$). Perceived stress scores were reduced by 13.9% (19.75±6.7 to 17.0±8.9), however this was not significant.
CONCLUSIONS: Despite the small sample size our findings provide preliminary evidence that an 8-week yoga intervention reduced the perception of stress in the participants and significantly reduced ESR, an established indicator of systemic inflammation. Further studies are needed to confirm and extend findings and find methods to improve feasibility in yoga interventions.

1653 Board #247 May 28 10:30 AM - 12:00 PM

Effects Of A 13-week Physical Education Class On College Aged Student's Exercise Motivation, Body Image, And Mood

Suet Hon. *The Chinese University of Hong Kong, Hong Kong, Hong Kong.* (Sponsor: Stanley Hui S.C, FACSM)
Email: hon1102suet@gmail.com

(No relevant relationships reported)

PURPOSE: More college students now participate in different types of exercises. Exercise motivation has been a topic well researched in the past, however, not many researches have been conducted on the relationship among the exercise motivation, body image and mood. The present study examined whether a 13-week physical education class will improve exercise motivation, body image and mood of college-aged students. METHODS: A sample of 280 students was recruited from university to participate in a 13-week physical education class. Measurement on exercise motivation and body image (Exercise Motivation Questionnaire and Body Image Questionnaire (Body Appreciation Scale-2) and mood questionnaire (The Positive and Negative Affect Scale) were used in the study. Data were analyzed at the significance level of p<.05 for the data set including 14 classes.RESULTS: The Mann-Whitney showed significance at the p<.05 for the body image and mood questionnaire. Students (18 ± 2.1years; 1.60 ± 0.15 m; 52 ± 8.4kg;) reported increased body appreciation (mean value from 3.8 to 4.2) and positive mood (mean value from 3.9 to 4.3) after the 13-weeks class. The students reported to achieve health as the most important exercise

motivation. The majority students desired to participate in more exercises in the future. CONCLUSIONS: This study suggests that a 13-week physical education class showed increasing positive body image and enhancing mood after participating in physical education classes. Health was a very important concern of students when choosing to exercise. Since the participants in this study were all girls and future study can examine the gender difference on the topic.

1654 Board #248 May 28 10:30 AM - 12:00 PM

Combination Of High-intensity Interval Training And Moderate-intensity Continuous Exercise On Cardio-metabolic Responses In Physically Inactive Middle-aged Adults

Eric Tsz-Chun Poon, Waris Wongpipit, Sinead Sheridan, Stephen Heung-Sang Wong, FACSM. *The Chinese University of Hong Kong, Hong Kong, Hong Kong.*

(No relevant relationships reported)

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% HR_{max} interspersed with 1-min active rest), MICE (40-min brisk walk at 65-75% HR_{max}), combined (COMB) (alternate between HIIT and MICE) or control (CON). Exercise sessions were conducted three times per week for 16 weeks under independent free-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 VO_{2max} (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, while fasting insulin level significantly decreased 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.

1655 Board #249 May 28 10:30 AM - 12:00 PM

Prehabilitation With High Intensity Inverval Training Before Major Abdominal Surgery

John C. Woodfield, Kari A. Clifford, William Tait, Tim McGuire, James C. Baldi, FACSM. *University of Otago, Dunedin, New Zealand.* (Sponsor: James C. Baldi, FACSM)
Email: john.woodfield@otago.ac.nz

(No relevant relationships reported)

PURPOSE: Improving cardiopulmonary reserve, or peak oxygen consumption (VO_{2peak}) measured during cardiopulmonary exercise testing (CPET), may reduce complications after surgery. This feasibility study determined the effectiveness of a supervised, preoperative High Intensity Interval Training (HIIT) program in increasing VO_{2peak} by 2ml/kg/min. Clinical outcomes were documented to determine the endpoint most sensitive to improved fitness. **METHODS:** In this prospective study, participants aged 50-85 undergoing major abdominal surgery were randomised to standard care or 14 sessions of HIIT over 4-6 weeks. HIIT sessions involved approximately thirty minutes of stationary cycling (5 warm-up, 20 interval training, 5 cool-down). Interval training alternated 1 minute of high and low intensity pedalling, with the goal of reaching 90% maximum heart rate during the session. Clinical outcomes included complications, postoperative morbidity survey, length of stay, and Short Form-36 quality of life questionnaire (SF-36). **RESULTS:** Of 63 participants, 46 completed both CPETs and 51 completed clinical follow-up. On per protocol analysis, mean VO_{2peak} increased 14%, from 20.3-23.2ml/kg/min in the exercise group and 0.7%, from 21.8-22.0 ml/kg/min in the control group. Change in VO_{2peak} was 2.87 vs. 0.14 ml/kg/min ($p<.001$). Exercisers increased peak work rate by 25 watts. Although there were no significant differences in the clinical outcomes, those most responsive to improved fitness with exercise were: the total number of postoperative complications (0.64 in exercisers vs. 1.16 in controls per patient, $p=.07$) and the physical component score of the SF-36 ($p=.07$), with the greatest difference six weeks after surgery indicating a quicker postoperative recovery. **CONCLUSION:** There was a significant improvement in VO_{2peak} and peak work rate with preoperative HIIT. We also noted a trend towards fewer postoperative complications and a more rapid recovery after surgery. Preoperative HIIT results in a clinically important improvement in cardiopulmonary reserve for patients undergoing abdominal surgery.

1656 Board #250 May 28 10:30 AM - 12:00 PM

Cardio-respiratory Fitness And Vigorous Physical Activity In Australian Truck Drivers Prior To A Hiit Intervention

Nicholas D. Gilson[1], Gregore I. Mielke[1], Jeff Coombes, FACSM[1], Mitch J. Duncan[2], Guy Wallis[1], Wendy J. Brown, FACSM[1]. [1]*The University of Queensland, Brisbane, Australia.* [2]*University of Newcastle, Newcastle, Australia.* (Sponsor: Wendy Brown, FACSM)
Email: n.gilson1@uq.edu.au

(No relevant relationships reported)

'Truck-Fit' is a cluster randomised controlled trial designed to test the efficacy of a 12-week high intensity interval training (HIIT) program delivered at driver depots. **PURPOSE:** To assess program need, this study examined baseline physical health (BMI, waist circumference and blood pressure), cardio-respiratory fitness (CRF), and vigorous physical activity (VPA) profiles of the Australian drivers recruited to the program. **METHODS:** Participants (n=31 men; mean [SD] age=44.5 [10.5] years) visited the *University of Queensland* exercise laboratory (June-August 2019) for clinical screening prior to intervention or control group allocation. Height, weight, waist circumference and resting blood pressure were measured using standard protocols. CRF (VO_{2peak}) was assessed during a graded exercise test to exhaustion on a cycle ergometer. In the week proceeding their visit, drivers wore an accelerometer (Actigraph GT3X) on the non-dominant wrist for 24 hours x 7 days, and kept a log recording daily wear time; raw acceleration was extracted and open-source software (GGIR) used to calculate VPA across this time period. **RESULTS:** Mean (SD) body mass index (31.9 [6.8] kg/m^2) and waist circumference (108.4 [17.4] cm) scores were high; 45% (n=14) of drivers were hypertensive, with three medicated for high blood pressure. CRF was 'below percentile 25' relative to age and sex in 52% (n=16) of drivers (mean [SD] VO_{2peak}= 29.7 [7.5] $mL.kg^{-1}.min^{-1}$); 23% (n=7) of drivers ranked 'below percentile 5' compared to VO_{2peak} normative data. Accelerometer data (5.3 [1.6] valid days) indicated drivers did very little high intensity physical activity (mean [SD] VPA=3.1 [2.8] minutes/day; range of 0.4-9.7 minutes/day). **CONCLUSIONS:** The study findings strongly support the need for intervention in this driver sample. Implementation of 'Truck-Fit' is particularly warranted, given strong beneficial associations between HIIT, CRF improvement and reduced mortality risk in low fit, obese groups.

1657 Board #251 May 28 10:30 AM - 12:00 PM

Evidence For Temporal Patterns Of Physical Activity Related To The Girls On The Move Program

Michael J. Wierenga, Jr, Dhruv B. Sharma, Lorraine B. Robbins, Karin A. Pfeiffer, FACSM. *Michigan State University, East Lansing, MI.* (Sponsor: Karin Pfeiffer, FACSM)

(No relevant relationships reported)

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 afterschool PA vs. during-school PA between intervention and control schools. **METHODS:** MVPA minutes were measured via accelerometers worn at the right hip for 7 days (5 weekdays, 2 weekend days). Monitors were set to start recording data at 5 A.M. on the day after distribution to at both the intervention and control schools. Data for the vertical axis were re-integrated to 15-s epochs and processed using Evenson cut-points. Average MVPA/hr was calculated from accelerometer data. MVPA was assessed at three different timepoints (e.g. pre-intervention, post-intervention, and 9-month follow-up) and examined for two time-blocks (during school, after school). **RESULTS**: Chi-square tests were performed to assess significant differences in the proportion of girls who achieved higher average MVPA/hr during school and girls who achieved higher average MVPA/hr after school in the intervention and control schools. The Chi-square test was not significant at baseline (χ^2=1.67, p=0.2, α=0.05), but was significant for both the post-intervention and 9-month follow-up, with the intervention group having a higher proportion of girls getting more PA after school (χ^2=14.82, p=.00014, α=0.05, χ^2=9.89, p=.0017, α=0.05, respectively). **CONCLUSION:** The Girls on the Move intervention significantly increased the proportion of girls who achieved higher average MVPA/hr after school compared to the girls in the control schools (synergistic effect of the intervention). These results suggest an after-school PA intervention may be effective in increasing girls' PA after school even after the completion of the

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, Savhanna Chrisco, Christina Johnson. *Cornell College, Mount Vernon, IA.*
Email: mbabcock20@cornellcollege.edu

(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 overlayed with neighborhood 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 low-income rural and urban settings. In particular, qualitative analysis of the data indicated that high quality resources clustered near the margins of higher-income neighborhoods, but were often scattered, absent entirely, or of significantly lower quality in lower-income neighborhoods. 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. Petro[1], Laura Pérez[1], Daniel Restrepo[1], Daniel Aguirre-Acevedo[1], Camila Trillos[1], Manuela Yepes-Calderón[1], Luis Valbuena[2], Yeliana L. Sánchez[1], Juan C. Aristizábal[1], Raul Narvaez-Sanchez[1], Juan C. Calderón[1], Jaime Gallo-Villegas[1]. [1]*University of Antioquia, Medellín, Colombia.* [2]*Indeportes Antioquia, Medellín, Colombia.*
Email: jlpetros@hotmail.com

(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 that are 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 (VO_2max) for 1 min followed by 2 min at 50% of VO_2max. The control group (n=31) received MICAT at an intensity of 60% of VO_2max 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 VO_2max of 29.0±6.3 mL O_2.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—0.098]; Cohen's d: 0.380; p value=0.153) and physical (-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. Interinstitucional 2016-13041. Colciencias Doctoral scholarships 727-2015.

1660 Board #254 May 28 10:30 AM - 12:00 PM

Intervention-related On Aging Health State Over European Countries. May The Context Frame The Difference?

J.M. Cancela Carral[1], Pedro Bezerra[2], LP Rodrigues[2], M Camões[2]. [1]*University of Vigo, Vigo, Spain.* [2]*Polytechnical Institute of Viana do Castelo, Viana do Castelo, Portugal.*
Email: chemacc@uvigo.es

(No relevant relationships reported)

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 (68,9±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-5D-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 interaction 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 changes over the time were similar between country's groups as the significance were maintained. **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 associations 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 Kehmeier, Lance Dalleck. *Western Colorado Univesity, Gunnison, CO.*
Email: sophie.seward@western.edu

(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= 45.612.5 yrs) and exercise intervention (age: M= 46.6, SD= 16.7 yrs) prescribed via VT1 and VT2, exercising three times week. VT1 and VT2 measures were obtained 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 (SPB) 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 primary outcome measures, respectively. Significance was set at $\alpha<0.05$. **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 ±

11.0, post: 121.2 ± 9.6), DBP (pre: 79.4 ± 8.4, post: 81.4 ± 6.6), and MetS z-score (pre: -4.14 ± 4.01, post: -3.68± -4.07). In contrast, the personalized exercise group showed statistically significant improvement in WC (pre: 84.0 ± 14.2, post: 83.1± 12.9), triglycerides (pre: 110.8 ± 54.4, post: 104.5 ± 45.7), HDL-C (pre: 54.2 ± 17.9, post: 57.8 ± 15.9), SBP (pre: 122.6 ± 14.1, post: 117.4 ± 13.1), DBP (pre: 79.7 ± 9.7, post: 77.3 ± 7.7), BG (pre: 92.5 ± 8.6, post: 89.7 ± 7.0), and MetS z-score (pre: -3.52 ± 3.82, post: -4.12 ± 3.24). **CONCULSION:** These findings provide preliminary evidence that individualized programming can be implemented into community-based exercise programs to reduce MetS risk in previously inactive individuals.

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

Rocío Nuche Salgado[1], María Fernanda Sanhueza[1], Barbara Munizaga[2], Jaime Leppe[2], Sandra Mahecha-Matsudo[3]. [1]*Universidad Mayor, Santiago, Chile.* [2]*Facultad de Medicina Clínica Alemana, Universidad del Desarrollo, Santiago, Chile.* [3]*Universidad Mayor, Clinica Meds, Santiago, Chile.*
Email: rnuche@gmail.com

(No relevant relationships reported)

Estimated Versus Calculated Time from Home to Squares/Parks, in Three Different Socioeconomic Status Neighborhoods.
Distance from homes to parks or squares, have shown to be related with environment interventions to increase physical activity (PA).
Purpose: Compare the estimated and calculated walking time from home to parks or squares according to sociodemographic variables and PA habits.
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 P_{50}=5 (P_{25}=3 P_{75}=13) minutes. This difference was greater in the low SES neighborhood P_{50}=9 (P_{25}=3 P_{75}=19) minutes and in the groups of 30-44 P_{50}=8 (P_{25}=2 P_{75}=16) and 65-80 years P_{50}=9 (P_{25}=4 P_{75}=16). Those who recognized public space as a place to perform PA had a lower overestimation of distance than those who didn´t P_{50}=4 vs P_{50}=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

Jin Yu, Qiongjia Yuan, Xue Li, Lu Wang. *Chengdu Sport University, Chengdu, China.*
Email: 253416871@qq.com

(No relevant relationships reported)

PURPOSE: Depression model building in rats based 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/or aerobic exercise for 4 weeks respectively. E received swimming training for 4 weeks (60 min/day, 6 days/week). SPT was used to test rat's 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 and WB. The experimental data was reported as mean±SE. The threshold of significance level was set at P<0.05.
RESULTS: 1) SPT: there was no difference in the total water consumption in each group (P >0.05). But depressive rats (M: 36.67±10.61; E:36.00±16.43) showed significant difference compared with C in consumption of sugar water (C:53.83±10.93, P<0.05); 2)MWM detection: during 6 days of navigation experiment, M showed more difficulty to find the platform compared with C and E(P<0.05), while there was no significant difference between C and E (P>0.05); During the space exploring experiment, M spent much time to find the platform compared with C and E (C:3.14±0.38; M:1.57±0.79; E:2.57±0.53, P<0.05); 3) mRNA and protein detection: compared with C, the mRNA(C:1.24±0.22;M:0.57±0.25;E:1.14±0.07) and protein level of VEGF (C:0.90±0.06;M:0.52±0.11;E:0.81±0.05) significantly decreased in group M, while increased in group E(P<0.05).
CONCLUSIONS: 4 weeks of aerobic exercise intervention effectively reverses the depression symptoms and improves their spatial learning and memorizing ability 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.

1664 Board #258 May 28 10:30 AM - 12:00 PM

Influence Of Affective Valence And High Intensity Intervention On Exercise Engagement

Riley Galloway[1], Sara Powell[1], Robert Booker[2], Megan E. Holmes[2], Jacob Gdovin[1]. [1]*Missouri State University, Springfield, MO.* [2]*Mississippi State University, Mississippi State, MS.*
Email: RileyGalloway@missouristate.edu

(No relevant relationships reported)

PURPOSE: This study aimed to determine the influence of affective valence and a structured high intensity exercise intervention on exercise habits and future participation at increased intensity than what one is accustomed to. **METHODS:** Participants (N=34; age=22.3±2.1 years) wore an accelerometer for a 7-day period to determine average exercise intensity. Affective responses were collected during voluntary exercise sessions using a smartphone app [self-efficacy 1-5 (5=confident), enjoyment scale 1-7 (7=most enjoyment), mood scale 1-7 (7=positive mood)]. An aerobic exercise intervention at 70%-85% of heart rate reserve was then administered. Accelerometers were then worn for an additional 7-day period. Participants logged information related to voluntary exercise engagement. **RESULTS:** The pre-intervention 7-day period, consisted of 75.7±9.4% sedentary and 4.0 ± 2.3% MVPA (3.5±1.6% moderate intensity, 0.5±0.7% vigorous intensity) while affective responses were positive as seen by self-efficacy (4.2±0.9), enjoyment (6.3±1.0), and mood (6.0±1.1). Participants maintained positive affective valence during the exercise intervention, although it was a significantly higher intensity than their daily average (self-efficacy=4.4±0.9, enjoyment=5.5±1.9, mood=5.9±1.2). Post-intervention 7-day period consisted of significant decrease in sedentary to 61.4±5.2% (p<0.001) while MVPA significantly increased to 9.1±2.1% (p<0.001) of the day (8.0±1.4% moderate intensity, 1.1±0.7% vigorous intensity). MVPA per day significantly increased from pre- to post-intervention (34.0±19.3 minutes and 44.4±15.8 minutes, respectively, p=0.04) while a positive affective valence was maintained (self-efficacy=4.7±0.4, enjoyment=6.6±0.5, mood=6.5±0.8). **CONCLUSION:** The high-intensity exercise intervention elicited only a minimal decrease in exercise enjoyment during the session which allowed participants to maintain an 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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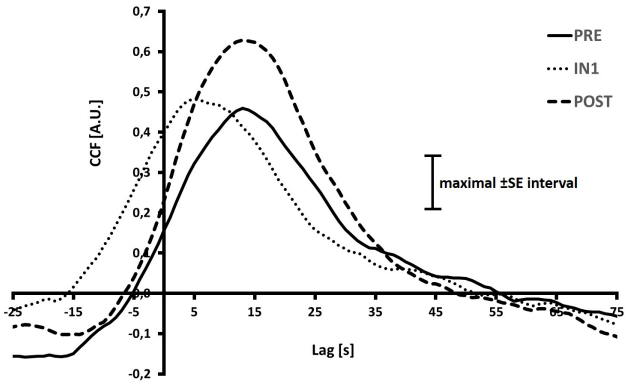
LIVING 4 MONTHS IN CONFINEMENT AFFECTS CARDIORESPIRATORY REGULATIONS DURING EXERCISE - FIRST RESULTS FROM SIRIUS-19

Uwe Hoffmann[1], Fabian Möller[1], Mathias Haeger[2], Fabian Steinberg[3], Natalia Didkovskaya[4], Elena Fomina[4], Jessica Koschate[5]. [1]*German Sport University, Köln, Germany.* [2]*Charité-Universitätsmedizin Berlin, Berlin, Germany.* [3]*Johannes Gutenberg-University Mainz, Mainz, Germany.* [4]*Institute of Biomedical Problems, Moscow, Russian Federation.* [5]*Carl von Ossietzky Universität Oldenburg, Oldenburg, Germany.*
Email: u.hoffmann@dshs-koeln.de

(No relevant relationships reported)

Purpose: A confined 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) as countermeasures were studied. The analysis was focused on pulmonary oxygen uptake ($V'O_2$) 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 s of constant speeds (3, 6, 9 km·h^{-1}) and pseudo-random changes of speed (3/6 km·h^{-1}). HR and $V'O_2$ kinetics responses were assessed by cross correlation functions (CCF) of speed vs. the respective parameter (Hoffmann et al.,

EJAP 113:1745-1754, 2013). ANOVA was applied to detect influences from mission day and training mode (MD) with Bonferroni's post-hoc test. Level of significance was set to α = 5%. **Results:** Regarding $V'O_2$, 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^{-1}: 120±11 bpm) compared to PRE and POST values (e.g. PRE/POST 9 km·h^{-1}: 142±11 bpm / 132±9 bpm). **CONCLUSIONS:** The specific environment and controlled daily routines influence $V'O_2$ 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.



Time courses of before (PRE), after 1 wk (IN1) and after (POST) the mission (means of 6 subjects, SE as indicated in the diagram).

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The Effect Of A Low Volume Trunk-stabilisation Exercise Protocol On Biomechanical Function And Compliance.

Jakob Henschke[1], Josefine Stoll[1], Stephan Kopinski[2], Yu-Hsien Lu[1], Frank Mayer[1]. [1]*University of Potsdam, Potsdam, Germany.* [2]*Olympic Training Centre Brandenburg, Potsdam, Germany.*
Email: jhenschke@uni-potsdam.de

(No relevant relationships reported)

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 (M1; 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, latissimus dorsi, external/internal obliquus 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±SD) 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±10; EG M1: 83±9, M2: 121±17) (p <.001). In SG, DL (M1: 95±13, M2: 113±16) (p=.011) and VR (M1: 83±14, M2: 110±29) (p=.010) muscle activity improved significantly during ECC rotation. Overall compliance was 7±3 (SG) and 7±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.

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Cardiometabolic Effects Of Free Access To An Exergame In Inactive Adults: A Randomized Controlled Trial

Jonathan Berg, Alf Inge Wang, Trine Moholdt. *Norwegian University of Science and Technology, Trondheim, Norway.*
Email: jonathan.berg@ntnu.no

(No relevant relationships reported)

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 providing 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 Playpulse exergaming platform for six months, whereas participants in CON continued with their normal daily routine. We measured maximum oxygen uptake ($\dot{V}O_{2max}$), 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 difference between CON and EXG for the primary outcome, post-intervention $\dot{V}O_{2max}$, after controlling for pre-intervention $\dot{V}O_{2max}$ (42.34 ± 0.76 vs 41.71 ± 0.82 mL·min^{-1}kg^{-1}, 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 $\dot{V}O_{2max}$, blood markers of cardiometabolic health, body composition, or increase physical activity levels in sedentary adults, even if the participants rated the exergame as enjoyable.
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Exploring The Physical Activity Counselling Practices Of Foundation Doctors: A Qualitative Study

Jimisayo Osinaike, Sandra Hartley. *Manchester Metropolitan University, Manchester, United Kingdom.*
Email: Jimisayoosinaike@gmail.com

(No relevant relationships reported)

Introduction: The evidence in support of physical activity (PA) as an effective modality in the treatment and management of non-communicable diseases (NCDs) is promising and quite robust. Consequently, PA promotion is now seen integral to the role of the physician. The challenge however, has been translating PA as a preventive and therapeutic modality into doctor's routine clinical practice. Therefore, it has been proposed that producing future doctors that will be proficient for practice in this regards will require adequate training at the undergraduate medical level. Thus, the purpose of this study is to explore the PA counselling of newly qualified doctors when in their foundation year to gain more insight into how the undergraduate and foundation training influences their PA counselling practices.
Methodology: A qualitative study was conducted amongst eleven foundation doctors (FDs) recruited by purposive sampling. This sample was representative of FDs from seven different medical schools in the United Kingdom. Semi-structured interviews were digitally recorded and transcribed verbatim. Thematic analysis were undertaken to identify emerging themes and concept from the interviews.
Findings: Three overarching themes were developed from the data. They include:PA counselling attitude and practices, barrier to Pa counselling and enablers to PA counselling in clinical practice.
Conclusion: The attitude and practices of FDs towards PA counselling was poor both in primary and secondary care and this was more evident whilst in the hospital setting. A lack of training and support from clinical supervisors were major reasons for this. However, it was also found that unexplored opportunities exists for FDs to champion PA counselling both in the primary and secondary care settings. Leveraging these opportunities will entail but not limited to only curriculum change and review at both

undergraduate and postgraduate medical level. It will involve: adequate mentoring and support by clinical supervisors, understanding of the role of other health professionals in PA promotion and creating an enabling policy that will ensure doctors have time to stay physically active.

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Physiological Responses To Animated Narrative Vs. Nonnarrative Videos In Active Video Gameplay

Caio V. Sousa[1], Austin Fernandez[1], Jungyun Hwang[2], Amy Lu[1]. [1]*Northeastern University, Boston, MA.* [2]*Stanford University Medical Center, Palo Alto, CA.*
Email: CVSOUSA89@GMAIL.COM

(No relevant relationships reported)

PURPOSE: Active video games (AVG) can induce similar physiological responses to physical activities in children. Narratives could be an alternative for increasing players' engagement due to their unique motivational properties We investigated the effects of an animated narrative video (NV) vs. an animated non-narrative video (N-NV) on heart rate (HR) and rate of perceived exertion (RPE) during children's AVG play sessions.
METHODS: After consent/assent, anamnesis and anthropometrics assessment, we randomly assigned 21 children aged 8-12 years old with no previous AVG experience to watch either an NV N-NV (duration: ≈11min). They played the AVG for as long as they wanted. HR was monitored pre, during and after the play session using a Polar® HR band ActiGraph Link. RPE was measured pre and post AVG session with Borg's scale. Participants reported their narrative immersion and game engagement via questionnaires. We applied independent samples t-test and repeated measures ANOVA to compare between and within groups. We used Pearson correlation coefficients for association analysis.
RESULTS: The NV and N-NV group did not differ significantly (age: 9.5±1.1 vs. 10.3±1.3, p=0.14; BMI%: 42.0±25.0 vs. 57.2±36.2, p=0.28). The NV group had significantly higher narrative immersion (3.5±0.6 vs. 2.9±0.6, p=0.03,d=1.03) and game engagement (4.0±0.4 vs. 3.2±0.3, p<0.01, d=1.92) than the N-NV group. Both HR and RPE had a within-group interaction (Time: ps<0.01), but not a between-group (ps>0.33) or interaction (Time×Group: ps>0.35). Narrative immersion was moderately correlated with HR post AVG (r=0.53; p=0.01) and game engagement (r=0.46; p=0.03).
CONCLUSIONS: We are the first to test the effect of N-NV vs. NV on physiological responses to AVG play. Although the narrative group did not show higher physiological response (HR and RPE) than the non-narrative group, those with higher immersion during the AVG session also had a higher HR post AVG, suggesting higher game engagement and play motivation.

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Effectiveness Of The Foreverfit Weight Loss Program

Charles E. Robison, Sarah Adcock. *George Mason University, Manassas, VA.*

(No relevant relationships reported)

INTRODUCTION- Overweight and obesity is an increasing health concern amongst US adults, as 68% of the adult population are currently classified as such. Several health issues, including cardiovascular health, are associated with increased adiposity. The ForeverFit Program was designed to promote weight loss and cardiovascular fitness via behavior change and structured exercise sessions. Programs that demonstrate weight loss and improved health variables are essential for societal health.
PURPOSE- The purpose of the current study was to assess the effectiveness of the ForeverFit Weight Loss Program.
METHODS- Ten overweight and obese (BMI= 31.4 kg/m^2 ± 4.8) women (49.4 years ± 11.4) were assessed for body composition, cardiovascular health, and exercise and nutrition self-efficacy prior to and following the ten week program. Bioelectrical impedance analysis (InBody 270, California, USA) measured body composition and weight, VO_2 max was estimated via the Ebbeling treadmill protocol, and resting heart rate and blood pressure were measured by an oscillometric automated device (Omron 10 series, Illinois, USA). Self-efficacy was measured via Eating and Exercise Habits Confidence Surveys. The participants underwent a ten week exercise and education program in which they exercised in small groups led by a personal trainer twice each week and given weekly behavior challenges. Variables were analyzed pre and post via paired t-test (p < .05).
RESULTS- Participants showed significantly decreased body weight (-2.54 kg ± 3.36, p=0.041), BMI (-0.84 kg/m^2 ± 1.11, p= 0.040), fat mass (-2.47 kg ± 0.02, p= 0.024), and water weight (-0.72 kg ± 0.17, p= 0.002). Diet (0.70 ± 0.58, p=0.025) and exercise (0.66 ± 0.87, p=0.040) self-efficacy demonstrated significant increases on the 5-point Likert scale. Percent body fat approached significance (-1.59% ± 2.36, p =0.059). Skeletal muscle mass, resting heart rate, blood pressure, and VO_2 max did not change significantly.
CONCLUSION- Twice weekly exercise sessions combined with weekly behavior change challenges were effective at reducing body weight and improving self-efficacy 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.

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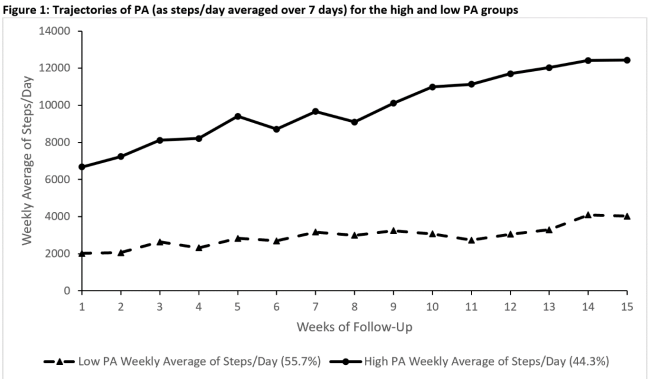
Trajectories Of Physical Activity In Adults After TKR: A Comparison Of Functional And Psychosocial Measures

Jason T. Jakiela, Dana Voinier, Lauren Neely, Laura A. Schmitt, Daniel K. White. *University of Delaware, Newark, DE.*
Email: jason.jakiela@gmail.com

(No relevant relationships reported)

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 Fitabase 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 ± 10.5 vs 5.6 ± 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

Figure 1: Trajectories of PA (as steps/day averaged over 7 days) for the high and low PA groups



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Quantifying Physical Activity After Concussion: The Relationship Between Sleep Quality, Symptoms, And Steps.

Corrine N. Seehusen, Julie C. Wilson, Gregory A. Walker, Sarah E. Reinking, David R. Howell. *Children's Hospital Colorado, Aurora, CO.*
Email: corrine.seehusen@childrenscolorado.org

(No relevant relationships reported)

BACKGROUND: Concussion management guidelines have evolved over recent years to include earlier introduction of physical activity. Determining optimal post-concussion physical activity levels with objective methods will further aid clinicians in counseling patients on the role of physical activity in concussion recovery.
PURPOSE: Our aim was to investigate the relationship of physical activity, as measured by daily step count, with post-injury sleep quality, symptom rating, and dual-task gait measures among youth athletes with concussion. **METHODS:** We conducted a longitudinal investigation of youth athletes who sustained a concussion and were evaluated at 2 time points: within 2 weeks of injury and at clearance for return-to-play. Following the initial visit, athletes wore an activity tracking device (Fitbit Charge 3).

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; 13,900±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 symptom severity (44.3±30.8 vs. 58.2±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 symptom 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 symptom 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.

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Safety Of High-intensity Interval Training Low-volume Vs Moderate Intensity Continuous Aerobic Training In Metabolic Syndrome

Jaime Gallo-Villegas[1], Daniel Aguirre-Acevedo[1], Laura Pérez[1], Daniel Restrepo[1], Luis Valbuena[2], Raúl Narváez-Sánchez[1], Juan C. Calderón[1]. [1]*University of Antioquia, Medellín, Colombia.* [2]*Indeportes Antioquia, Medellín, Colombia.*
Email: jaime.gallo@udea.edu.co
(No relevant relationships reported)

Moderate intensity continuous aerobic training (MICAT) and high-intensity interval training low-volume (HIIT-low volume) improve the alterations associated to the metabolic syndrome (MS). Patients with MS have multiple morbidities and low fitness, which may predispose them to adverse events when exercising. The safety of these interventions on patients with MS has not been evaluated in depth. **PURPOSE**: to evaluate the safety of HIIT-low volume compared to MICAT in adults with MS. **METHODS**: a controlled, randomized, clinical trial using the minimization method. 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 a treadmill exercise program of 12 weeks, 3 sessions/week. Volunteers in the intervention group received HIIT-low volume (n=29) in 22 min sessions that included six intervals at a load of 90% of maximum oxygen consumption (VO_2max) for 1 min followed by 2 min at 50% of VO_2max. The control group received MICAT (n=31) at an intensity of 60% of VO_2max for 36 min. A new approach to record and classify the adverse events according to possible causality based in Naranjo´s algorithm was developed. **RESULTS**: patients had a mean age of 50.8±6.0 years, body mass index (BMI) of 30.6±4.0 $kg.m^{-2}$, body fat percentage of 38.7±7.0% and VO_2max of 29.0±6.3 mL $O_2.kg^{-1}.min^{-1}$; 70% were women. In total, 60 clinical events were recorded in HIIT-low volume group and 48 in MICAT. Most of them (59.3%) were classified as general disease; there were no serious adverse reactions. Only 21 events (19.5%) were classified as an adverse reaction possibly related to exercise. HIIT-low volume and MICAT, had a similar frequency of musculoskeletal events (IRR: 1.1; 95% CI 0.6—1.8; p value=0.791), but higher of cardiovascular events (IRR: 2.9; 95% CI 0.4—22.8; p=0.310), after adjusting for age, sex and BMI (HIIT-low volume: chest pain (n=1) and symptoms of venous insufficiency of the lower limbs (n=2); MICAT: chest pain (n=1)). **CONCLUSION**: HIIT-low volume and MICAT are safe, however, we recommend a muscle-conditioning program prior to both and to avoid HIIT-low volume in treadmill in patients with history of venous insufficiency of the lower limbs. Colciencias 111562638757. Interinstitucional 2016-13041. Doctoral scholarships 727-2015

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Effect Of Single Resistance Training On Body Composition Of Females

Li Peng, Jie Zeng. *College of Physical Education, South-West University, Chongqing, China.*
(No relevant relationships reported)

PURPOSE: Resistance training (RT) is considered to be a effective way to increase muscle mass and reduce fat mass. This study analyzed the effect of single RT on fat mass (FM), body fat percentage (BF%), fat-free mass (FFM) and muscle mass (MM) of females, in order to clarify whether the role of single RT is also applicable to female subjects in reducing fat and increasing muscle mass.
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 < 0.00001) and BF% (WMD: 0.54; 95% CI: 0.09, 0.98; P=0.02), and also significantly increased their FFM e (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 BF%, 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

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Employees With Metabolic Syndrome And Increased Depression Severity Profit Most From Exercise For Work Ability.

Sven Haufe[1], Kai G. Kahl[1], Arno Kerling[1], Pauline Bayerle[1], Hedwig T. Stenner[1], Simone Rolff[1], Thorben Sundermeier[1], Katriona Keller-Varady[1], Ralf Ensslen[2], Lars Nachbar[2], Dirk Lauenstein[3], Meike Stiesch[1], Axel Haverich[1], Uwe Tegtbur[1]. [1]*Hannover Medical School, Hannover, Germany.* [2]*Volkswagen AG, Wolfsburg, Germany.* [3]*Audi BKK health insurance, Ingolstadt, Germany.*
(No relevant relationships reported)

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 314 subjects from which 287 finished the intervention. After baseline stratification for normal (HADS scores 0-7) and increased depression scores (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.

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Effects Of Hatha Yoga And HIIT On The Psychological Status Of Female University Students With High Risk Of Eating Disorder

SHANSHAN MAO, Qiao-gui LIU. *Beijing Sport University, Beijing, China.*
Email: ss.mao@163.com
(No relevant relationships reported)

PURPOSE:By using Hatha Yoga (Yoga) and High Intensity Interval Training (HIIT) to intervene the female university students at high risk of eating disorder (ED), this study was purposed to get better understanding of the effects of exercise on the reduction of ED risk and improvement of psychological status.
METHODS: A total of 384 female university students (20.40 yrs) were involved in the EDI-3 estimate, and 92 of them were judged to have high risk of ED. Eventually

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 accelerators 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×(3min of 90% VO_{2max} exercise + 2min of 50% VO_{2max} exercise), 5 min of relax, 3 times/wk. (3) C: daily physical activity without extra exercise. At the end of 8-week experiment, EDI-3 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 BD (ΔBD=-5.3), 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 Interoceptive 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 status in terms of EDy and P. (4) HIIT were more effective in reducing the BD 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 BSU.

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EXERCISE METHOD AND EFFECT EVALUATION OF HIGH INTENSITY INTERVAL EXERCISE INTERVENTIONNAFLD IN EXERCISE AND MEDICAL INTEGRATION

Hanran Li, Chao Luo, Liangyi Hu, Yuhan Cao, Yiqing Lan, Qingjia Song, Zhiping Zhen. *Beijing Normal University, Beijing, China.*
Email: 736147552@qq.com
(No relevant relationships reported)

PURPOSE:
Based on the analysis of the detection rate of fatty liver in the physical examination of the faculty in Beijing Normal University from 2017 to 2018, this study designed and implemented a high-intensity interval centered on improving exercise intensity, imparting motor skills, comprehending sports value, and experiencing exercise effects.
METHODS:
①Intervention: The exercise mode is high-intensity intermittent exercise, and the specific exercise forms cover resistance and aerobic content. HIIT exercise intensity is 85%-95% HRmax, exercise time is 50 minutes each time, the number is 3 times a week for 12 weeks.②Physical and medical routine monitoring indicators of comprehensive health response NAFLD population, including body shape, quality index, heart rate, blood pressure, maximal oxygen uptake, blood biochemical index.
RESULTS:
①The detection rate of fatty liver in faculty and staff was higher in males than in females (P<0.01); it was characterized by increasing age (P<0.01) and obesity being higher than normal (P<0.01).②After 12 weeks of HIIT intervention, the body weight, waist circumference and waist-to-height ratio of the exercise group decreased significantly, which decreased by 1.9%, 0.9% and 1.9%(*P*<0.01), respectively.③In the exercise group, the four physical quality indicators increased significantly (*P*<0.01).④The HDL-C of the exercise group increased significantly (*P*<0.05), LDL-C increased slightly, FBG, TC, TG decreased slightly.⑤AST and ALT in the exercise group decreased significantly(*P*<0.01).⑥The effective rate of exercise on NAFLD was 57.7% in the exercise group, which was significantly higher than that in the control group (P <0.05). ⑦The health skills acquisition scores of the exercise group were significantly higher than those of the control group (*P* <0.01).
CONCLUSIONS:
①From 2017 to 2018, the detection rates of fatty liver in physical examination of teachers were 32.2% and 25.3% respectively. ②12-week HIIT can significantly reduce the body weight,waist circumference ,AST and ALT of NAFLD subjects,and it can significantly improve the lung capacity,physical fitness indicators, HDL-C of NAFLD subjects. ③12-week HIIT can significantly improve the liver sonogram of NAFLD subjects,and it can effectively promote the improvement of motor skills of NAFLD subjects.

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Multicomponent Training For Dementia Patients: Body&Brain Project Primary Results On Functional Fitness

Joana Carvalho[1], Flávia B. Machado[1], Arnaldina Sampaio[1], Inês Marques-Aleixo[1], José Magalhães[1], Duarte Barros[1], Oscar Ribeiro[2]. [1]*Faculty of Sports, University of Porto, Porto, Portugal.* [2]*University of Aveiro, Aveiro, Portugal.*
Email: jcarvalho@fade.up.pt
(No relevant relationships reported)

PURPOSE: Evidence is necessary to attest the therapeutic role of physical exercise as a non-pharmacological adjuvant treatment for dementia. In addition to the intrinsic benefits of regular exercise on physical fitness, individual wellness and quality-of-life, it also may have a positive influence on cognitive function, daily functionality and minimizing the risk of falls. Multicomponent Training (MT) combines aerobic, strength, balance and postural exercises and has been suggested as an effective training modality for dementia individuals. This study aimed to examine the effects of a MT intervention on functional fitness in elders with dementia. **METHODS:** A 6-month MT exercise program was conducted twice a week with 50-minute group-based sessions. This intervention included 25 subjects clinically diagnosed with dementia, referred from hospitals, daycare centers and municipalities - conducted in 6 community-based settings. Sessions were divided in 3 main parts: warm-up, specific training at light-to-moderate intensity, and cool down. The *Short Performance Physical Battery* (SPPB), *Timed-up-and-Go* (TUG), and *One-Leg Balance (OLB) tests* were used before and after intervention. **RESULTS:** The sample comprised 18 women with medium age of 77 years [range 62-90], and a baseline medium score of 20,64 points on *Mini Mental State Examination*. Results from Paired-Samples Signed Test revealed a statistically significative positive effect on SPPB (*p*=0,001) from pre (9,04 ± 2,42) to post intervention (10,28 ± 1,97); and on TUG (*p*<0,000), emphasized by 22 individuals that performed the task quicker at post-test (9,35 ± 3,27). Results from OLB showed a slight improvement from baseline (4,40 ± 6,83) to post-intervention (6,00 ± 7,51), although not statistically significative (*p*=0,307). **CONCLUSIONS:** Data suggest that a 6-month MT intervention may be an important strategy to improve physical function on dementia patients and, therefore, it might have an impact on reducing the risk of falls. In addition, this intervention may positively influence dementia subjects on daily tasks by promoting their mobility, critical to decrease the progression of dependence on caregivers'. **FUNDING:** FCT - CIAFEL (UID/DTP/00617/2019), "Body&Brain" (POCI-01-0145-FEDER-031808), and Ph.D. Grant (SFRH/BD/136635/2018); & IPDJ.

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Physical Function Of Aged Population Is Predicted By Motor Competence And Physical Fitness

Pedro Bezerra[1], Vitor Lopes[2], Celina Gonçalves[2]. [1]*Polytechnical Institute of Viana do Castelo, Viana do Castelo, Portugal.* [2]*Polytechnical Institute of Bragança, Bragança, Portugal.*
Email: pbezerra@esdl.ipvc.pt
(No relevant relationships reported)

Fitness and cognitive status on aging has been widely studied and well reported on literature. Independence and functioning are decisive in elders life quality. Motor competence has been associated to children physical activity levels and healthy weight status. Whether or not Motor Competence has additional value in promoting physical function on aging is not well stablished.
PURPOSE: to investigate the relationship and influence of motor competence, physical fitness and cognitive status on physical functioning, in aged population.
METHODS: institutionalized participants were recruited as a convenience sample in three day-care centers (N=283, women N=184, mean age = 82.05±7.70 years). Physical functioning was assessed through self-report using a composite physical function scale. Physical fitness was evaluated with the Senior Fitness Test. Motor competence was evaluated as the proficiency in overarm throw a tennis ball, measuring the ball velocity, and standing long jump. Cognitive performance was assessed with Mini-Mental State Examination test. T test was used to test the difference between women and men in all variables. Pearson correlation between physical functioning, physical fitness and motor competence was performed. Stepwise regression was used to identify the predictor variables of physical functioning. Significance was set at p < 0.05.
RESULTS: Men had significant better motor competence and physical fitness results than women. In women, the highest correlation were found between physical functioning and Chair stand (r=0.25), standing long jump (r=0.19) and 2-min step (r=0.19). In men, the highest correlation were found on 2-min step (r=0.30) and overarm throw (r=0.27). Stepwise regression retained the following variables: 2.44 m up-&-Go, standing long jump, and sex ($F_{(3; 212)} = 33.73$; $p < 0.001$, $R^2 = 0.32$). Men has an estimate of more 2.162 points in physical functioning than women. Physical functioning is estimate to increased 1 point for every -0.151 s in 2.44 m Up-&-Go, and 1 point for every 0.051 cm in standing long jump.

CONCLUSION: Despite having found significant moderate to low correlations in both men and women, it seems that both Motor Competence and Fitness status has important influence on physical functioning.

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The Effect Of Traditional Chinese Exercise On Diabetic : A Non-randomized Controlled Trial

Haili Zhang[1], Jing Li[1], Mian Jia[2], YiYun Jiang[3], TongTong Gao[3], Jing Zhang[1], YaQing Cheng[1]. *[1]Dongzhimen Hospital of Beijing University of Chinese Medicine, Beijing, China. [2]World Federation of Chinese Medicine Societies, Beijing, China. [3]Beijing Chinese Medicine Hosipital PingGu Hosipital, Beijing, China.*
Email: 1134342260@qq.com
(No relevant relationships reported)

Objective: 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 on patients with 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 80.18±9.02 vs post 86.64±9.91) , muscle endurance (pre 3.76±4.38 vs post 6.91±5.73) and flexibility (pre 2.86±9.69 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.

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Peer-led Fall Prevention Program For People Aged 50+: Are We Attracting The Right People?

Molly Gallibois. *University of New Brunswick, Fredericton, NB, Canada.*
Email: molly.gallibois@unb.ca
(No relevant relationships reported)

Falls are established as the leading cause of hospitalization amongst older adults leading to institutionalization 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

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Impact Of Psychological Effects On Adolescent Physical Activity: An Intervention Study

Yao Zhang. *Tsinghua University, Beijing, China.*
Email: yao-zhan19@mails.tsinghua.edu.cn
(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=5.279, p=0.024), exercise intention (F=10.662, p=0.002) and self-efficacy (F=6.427, p=0.013) over the control group, but not in 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 (=6.621,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.

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Pilot Study- Effects Of A Standardized Eight-week Exercise Program On Fundamental Physical Components

Kendra Holte[1], Brittany N. Followay[2], Mark E. Cole[2]. *[1]Ripon College, Ripon, Wisconsin and Kansas State University, Manhattan, KS. [2]Ripon 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.

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The Effects Of A Sit-to-stand Workstation On Body Composition Over 12 Months

Kelly Monaghan, Marlee Hearn, Alex J. London, Larissa Boyd, Melissa Powers. *University of Central Oklahoma, Edmond, OK.*
Email: kmonaghan@uco.edu

(No relevant relationships reported)

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% ($F_{(2, 60)}$ = .17, p > .05), total fat mass ($F_{(2, 60)}$ = .26, p > .05), total lean mass ($F_{(2, 60)}$ = .51, p > .05), total BMD ($F_{(2, 60)}$ = .15, p > .05), and A/G ratio ($F_{(2, 60)}$ = .37, p > .05). Additionally, there was not a significant main effect found for groups among any of the five body composition variables. A significant main effect for time was found for total BMD ($F_{(2, 60)}$ = 11.6, p < .001) and A/G ratio ($F_{(2, 60)}$ = 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.

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Hit Effects On Substrates Oxidation Rates Of Women In Different Phases Of Monthly Ovarian Cycle

Marcelo L. Marquezi[1], Caroline Santana Frientes[1], Juliana M. Lino[1], Marcelo S. Cascapera[2], Antonio H. Lancha Jr[3].
[1]*Universidade Cidade de São Paulo, São Paulo, Brazil.*
[2]*Santa Casa de Misericórdia de São Paulo, São Paulo, Brazil.*
[3]*Universidade de São Paulo, São Paulo, Brazil.*
Email: mlmqzz@gmail.com

(No relevant relationships reported)

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 (HIT) sessions on carbohydrate and lipid oxidation rates (CHOox and LIPox, respectively) and intensities of ventilatory anaerobic thresholds (VATs) 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 VATs, VO_{2peak}, peak velocity (V_{peak}), 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 HIT sessions, composed each one of eight sets of 60s running at 100%V_{peak} interspersed by 75s recovery, every 48h. **Results:** Our results showed no significant differences in VATs intensities between groups. The comparison between groups showed significant differences in relative energy derived from CHOox pre-post training of the -61.4% and -59.3% respectively, and LIPox pre-post training of the 27.5% and 34.4% respectively. The relative energy derived from CHOox after the training period were 18.9% and 25.5% higher to FPG and LPG, respectively; consequently, the relative energy derived from LIPox after the training period were 8,45% and 3.46% lower to FPG and LPG, respectively. Over the training period, V_{peak} was ~13.5 km/h, which produced the relative intensities of ~89%VO_{2peak} e ~93%HR_{peak} for both groups. **Conclusion:** The monthly ovarian cycle phases promote significant changes on substrates oxidation rates leading to decrease of CHOox. High intensity interval training can minimize the differences observed and constitute an alternative intervention.

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Do The Health Benefits Of Different Physical Fitness Levels Of Young Adults Outweigh The Risks?

Haili Tian, Peijie Chen. *Shanghai University of Sport, Shanghai, China.*

(No relevant relationships reported)

PURPOSE: Air pollution has become a substantial environmental issue affecting human health and health related behavior. Physical activity is widely accepted as a method to promote health and well-being and is potentially influenced by air pollution. There is a paucity of research on the point at which exercise level in a polluted environment becomes more beneficial than harmful, thus limiting the capacity to effectively balance the risk and benefits of regular outdoor exercise. Therefore the purpose of the study was to determine whether long-term regular exercise could prevent the health damage among healthy young adults in air pollution conditions.
METHODS: In our study, we constructed a real-world crossover study with repeated measures of 25 healthy young adults. Linear mixed models were used to determine the impact of short-term exposure to air pollution environment on respiratory and inflammatory functions among 25 different physical fitness levels of health young adults after 2 hours moderate intensity physical activity. **RESULTS**: There were increased statistically significance (p≤0.05) in pulmonary function(forced expiratory volume in 1s (35 mL), forced vital capacity (25 mL), forced expiratory flow(FEF25-75%)(69 mL)) and number of lymphocytes among young adults with high physical fitness levels, while decreased statistically significant in lung inflammation(fraction of exhaled nitric oxide, FeNO). However, different outcomes were found in normal physical fitness levels' counterparts. Additionally, Studies have generally suggested that moderate-intensity physical activity can increase lymphocyte immune function and improve health by causing an increase in the secretion of neurotransmitter-catecholamines. **CONCLUSIONS**: Our findings suggest that: 1) the young adults with high levels of physical fitness may reduce the immediate adverse effects of air pollution, such as inflammatory responses and increase respiratory function, compared to normal physical fitness levels' counterparts; 2) the regulation of neurotransmitter-catecholamine secretion may be a potential mechanism for physical activity and air pollution to affect health by regulating lymphocytes. Further studies with larger sample size and longer exposure time are highly needed to duplicate the work.

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The Effect Of Yoga On Body Fat And Cardiorespiratory Fitness Of Sedentary Overweight Female Students

Hongmei Li, Shanshan mao, Yimin Zhang. *BeiJing Sport University, Beijing, China.*
Email: 18101302162@163.com

(No relevant relationships reported)

PURPOSE: To observe the effects of 8-week yoga on body fat and cardiorespiratory fitness of sedentary overweight female students.
METHODS: 25 healthy overweight female students were recruited online or in classroom. They were randomly divided into the yoga(n=13) and control (n=12) group. 8-week Hatha yoga, 4 times/week, 60 minutes/time. After each session, subjects were asked about their feelings to adjust the intensity. During the intervention, all subjects maintained their daily diet and physical activity. Control group can join our yoga practice if they wanted to after the experiment. Before the experiment, the height was measured twice with a height meter. Body composition was measured by DXA, cardiorespiratory fitness was tested with the Bruce Protocol in pre-and post-experiment, body weight, fat mass, Fat%, the fat mass in android and gynoid areas, absolute VO_{2max} and relative VO_{2max} were automatically identified by the computer. All operations were done by same person. All the data were compared between groups with independent sample t-test, and within groups with paired sample t-test, SPSS was used for statistics.
RESULTS: (1) In pre-experiment, there were no significant difference in age, height, weight, BMI, body Fat, Fat%, android and gynoid Fat mass, absolute and relative VO_{2max} between the two groups; (2) In post-experiment, the relative VO_{2max} (38.54±4.01 VS 34.75±3.77, p < 0.05) in the yoga but not the control group was significantly increased; (3) Compared with the pre-experiment, Fat% (34.36%±2.41% VS 33.63%±2.64%, p < 0.05) in yoga group decreased significantly, absolute VO_{2max} (1.95±0.33 VS 2.19±0.27, p < 0.01) and relative VO_{2max} (33.85±3.41 VS 38.54±4.01, p < 0.01) increased significantly in the post-experiment, All indicators in the control group showed no significant difference in pre- and post-experiment; (4) Significant differences in the changes of Fat% (-0.73%±0.98% VS 0.06%± 0.68%, p < 0.05), absolute VO_{2max} (0.24±0.21 VS 0.06±0.13, p < 0.05) and relative VO_{2max} (4.69±3.45 VS 1.17±1.90, p < 0.01) existed between the two groups.

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.

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IMPROVEMENT IN ELEMENTARY STUDENTS PREFERENCE FOR PHYSICAL ACTIVITY ENGAGEMENT FOLLOWING PHYSICAL LITERACY PROGRAMMING

Abigail Daugherty, Brandi Eveland-Sayers, Alyson Chroust, Andrew Dotterweich, Brianna Steffey. *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=82) 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) = 4.948, $p < 0.05$). 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.

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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 Izquierdo[1], Katherine González-Ruíz[2], Carolina Medrano-Mena[3], Jorge E. Correa-Bautista[1], Robinson Ramírez-Vélez[1]. [1]*Public University of Navarra, Pamplona, Spain.* [2]*Universidad Manuela Beltrán, Bogotá, Colombia.* [3]*Universidad 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 > 26 wt./ht.2 (mean age, 40.7±7.0 years) 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 gynecoid 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 (5.3), p=0.024, η^2p=0.058], legs fat mass [F(4.4), p=0.037, η^2p=0.050], android fat mass (%) [F(5.8), p=0.023, η^2p=0.123] and total fat mass (%) [F(5.2), p=0.025, η^2p=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), p=0.006, η^2p=0.130] and group × time interaction between RT and NG group in total muscle mass (g) [F(2.9), p=0.038, η^2p=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.

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A Short-term Longitudinal Study Of The Effectiveness Of Kids Get Fit Fitness And Nutrition Curriculum

Pranav Gupta[1], Benjamin Hoag[1], Jose Miguel Malaspina[1], Ana Mafalda Martins[1], Toyin Ajisafe[2], Jon Roberts[1]. [1]*Driscoll Children's Hospital and Texas A&M College of Medicine, Corpus Christi, TX.* [2]*Texas A&M College of Medicine, Corpus Christi, TX.*
Email: pranav.gupta@dchstx.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 behaviors (EFNEP 3rd-5th 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 90o push-up performance compared to the control group. There were no significant differences in sugar-sweetened beverage (U = 1311.500, P = .505), vegetable (U = 1399.500, 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.

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Maternal Fitness And Physical Activity Levels Decrease Infant Adiposity Up To 1 Year Of Age

Jacob K. Rasey, Jeanine 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± 2weeks, maternal cardiorespiratory fitness (VO_{2peak} ml/kg/min) was assessed using cycle ergometry, percent body fat via skinfolds, and 5-day levels of physical activity with 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 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 maternal 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 ± 38.3 vs. 23.8 ±

23.6min, p<0.001). At the 1 year time point, for every 1 unit increase in maternal cardiorespiratory fitness, infant waist circumference, biceps skinfolds and triceps skinfolds decreased by 1.4cm, 1.6mm, and 1.1mm, respectively (p<0.05).
Conclusion: Our findings suggests that greater cardiorespiratory fitness is associated with reduced infant adiposity up to one year of age, possibly mediated by levels of moderate to vigorous physical activity throughout pregnancy.

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Sedentary Behavior, Physical Activity And Bone Mineral Density In Ckd Patients: An Isotemporal Substitution Approach

Masaki Yoshioka[1], Keisei Kosaki[2], Masahiro Matsui[1], Kanako Takahashi[1], Ai Shibata[1], Koichiro Oka[2], Makoto Kuro-o[3], Chie Saito[1], Kunihiro Yamagata[1], Seiji Maeda[1]. [1]*University of Tsukuba, Ibaraki, Japan.* [2]*Waseda University, Saitama, Japan.* [3]*Jichi Medical University, Tochigi, Japan.*
Email: masakiyoshioka1129@gmail.com
(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 = 1.328, 95%Cl; 0.004, 2.652), BUA (B = 0.827, 95%Cl; 0.046, 0.609) and stiffness index (B = 0.926, 95%Cl; 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%Cl; 0.224, 2.686), BUA (B = 1.015, 95%Cl; 0.289, 1.742) and stiffness index (B = 1.088, 95%Cl; 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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Effects Of A Personalized Six-week Resistance Exercise Program On Senior Citizens' Cardiometabolic Health And Adherence

Garrett L. Peltonen[1], Takahiro Sato[1], Susumu Iwasaki[2]. [1]*Western New Mexico University, Silver City, NM.* [2]*Fort 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 trainers 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

C-45 Free Communication/Poster - Nutrition and Metabolism: Meta-Analyses

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

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 VO_{2max}) 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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Interval Training Versus Continuous Training On Glycemic Control In Prediabetes And Type 2 Diabetes: Meta-analysis

JUAN WANG, Zhengzhen Wang, FACSM, Yan Wang, Yan Yan. *BEIJING SPORT UNIVERSITY, BEIJING, China.* (Sponsor: Zhengzhen Wang, FACSM)
(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), VO_{2peak}.
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, HIIT improved significantly of 0.33 L/min [95%CI (0.26—0.41), $P < 0.0001$] of absolute VO_{2peak}, 3.31 mL/min/kg [95%CI (-2.25—8.85), $P < 0.0001$] of relative VO_{2peak} in T2D patients, and 0.83 mL/min/kg [95%CI (0.03—1.63), $P = 0.04$] of relative VO_{2peak} 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) HIIT 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: 1) HIIT induced more positive benefits in glycemic control and cardiorespiratory fitness than MICT in T2D patients. 2) In prediabetes, HIIT 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).

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Effects Of Exogenous Testosterone Administration On Lean Body Mass And Physical Performance: A Meta-analysis

Alyssa N. Varanoske, Lee M. Margolis, Stefan M. Pasiakos, FACSM. *U.S. Army Research Institute of Environmental Medicine (USARIEM), Natick, MA.* (Sponsor: Stefan Pasiakos, FACSM)
Email: alyssa.n.varanoske.ctr@mail.mil
(No relevant relationships reported)

Testosterone (T) administration (TA) increases serum T and lean body mass (LBM). Although TA-mediated increases LBM may enhance physical performance, the data are largely equivocal, which may be due to differences study populations, the magnitude change in serum T and LBM, or the performance metrics themselves.
PURPOSE: This meta-analysis explored the effects of TA on changes in serum T, LBM, and physical performance. The association between increases in serum T and LBM was assessed, and if changes in LBM, study population, or the performance metrics studied affected physical performance was determined. **METHODS:** A systematic review of double-blind randomized control/clinical trials comparing TA versus placebo on serum T, LBM, and physical performance was performed. Data were extracted from 20 eligible manuscripts. Effect sizes (ES) were assessed using Hedge's g and a random effects model. Data are presented as ES (95% CI). **RESULTS:** Compared to placebo, TA had a large effect on serum T [2.65 (1.35, 3.96), $p < 0.001$], a small effect on LBM [0.32 (0.18, 0.46), $p < 0.001$], and a trivial effect on overall performance [0.14 (0.08, 0.20), $p < 0.001$]. Changes in serum T in TA groups were not associated with the ES of TA on LBM compared to placebo ($p = 0.221$). However, when TA groups were dichotomized based on median increase in serum T, medium [0.50 (0.23, 0.76), $p < 0.05$] and small [0.22 (0.14, 0.29), $p < 0.05$] effects were observed for LBM in those with increases in serum T above and below 8.82 nmol/L, respectively. Overall, performance increased with TA in diseased [0.17 (0.06, 0.27), $p < 0.05$] and older (60+ years) [0.16 (0.08, 0.24), $p < 0.05$] males, but not in younger (18-55 years) males. TA increased lower body [0.09 (0.04, 0.14), $p < 0.05$], upper body [0.22 (0.03, 0.41), $p < 0.05$], and handgrip [0.14 (0.06, 0.22), $p < 0.05$] strength, and lower body muscular endurance [0.38 (0.09, 0.68), $p < 0.05$]. TA had no effect on lower body power, aerobic endurance, and functional performance. **CONCLUSIONS:** These data show that the effects of TA on: 1) LBM are mediated by the overall effect of TA on serum T concentrations, and 2) physical performance are observed in mainly tests of muscular strength and endurance in diseased and older males.

1697 Board #291 May 28 9:30 AM - 11:00 AM

Effects Of Intermittent Fasting On Exercise Performance And Body Composition: A Systematic Review And Meta-analysis

Joana M. Correia. *Faculdade de Motricidade Humana, Lisboa, Portugal.* (Sponsor: Bo Fernhall, FACSM)
Email: joanacorreia-19@live.com.pt
(No relevant relationships reported)

Intermittent fasting (IF) has been mostly studied in athletes during Ramadan and in those willing to decrease adiposity while maintaining or increasing lean body mass.
PURPOSE: To estimate the effects of IF on performance outcomes, namely aerobic, anaerobic, muscle strength and body composition adaptations.
METHODS: We conducted a comprehensive search of peer-reviewed articles in 3 electronic databases: PubMed, Web of Science and Sport Discus (all articles published until March 2019). Studies were selected if they included samples of adults (≥18 years), had an experimental or observational design, investigated IF (Ramadan and non-Ramadan IF) and included performance or body composition outcomes. Meta-analyses were performed when feasible. Eighteen articles met eligibility criteria.
RESULTS: Overall, IF had a medium, negative effect on relative fat mass (SMD = -0.51, $p = 0.029$; $Q = 2.09$, $p = 0.554$; $I^2 = 0\%$; k = 4), and a small, but significant negative effect on maximum oxygen uptake (VO_{2max}) (SMD = -0.45, $p = 0.023$; $Q = 12.09$, $p = 0.002$, $I^2 = 83\%$; 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).

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β-hydroxy-β-methylbutyrate (HMB) Does Not Improve Resistance Exercise-Induced Changes In Body Composition: A Systematic-review And Meta-analysis

Everson A. Nunes[1], Josie Jakubowski[1], Filipe J. Teixeira[2], Victoria Vescio[1], Robert W. Morton[1], Stuart M. Phillips, FACSM[1]. [1]*McMaster University, Hamilton, ON, Canada.* [2]*CBIOS—Universidade Lusófona's Research Center for Biosciences and Health Technologies, Lisbon, Portugal.*
Email: nunese1@mcmaster.ca
(No relevant relationships reported)

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 (RET). However, literature definitive evidence-based answer to the question of the efficacy of HMB is lacking.
Purpose: The aim of this systematic-review and meta-analysis was to determine the efficacy of HMB supplementation, in the calcium (HMB-Ca) or free acid (HMB-FA) form, to augment lean body mass and strength gains during RET.
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 V.5.3. Cochrane risk-of-bias tool for randomized trials (RoB 2) 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 (LwB) 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 8 ± 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=0.56; BP 1RM: 1.49kg [-1.33, 4.30], p=0.30 and LwB 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 RET. In addition, effects on strength were not significant. Therefore, the claims for HMB consumption to optimize RET effects seem to be based on studies with considerable risk of bias. When such studies are not considered, there is no support for HMB ingestion.

1699 Board #293 May 28 9:30 AM - 11:00 AM

Effect Of Vitamin D3 Supplementation On Serum $1,25(OH)_2D$ Status Of Athletes: Systematic Review And Meta-analysis

Qi Han[1], Qiushi Tan[2], Jing Shao[2], Yingbin Ren[1], Jia Cheng[3], Ziyu Gao[1], Minhao Xie[2]. [1]*Beijing Sport University, BEIJING, China.* [2]*National Research Institute of Sports Medicine, BEIJING, China.* [3]*The Third Affiliated Hospital of Chong Qing Medical University, Chongqing, China.*
Email: hanqi0418@163.com
(No relevant relationships reported)

Vitamin D is an essential fat-soluble vitamin, which plays an important role in the maintaining of good health. Without sufficient vitamin D, people cannot absorb enough calcium, which is a primary component of the bone. In the past century, vitamin D deficiency is heavily studied and lots of scientists report that vitamin D deficiency is related to several health problems, such as osteoporosis, muscle aches and weakness. Vitamin D supplements and vitamin D fortified foods always have claims of bringing people health benefits including bone health and muscle function. **PURPOSE**: This study is designed to investigate the effects of vitamin D3 supplementation on serum $1,25(OH)_2D$ among athletes. **METHODS**: Literature search of PubMed, Embase and Cochrane Library databases from inception to Sept. 2019 was accomplished.

Duplicates were removed at the stage of title and abstract assessment with assistant from Mendeley tools and by notes from Cochrane library. **RESULTS**: 6 RCTs with 205 athletes (vitamin D3 = 107, placebo = 98) finally met inclusion criteria. 20 athletes were lost to follow-up and 185 athletes (vitamin D3 = 100, placebo = 85) were documented with complete result. The intervention of vitamin D3 significantly improved the level of serum $1,25(OH)_2D$ (SMD 3.77, 95% CI: 1.88 to 5.66, P < 0.01). Among athletes with insufficient baseline serum $1,25(OH)_2D$, vitamin D3 daily dosage at 5000 IU for over 4 weeks led to serum $1,25(OH)_2D$ concentration of 31.7 ng/ml. Athletes with sufficient serum $1,25(OH)_2D$ level at baseline were recruited in only one study, and the participants were assigned to either vitamin D3 at a daily dosage of 3570 IU or placebo for 12 weeks, their serum $1,25(OH)_2D$ sufficiency (VD: 37.2 ± 7.6 vs 45.6 ± 7.6; PL 38 ± 6.8 vs 32 ± 8.4) was well maintained above the cut-off boundary with improved serum $1,25(OH)_2D$ status in supplementation group. **CONCLUSIONS**: Serum $1,25(OH)_2D$ concentration was improved after supplementation in this meta-analysis. Additional well-designed RCTs with large number of participants from a variety of sports that examined the effect of vitamin D3 supplementation on serum $1,25(OH)_2D$ concentrations are needed.

1700 Board #294 May 28 9:30 AM - 11:00 AM

Acute And Chronic Effects Of Branched-chain Amino Acid Supplementation: A Systematic Review And Meta-analysis

Lauren M. Colenso-Semple, Robert W. Morton, Matthew Fliss, Mirette Mounir, Mina Mladenovic, Erin Webb, Stuart M. Phillips, FACSM. *McMaster University, Hamilton, ON, Canada.*

(No relevant relationships reported)

Branched-chain amino acids (BCAA) influence muscle protein 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 free 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.

1701 Board #295 May 28 9:30 AM - 11:00 AM

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

Harold C. Mayer[1], Lucas G. Valenca[1], G. W. Heath, FACSM[2], Michael A. Liedke[1], Kristina N. Hall[1], Robert C. Benge[1]. [1]*Southern Adventist University, Collegedale, TN.* [2]*University of Tennessee, Chattanooga, TN.*

(No relevant relationships reported)

Resting 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·24 h^{-1} caloric deficit, adherence to whole-foods, plant-based diet, and randomization into three exercise groups. Exercise intensity levels were set by respiratory exchange ratio (RER) ranges determined through submaximal VO_2-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—respiratory quotient (RQ), VO_2, VCO_2, 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 VCO_2 were noted between groups (F 1,46=7.88, **p=.001**; F 1,46=3.51, **p=.039**, respectively). Significant differences in KCHO and KFAT substrate oxidation rates were noted between groups likewise (F 1,46=5.74, **p=.006**; F 1,46=5.05, **p=.011**, respectively). Changes in total body mass showed significant differences (F 1,46=6.39, **p=.004**). 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 status and corrective energy homeostasis that promotes effective body composition normalization.

C-46 Free Communication/Poster - **Mental Health**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1702 Board #296 May 28 9:30 AM - 11:00 AM

Combined Exercise Training Improves Work-Related Burnout Symptoms And Psychological Stress: A Randomized Controlled Study

Gianpiero Greco, Stefania Cataldi, Francesco Fischetti. *University of Study of Bari, Bari, Italy.*
Email: gianpigreco@hotmail.it

(No relevant relationships reported)

Burnout syndrome is an important public health problem due to the negative effects on workers and workplace wellbeing with consequent social and economic repercussions. Physical activity is recognized as a useful treatment to reduce burnout and psychological stress among the workers, however, there are few rigorous studies on treatment efficacy. **PURPOSE:** This randomized controlled study aimed to evaluate the effects of a Combined Exercise Training on burnout symptoms and perceived stress among workers in the helping professions. **METHODS:** Forty-two men (46.3 ± 8.1 years), scoring medium to high on the Maslach Burnout Inventory (MBI) emotional exhaustion and depersonalization subscales, were allocated into an intervention (n = 21) or waitlist control (n = 21) group. The intervention group performed a combined 8-week circuit resistance training and agility training (60 min, 3d·wk^{-1}) at a local fitness center, whereas the control group did not participate in an exercise program. At baseline and after the intervention, the MBI and Perceived Stress Scale were administered. **RESULTS:** Significant interaction effects group-by-time ($p < 0.001$; $\eta^2_p > 0.35$) showed improvements for the intervention group that reduced emotional exhaustion (-9.2 ± 2.7, $p < 0.001$, $d = 1.21$), depersonalization (-4.7 ± 2.8, $p < 0.001$, $d = 1.00$) and perceived stress (-6.0 ± 2.5, $p < 0.001$, $d = 1.16$), and increased personal accomplishment (4.3 ± 1.9, $p < 0.001$, $d = 0.81$). The magnitude of the effects was large, revealing changes of crucial practical relevance. Adherence (90.4 %) and satisfaction (3.71 ± 0.56; rating 1-4) with the intervention were high. No significant changes were found in the control group ($p > 0.05$). **CONCLUSION:** The findings support the evidence that Combined Exercise Training may reduce burnout symptoms and perceived stress among workers in the helping professions. We recommend participation in exercise in the leisure time or workplace because it may likely improve work performance, wellbeing and life quality.

1703 Board #297 May 28 9:30 AM - 11:00 AM

Prevalence And Associated Factors Of Depressive Symptoms In Chinese Elderly Women

Yaofei Xie, Guanglin Si, Xuyu Chen, Li Ran, Xiaodong Tan. *Wuhan University, Wuhan, China.*

(No relevant relationships reported)

Purpose To explore the prevalence and associated factors of depressive symptoms among Chinese elderly women. **Methods** The public data of China Health and Retirement Longitudinal Study collected in 2015 was adopted, and 2575 female participants aged 60 years and above were included in this study. Part of observed variables of demographics, family transfer, health status and functioning portions were used. Depressive symptoms was measured using the 10-item version of the Center for Epidemiologic Studies Depression Scale. Analysis of variance and *Pearson's* χ^2 test were adopted to compare the differences among subgroups, and univariate and multivariate logistic regression models were applied to explore associations between different factors and depressive symptoms. **Results** The mean age of the participants was 69.16 ± 7.22 years old, the mean score of CED-10 scale was 10.23 ± 7.05, about 46.45% participants had depressive symptoms last month. Multiple regression analysis

revealed that higher odd ratio of depressive symptoms appeared in the following subgroups: older age (*OR* = 1.98, 95% *CI* = 1.41-2.79) , not living with spouse (*OR* = 1.31, 95% *CI* = 1.07-1.60), living in further area from main city zone (*OR* = 1.49, 95% *CI* = 1.17-1.90), providing more economic supports to children last year (*OR* = 2.93, 95% *CI* = 1.45-5.92), lower parent-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* = 2.09, 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

Kezia Alexander[1], Melita N. Moore[1], Joseph Bano[2], Justin B. Cooper[1], Aviram Giladi[3], Andrew E. Lincoln[1]. [1]*MedStar Sports Medicine, Baltimore, MD.* [2]*Georgetown University School of Medicine, Washington DC, MD.* [3]*MedStar Union Memorial Hospital, Baltimore, MD.*
Email: kezia.alexander@medstar.net

(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 (BMHQ), Patient Rated Outcomes Measurement Information 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. **CONCLUSIONS**: 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.

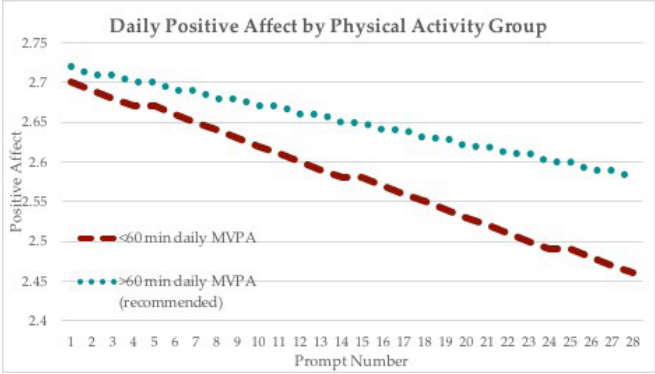
1705 Board #299 May 28 9:30 AM - 11:00 AM

Daily Physical Activity And Affect In Preschoolers

Diana Whalen[1], Greg Hajcak[2], Joan Luby[1]. [1]*Washington University in St. Louis, St. Louis, MO.* [2]*Florida State University, Tallahassee, FL.*
Email: diana.whalen@wustl.edu

(No relevant relationships reported)

PURPOSE: Physical activity is vital to mental health yet relatively little is known about the temporal dynamics of this relation, particularly in young children. This 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 wGT3X-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 week-long cell-phone based ecological momentary assessment protocol. Caregivers responded to four prompts each day (28 total) about their child's affect and behavior. **RESULTS:** The dataset consisted 2,016 observations. 38% (*n*=27) of the sample failed to meet the minimum recommended guidelines (<60 minutes) for MVPA. Linear growth models for positive affect allowed each preschooler to have his/her own initial level of positive affect and rate of change in positive affect. Models also accounted for child age, sex, and psychopathology. Initial positive affect was higher among preschoolers meeting MVPA guidelines (Est= 0.37, *SE*= 0.15, *t*=2.51, *p*=.01). Across the week, active preschoolers maintained positive affect (Figure 1), whereas less-active preschoolers reported a significant *decrease* in positive affect (Est= -0.01, *SE*= 0.01, *t*=2.10, *p*=.04). **CONCLUSION:** Initial levels of positive affect and the maintenance of positive affect were higher among children meeting MVPA guidelines. Although only small changes were evident across the week, this finding indicates that physical activity may sustain positive affect in young children and over time, potentially buffer against the onset of psychological disorders such as depression.



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

Association Between Sport Specialization, Athlete Burnout, And Past Injury In High School Athletes

Kathryn Stockbower, David Howell, Corrine Seehusen, Katherine Dahab, Gregory Walker. *The Children's Hospital of Colorado, Aurora, CO.*
Email: kathryn.stockbower@cuanschutz.edu

(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 0.44 - 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

Jessica M. McDermott[1], Julia Browne[2], Claudio Battaglini, FACSM[1], Fred Jarskog[1], Ana Abrantes[3], Paschal Sheeran[1], David L. Penn[1]. [1]*UNC Chapel Hill, Chapel Hill, NC.* [2]*Harvard Medical School, Boston, MA.* [3]*Brown University, Providence, RI.*
(Sponsor: Dr. Claudio Battaglini, FACSM)
Email: mcdermottjessica13@gmail.com

(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 were enrolled in a group-based, six-month, progressive 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 dependent 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 43%. 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 6MWT distances which is very 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.

1708 Board #302 May 28 9:30 AM - 11:00 AM

The Association Between Physical Activity And Eudaimonic Well-being In College Students

Zhanjia Zhang[1], Zhonghui He[2], Weiyun Chen[1]. [1]*University of Michigan, Ann Arbor, MI.* [2]*Peking University, Beijing, China.*
Email: zzj@umich.edu

(No relevant relationships reported)

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 set of questionnaires measuring PA and EWB. PA was assessed using the International Physical Activity Questionnaires. The metabolic equivalent (MET)-minutes per week were calculated to indicate the level of PA. EWB was operationalized as consisting of six components, including autonomy (AU), environmental mastery (EM), personal growth (PG), positive relations with others (PR), purpose in life (PL), and self-acceptance (SA). EWB was assessed using the 42-item Psychological Well-Being Scale (PWBS) on a 6-point Likert scale. The PWBS consists of six 7-item subscales, each assessing a unique component of EWB. Six multiple regressions were conducted with AU, EM, PG, PR, PL, and SA as the outcomes, respectively. In all models, PA was the predictor and age and gender were controlled as covariates. **RESULTS**: The regression models significantly explained the variances of AU ($R^2 = 3.54\%$, $p < 0.001$), EM ($R^2 = 4.34\%$, $p < 0.001$), PG ($R^2 = 5.59\%$, $p < 0.001$), PR ($R^2 = 5.28\%$, $p < 0.001$), PL ($R^2 = 3.93\%$, $p < 0.001$), and SA ($R^2 = 4.15\%$, $p < 0.001$) in college students. PA was significant in all models with higher levels of PA associated with higher levels of AU ($\beta = 0.13$, $p < 0.001$), EM ($\beta = 0.19$, $p < 0.001$), PG ($\beta = 0.09$, $p < 0.001$), PR ($\beta = 0.15$, $p < 0.001$), PL ($\beta = 0.13$, $p < 0.001$), and SA ($\beta = 0.17$, $p < 0.001$). The results indicated positive associations between PA and all components of EWB. **CONCLUSIONS**: For college students, regular PA is positively associated with all components of EWB. The strength of the positive association is strongest between PA and environmental mastery. Universities may consider creating more opportunities for PA participation to improve positive psychological well-being for college students.

1709 Board #303 May 28 9:30 AM - 11:00 AM

Does Age Influence The Effects Of Exercise On Anxiety Levels Of Children With ASD?

Sharon Kinsella[1], Damien Sheehan[1], Marie Carey[1], Fiona Knott[2]. [1]*Institute of Technology Carlow, Carlow, Ireland.* [2]*University of Reading, Reading, United Kingdom.*
Email: sharon.kinsella@itcarlow.ie

(No relevant relationships reported)

Anxiety is a common comorbidity among children with Autism Spectrum Disorder (ASD), with approximately 40% of youths with ASD meeting the criteria for at least one anxiety disorder (van Steensel *et al.,* 2011). Furthermore, anxiety has been shown to be more likely in adolescents with ASD (Mayes *et al.*, 2011; Vasa *et al.*, 2013). Only one study has shown that exercise has potential benefits for anxiety in 13-27 year olds with mainly mild ASD, following an eight week programme (Hillier *et al.,* 2011). Further research is need to examine the effects of exercise on anxiety in children with more severe symptoms of ASD and to establish if age is a factor on the effects of exercise on anxiety.
PURPOSE: To determine whether age influences the effects of exercise on anxiety levels of children with moderate to severe ASD.
METHODS: Twenty children (5-18 years) with moderate to severe ASD, were included in the study. A 16-week school-based exercise programme was implemented for 60 minutes, three days a week. Anxiety was measured using the Anxiety Scale for Children with ASD (ASC-ASD), which was given to the children's teacher, before and at the end of the programme. A Spearman's rank-order correlation was run to measure the relationship between age and the responsiveness of the intervention.
RESULTS: There was a significant, strong negative correlation between age and the effectiveness of the intervention on total ASC-ASD scores, $r_s(14) = -0.77$, $p = 0.001$, and on performance anxiety, $r_s(14) = -0.73$, $p = 0.003$. There was a significant, moderate negative correlation between age and the effectiveness of the intervention on anxious arousal, $r_s(14) = -0.65$, $p = 0.012$, and on uncertainty, $r_s(14) = -0.58$, $p = 0.028$. There was an insignificant, weak negative correlation between age and the effectiveness of the intervention on separation anxiety.
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.

1710 Board #304 May 28 9:30 AM - 11:00 AM

Associations Between Physical Activity, Generalized Anxiety Disorder, And Social Physique Anxiety Among Young Adults

Leanne M. Quinn, Brett R. Gordon, Mark Lyons, Matthew P. Herring, FACSM. *University of Limerick, Castletroy, Ireland.*
Email: Leanne.Quinn@ul.ie

(No relevant relationships reported)

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 based on gender and AGAD status. Cohen's d quantified the magnitude of difference. 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.
RESULTS: Females reported less PA ($p \leq 0.002$, d=0.31) and greater SPA ($p \leq 0.001$, d=-0.63) and GAD symptom severity ($p \leq 0.001$, d=-0.51). AGAD reported greater SPA ($p \leq 0.001$, d=0.92). Compared to inactive, odds of AGAD were 28.3% (OR=0.72, 95%CI: [0.43, 1.20], $p \geq 0.21$) and 42.5% (OR=0.58, [0.35, 0.94], $p \leq 0.03$) lower among moderately active and highly active, respectively. In adjusted models, compared to inactive, odds were 29.3% (OR= 0.71, [0.42, 1.20], $p \geq 0.21$) and 36.9% (OR=0.63, [0.38, 1.06], $p \geq 0.08$) lower among moderately active and highly active, respectively. Regression models of PA on GAD symptoms (β=-0.01, $p \leq 0.04$), SPA on PA (β=-0.02, $p \leq 0.03$), and SPA on GAD symptoms (β=0.14, $p \leq 0.001$) were significant. When regressed together, SPA was (β=0.14, $p \leq 0.001$), but PA was not (β=-0.003, $p \leq 0.27$), statistically significant, supporting mediation.
CONCLUSION: PA may lower odds of GAD, but findings were not significant after adjusting for covariates. SPA, a modifiable factor that was higher among females and those with AGAD, mediated the association between PA and GAD. Future research should examine these relationships longitudinally and explore SPA experimentally.

1711 Board #305 May 28 9:30 AM - 11:00 AM

Mental Health, Cardiovascular Risk Factors, And The College Student

Heather Hayes Betz, FACSM, V. Morgan Leadbetter, Julie M. Cousins. *Albion College, Albion, MI.*
Email: hbetz@albion.edu

(No relevant relationships reported)

College is a time when many health habits, both physical and behavioral, start to form that will remain throughout one's adult life (Kemper & Welsh, 2010). It has been estimated that between 12-50% of college students have one or more of the common mental health disorders (Hunt & Eisenburg, 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$\pm$0.1mmHg) than those in the high (102.7$\pm$5.7mmHg) or low groups (104.9$\pm$7.9mmHg) (p=0.033). No significant differences in days/week of physical activity, hours of nightly sleep, 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.

1712 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

jianxiu liu, Ruidong liu, Xindong Ma. *Tsinghua University, Beijing, China.*
Email: liujianxiu01@163.com

(No relevant relationships reported)

The relationship between physical activity (PA) and metal health has been documented, but the relationships 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 2018. 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. PA was measured by Physical Activity Questionnaire for Adolescents. Height and weight were measured by portable stadiometers and digital scales, and BMI (kg/m^2) was converted to BMI z-score. Chi-square tests were used to compare mental health problems in rural and urban areas. Multilevel logistic regressions were performed to examine the relationship between PA and different mental health problems, and other individual variables were controlled as covariates. **RESULTS**: The detection rates of overall mental health problems among urban (5.27%) and rural areas (7.28%) differed (&#956^2=9.23, p<.01). Seven of eight subscales differed in urban and rural areas: learning anxiety (53.64% vs. 59.44%), anxiety with people (9.29% vs. 11.32%), solitude tendency (5.05% vs. 6.21%), self-accusation tendency (19.52% vs. 24.46%), sensitivity tendency (21.66% vs. 26.61%), physical symptoms (24.09% vs. 30.44%), and terror tendency (7.60% vs. 10.81%). Every SD increase of PA (all p<.01) related to a decrease of learning anxiety by 33%, anxiety with people by 24%, solitude tendency by 34%, sensitivity tendency by 23%, and physical symptoms by 29%. Compared with urban areas, rural areas have greater odds of learning anxiety by 23% (p<.01), solitude tendency by 27% (p<.001), and physical symptoms by 37% (p<.05). **CONCLUSIONS**: People in urban areas have fewer mental health problems than those in rural areas. More PA correlates with decreased odds of mental health problems, including learning anxiety, anxiety with people, solitude tendency, sensitive tendency, and physical symptom. Supported by THU 2016THZWLJ12

1713 Board #307 May 28 9:30 AM - 11:00 AM

Sitting Time Predicts Cortisol Levels In Women, Independent Of Cardiorespiratory Fitness Level

Shannon K. Crowley, Jessica D. Wall, Alissa G. Avery, Danielle F. Braxton, Daniel Henderson, Meir Magal, FACSM. *North Carolina Wesleyan College, Rocky Mount, NC.*
Email: scrowley@ncwc.edu

(No relevant relationships reported)

PURPOSE: Research suggests that sitting time may be an independent predictor of negative health outcomes, even after accounting for physical activity (PA) participation. There is limited investigation of the association between sitting time and mental health outcomes, and the mechanisms by which sitting time may increase the risk for mental health disorders are not completely understood. Considering that cortisol [an index of hypothalamic pituitary adrenal axis regulation] has been shown to be a robust predictive biomarker for depression and anxiety disorder risk, this study aimed to investigate whether sitting time was associated with salivary cortisol levels in women, and whether this relationship remained significant after controlling for indices of physical fitness. **METHODS:** Twenty-one healthy women [18-45y, mean age: 23.9 +/- 6.3y; mean body mass index (BMI): 23.9 +/- 4.6] who were medication-free and had regular menstrual cycles completed (1) self-report of weekly PA and weekly sitting time; (2) assessment of cardiorespiratory fitness (CRF) via maximal oxygen consumption during exercise; (3) one-week recording of sleep and activity patterns by wrist actigraphy; and (4) measurement of salivary cortisol levels (collected during the follicular phase of the ovarian cycle in order to control for the influence of ovarian cycle hormone fluctuations on salivary cortisol). **RESULTS:** Regression analysis revealed that greater total sitting time/week significantly predicted higher cortisol levels in women (ß= 0.71, p< 0.001), and this relationship remained significant after controlling for age, BMI, and CRF level (ß= 0.67, p< 0.01). Additionally, greater total sitting time/week was significantly associated with lower actigraph-measured PA (activity counts/min; r = -.57 p < 0.01). **CONCLUSIONS:** Results suggest that, although greater total sitting time was associated with a reduced amount of daily PA, greater total sitting time may still predict higher salivary cortisol levels, independent of indices of fitness (BMI and CRF). It is possible that the stress-related mechanisms underlying the relationship between sitting time and depression and anxiety risk may be related to sitting time itself, and not a simply a product of reduced daily PA. Further investigation is needed to explore these associations.

1714 Board #308 May 28 9:30 AM - 11:00 AM

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

Karl M. Fleming, Susan B. Coote, Matthew P. Herring, FACSM. *Health Research Institute, Limerick, Ireland.*

(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 y) with physician diagnosed MS (Patient Determined Disease Steps score <3), no previous Pilates experience, and no other significant physical or psychiatric condition. **METHODS:** After providing informed consent, participants were randomised 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. RM-ANOVA examined between-group differences across time. Hedges' *d* quantified the magnitude of differences in outcome change for home-based Pilates compared to delayed-start wait-list. **RESULTS:** Group X time interactions were significant for depressive symptoms ($F_{(4,50)}$=3.21, $p\leq0.02$), physical symptoms of fatigue ($F_{(4,50)}$=3.45, $p\leq0.01$), cognitive symptoms of fatigue ($F_{(4,50)}$=3.08, $p\leq0.02$), psychosocial symptoms of fatigue ($F_{(4,50)}$=3.51, $p\leq0.009$), and total fatigue ($F_{(4,50)}$=3.82, $p\leq0.007$). Compared to wait-list, home-based Pilates significantly reduced (all $p\leq0.041$) depressive symptoms at weeks 6 (d=0.39), and 8 (d=0.69), physical symptoms of fatigue at weeks 2 (d=0.41),4 (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),4 (d=0.48), 6 (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.

1715 Board #309 May 28 9:30 AM - 11:00 AM

Mental Toughness, Self-compassion, And Mental Health In Esports: A Meditation Analysis

Robert T. Sanders[1], Grant B. Morgan[2], Silvio Valladão[1], T.L. Andre[1], Andreas Stamatis[3]. [1]*University of Mississippi, University, MS.* [2]*Baylor University, Waco, TX.* [3]*State University of New York Plattsburg, Plattsburg, NY.*

(No relevant relationships reported)

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 (>6hours 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, Forsse, 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.

1716 Board #310 May 28 9:30 AM - 11:00 AM

Associations Between Daily Steps And Prolonged Sitting And Suicidal Ideation In Depressed Adults

Maria Perez[1], Jacob D. Meyer[1], Gabriel Cruz-Maldonado[1], Laura Ellingson, FACSM[2]. [1]*Iowa State University, Ames, IA.* [2]*Western Oregon University, Monmouth, OR.* (Sponsor: Laura Ellingson, FACSM)

(No relevant relationships reported)

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.

Suicidal Ideation	Steps Per Day	Prolonged ST (minutes in>60-minute bouts)
None (n=16)	8,207±3,487	262±109
Low/Moderate (n=18)	6,993±2,209	362±145
High (n=13)	7,272±2,872	347±184

1717 Board #311 May 28 9:30 AM - 11:00 AM

Burnout Syndrome As A Predictor Of Low Individual Attractions To The Group-social In Mexican Athletes

Alberto Martin del Campo-Arellano, Victo Hugo Montejo-Lambaren, Sara Ramirez-Hernandez, Alejandro Gaytan-Gonzalez, Juan Ricardo Lopez-Taylor. *Universidad de Guadalajara, Guadalajara, Mexico.*

(No relevant relationships reported)

PURPOSE: To identify the relationship between Burnout Syndrome and the Individual Attractions to the Group-Task (ATG-S) factor in college athletes.
METHODS: 224 college athletes from 11 team sports (134 men and 90 women in an age range between 19 and 24 years old) of a high-performance program were evaluated with a psychometrical battery that included the Sport Burnout Inventory - Reviewed conformed by 3 subscales: Emotional Exhaustion (EE), Depersonalization (D), and Reduced Personal Realization (RPR); it brings four possible categories: "Low Risk", "Moderated Risk", "High Risk" and "With Burnout". Also, these athletes answered The Group Environment Questionnaire (GEQ), which evaluates the cohesion in sports teams in four group and individual factors; Individual Attractions to the Group-Social (ATG-S) was the only factor analyzed, the results were summarized in quartiles, the higher quartile the worst the score. Multinomial logistic regression was performed to associate the categories of burnout syndrome by component and the results of the ATG-S factor.
RESULTS: Statistically significant associations were observed between moderate risk of Burnout Syndrome in EE and D and scoring in the second quartile in ATG-S. On the other hand, moderate risk in EE and the three risk dimensions in RPR were significantly associated with the fourth quartile in ATG-S.
CONCLUSIONS: Individuals who got a moderate risk of suffering Burnout Syndrome in the EE and D factors had more chances of getting a worse score in the ATG-S factor. However, RPR was more consistently associated with worse ATG-S scores. These results allow us to relate some of the Burnout Syndrome signs with a low perceived social cohesion in college team sports.

Table 1. Association between Burnout Syndrome dimensions and ATG-S scores.

		ATG-S		
		Q2	Q3	Q4
EE	With BO	-†	-†	-†
	High risk	0.73 (0.15-3.67)	0.50 (0.10-2.48)	1.81 (0.45-7.24)
	Moderate risk	3.12* (1.29-7.55)	2.25 (0.97-5.24)	2.93* (1.18-7.28)
D	With BO	1.59 (0.19-13.36)	2.24 0.38-15.55)	1.10 (0.13-9.50)
	High risk	2.25 (0.56-9.03)	1.18 (0.28-4.98)	2.40 (0.61-9.51)
	Moderate risk	2.92* (1.09-7.77)	1.48 (0.55-3.96)	2.04 (0.73-5.67)
RPR	With BO	6.14 (0.63-60.39)	3.94 (0.38-40.44)	15.35* (1.72-137.42)
	High risk	2.29 (0.68-7.71)	2.64 (0.87-8.05)	3.69* (1.15-11.90)
	Moderate risk	2.19 (0.74-6.49)	2.23 (0.78-6.39)	3.06* (1.03-9.07)

Data expressed as OR (95% CI).
* p<0.05. † The sample was too small to perform the analysis. ATG-S: Attraction to the Group-Social. BO: Burnout. D: Depersonalization. EE: Emotional exhaustion. Q: Quartile number. RPR: Reduced personal realization.

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, Victo Hugo Montejo-Lambaren, Sara Ramirez-Hernandez, 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 worst 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	Q3	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 Ramirez-Hernandez, Victo 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 Infiniti 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, VLF % power, LF % power and 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= .01) and EMOTIONAL (p= .004) stage in HRV peak frequency; in VLF% between PHYSIOLOGICAL and 1st REST (p= .01) stage; among the BASELINE and the EMOTIONAL (p= .04) stage on SDRR; and with pNN50 on COGNITIVE and 3rd REST (p= .02) stage. (Table 1).
CONCLUSIONS: The results show 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.

Table 1. Heart Rate Variability indicators comparison between each stage.

	Baseline	Physio-logical	1st Rest	Cognitive	2nd Rest	Emotional	3rd Rest
SDRR[1]	78.4 (58.3 - 92.4) a	76.3 (67.5 - 110.5)	91.6 (70.5 - 117.4)	80.7 (62.4 - 114.6)	89.9 (72.8 - 114.6)	112.2 (62.9 - 155.5) a	90.1 (68.8 - 115.5)
pNN50[2]	20.4 (2.4)	20.9 (2.6)	19.2 (2.5)	15.2 (2.2) b	22.1 (2.2)	17.4 (2.5)	22.1 (2.5) b
HRVPF[2]	0.12 (0.01) c	0.13 (0.01) d	0.09 (0.01)	0.07 (0.01) c,d	0.13 (0.02)	0.10 (0.01)	0.11 (0.02)
VLFTP[1]	227 (86 - 444)	130 (64 - 310)	409 (198 - 608)	254 (171 - 373	319 (140 - 555)	399 (112 - 742)	417 (122 - 651)
LFTP[1]	480 (308 -1015)	604 (330 - 1160)	609 (267 - 1490)	850 (394 - 1673)	508 (400 - 1439)	924 (597 - 2735)	506 (321 - 1442)
HFTP[1]	628 (378 - 1094)	641 (273 - 935)	681 (278 - 1055)	473 (194 - 927)	723 (210 - 1564)	656 (321 - 2389)	746 (304 - 1324)
VLF%[1]	16.8 (10.1 - 23.9)	11.9 (4.1 - 17.7) e	22.4 (12.2 - 27.8) e	21.7 (11.3 - 29.4)	15.6 (10.3 - 25.2)	11.4 (6.1 - 18.9)	18.9 (10.6 - 26.9)
LF%[1]	36.7 (24.7 - 51.6)	41.8 (29.4 - 51.6)	31.9 (26.5 - 55.9)	48.6 (33.6 - 58.0)	36.9 (27.1 - 56.0)	47.9 (37.0 - 64.7)	33.5 (25.1 - 49.9)
HF%[2]	43.9 (17.0)	43.1 (20.4)	37.9 (16.5)	30.0 (12.8)	40.7 (20.8)	34.1 (16.2)	40.2 (18.5)

[1] Non-normal distribution is expresed with Median (P_{25} - P_{75}).
[2] Normal distribution is expresed with Mean (SD). Same letters denote significant differences between the indicator of HRV during each stage (p<0.05).

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, Victo Hugo Montejo-Lambaren, Sara Ramirez-Hernandez, 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 (RPR); 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 neither showed statistically significative association with the Burnout inventory scores. We recommend continuing making this kind of investigation, which may give us better information about the time-related etiology of Burnout Syndrome.

Table 1. Association between experience, emotional exhaustion, and depersonalization.

		Emotional exhaustion		Depersonalization		
		Moderate risk	High risk	Moderate risk	High risk	With BO
Experience practicing the sport	>10 years	0.80 (0.36 - 1.76)	0.63 (0.10 - 4.10)	2.91 (0.78 - 10.88)	4.98 (0.60 - 41.66)	3.11 (0.35 - 27.83)
	7 to 9 years	0.80 (0.33 - 1.91)	1.36 (0.23 - 8.17)	4.77* (1.24 - 18.37)	7.70 (0.89 - 66.29)	2.20 (0.19 - 25.52)
	4 to 6 years	0.81 (0.35 - 1.84)	1.32 (0.23 - 7.45)	5.50* (1.49 - 20.26)	6.08 (0.71 - 52.01)	2.61 (0.26 - 26.27)
	1 to 3 years	1.12 (0.49 - 2.53)	1.78 (0.33 - 9.73)	5.34* (1.43 - 19.93)	10.37* (1.27 - 84.83)	6.60 (0.77 - 56.58)

Data expressed as OR (95% CI).
* p<0.05. BO: Burnout.

1721 Board #315 May 28 9:30 AM - 11:00 AM

A Qualitative Investigation Of Comorbid Psychological And Physical Health Conditions With Low Energy Availability In Current And Former NCAA Female Distance Runners Of Reproductive Age

Traci L. Carson. *University of Michigan School of Public Health, Ann Arbor, MI.*
Email: tlcars@umich.edu

(No relevant relationships reported)

PURPOSE: It is widely accepted that low caloric energy intake, with or without disordered eating, is associated with health consequences in female athletes. Female distance runners are subject to the societal "thin ideal" in addition to sport-specific body ideals and performance pressures, that may result in low energy intake and over exercise to control body weight. There is a gap in the literature regarding the structural and environmental predictors of low energy intake and the pursuit of weight loss in collegiate distance runners, as well as specific health consequences experienced by this population.The purpose of this study is to address this gap in the literature through a qualitative investigation of collegiate distance runners with low energy intake, with or without disordered eating.
METHODS: Motivated by feminist theory, we conducted semi-structured, in-depth interviews. Interviews were transcribed and coded for major themes.
RESULTS: Participants (n=30) represented 19 Universities and had a mean age of 25. Four major themes emerged, including the pursuit of the "ideal of the runner body," coaches encouraging athletes lose weight, as well as both severe injury and performance burnout following a period of restrictive eating and overtraining.
CONCLUSION: These findings will serve to better understand prevention, early intervention, and tertiary care in the population of female distance runners.

1722 Board #316 May 28 9:30 AM - 11:00 AM

Cardiorespiratory Fitness And Incident Use Of Sedative-hypnotics: A Longitudinal Population-based Study

Linda Ernstsen[1], Ekaterina Zotcheva[1], Nicolás Martínez Velilla[2], Graziano Onder[3], Xuemei Sui, FACSM[4], John Chr. Fløvig[5]. *[1]Norwegian Univ of Science and Technology, Trondheim, Norway. [2]Navarrabiomed, Universidad Pública de Navarra, Pamplona Navarra, Spain. [3]Istituto Superiore di Sanità (ISS), National Institute of Health, Rome, Italy. [4]University of South Carolina, Columbia, SC. [5]St. Olavs Hospital, Trondheim University Hospital, Trondheim, Norway.*
Email: linda.ernstsen@ntnu.no

(No relevant relationships reported)

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 Study in 2006-08. Data on psychotropic drugs were retrieved from the Norwegian Prescription Database and incident sedative-hypnotics was measured as first registered prescription with code N05C in the Anatomical Therapeutic Chemical Classification System. Participants using any psychotropic drugs three months prior to participation and three months after participation were excluded. The participants were followed from three months after participation until incident use of sedative-hypnotics, emigration, death or study end 1st 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, symptoms of anxiety and depression, limiting-longstanding illness, and sleep problems. **Results:** During follow-up, 4,632 (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, 0.62-0.94) 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.
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1723 Board #317 May 28 9:30 AM - 11:00 AM

Severe Intensity Exercise Promote Greater Reduction In Anxiety Scores Than Moderate In Adults

Cyro G. Borges[1], Marcos Mônico-Neto[1], Sergio Tufik[2], Hanna Karen Moreira Antunes[1]. *[1]UNIFESP, Santos, Brazil. [2]UNIFESP, São Paulo, Brazil.*

(No relevant relationships reported)

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:** 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/m^2; 18.04±5.5%Fat mass; 27.33±4.5 Trait Anxiety Score), were submitted to two tests at intensities based on Vpeak percentage of a treadmill maximal graded test separated by 7 days: 1) 60% Vpeak for 30 minutes (moderate intensity); 2) 85% Vpeak until volitional exhaustion (severe intensity). For these conditions, the subjects answered de state subscale of the State-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 $p \leq 0.05$. The protocol was approved by Unifesp Ethics Committed (#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

1724 Board #318 May 28 9:30 AM - 11:00 AM

Examination Of Pathogenic Behaviors And Weight Perceptions Among Female Collegiate Athletes And Dancers

Nancy A. Uriegas[1], Toni M. Torres-McGehee[1], Allison B. Smith[1], Erin M. Moore[2]. *[1]University of South Carolina, Columbia, SC. [2]University of South Florida, Tampa, FL.*
Email: nuriegas@email.sc.edu

(No relevant relationships reported)

Engaging in pathogenic behaviors (PB; e.g., dieting, purging, etc.) to control weight (WT) is often seen in athletics. Female athletes, especially those in aesthetic sports, have a higher risk of disordered eating, eating disorders and body image dissatisfaction.
Purpose: To examine PB and WT perceptions [current: CWT, ideal: IWT, mental weight: MWT (perceived WT if they didn't control their WT)] in collegiate athletes/dancers.
Methods: A convenient sample of female athletes/dancers (n=125; age: 19.8 ± 2.0; height: 163.9 ± 28.8 cm; WT: 63.6 ± 9.2 kg) across 6 sports and dance (i.e., equestrian (EQ), volleyball, beach volleyball, softball, soccer, ballet) from an NCAA Division I institution participated in a larger cross-sectional study. Participants were measured for height, WT, and body composition and completed a demographic survey (included

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%: $X^2(5, N=125) = 16.5$, $P=0.006$]. EQ (8.9%) and ballet had the highest risk (13.4%). Significant differences were found between dieting and sport type [$X^2(5, N=125) = 12.2$, $P=0.033$] for an overall risk of 52.8% with highest risk for EQ (13.6%) and ballet (16%). Significant differences were found between excessive exercise and sport type [$X^2(5, N=125) = 32.7$, $P\leq0.01$] for an overall risk of 13.6% with highest risk for EQ (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 ($F_{1,115}=1625$, $P\leq0.01$, $\eta^2=.988$), with significant interactions for WT type ($F_{2,115}=40.3$, $P\leq0.01$, $\eta^2=.260$) and WT type and sport ($F_{10,115}=3.3$, $P=0.001$, $\eta^2=.124$).
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 smaller 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

Jonathon Whipps, John Bennison, 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 consequences, including a reduced 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 to 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=7.0; P<0.001) and males (md=6.5; P<0.05). The majority of both male (77.9%) and female (73.0%) 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 Juenemann, Ben Resnick, Jennifer Dysterheft Robb. *Hamline University, St. Paul, MN.* (Sponsor: Lisa Stegall, FACSM)
Email: jjuenemann01@hamline.edu
(No relevant relationships reported)

PURPOSE: Awareness and research on the mental health of student athletes has been rapidly increasing and recently become 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@d.umn.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 Endrocrinology 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], Eliott Arroyo[1], Tricia H. Hart[2], Brandon A. Miller[1], Adam R. Jajtner[1]. [1]*Kent State University, Kent, OH.* [2]*Lipscomb 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 on monocyte subsets to interval and continuous aerobic exercise. **Methods:** Six men (22.5±3.9 yrs; 180.8±5.0 cm; 80.5±6.6 kg; 11.8±4.3 %BF; 44.2±2.4 $ml \cdot kg^{-1} \cdot min^{-1}$) 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 (VO_2max) on a cycle ergometer. HIIT consisted of 15 90-sec bouts at 85% VO_2max and 90-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% VO_2max. 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.

Changes in surface expression, as measured by median fluorescent intensity (MFI) of TNFR 1 and 2 on monocyte subsets (classical: $CD14^{++}CD16^{-}$; intermediate: $CD14^{++}CD16^{+}$; and non-classical: $CD14^{+}CD16^{++}$) 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 (6637 ± 704 MFI), IP (6538 ± 522 MFI), 30M (6836 ± 661 MFI), and 2H (6600 ± 564 MFI) at 6H (5934 ± 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 (6418 ± 569 MFI) at 6H (5912 ± 814 MFI) and 24H (5936 ± 443 MFI). A time effect (F= 4.079, p=0.002) was observed for TNFR2 expression on intermediate monocytes, with a decrease (p< 0.05) from PRE (25528 ± 3188 MFI) at 30M (22327 ± 4067 MFI), 2H (21008 ± 5113 MFI), and 6H (20515 ± 5918 MFI). TNFR2 expression on intermediate monocytes recovered by 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 in 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 Navalta PhD., FACSM)

(No relevant relationships reported)

BACKGROUND: Exercise induced production of specific myokines, namely Interluekin-6 (IL-6), is essential in protecting the heart against cardiac ischemia-reperfusion (IR) injury 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, how the circadian rhythm affects the exercise-mediated IL-6 signaling pathways in the heart is not currently 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/rest phase) and ZT12 (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 allowed to recover for 2 days. Following a single 60-minute bout of treadmill exercise at 10 m/min, mice were sacrificed at 3 time points; pre-exercise (SED), immediately post-exercise (POST), and 1-hour post-exercise (1HR). Hearts were cleared of blood and rapidly snap frozen in LN2. IL-6 signaling was assessed via western blotting of phosphorylated Signal Transducer and Activator of Transcription 3 (pSTAT3). Statistical analyses was performed using SPSS 25 (SPSS Inc., Chicago, IL, USA). Differences in p-STAT3 at the various time points was analyzed using 2x3 factorial ANOVA and significance accepted at $p < 0.05$.
RESULTS: Values are presented as (Mean ± SD), fold change from sedentary mice at ZT0. No difference was observed in p-STAT3 (Tyr705) between sedentary mice at ZT0 and ZT12 (1.00 ± 0.35 vs 0.95 ± 0.60). A significant interaction effect revealed that p-STAT3 (Tyr705) levels were significantly increased following exercise performed at ZT0 (POST; 4.45 ± 1.30, and 1HR; 2.70 ± 1.35, $p < 0.05$), while exercise at ZT12 had no effect on IL-6 (POST; 1.42 ± 0.52), and 1HR; 1.32 ± 0.56, $p < 0.05$).
CONCLUSIONS: Exercise-induced myocardial IL-6-signaling was strongly activated at ZT0 compared to exercise at ZT12. Induction of IL-6 activation in cardiac tissue by exercise is time-of-day dependent.

Funding: Work was supported by NV INBRE Pilot Grant to Dr. McGinnis

1730 Board #324 May 28 9:30 AM - 11:00 AM

Pituitary-thyroid Hormone Responses Following Resistance Exercise Performed At Submaximal Movement Velocity

Anastassios Philippou[1], Ilias Smilios[2], Savvas Tokmakidis[2], Michael Koutsilieris[1], Roxane Tenta[3]. [1]*Medical School, National and Kapodistrian University of Athens, Goudi-Athens, Greece.* [2]*School of Physical Education and Sport Science, Democritus University of Thrace, Komotini, Greece.* [3]*School 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. **PURPOSE**: This study investigated the responses of thyrotropin (TSH), free thyroxine (fT4) and prolactin (PRL) in young volunteers after a bout of resistance exercise performed at 70% of the maximal velocity of movement. **METHODS:** Nine healthy males (age: 22.5 ± 3.3 years, height: 181 ± 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 before, immediately after and at 20 and 40 min post-exercise. Plasma levels of TSH, fT4 and PRL were measured by ELISA. One-way ANOVA was used for statistics and data are presented as mean±SE. **RESULTS:** TSH 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 3.26±0.65 ng/dl at baseline). Plasma fT4 levels exhibited also a no 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, 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, 17.3±1.24 ng/ml and 17.46±1.10 ng/ml, immediately after, at 20 and 40 min post-exercise, respectively, compared to 21.59±2.29 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.

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. Miller[1], Ryan T. Wiet[1], Emily C. Tagesen[1], Kylene Boka[2], Eliott Arroyo[1], Ellen L. Glickman, FACSM[1], Adam R. Jajtner[1]. [1]*Kent State University, KENT, OH.* [2]*Malone 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-α, 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 $mL \cdot kg^{-1} \cdot min^{-1}$) completed three exercise trials under different conditions: low temperature (5ºC), moderate temperature (22ºC), and high temperature (35ºC). Each protocol consisted of a 60-min cycling trial at 60% VO_2max, a 15-min rest, and a time-to-exhaustion trial at 90% VO_2max (TTE). Blood was sampled before (PRE) and after the 60-min time trial (60), immediately following the TTE (90), and one hr post-TTE (REC). Serum concentrations of TNF-α, 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 $\alpha \leq 0.05$. 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 at 60 with IL-1ra at 60 and 90, BDNF-S at 90 with IL-1ra at 90, and BDNF-S at REC with IL-1ra at 90 and REC ($r \geq 0.568$, $p \leq 0.043$). Correlation coefficients between BDNF-P and TNF-α indicated a moderate positive relationship between BDNF-P at 60 with TNF-α 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 at 90 and REC with IL-1ra at 60 ($r = 0.456$, $p = 0.087$; $r = 0.508$, $p = 0.064$; respectively). Similarly, correlation coefficients between changes in BDNF-S and IL-10 presented weak to moderate, non-significant relationships BDNF at 60 and 90 with IL-10 at 60 ($r = 0.544$, $p = 0.068$; $r = 0.498$, $p = 0.070$; respectively). No other relationships were observed. **CONCLUSION:** 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 Luk[1], Casey Appell[1], Mohamed Fokar[1], Jakob Vingren, FACSM[2]. [1]*Texas Tech University, Lubbock, TX.* [2]*University of North Texas, Denton, TX.* (Sponsor: Jakob L. Vingren, 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:**

Untrained men (n=8, 22 ± 3y) and women (n=8, 20 ± 1y) 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)-ß before exercise (BL), and 12 (12h) 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 (13.64 ± 4.22-fold) and 24h (29.34 ± 8.42-fold) compared to at 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 ± 2.17-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-ß 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 intramuscular pro-inflammatory and anti-inflammatory cytokines.

1733 Board #327 May 28 9:30 AM - 11:00 AM

Monitoring Of Exhaustion 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 (25.1 ± 3.5 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 h, 3 h 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 (Cytoflex, Beckman Coulter) in comparison to the reference method (XE-2100, Sysmex Austria).
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: Capillary 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 Kincaid, Travis Anderson, Allan H. Goldfarb, FACSM, 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 yrs, 9.7±3.2 %BF) completed two trials separated by a minimum of eight weeks. Resting HRV was assessed during a 5-min seated period at both trials; the root mean square of successive differences (rMSSD) was used to assess vagal input. Maximal oxygen uptake (VO_{2max}) was assessed via ramp protocol on the cycle ergometer (100W + 25W per minute) until volitional fatigue. A blood draw was collected immediately pre-, and immediately post-maximal oxygen uptake testing. Inflammatory markers were quantified in serum using a high sensitivity T-Cell multiplex (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 (p=.095). However, none of the 3 components were significantly different in response to maximal exercise (p=.824). **CONCLUSIONS:** Vagal input was assessed by seated resting HRV (rMSSD) which influenced baseline resting inflammatory status but did not influence the exercise-induced inflammatory response. This data suggests that when investigating inflammatory responses, resting vagal input should be considered.

1735 Board #329 May 28 9:30 AM - 11:00 AM

A Twist2 Expressing Progenitor Cell Type Population Exists In Human Skeletal Muscle

Nick Gaulton[1], Alasdair Cameron[1], Laura V. Young[1], Tim Snijders[2], Joshua Neverdeen[3], Adam W. Johnston[1]. [1]*University of Prince Edward Island, Charlottetown, PE, Canada.* [2]*University of Maastricht, Maastricht, Netherlands.* [3]*McMaster University, Hamilton, ON, Canada.*

(No relevant relationships reported)

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-IIb 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 ~25years), 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 ofTw2-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 Twist-2 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 Wiet[1], Emily C. Tagesen[1], Tori Hargett[1], Carly Sedlacek[1], Elliot Arroyo[1], Brandon A. Miller[1], Kylene Boka[2], Ellen Glickman, FACSM[1], Adam R. Jajtner[1]. [1]*Kent State University, Kent, OH.* [2]*Malone 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 yrs) completed a VO_2max test (48.6 ± 5.7 mL/kg^{-1}/min^{-1}) along with three separate trials in 5°C (LT), 22^{0}C (MT), and 35°C (HT). Each trial consisted of cycling for 60 minutes at 60% VO_2max, a time to exhaustion trial at 90% VO_2max (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 as percentages (ΔPRE to 60; ΔPRE to 90; ΔPRE to REC) and analyzed using a Pearson Correlation, with significance defined as α ≥ 0.05. **Results:** Changes in serum IL-6 (ΔPRE to 60) were significantly (r = .566, p = 0.018) correlated to changes in plasma BDNF (ΔPRE to 60). Changes in serum

IL-6 (ΔPRE to 90) were significantly ($r = 0.511$, $p = 0.043$) correlated to changes in serum BDNF (ΔPRE to 90). Changes in serum BDNF were not significantly correlated to changes in plasma BDNF. No 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

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. Stout[1], Jake A. Deckert[2], Jacob A. Siedlik[3], Stefan Graw[4], Matthew P. Bubak[1], John P. Vardiman[5], Devin C. Koestler[6], Philip M. Gallagher, FACSM[1]. [1]*University of Kansas, Lawrence, KS.* [2]*University of Gonzaga, Spokane, WA.* [3]*Creighton University, Omaha, NE.* [4]*University of Arkansas for Medical Sciences, Little Rock, AR.* [5]*Kansas State University, Manhattan, KS.* [6]*University 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 minutes total) 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 a Direct-zol RNA MicroPrep Kit. The NEBNext 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 programming language and EdgeR, followed by differential gene expression analyses per EdgeR protocol. Finally, pathways effected 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 effected 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 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 roles 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 Egger[1], Jürgen Scharhag, FACSM[2], Andreas Kästner[3], Jiri Dvorak[4], Philipp Bohm[5], Tim Meyer, FACSM[1]. [1]*Saarland University, Saarbrücken, Germany.* [2]*University of Vienna, Vienna, Austria.* [3]*University Heart Center Freiburg, Bad Krozingen, Germany.* [4]*Schulthess Clinic, Zurich, Switzerland.* [5]*University Heart Center of Zurich, Zurich, Switzerland.*
(Sponsor: Tim Meyer, FACSM)
Email: florian.egger@uni-saarland.de

(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 media monitoring (Meltwater®), a confidential web-based data platform and data synchronization 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.

1739 Board #333 May 28 9:30 AM - 11:00 AM

Arterial Blood Pressure And Vascular Stiffness In Young And Masters Road Cyclists Matched For Performance

Napasakorn Chuensiri[1], Patcharin Tangchaisuriya[1], Wirungrong Nualpech[1], Hirofumi Tanaka, FACSM[2], Daroonwan Suksom[3]. [1]*Faculty of Sports Science, Chulalongkorn University, Bangkok, Thailand.* [2]*The University of Texas at Austin, Austin, TX.* [3]*Exercise Physiology in Special Population Research Group, Chulalongkorn University, Bangkok, Thailand.* (Sponsor: Hirofumi Tanaka, FACSM)
Email: napas.ch@gmail.com

(No relevant relationships reported)

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 avoiod 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. A 20-km time trial time and cycling time to exhaustion during graded exercise tests were used to determine cycling performance. Arterial blood pressure, brachial-ankle pulse wave velocity (baPWV), and carotid artery intima-media thickness (IMT) were measured. **RESULTS:** Mean 20-km time trial, time to exhaustion, and maximum oxygen consumption were not significantly different between young and master road cyclists. Peak power output was higher in masters road cyclists than in young cyclists ($p<0.05$). Young road cyclists had higher ($p<0.05$) heart rate at rest, maximum heart rate, and submaximal heart rate during the 20-km time trial than masters cyclists. Systolic and diastolic blood pressure was greater ($p<0.05$) in masters cyclists (127±12 / 77±11 mmHg) than in young cyclists (119±7 / 63±7 mmHg). Both baPWV (1237±117 vs. 993±105 cm/s) and carotid IMT (0.49±0.07 vs. 0.43±0.02 mm) were significantly higher in masters road cyclists than in young cyclists ($p<0.05$). **CONCLUSION:** Masters road cyclists demonstrated greater arterial blood pressure and vascular stiffness compared with younger and developing cyclists who were matched for cycling performance.

1740 Board #334 May 28 9:30 AM - 11:00 AM

New Conditioning Evaluation Method Using Heart Autonomic Function In Competitive Archery Athletes

Kazuhiko Yamashita[1], Akira Okada[1], Kuniko Yamashita[1], Masao Ioroi[1], Nobuko Hongu, FACSM[2], Hitoshi Watanabe[1]. [1]*Osaka City University, Osaka, Japan.* [2]*University of Arizona, Tucson, AZ.* (Sponsor: Nobuko Hongu, FACSM)
Email: kazubmset@yahoo.co.jp

(No relevant relationships reported)

PURPOSE: Archery is mainly an outdoor sport that involves shooting arrows from a standing position at a target 70 meters away. It is a relatively static sport that requires less physical activity than most other sports, but extremely fine control over movements. In the present study we investigated a new method of evaluating the condition of athletes in target sports, such as archery, for improving performance from the perspective of autonomic function, i.e., heart rate and heart rate variability (HRV) and respiratory sinus arrhythmia (RSA). **METHODS:** The participants were members of the Japanese women's national archery team (athlete A: age, 30 years, height, 180.0 cm, weight, 69.0 kg; athlete B: age, 18 years, height, 157.5 cm, weight, 50.0 kg). HRV was measured 1) at rest in the supine position for 5-min, 2) at rest in the supine position for 3-min, after having five deep breaths, then, 3) in the standing position for 3-min and finished the measurement with five deep breaths. The ECG data were derived from the chest II leads using the Biopac MP36 data acquisition system (Santa Barbara, CA, USA) and input at a sampling frequency of 1 kHz, and heart rate and HRV were measured from the R-R interval. **RESULTS:** The HRV results for athletes A and B are shown in Table 1. In the present study, athletes A and B were both asked about their subjective feelings of fatigue and their archery performance (scores) at the time of the HRV measurements. Athlete A reported subjective feelings of fatigue at the time of the measurement. Athlete B had no subjective feelings of fatigue, but the inability to achieve high scores.
CONCLUSION: 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.

Athlete A	Supine 5min	Max HR	Min HR	Difference HR	Supine 3min	Standing 3min	Max HR	Min HR	Difference HR
HR (bpm)	98.8	104.2	90.6	13.6	100.3	106.0	111.1	100	11.1
HF; ms^2	20.4				5.1	1.7			
LF / HF	0.3				0.4	7.1			
Athlete B	**Supine 5min**	**Max HR**	**Min HR**	**Difference HR**	**Supine 3min**	**Standing 3min**	**Max HR**	**Min HR**	**Difference HR**
HR (bpm)	62.6	87.0	51.1	35.9	62.3	77.9	99.7	67.6	32.1
HF; ms^2	366.4				821.0	7.2			
LF / HF	0.1				0.5	9.8			

1741 Board #335 May 28 9:30 AM - 11:00 AM

Time And Dose Of Blood Pressure Medication Improves Hidden Hypertension Risk In A Firefighter

Meghan T. Lashley[1], Megan A. Carty[1], Rachel L. Dickinson[1], Emily H. Reeve[1], Julia Gilpin[1], Brian Varani[1], Paige E. DeAlba[1], Deborah L. Feairheller, FACSM[2]. [1]*Ursinus College, Collegeville, PA.* [2]*University of New Hampshire, Durham, NH.* (Sponsor: Deborah L. Feairheller, PhD, FACSM)
Email: dfeairheller@gmail.com

(No relevant relationships reported)

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 fatal cardiac incidents. Using ambulatory BP (ABP) monitoring to measure BP over time is a recommended way to assess risk. **PURPOSE:** To provide evidence that time and dosage of BP medication can improve hypertension risk in FF. **METHODS**: We included 43 FF in an ongoing clinical trial. FF wore an ABP cuff for a period, and the overall average BP, daytime BP and nighttime BP levels were examined. FF also came to the lab for a clinical fasted visit including BP, body fat, and vascular health measures. For this sub-analysis, we report data from 1 FF who was found to have nocturnal hypertension and morning BP surge. **RESULTS**: Overall the entire group of FF were hypertensive with clinic BP of 128.7 ± 1.7/ 81.8 ± 1.2 mmHg, had high central BP measured by SphygmoCor® XCEL (121.8 ± 2.7/ 84 ± 1.5 mmHg), and had high average SBP measured by ABP (130.9 ± 1.5 mmHg). We identified several FF with nocturnal hypertension and high morning BP surge levels, and here we report on data on one. He was 53 yr old, weighed 226 lbs, had 36.1% body fat, was an uncontrolled hypertensive (140.5/84.5 mmHg), and had high central BP levels (134/81 mmHg). During the initial ABP monitoring, his daytime BP was 160.2/86.9 and nighttime BP was 178.9/87.1 mmHg. His BP rose in the morning to 203/104 mmHg and remained that level for 2hrs. The FF self-reported feeling headaches and a 'rushing sensation' during fire calls, so he took his ABP data to a clinician. Initially, he was prescribed BP med in AM. The doctor increased dosage and switched to nighttime medication. During follow-up ABP monitoring, the FF's BP was much more controlled. His average daytime BP was 145.1/82.6, nighttime BP was 114.8/66.2, and morning BP was only 125/69 mmHg. **CONCLUSION**: With this case-study data from one FF in a larger clinical trial, we confirmed that timing and dosage of medication leads to improved BP levels. This further confirms that overall health awareness in FF is important. Fire chiefs and the firehouse medical director should encourage and increase BP monitoring. This one example proves to be a valuable anecdote when we enter firehouses and discuss our clinical trial.

1742 Board #336 May 28 9:30 AM - 11:00 AM

Differential Gut Scfa Microbial Taxa Correlated With Blood Pressure Status In African American Collegiate Athletes

Marc D. Cook[1], Jarrad Hampton-Marcell[2], Michael Brown, FACSM[3]. [1]*North Carolina A&T State University, Greensboro, NC.* [2]*University of Illinois at Chicago, Chicago, IL.* [3]*Auburn University, Auburn, AL.* (Sponsor: Michael Brown, FACSM)
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 epidemiologic 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 SCFA), but it is unknown whether there are differential gut microbial characteristics related to BP status in athletes. **Purpose:** To determine gut microbial characteristics related to gut SCFA 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_Aldercruetzia, R=0.59 p=0.001; g_Paraprevotella, R=-0.38 p=0.044; g_cc_115, 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 broadly increases 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.

1743 Board #337 May 28 9:30 AM - 11:00 AM

Masters Athlete Screening Study: Four-Year Cardiovascular Disease and Event Incidence

Barbara N. Morrison[1], Darren E. R. Warburton[2], Jack Taunton, FACSM[2], Mackenzie MacDonald[1], Carlee Cater[1], Saul Isserow[1], James McKinney[1]. [1]*SportsCardiologyBC, Vancouver, BC, Canada.* [2]*University of British Columbia, Vancouver, BC, Canada.*
Email: barb.morrison@fivemorefitness.com

(No relevant relationships reported)

Background: Masters athletes (≥35 yrs) are not immune to elevated cardiovascular risk and cardiac events. In the first year of Masters Athlete Screening Study, 798 masters athletes were screened; 91 (11.4%) of the cohort were found to have cardiovascular disease (CVD). Coronary artery disease (CAD) was the most common diagnosis (7.9%).
Purpose: To evaluate the incidence of CVD and adverse cardiovascular events over four years of the screening study.
Methods: Masters athletes (≥35yrs) from a variety of sports without previous history of CAD underwent yearly cardiovascular screening for four years. The screen consisted of anthropometrics, resting blood pressure, resting electrocardiogram, modified American Heart Association 14-element recommendations, cardiovascular event questionnaire, physical examination (year one), and Framingham Risk Score. Participants with an abnormal screen according to the European Association of Cardiovascular Prevention and Canadian Cardiology Society Guidelines underwent further evaluations.
Results: During 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; 62%M), and 1.5/100 (65.0±5.8yr; 80%M), for years two, three, and four, respectively. Twelve participants had a new CVD diagnoses or progression of a diagnoses. The

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 (atrial fibrillation n=2; moderate CAD n=2; mild CAD n=4; genotype positive hypertrophic cardiomyopathy n=1). Five out of 798 (0.6%) participants had a myocardial infarction. A single CV death occurred. Three of the individuals who had a cardiac event demonstrated a negative exercise treadmill test (ETT) (mean time 15±2.9 min) and three had a positive ETT (mean time 12±1.2 min); two of which initiated cholesterol-lowering medication after confirmation of CAD via CCTA, and one declined medication after a negative MIBI.
Conclusion: Yearly cardiovascular screening of masters athletes identified ~2 new diagnoses per 100 athletes per year (primarily CAD and atrial fibrillation). Despite yearly cardiovascular screening and high fitness, myocardial infarctions still occur.

1744 Board #338 May 28 9:30 AM - 11:00 AM

Cardiovascular And Respiratory Responses During Aquatic Rehabilitation At Different Depths Of Supine Immersion

Helen N. Soultanakis[1], Maria-Elissavet Nikolaidou[1], Evangelia Florou[2], Giovanni Baccarani[3], Emmanuel Vagiakis[2]. *[1]National and Kapodistrian University of Athens, Athens, Greece. [2]National and Kapodistrian University of Athens Medical School, Athens, Greece. [3]AQUA TERRA Institute SLU, Valencia, Spain.*
Email: esoultan@phed.uoa.gr
(No relevant relationships reported)

Aquatic Rehabilitation (AR), is used in the treatment of athletic injuries, initially in a supported supine aquatic position, before progressing to an independent vertical position. In water entry, cardiovascular and respiratory shifts are affected by, the hydrostatic pressure, the diving reflex responses, the water temperature, and vary at different positions and levels of immersion.
PURPOSE: The purpose of this study was to investigate how the depth of submersion during AR at 32°C in a supine position, affects cardiovascular and respiratory function. **METHODS:** Seven participants (35±10 years), were subjected to two 15-min trials of AR aquatic bodywork manipulations (MKS). Subjects were supported in a supine position by the provider's elbow under the head, and the trunk and lower legs, a) were either kept in alignment to the surface (SI) of the water with a lumbar curve support, or b) allowed to diagonally submerge to a deeper level (DI) during movements. An underwater video camera (FinepixGPS) was used for recording, and via 2-dimensional (2-D) kinematic analysis, the depth of submersion (LOGERPRO 3.8) and hydrostatic pressure, were evaluated. During the trials, respiratory rate (RR), heart rate (HR), and oxygen saturation (SO_2) were measured (ApneaLink 1_218). Before and after the trials, arterial blood was drawn for gas analyses (Abbott-I-Stat) in addition to blood pressure determination. Trials were conducted in a randomized cross-over design and analyzed for dependent measures ($p<0.05$). **RESULTS:** The depth of submersion of the trunk and legs with the SI was 0.022±0.036 m versus 0.575±0.06 m with the DI. Significant differences were observed for RR, 14.42±2.29 breaths/min vs 11.34±2.42 breaths/min (p=0.03), and systolic blood pressure, 124.85±6.52 mmHg vs 109±7.00 (p=0.008), for SI and DI respectively. No significant differences were observed for oxygen saturation or any other arterial gas variables measured. **CONCLUSIONS:** The increase of the depth of submersion during AR significantly impacted select cardiorespiratory parameters, i.e. breathing frequency and systolic blood pressure, consistent with an increase in parasympathetic and/or decrease in sympathetic activity. Depending on pre-existing conditions this may affect the quality of clinical care during rehabilitation of the athlete.

1745 Board #339 May 28 9:30 AM - 11:00 AM

Cardiac Remodeling In Child And Adolescent Athletes In Association With Sport Discipline And Sex.

Pia Brecht, Claudia Beckendorf, Frank Mayer. *University of Potsdam, Potsdam, Germany.*
(No relevant relationships reported)

Continuous high training loads are associated with structural cardiac adaptations and development of an athletic heart in adult athletes, especially in sport disciplines with high dynamic training components. In child and adolescent athletes these effects are increasingly reported. However, study populations are still very small. **PURPOSE**: To determine cardiac dimensions indicating cardiac remodeling in child and adolescent athletes.
METHODS: M Mode echocardiographs of 1021 athletes (m 575, f 446; 8-18 yrs; body surface area (BSA) 0.88-2.0 m²) from 19 sport disciplines were analyzed retrospectively. Sport disciplines were clustered into 9 groups according to Mitchell, categorizing sports by components of dynamic and static training loads. Groups were analyzed separately. Previous organized sporting experience (at least 3-13 yrs) was a requirement for inclusion. Left ventricular diameter (LVEDD), interventricular septal (IVS) and posterior wall (PW) thickness at end-diastole were analyzed and compared to cardiac z Scores (zS) for central European children. Deviations from normal mean (zS = 0) were defined as difference. Data was analyzed descriptively (median ± SD), Bland-Altman analysis was performed. **RESULTS**: For all analyzed parameters, athletic children and adolescents showed higher median zS though large deviations from the normal mean (zS>1.88) were only seen in single cases. Differences in sport discipline and sex were discovered. Throughout all disciplines, boys showed higher zS compared to girls (LVEDD 0.48±0.96 vs 0.22±0.92; IVS 0.47±0.99 vs 0.29±1.05; PW 0.53±0.76 vs 0.08±0.76), especially in disciplines with high dynamic training loads (Mitchel C I-III). Additionally, high zS were observed in the group of athletes with the highest static and low dynamic training load (Mitchell A III). **CONCLUSIONS**: Cardiac remodeling in response to athletic training starts at a young age, especially in boys exposed to high dynamic as well as static training loads. The development of zS for young athletes is essential to determine whether zS above the mean in this group are physiological adaptations or the beginning of pathologies. Differences between boys and girls and the high zS in boys with high static training loads indicate an association between fat free mass and cardiac dimensions stronger than BSA.

1746 Board #340 May 28 9:30 AM - 11:00 AM

Benign And Pathological Electrocardiographic Changes In Basketball Athletes Of BrasíLia - Brazil

Alexandra Correa Gervazoni Balbuena Lima[1], Giovanni Gonçalves De Toni[2], João Manoel Montenegro Pinheiro[3], Tiago Zavascki Turra[1], Antônio Aurélio Fagundes Jr[1]. *[1]Nucleo Cardiologico de Brasilia, Brasilia, Brazil. [2]Escola Superior de Ciências da Saúde do Distrito Federal (ESCS/FEPECS), Brasilia, Brazil. [3]Cerrado Basketball, Brasilia, Brazil.*
Email: alexandra.lima@gmail.com
(No relevant relationships reported)

PURPOSE: Basketball has evolved a lot and the level of competition has increased considerably. Athlete's Heart Syndrome comprises a set of clinical, electrocardiographic (ECG) and echocardiographic (ECHO) changes, such as sinus bradycardia, myocardial hypertrophy or enlargement of the cardiac cavities. Thus, it is important to distinguish potentially fatal pathological changes from normal physiological adaptations. The aim of this study was to describe the clinical, ECG and ECHO characteristics of Brazilian basketball players and evaluate the presence of benign and pathological changes.
METHODS: Fifteen male basketball athletes (23 ± 3.74 years) competing in the National Brazilian Basketball Gold League were evaluated during the last week of preparatory training for the competition. The athletes performed clinical evaluation (cardiovascular risk factors, medication use, sleep quality, and application of the Physical Activity Readiness Questionnaire - PAR-Q), anthropometric (body mass index - BMI, kg.m-2 muscle mass - MM, Kg; fat percentage - FP,%), resting ECG, and transthoracic doppler ECHO (left ventricular ejection fraction - LVEF,%; left ventricular diastolic diameter - LVDD, cm; left ventricular mass index - LVMI, g.m-2). ECG changes were classified as benign or malignant according to the Seattle Criteria. **RESULTS**: The athletes did not report cardiovascular risk factors, medication use and presented negative PAR-Q. Most athletes (90%) complained of poor sleep quality. The anthropometric variables were BMI 24.13 ± 2.05 Kg.m-2, MM 47.6 ± 5.01 Kg; FP 8.89 ± 4.79%. All individuals presented sinus rhythm (100%). The main benign ECG alteration was early repolarization alteration (10 - 66.7%). The malignant ECG change was LV hypertrophy with negative T-wave (3 - 100%). On ECHO we found LVEF 65.76 ± 2.35%, LVDD 53.15 ± 3.57 cm and LVMI 81.46 ± 11.72 g.m-2, within the normal range for age and body surface. **CONCLUSIONS**: The presence of ECG criteria for LV overload was not associated with the presence of hypertrophy or ventricular remodeling on echocardiography. Evidence supports the use of ECG in screening, coupled with a cost-effective interpretation algorithm to assist abnormal or borderline changes to identify possible cardiovascular causes and prevent sudden death in athletes.

1747 Board #341 May 28 9:30 AM - 11:00 AM

Distribution Of Cardiorespiratory Fitness Among Children In The Hearts And Parks Study

Josi R. Gabaldon, Alexandra R. Zizzi, Alyssa M. Zidek, Jonathan D. Kenyon, Julie Counts, Leanna M. Ross, Ashley C. Skinney, Jennifer S. Li, William E. Kraus, FACSM, Sarah C. Armstrong. *Duke, Durham, NC.*
(No relevant relationships reported)

One-third of children in the U.S. have an unhealthy body mass index (BMI). Vigorous activity improves BMI and reduces cardiovascular risk in children. Additionally, greater cardiorespiratory fitness (CRF) in youth may confer lower risks of poor cardiovascular and metabolic health in adulthood. The Hearts and Parks study utilizes a novel clinic-community intervention exploring how various types of physical activity, nutrition education and behavioral support affect the health of children (5-17 y) with a BMI ≥ the 95th percentile. PURPOSE: To explore 1-min post-exercise heart rate (HR) recovery following a physical fitness test and the distribution of CRF in children with obesity at baseline of enrollment in the Hearts and Parks study. METHODS:

Participants aged 6-12 [n=109, Non-Hispanic: 59.1%, 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 Stepping 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: 99.5, 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 VO_{2peak} 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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Cardiorespiratory Fitness	Younger Boys (6-9y)			Older Boys (10-12y)			Younger Girls (6-9y)			Older Girls (10-12y)		
	Ref Range	*n*	% of total	Ref Range	*n*	% of total	Ref Range	*n*	% of total	Ref Range	*n*	% of total
Excellent ($HR_{mean\ post\text{-}ex}$ < 5th%tile)	<95	11	10.1%	<93	9	8.3%	<100	8	7.3%	<102	6	5.5%
Very Good ($HR_{mean\ post\text{-}ex}$ ≤ 25th %tile)	95-106	8	7.3%	93-105	4	3.7%	100-113	12	11.0%	102-116	8	7.3%
Good ($HR_{mean\ post\text{-}ex}$ ≤ 50th%tile)	107-115	7	6.4%	106-116	5	4.6%	114-123	11	10.1%	117-128	3	2.8%
Sufficient ($HR_{mean\ post\text{-}ex}$ ≤ 75th%tile)	116-126	2	1.8%	117-128	3	2.8%	124-134	3	2.8%	129-141	1	0.9%
Poor ($HR_{mean\ post\text{-}ex}$ ≤ 95th%tile)	127-142	1	0.9%	129-147	1	0.9%	135-52	2	1.8%	142-157	4	3.7%
Very Poor ($HR_{mean\ post\text{-}ex}$ > 95th %tile)	>142	0	0.0%	>147	0	0.0%	>152	0	0.0%	>157	0	0.0%

C-49 Free Communication/Poster - Musculoskeletal/Neuromuscular Diseases

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1748 Board #342 May 28 9:30 AM - 11:00 AM

High Intensity Shoulder Exercise Improves Function, Pain And Tendinous Blood Flow In Subacromial Pain Syndrome.

Ole Kristian Berg[1], Fredrik Paulsberg[2], Clara Brabant[3], Keyvan Arabsolghar[3], Sigrid Ronglan[3], Nina Olinn Aasen Bjørnsen[3], Tom Tørhaug[3], Fredrik Granviken[3], Sigmund Østgård Gismervik[3], Jan Hoff[3]. [1]*Molde University College, Molde, Norway.* [2]*Rosenborg Clinique of Physiotherapy, Trondheim, Norway.* [3]*Norwegian University of Science and Technology, Trondheim, Norway.*

(No relevant relationships reported)

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. **PURPOUSE:** 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) of the m. supraspinatus and tendon was utilized to indicate tendon blood flow. Limitations in daily life was assessed by the shoulder pain and disability index (SPADI). **RESULTS:** Endurance in the TTE-test improved by an estimated 233 seconds more on average in HIIT than in CG (p=0.001, 95%CI: 102 to 363), the change was significant in HIIT (p<0.001), no change was seen in CG. The SPADI score was reduced 22 points more on average in HIIT (p=0.017, 95%CI: -40 to -5). The change from pre to post-test was significant in HIIT(p<0.001), but not in the CG. HIIT also experienced less pain during exercise after the intervention compared to CG (p<0.001). CEUS indicated an increase in tendinous blood flow in the HIIT group (p=0.019), no change was observed in CG. **CONCLUSIONS:** HIIT rotator cuff exercise appear to be a feasible intervention in SAPS, reducing pain and increasing endurance performance more than exercise with low load. CEUS indicate that HIIT may increase tendon microcirculation, thus abating a potential hypoperfused/ hypoxic state underlying the condition.

1749 Board #343 May 28 9:30 AM - 11:00 AM

Effect Of Whole-body Vibration Training On Muscle Strength In Individuals With Knee Osteoarthritis

Zhangqi Lai, Lin Wang. *Shanghai University of Sport, Shanghai, China.*
Email: laizhangqi@126.com

(No relevant relationships reported)

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. The participants in the control group were asked to maintain their previous lifestyle and to avoid participating in any other regular rehabilitation programs. The isokinetic muscle strength measurements were performed at baseline and post-intervention at angular velocity of 90°/s and 180°/s. Two-way repeated measures ANOVA was used to determine the difference in outcomes between the two groups.
RESULTS: 40 participants completed the intervention and measurements (Control; n=20, age=62.80±4.43 years; WBV; n=20, age=64.10±4.95 years). At an angular velocity of 90°/s, only significance was found at interaction in the peak power of flexors (p = 0.025). However, the peak torque (PT) of the flexors at 180°/s increased significantly in WBV group compared with control group (p = 0.023, partial eta-square = 0.132). Additionally, the significances were found at the interaction in the peak torque and peak power of extensors as well as the peak power of flexors at 180°/s.
CONCLUSIONS: This study found that WBV training offered positive effects on muscle strength gain in patients with KOA.

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Abstract Withdrawn

1751 Board #345 May 28 9:30 AM - 11:00 AM

Sarcopenic Obesity Among Adults With Facioscapulohumeral Muscular Dystrophy

Kathryn Vera[1], Mary McConville[2], Michael Kyba[1], Manda Keller-Ross[1]. [1]*University of Minnesota, Minneapolis, MN.* [2]*College of St. Benedict, St. Joseph, MN.*
Email: giero002@umn.edu

(No relevant relationships reported)

BACKGROUND: Sarcopenic obesity has been observed in people with neuromuscular impairment and is linked to adverse health outcomes; it is unclear, however, if adults with facioscapulohumeral muscular dystrophy (FSHD) develop this condition.
PURPOSE: Determine if adults with FSHD meet criteria for sarcopenic obesity (appendicular lean mass index (ALMI) scores of <7.26 kg/m^2 or 5.45 kg/m^2; % body fat of ≥27% or 38% in men/women).
METHODS: Ten FSHD patients (50±11.4 years, 2 females) and ten age/sex-matched controls (47±13.6 years, 2 females) completed one visit, which included a full-body DXA scan. Regional and whole body total mass (g), fat mass (FM, (g, %)), and lean mass (LM, (g, %)) were collected; body mass index (BMI, kg/m^2) and sarcopenia measures (appendicular lean mass (sum of arm/leg lean mass, ALM (kg)) and ALM index (ALMI, kg/m^2)) were computed.
RESULTS: Whole body total mass was similar between cohorts (FSHD: 84.5±12.9 vs. control: 81.8±13.5 kg; p=0.65). A decrease in ALM volume was found in the FSHD group (FSHD: 20.5±4.4 vs. control: 26.5±5.9 kg; p=0.02); similarly, ALMI scores were different between FSHD and controls (FSHD: 6.3±1.2 vs. control: 8.6±1.4 kg/m^2; p=0.001). An increase in the proportion of whole body FM to whole body total mass (% body fat) in the FSHD group was observed (FSHD: 40.8±7.0 vs. control: 27.9±7.5%; p=0.001). While mean alterations in ALMI (6.3 ±1.3 kg/m^2) and % body fat (40.0 ± 6.4%) among men with FSHD met diagnostic criteria for sarcopenic obesity, this finding was not mirrored among female FSHD counterparts (ALMI: 6.2 ±1.0 kg/m^2, % body fat: 44.1 ±11.4%). Whole body LM was 15% lower in FSHD (p=0.05), furthermore, the FSHD group had a reduced proportion of whole body LM to whole body total mass vs. controls (p=0.001), along with lower total arm (p<0.01) and total leg lean mass (p=0.03). Study participants with FSHD did exhibit an increase in total body FM (p<0.01), along with greater total leg fat mass (p<0.001) but not total arm fat mass (p=0.09).
CONCLUSIONS: A loss in ALM and increase in FM may lead to sarcopenic obesity in men with FSHD, resulting in a reduced quality of life and longevity.

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 Dinh[1], Brisamar Estebanez[2], Alexandra A. Rodriguez[1], Nishant P. Visavadiya[1], Maria J. Cuevas[2], Michael Whitehurst, FACSM[1], Javier Gonzalez-Gallego[2], Chun-Jung Huang, FACSM[1]. [1]*Florida Atlantic University, Boca Raton, FL.* [2]*University 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 immunes cells and utilizes its counter-regulatory function in promoting the anti-inflammatory response via the inhibition of toll-like receptor 4 (TLR4). Although increased level of PTX3 has been shown following stimulation of oxidative stress and is also associated with aging-related diseases, the relationship between PTX3 and oxidative stress in aging remains to be elucidated. However, exercise has been proposed as the key intervention for the maintenance of health in the elderly. Therefore, this study was to examine whether or not the level of PTX3 on TLR4-dependent inflammation would be associated with changes in oxidative stress in both plasma and peripheral blood mononuclear cells (PBMCs) following 8 weeks of aerobic training in the elderly.
METHODS: Fourteen elderly subjects (9 trained and 5 controls) were recruited to participate in an 8-week aerobic training. The ELISA and western blot analyses were used to determine the levels of PTX3 and biomarkers of oxidative stress in both plasma and PBMCs prior to and following training.
RESULTS: No changes in plasma levels of PTX3 and oxidative stress markers (GSH, TEAC, and ROS/RNS) were observed in trained vs. control groups. However, our analyses showed a downregulation of PTX3 expression in PBMCs ($P = 0.017$) following aerobic training, along with decreased ratio of PTX3/TLR4 ($P = 0.047$). Furthermore, the tendency of oxidative stress response in PBMCs remained unchanged as shown in plasma levels. Finally, no correlation was observed between PTX3 and any oxidative stress biomarkers following training protocol.
CONCLUSIONS: These findings demonstrate the downregulation of PTX3 and PTX3/TLR4 ratio in PBMCs of elderly subjects, irrespective of changes in oxidative stress following 8 weeks of aerobic training.

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 Hjalmarsson[1], Rodrigo Fernandez-Gonzalo[1], Jessica Pingel[2], Laura Barrero Santiago[1], Alexandra Palmcrantz[3], Eva Pontén[1], Ferdinand von Walden[1]. [1]*Karolinska Institutet, Stockholm, Sweden.* [2]*University of Copenhagen, Copenhagen, Denmark.* [3]*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 dorsi-flexion, 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 ($r > \pm 0.500$, $p<0.01$) 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.
CONCLUSIONS: Spasticityin extensor-muscles of hip and knee and poor selective motor control in ankle effects 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.

Pearson correlation between physical parameters and distance on the 6-min RR test

Physical parameter	Side	Pearson r	p-value
GMFCS	N/A	0.6	<0.01
Spasticity (Hip-extensor)	Most affected	-0.7	<0.01
Spasticity (Hip-extensor)	Least affected	-0.6	<0.01
Spasticity (Knee-extensor)	Most affected	-0.5	<0.01
Spasticity (Knee-extensor)	Least affected	-0.6	<0.01
SMC (Ankle dorsiflexion)	Most affected	0.6	<0.01
SMC (Ankle dorsiflexion)	Least affected	0.6	<0.01
Muscle thickness (VL+VI)	Most affected	0.6	<0.01
Muscle thickness (VL+VI)	Least affected	0.5	<0.01
Muscle thickness (Med. Gastrocnemius)	Most affected	0.4	<0.01
Muscle thickness (Med. Gastrocnemius)	Least affected	0.5	<0.01

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±8.9 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 I 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 Stimlulated Rowing In An Individual With Leukodystrophy: A Case Study

Cody Dulaney. *Kent state university, Kent, OH.* Email: cdulane1@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 epidermal 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

(PRE) and after (POST) intervention. The participant completed one of two training protocols during each training session. The PRE protocol consisted of FES for 10, two-minute bouts. The POST session was four, 10-minute bouts. **RESULTS**: VO2 was significantly increased (t = 2.81, p = 0.048) from PRE (795.82 mL min) to POST (973.14 mL min). Heart Rate (HR) was significantly different form PRE to POST (t = 6.44, p = 0.003). Heart rate increased from 64 (PRE) to 82 beats per minute (POST). There was no significant difference in the respiratory exchange ratio (RER) from PRE to POST (t = 1.05, p = 0.354). **CONCLUSIONS**: These data indicate that FES can be utilized as a mode of physical activity for individuals with LD and shows potential use for other diseases that cause paralysis of the lower limbs. Furthermore, FES has shown to increase the functional capacity of the participant demonstrated by the increase in VO_2 and HR during the FES sessions. Therefore, leading to greater calories expended per session and potentially driving further beneficial cardiovascular adaptation.

1756 Board #350 May 28 9:30 AM - 11:00 AM

Body Composition In Persons With Multiple Sclerosis Vs. Healthy Controls

Brian A. Pribble[1], John W. Farrell, III[2], Gregory S. Cantrell[3], David J. Lantis[4], Debra A. Bemben, FACSM[1], Christopher D. Black, FACSM[1], Daniel J. Larson[1], Rebecca D. Larson[1]. *[1]University of Oklahoma, Norman, OK. [2]University of Ottawa, Ottawa, ON, Canada. [3]Northern State University, Aberdeen, SD. [4]St. Ambrose University, Davenport, IA.* (Sponsor: Christopher D. Black, FACSM)
Email: brian.a.pribble-1@ou.edu

(No relevant relationships reported)

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 ($\bar{x}$=3.1 ± 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 ($\%LM_{WB}$) (60.9 ± 6.3% vs. 74.0 ± 11.0%, p=0.02), $\%LM_{ARMS}$ (66.7 ± 8.5 vs. 79.0 ± 8.6%, p=0.03), $\%LM_{LEGS}$ (61.8 ± 6.2 vs. 75.2 ± 9.9%, p=0.02), % appendicular lean mass (aLM) (28.1 ± 5.1 vs. 35.3 ± 5.8%, p=0.03), and aLM/BMI (90.0 ± 21.10 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.

1757 Board #351 May 28 9:30 AM - 11:00 AM

Overground Locomotor Training In Parkinson's Disease: Effects On Walking Economy And Performance Fatigability

Andrew E. Pechstein, Kerry B. Rosen, Randy Jamil Pugh, Lobna S. Elsarafy, Emily M. Leonard, Clint J. Wutzke, Randall E. Keyser, FACSM, Andrew A. Guccione. *George Mason University, Fairfax, VA.* (Sponsor: Randall E Keyser, FACSM)
Email: apechste@masonlive.gmu.edu

(No relevant relationships reported)

Walking economy (WE) is a measure of metabolic energy expenditure relative to walking speed, and, when elevated, may contribute to decreased capacity and performance relative to sustained walking in people with Parkinson's Disease (PD). Coupled with performance fatigability (PF), these factors may increase disability in this population. Although sustained walking underlies many daily activities and impacts physical activity for many people with PD, responses to walking-specific interventions to develop optimal training methods have not been fully investigated in this population.

PURPOSE: Determine changes in WE, PF, and physiologic response during sustained walking following a task-specific, performance-based overground locomotor training program (OLT) in people with mild/moderate PD.
METHODS: 7 males and 2 females (68.9 ± 7.1 years old, H&Y scores 1-3) completed a 12-week program of 24 OLT sessions lasting 45 - 60 minutes each. Subjects were coached through multiplanar movement drills based on components of the gait cycle emphasizing power, stability and stepping under aerobically challenging conditions (ClinicalTrials.gov. - NCT03864393). Walking performance was measured during an overground 10-minute walk test (10MWT) by total distance (TD) and PF (Δ speed/total distance). During the final 5 minutes of the 10MWT, average heart rate (HR), oxygen consumption ($\dot{V}O_2$), and carbon dioxide production ($\dot{V}CO_2$) were recorded using a portable metabolic system. These values were divided by the average speed in the final 5 minutes of the 10MWT to assess WE and physiologic response.
RESULTS: There were moderate to large, significant effects for TD (925.77 ± 175.67 vs 1018.37 ± 133.83, p=0.019, d=0.59), PFS (1.11 ± 0.19 vs 0.98 ± 0.13, p=0.013, d=0.79) and HR/speed (76.46 ± 7.69 vs 71.49 ± 6.71 bpm/m/s, p=0.05, d=0.69). There were small, non-significant effects for $\dot{V}O_2$/speed (12.14 ± 1.99 vs 11.47 ± 2.89 mL/min/kg/m/s, d=0.34) and $\dot{V}CO_2$/speed (790.56 ± 196.8 vs 778.93 ± 197.94 mL/min/m/s, d=0.06).
CONCLUSIONS: OLT improved WE and PFS during sustained walking. Despite a moderate effect, HR changes in response to OLT are difficult to interpret without additional measures of cardiorespiratory function. Larger and more mechanistic studies can provide further insight into this potential adaptation.

C-50 Exercise is Medicine®/Poster - EIM: Health Promotion, Benefits of Exercise, and Exercise Prescription

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

1758 Board #352 May 28 9:30 AM - 11:00 AM

A Home Based Telerehabilitation Exercise Program For Heart Failure Patients - Changes In Quality Of Life

Kari M. Lundgren, Knut A R Langlo, Elisa Cittanti, Øyvind Ellingsen, Håvard Dalen, Inger-Lise Aa Aksetøy. *Norwegian University of Science and Technology, Trondheim, Norway.*

(No relevant relationships reported)

Heart failure (HF) patients are strongly recommended to participate in cardiac rehabilitation programs. Due to frailty and rural living, many HF patients refuse to do so. A home based telerehabilitation program was designed to enable heart failure patients to exercise via video-conferencing in their homes. Video-conferencing allowed for two-way communication and for patients to exercise together. **PURPOSE**: This project aims to study the changes in quality of life in HF patients undertaking a telerehabilitation intervention, compared to controls.
METHODS: 67 patients were randomized into an exercise or control group if they had stable HF, were medically optimized, and refused to participate in standard outpatient rehabilitation. The exercise group received telerehabilitation for 3 months. Both groups participated in a 2-day "Living with HF" course. The EQ-5D (5L), and the Minnesota living with heart failure Questionnaire (MLHFQ) were administered to all participants before and after the intervention period. Patients were included in this analysis if they completed the EQ-5D and MLHFQ at baseline (BL) and at 3-month follow-up.
RESULTS: Mean age was 68 (65.6-71.1) years (82 % male). There was a significant decrease in EQ-5D score for the exercise group from BL to 3md follow-up (-1.23), p=0.015. The decrease was not significant for the control group (-0.59), p=0.077. Still, there was no significant difference between groups regarding changes in EQ-5D score for the exercise (-1.23, SD 2.41) and control groups (-0.59, SD 1.67), p=0.27, or between groups regarding change in the EQ-5D VAS-score for exercise (5.18, SD 13.64) and control groups (5.48, SD 16.35), p=0.95. We found a significant decrease in MLHFQ score for the exercise group from BL to 3md follow-up (-13.8), p=0.003, and for the control group (-12.56), p=0.002. Still, there was no significant difference between groups regarding change in MLHFQ score for the exercise group (-13.8, SD 21.23) and the controls (-12.56, SD 19.08), p=0.83.
CONCLUSIONS: Both groups seem to increase the quality of life by participating in this study. This might be due to the attention by attending a study, coming to regular follow-ups, or information and motivation gained during the 2-day "living with HF" course.

1759 Board #353 May 28 9:30 AM - 11:00 AM

Effects Of Health Wearables On BMI And Weight In Clinical Populations: A Network Meta-analysis

Daniel J. McDonough, Xiwen Su, Zan Gao, FACSM. *University of Minnesota - Twin Cities, Minneapolis, MN.* (Sponsor: Zan Gao, FACSM)
Email: mcdo0785@umn.edu

(No relevant relationships reported)

PURPOSE: Clinical trials with various health wearable interventions are available to address overweight/obesity and chronic disease prevalence. Yet, no known research has used network meta-analysis to quantitatively synthesize the findings. Therefore, this network meta-analysis aimed at comparing the effects of health wearable interventions on body mass index (BMI) and weight loss in various clinical populations.
METHODS: A total of 347 published studies on health wearable intervention programs were retrieved and 28 studies met the following inclusion criteria: (1) data-based articles published in English between 2007 and 2019; (2) randomized controlled trial design; (3) subjects with or at high-risk of chronic diseases; and (4) investigated some type of intervention on BMI or weight loss (kg) using health wearables. Data extraction for comparisons was completed for six intervention categories: (1) control (T1; no intervention); (2) comparison group (T2); (3) Smart-wear (e.g., Fitbit, Polar M400) intervention (T3); (4) accelerometer/pedometer intervention (T4); (5) Smart-wear multi-component intervention (T5); and (6) accelerometer/pedometer multi-component intervention (T6). Package "pcnetmeta" in R software was used to carry out the network meta-analysis. Statistical significance was determined by 95% confidence intervals (CIs) which did not include 0.
RESULTS: Based on mean difference comparisons, T6 and T4 were the most effective intervention strategies in reducing chronically ill patients' BMI compared with the other four treatments (Effect Size [ES] = -3.43, 95% CI: (-5.02, -2.05); ES = -2.03, 95%CI: (-3.30, -0.70), respectively). For weight reduction in chronically ill patients, T4, T5, and T3 interventions were the most effective intervention strategies compared with the three other treatments (ES = -4.38, 95%CI: (-7.53, -1.19); ES = -3.24, 95% CI: (-4.73, -1.68); ES = -2.53, 95%CI: (-3.86, -1.23), respectively).
CONCLUSIONS: Physical activity interventions using health wearables, especially multi-component interventions, are highly effective for reducing BMI and weight in patients with or at high-risk of chronic disease which may attenuate their conditions.

1760 Board #354 May 28 9:30 AM - 11:00 AM

A Nonexercise Prediction Equation For Cardiorespiratory Fitness Without The Use Of Physical Activity

Robert A. Sloan[1], Marco Visentini-Scarzanella[2], Susumu S. Sawada, FACSM[3], Xuemei Sui, FACSM[4], Jonathan N. Myers, FACSM[5], Steven N. Blair, FACSM[6]. [1]*Kagoshima University Graduate Medical School, Kagoshima, Japan.* [2]*Kagoshima University, Kagoshima, Japan.* [3]*Waseda University, Tokyo, Japan.* [4]*University of South Carolina, Columbus, SC.* [5]*Stanford Medicine, Pal Alto, CA.* [6]*University of South Carolina, Columbia, SC.* (Sponsor: Steven N Blair, FACSM)

(No relevant relationships reported)

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. Correct category classification was found in 84% of men and 80% of women. **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

1761 Board #355 May 28 9:30 AM - 11:00 AM

Cardiovascular Responses To Exercise Vary Between Cancer And Type 2 Diabetes

Alex F. Roque[1], Courtney D. Jensen[1], Paul D. Vosti[2], J. Mark VanNess[1], Cynthia Villalobos[1]. [1]*University of the Pacific, Stockton, CA.* [2]*St. Joseph's Medical Center, Stockton, CA.*
Email: alexroquecuts@gmail.com

(No relevant relationships reported)

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 DBP ($\beta=-5.046$, $p=0.003$) and MAP ($\beta=-5.334$, $p=0.003$) 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.

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Knowledge, Attitudes And Perceptions Of Type 2 Diabetes Mellitus And The Role Of Exercise Interventions

Takshita Sookan, Talia Pillay, Aadilah Vaizie, Shreyen Moodley, Keshena Naidoo. *University of KwaZulu Natal, Durban, South Africa.* (Sponsor: Robert Hickner, FACSM)
Email: taks2@hotmail.com

(No relevant relationships reported)

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 identified 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. Significance was set at $p\leq 0.05$. **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.

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Differences Between Included And Excluded Participants In An Exercise Study Following Resuscitation From Cardiac Arrest

Katharyn Louise Flickinger[1], Melissa J. Repine[1], Kara Kenton[1], Jon C. Rittenberger[2]. [1]*University of Pittsburgh, Pittsburgh, PA.* [2]*Guthrie Medical Group, Sayre, NY.*
Email: holquistkl@upmc.edu

(No relevant relationships reported)

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.

	Eligible Sample N = 234	Enrolled N = 12	Not Enrolled	p-value
Male (%)	90 (38%)	6 (50%)	138 (62%)	0.399
Age (SD)	58 (15%)	53 (19)	59 (15)	0.103
OOHCA (%)	187 (80%)	9 (75%)	178 (80%)	0.663
Primary Rhythm (%)				
No loss of pulse	7 (3%)	-	7 (3%)	
VT/VF	111 (47%)	5 (42%)	106 (48%)	
PEA	62 (27%)	4 (33%)	58 (26%)	
Asystole	24 (10%)	2 (17%)	22 (10%)	
Unknown	30 (13%)	1 (8%)	29 (13%)	0.845
PCAC Score (%)				
Unknown	44 (19%)	2 (17%)	42 (19%)	
I	106 (45%)	5 (42%)	101 (45%)	
II	57 (24%)	3 (25%)	54 (24%)	
III	16 (7%)	1 (8%)	15 (7%)	
IV	11 (5%)	1 (8%)	10 (4%)	0.977
TTM (%)				
36 °C	83 (35%)	6 (50%)	77 (35%)	0.230
33 °C	30 (13%)	1 (8%)	29 (13%)	
Hospital LOS (IQR)	17 (7 - 21)	15 (9.5 - 17.5)	17 (7 - 21)	0.703
ICU LOS (IQR)	9 (2 - 11)	6 (3.5 - 8)	9 (2 - 12)	0.982
Disposition (%)				
Home	114 (49%)	7 (58%)	107 (48%)	
Acute Care Rehab	55 (23%)	3 (25%)	52 (24%)	
Skilled Nursing Facility			36 (16%)	
Long Term Acute Care	27 (16%)	1 (8%)	12 (6%)	
Hospice				
Other	14 (6%)	1 (8%)	1 (1%)	
	1 (1%)	-	12 (5%)	
	12 (5%)	-		0.912
mRS (%)				
0	10 (4%)	1 (8%)	9 (4%)	
1	16 (7%)	-	16 (7%)	
2	48 (21%)	4 (33%)	44 (20%)	
3	30 (13%)	1 (8%)	29 (13%)	
4	86 (37%)	4 (33%)	82 (37%)	
5	43 (18%)	2 (17%)	41 (19%)	0.759
CPC (%)				
1	26 (11%)	1 (8%)	25 (11%)	
2	50 (21%)	4 (33%)	46 (21%)	
3	154 (66%)	7 (58%)	147 (67%)	
4	3 (1%)	-	1 (1%)	0.753

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Health Benefits Of Fitness, Even For Individuals Within The Lowest Categories Of The Fitness Spectrum

Alyt Oppewal[1], Thessa Hilgenkamp[2]. [1]*Erasmus MC, University Medical Center Rotterdam, Rotterdam, Netherlands.* [2]*University of Nevada, Las Vegas, NV.*
Email: a.oppewal@erasmusmc.nl

(No relevant relationships reported)

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 those 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], comfortable gait speed HR = 0.65 [0.54-0.78], grip strength HR = 0.97 [0.94-0.99]). **CONCLUSION:** Our data support 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.

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Does A Free Ticket For Local Transport Increase Physical Activity?

Eszter Füzéki, Lukas Göbel, Winfried Banzer, FACSM. *Goethe University Frankfurt, Frankfurt am Main, Germany.* (Sponsor: Winfried Banzer, FACSM)
Email: fuezeki@sport.uni-frankfurt.de

(No relevant relationships reported)

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 $p \leq 0.05$.
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 and 12±7 vs 3±3 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.

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Park-Based Physical Activity: Testing Feasibility, Acceptability, And Preliminary Effectiveness In Adults With Serious Mental Illness

Kasi Bardouche[1], Gina Besenyi[1], Victor Andrews[1], Katie Heinrich[1], Joseph McEvoy[2], Catherine Davis[2]. [1]*Kansas State University, Manhattan, KS.* [2]*Augusta University, Augusta, GA.* (Sponsor: Craig A. Harms, FACSM)
Email: kbardouche26@gmail.com
(No relevant relationships reported)

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-base 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 years and BMI of 34 ± 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 no statistically significant changes were observed pre-test to post-test for BMI (30.7 ± 4.9 vs 30.1 ± 3.9 kg/m^2), weight (76.8 ± 0.9 vs 75.6 ± 3.0 kg), 6MWT (383.3 ± 62.9 vs 408.3 ± 72.2 meters), and MET-min/week 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.

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Patterns Of High And Low Response To Regular Exercise Across Multiple Clinically Relevant Traits

Mark A. Sarzynski, FACSM[1], Jonathan J. Ruiz-Ramie[1], Jacob L. Barber[1], Jeremy M. Robbins[2], Robert E. Gerszten[2], Arthur S. Leon, FACSM[3], James S. Skinner, FACSM[4], Claude Bouchard, FACSM[5]. [1]*University of South Carolina, Columbia, SC.* [2]*Beth Israel Deaconess Medical Center, Boston, MA.* [3]*University of Minnestoa, Minneapolis, MN.* [4]*Indiana University, Bloomington, IN.* [5]*Pennington Biomedical Research Center, Baton Rouge, LA.*
Email: sarz@mailbox.sc.edu
(No relevant relationships reported)

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 representing the favorable end of the response trait distribution (e.g., top end for VO_{2max} response, bottom end for fasting insulin response), while low responders were defined as the 20th percentile from the least favorable end. Those between the 20th and 80th percentile were labeled 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: Inter-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. 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

# of low-response traits	# of high-response traits: 0	1	2	3	4	5	6	7	Low-resp. total
0	1.9 (11)	6.7 (38)	9.5 (54)	5.3 (30)	1.9 (11)	0.4 (2)	0	0.2 (1)	25.9 (147)
1	6.9 (39)	13.4 (76)	8.8 (50)	4.8 (27)	1.1 (6)	0	0	0	35.0 (198)
2	7.8 (44)	7.0 (40)	4.6 (26)	2.3 (13)	0.7 (4)	0	0	0	22.4 (127)
3	4.8 (27)	5.0 (28)	0.9 (5)	0.4 (2)	0	0	0	0	11.1 (62)
4	2.3 (13)	1.1 (6)	0.5 (3)	0	0	0	0	0	3.9 (22)
5	0.5 (3)	0.5 (3)	0	0	0	0	0	0	1.0 (6)
6	0.5 (3)	0	0	0	0	0	0	0	0.5 (1)
7	0.2 (1)	0	0	0	0	0	0	0	0.2 (1)
High-resp. total	24.9 (141)	33.7 (191)	24.3 (138)	12.8 (72)	3.7 (21)	0.4 (2)	0	0.2 (1)	100 (566)

Frequencies are given as percentage (number of subjects)

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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)

ACSM's *Exercise is Medicine* recommends that providers give patients exercise prescription referrals (EP) to community facilities, however data are lacking about minority patient use. **PURPOSE**: Explore potential correlates associated with EP use with a mixed-methods community-engaged design. **METHODS**: We collaborated with an urban women's only wellness facility that exchanges EP for 1-3 months of free access. Women were eligible if given an EP within the past year, ≥18 years of age, not pregnant, and without any conditions precluding physical activity (PA). Pilot data were collected by phone and included quantitative questionnaires (individual, interpersonal and environmental characteristics) and qualitative open-ended semi-structured interviews guided by the socioecological model. Transcribed interviews were coded and content analysis was used to identify themes. Utilization was defined as mean # visits/week over duration of membership (high: ≥1 visit/week). Means and percentages were compared between high and low utilization with t-tests and chi-square, respectively. **RESULTS**: Women (n=30) were 73% Black, 42.5±13.4 years, 57% employed, 50% ≤ high school diploma, 69% household income ≤45,000/yr, with BMI 35.5±7.2kg/m^2 and mean 0.7±1.1 visits/week (67% low; 33% high). Women with high utilization had less education, higher usual daily activity, lower lack of motivation, higher # family CVD risk factors and higher family hypercholesterolemia (Table 1). No differences were found for PA, sedentary behavior, self-efficacy, stage of change, social support, Walkscore, or distance to facility. Common themes identified in all women were sense of community and ease of location. Low utilization barriers were mismatched expectations and competing priorities; high utilization facilitator was readiness for lifestyle change. **CONCLUSIONS**: Factors associated with EP utilization may inform recruitment and tailored programming to promote EP utilization.

Table 1. Comparison of individual, interpersonal, and environmental factors for low vs. high utilization of exercise prescriptions (n=30).

Definition	Low Utilization <1x/week	High Utilization ≥1 x/week	p-value
N (% of total)	20 (67)	10 (33)	
Individual Factors: Demographics, Health Status, and Health Behaviors			
Race: Black (Hispanic/Non-Hispanic)	15 (75)	7 (70)	0.72
BMI (kg/m2)	35.4 ± 7.9	35.7 ±6.0	0.92
Education: < high school n (%)	13 (65)	2 (20)	**0.02**
Household Income <45,000/year	14 (73)	4 (57)	0.42
Health: Self-perceived Mental Health (Range 0-100)	45.3 ± 13.5	41.9 ± 13.2*	0.54
Self-perceived Physical Health	48.2 ± 7.5	53.3 ± 6.2	0.09
CVD Risk factors (#)	1.0 ± 1.0	0.6 ± 1.0	0.37
Sedentary Behavior: TV ≤2 hrs/day	13 (65)	7 (70)	0.78
Sitting (mins/day)	268 ± 211	307 ± 193	0.65
Usual Daily Activity: Sits	5 (25)	1 (10)	
Stand/walks	9 (45)	1 (10)	**0.03**
Lift loads	6 (30)	8 (80)	
Physical Activity: Walking (MET*mins)	766 ± 1041	1210 ± 1034	0.31
Moderate (MET*mins)	1036 ± 2180	2333 ± 3943	0.38
Vigorous (MET*mins)	1338 ± 2302	1809 ± 1936	0.60
Total (MET*mins)	3184 ± 3402	5352 ± 5609	0.22
Self-efficacy (Range 1-5)	2.5 ± 0.8	3.1 ± 0.9	0.08
Stage of Change: Pre-action/Action n (%)	10 (50) / 10 (50)	3 (33) / 6 (67)	0.40
Barriers: Lack of Time (Range 0-9)	3.0 ± 2.6	1.6 ± 2.3	0.18
Social Influence	3.9 ± 2.3	2.2 ± 2.4	0.09
Lack of Energy	4.3 ± 2.9	2.0 ± 2.9	0.07
Lack of Willpower/Motivation	6.0 ± 2.5#	2.8 ±2.8	**0.007**
Fear of Injury	2.0 ± 2.4	1.2 ± 1.8	0.40
Lack of Skill	1.2 ± 1.3	0.9 ± 1.5	0.55
Lack of Resources	4.0 ± 2.9	2.2 ± 2.3	0.12
Interpersonal and Social Factors			
Marital Status: Married n %	4 (20)	1 (10)	0.48
Children	2.1 ± 1.1	2.2 ± 1.7	0.78
CHAOS: Confusion, Order and Hubbub Scale (Range 15-60)	28.5 ± 11.1	27.3 ± 7.5	0.78
Social Support: Family Participation (Range 10-80)	20.4 ± 10.0	20.4 ± 8.9	0.99
Friend Participation	21.4 ± 9.4	16.6 ± 5.9	0.15
Family Health History CVD risk factors (#)	1.1 ± 1.1	2.0 ± 1.2	**0.04**
Diabetes n (%)	7 (35)	4 (40)	0.79
Hypertension n (%)	9 (45)	8 (80)	0.07
Cholesterol n (%)	3 (15)	5 (50)	**0.04**
CVD n (%)	2 (10)	3 (30)	0.17
Environmental Factors			
WalkScore (Range 0-100)	79.9 ± 13.2	78.6 ± 11.0	0.79
Walking distance to health center (miles)	1.5 ± 2.1	2.1 ± 1.7	0.58

* Perceived health <45 indicates impaired functioning
\# Scores ≥5 considered an important barrier to overcome
Bolded p-values are statistically significant p<0.05; **Note:** Numbers vary for some variables since not all women answered all survey questions

C-51 Free Communication/Poster - **Implementation, Referral and Community Based Exercise Oncology**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

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Breast Cancer Survivor Compliance And Satisfaction With A Community-based Exercise Program: Implications For Future Design

Jordan T. Lee, Chad W. Wagoner, D J. Amatuli, Erik D. Hanson, Kirsten A. Nyrop, Hyman B. Muss, Brian C. Jensen, Claudio L. Battaglini, FACSM. *University of North Carolina Chapel Hill, Chapel Hill, NC.* (Sponsor: Claudio Battaglini, PhD, FACSM)
Email: jlee25@live.unc.edu

(No relevant relationships reported)

PURPOSE:Community-based exercise programs will be necessary to accommodate the volume of breast cancer survivors (BCS) in need of lifestyle/exercise guidance. However, attendance and enjoyment are critical components potentially preceding ideal outcomes. This study evaluated BCS compliance and satisfaction with 16-weeks of training at UNC Get REAL & Heel (GRH), a community-based exercise program.
METHODS: BCS within 1 year of completing primary therapy (surgery, chemo, radiation) were prescribed 3, 1-hour days/week of combined aerobic and strength exercise training for 16 weeks at GRH. At exercise initiation, the intervention was designed to meet unique fitness/mobility needs of each BCS with gradual increases in intensity, duration, and volume of training. Compliance was the number of days BCS completed ≥80% of prescribed aerobic duration and strength sets/reps at the prescribed intensity using Borg Rating of Perceived Exertion scale. Satisfaction was captured with an agreement scale questionnaire: 1(strongly disagree) to 4(strongly agree) and open-ended feedback after program completion.
RESULTS: Thirty-two BCS (mean±SD; age 54±12ys, BMI 27.5±5) participated. They attended 73% of exercise sessions; yet average compliance was 26±9.6 days (54%) for aerobic and 14±5.2 days (29%) for strength. Program expectation and enjoyment was 3.6±0.6, self-motivation and empowerment was 3.5±0.6, and patient desire to have participated during treatment was 3.5±0.6 in n=30 (94%) BCS who responded to the questionnaire.
CONCLUSIONS: Attendance was acceptable yet compliance to exercise prescription was suboptimal. Increasing intensity, especially for strength, appeared to be the primary contributor to lack of compliance because volume and duration prescription components were frequently met. Nevertheless, there was overwhelming positivity regarding BCS enjoyment of program, confidence to exercise independently, and desire to have started exercising during treatment. Expanding GRH days and hours/day was a recurring feedback theme and may have improved attendance. These factors are important for future program designs to best accommodate BCS returning to physiological and daily life challenges following cancer treatment. Funding support: Breast Cancer Research Foundation (New York, NY).

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Comparison Of Different Types Of Community-based Exercise Programming In The Alberta Cancer Exercise (ACE) Study.

Christopher M. Sellar[1], Elaine Gobeil[1], Anil A. Joy[2], Nicole Culos-Reed[3], Margaret M. McNeely[1]. [1]*University of Alberta, Edmonton, AB, Canada.* [2]*Cross Cancer Institute, Edmonton, AB, Canada.* [3]*University of Calgary, Calgary, AB, Canada.*

(No relevant relationships reported)

The benefits of exercise for cancer survivors (CS) have been clearly shown, but many CS do not meet exercise recommendations and the availability of cancer-specific programs is minimal in Alberta, Canada. The ACE Study is bringing evidence into practice by implementing community exercise programming for CS. To make delivery more feasible, sites have the option of offering circuit (CT) or group personal (PT) training. **PURPOSE**: To compare changes in fitness and patient reported outcomes from study baseline to 12-weeks in participants completing CT vs. PT. **METHODS**: As of Summer 2019, 459 CS have completed 12-weeks of either CT or PT in the ACE study in Edmonton, Alberta, Canada. CS of any cancer diagnosis and stage were eligible to participate. The twice weekly program consisted of either 1-hour group fitness circuit classes (CT; n=118) or personalised combined aerobic and resistance training sessions (PT; n=341). 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=0.073). 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 (+31.7s), balance (right = 3.6s, left = 3.1s), waist circumference (-0.9cm), fatigue (+2.3pts /52), and self-reported health (+4.4pts /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).
CONCLUSION: Although CS experienced significant improvements regardless of program type, differences in benefit exist between CT and PT. When feasible, matching the type of exercise programming to the individual needs, goals, and preferences of CS may maximize the benefits experienced.

1771 Board #365 May 28 9:30 AM - 11:00 AM

Do Exercise Oncology Guidelines Have To Be Met To Obtain Improvements In Breast Cancer Outcomes?

Carolina X. Sandler[1], Rosa Spence[1], Sheree Rye[1], Ben Singh[1], Jodie Tanner[1], Sandi Hayes[2]. [1]*Queensland University of Technology, Brisbane, Queensland, Australia.* [2]*Griffith University, Brisbane, Queensland, Australia.*
Email: carolina.sandler@qut.edu.au

(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 ACTRN12616000954426.
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)

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<0.01), aerobic fitness (59.8±11.4 metres, p<0.05) and upper body strength (11.4±2.2, p=0.25). 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.

1772 Board #366 May 28 9:30 AM - 11:00 AM

Are The ACSM Exercise Guidelines Safe And Achievable For Women Receiving Chemotherapy For Ovarian Cancer?

Tamara Jones[1], Rosalind Spence[2], Carolina Sandler[1], Andreas Obermair[3], Michael Friedlander[4], Linda Mileshkin[5], Alison Davis[6], Monika Janda[3], Elizabeth Eakin[3], Elizabeth Barnes[7], Vanessa Beesley[8], Louisa Gordon[8], Alison Brand[7], Sandra Hayes[2]. *[1]Queensland University of Technology, Brisbane, Australia. [2]Griffith University, Brisbane, Australia. [3]University of Queensland, Brisbane, Australia. [4]Prince of Wales Hospital, Sydney, Australia. [5]Peter MacCallum Cancer Centre, Melbourne, Australia. [6]The Canberra Hospital, Canberra, Australia. [7]University of Sydney, Sydney, Australia. [8]QIMR Berghofer Medical Research Institute, Brisbane, Australia.*

(No relevant relationships reported)

Purpose: 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 randomised to the exercise 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 was 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 been 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, flexibility 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.

1773 Board #367 May 28 9:30 AM - 11:00 AM

Pink Matters: Impact Of Cause-related Marketing Campaign On Intentions To Test Breast Cancer

Woo-Young Lee[1], Kyungun Kim[1], Robert Slana[1], Choonghoon Lim[2], Youngjin Hur[3]. *[1]University of Central Missouri, Warrensburg, MO. [2]Seoul National University, Seoul, Korea, Republic of. [3]Konkuk University, Seoul, Korea, Republic of.*
Email: wylee@ucmo.edu

(No relevant relationships reported)

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 Marathon.
RESULTS: The overall structural model's goodness of fit showed excellent ($\chi 2$ = 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 = .-0.168), Self-Efficacy (β =.405), and Cues to Action (β =.650). All four factors regarding health belief positively influence on 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.

1774 Board #368 May 28 9:30 AM - 11:00 AM

Qualitative Analysis Of Patient Comments Regarding Adherence To An Exercise Oncology Rehabilitation Program

Shaelyn L. Parry[1], Travis Yahner[1], Karen Wonders, FACSM[2], Stephen LoRusso[1]. *[1]Saint Francis University, Loretto, PA. [2]Maple Tree Cancer Alliance, Dayton, OH.*
Email: slp113@francis.edu

(No relevant relationships reported)

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 results (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.

1775 Board #369 May 28 9:30 AM - 11:00 AM

Exercise During The Cancer Continuum: Patients' Knowledge And Perceived Barriers

Katharina Graf[1], Lutz Vogt[2], Lena Holzapfel[2], Philipp Gießelmann[2], Winfried Banzer, FACSM[2], Elke Jäger[1]. [1]*University Cancer Center (UCT), Krankenhaus Nordwest, Frankfurt am Main, Germany.* [2]*Goethe-University, Frankfurt am Main, Germany.* (Sponsor: Joachim Wiskemann, FACSM)
Email: Graf.Katharina@khnw.de

(No relevant relationships reported)

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.
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 tables 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.

1776 Board #370 May 28 9:30 AM - 11:00 AM

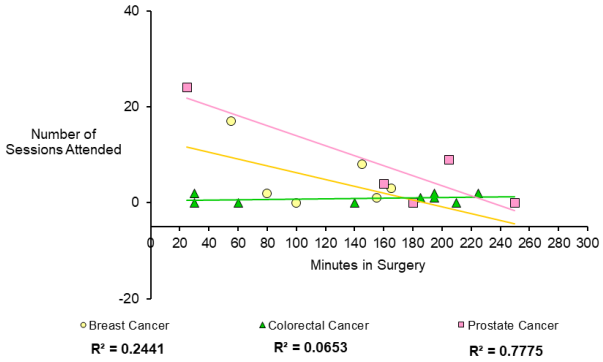
Examination Of Pre-surgical Allied Health Referrals In Cancer Patients At A Regional Australian Hospital.

Luke Evans[1], Declan T. Hennessy[2], Matthew Wallen[2], Jonathan Rawstorn[3], Anna Wong Shee[4], Drew Aras[5], Stephen Brown[1], Fergal Grace[2]. [1]*Ballarat Health Services, Ballarat, Australia.* [2]*Federation University Australia, Ballarat, Australia.* [3]*Institute for Physical Activity and Nutrition, Geelong, Australia.* [4]*Deakin University, Geelong, Australia.* [5]*Western Alliance Health Research Ltd, Geelong, Australia.*
Email: Luke.Evans@bhs.org.au

(No relevant relationships reported)

There has been a recent international call to action for key stakeholders to create the infrastructure and cultural adaptations needed so that all people living with and beyond cancer can be as active as is possible. Among the reasons for this is a lack of clarity on the part of those who work in oncology clinical settings of their role in assessing, advising, and referring patients to exercise. **PURPOSE**: To conduct a retrospective sample audit of allied health referral for breast, prostate and colorectal cancer diagnoses scheduled for surgery. **METHODS**: A SQUIRE compliant retrospective study was conducted on a representative sample of electronic medical record (EMR) data harvested from the files of (n=100) patients diagnosed with either breast, colorectal and prostate cancer and scheduled for surgery at a regional hospital in Victoria, Australia. Association between 'time in surgery' ($mins^{-1}$) and number Allied Health (exercise physiology) sessions were performed using Pearson product-moment correlation.**RESULTS**: 62% of cancer referrals attended at least one allied health appointment. Bivariate comparison of referral to allied health revealed strong: prostate (r^2=0.78), small/moderate: breast (r^2=0.24), and no (r^2=0.07) association between surgical time and frequency of allied health attendance amongst cancer diagnoses requiring surgery. **CONCLUSIONS**: 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



1777 Board #371 May 28 9:30 AM - 11:00 AM

EXPLORE EXERCISE LEVEL AND PREFERENCES IN PANCREATIC CANCER PATIENTS

Alice Avancini[1], Valeria Maria Pala[2], Sabine Sieri[2], Vittorio Krogh[2], Luigi Mariani[2], Ilaria Trestini[1], Daniela Tregnago[1], Michele Milella[1], Sara Pilotto[1], Massimo Lanza[1]. [1]*University of Verona, Verona, Italy.* [2]*National Cancer Institute, Milan, Italy.*
Email: alice.avancini@univr.it

(No relevant relationships reported)

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 worsen 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 to perform at home, 29% a training group with a kinesiologist, while 25% chose 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.

1778 Board #372 May 28 9:30 AM - 11:00 AM

Effects Of Community-based Supervised Exercise In The Body Composition And Strength Of Breast Cancer Survivors

Ana Joaquim[1], Pedro Antunes[2], Catarina Garcia[3], Anabela Amarelo[1], Bárbara Duarte[4], Micael Vieira[5], Sofia Viamonte[6], Ana Tavares[1], Ricardo Lopes[3], Patrícia Mendanha[3], Maria Inês Martins[3], Inês Leão[1], Joana Marinho[1], Andreia Capela[1], Vera Afreixo[7], Luísa Helguero[7], Alberto Alves[8]. *[1]Centro Hospitalar de Vila Nova de Gaia/Espinho, Vila Nova de Gaia, Portugal. [2]University of Beira Interior, Covilhã, Portugal. [3]University Institute of Maia, Maia, Portugal. [4]Associação de Investigação e Cuidados de Suporte em Oncologia, Vila Nova de Gaia, Portugal. [5]Solinca Health & Fitness, Porto, Portugal. [6]Centro de Reabilitação do Norte, Vila Nova de Gaia, Portugal. [7]University of Aveiro, Aveiro, Portugal. [8]University Institute of Maia, Vila Nova de Gaia, Portugal.*
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 material. 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.

	M1	M2	M3	M4	M5	Effect size	P-value
Surgical limb handgrip strength (Kgf)	18.6± 5.0	20.9± 5.4*	21.2± 4.9*	23.5± 5.1*	26.6± 6.6***	0.599	p<0.0001
Non-surgical limb handgrip strength (Kgf)	19.6± 5.4	21.4± 5.9*	21.9± 5.8*	23.8± 5.5*	25.8± 4.5**	0.423	p<0.0001
STS (Reps)	12.0± 2.8	13.7± 3.4	14.1± 3.6	15.1± 3.6	16.5± 3.6†	0.289	p<0.0001
BMI (Kg/m^2)	30.9± 5.5	30.9± 5.6	31.1± 5.5	30.3± 5.4‡	30.7± 5.3	0.125	p=0.050

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.

1779 Board #373 May 28 9:30 AM - 11:00 AM

Accessing Medically-based Exercise Therapy Via Cardiac Rehabilitation And Preventive Cardiology

Ellen Hitt[1], Jennifer Huberty[1], Robert Scales[2], Helen Whited[2]. *[1]Arizona State University, Phoenix, AZ. [2]Mayo Clinic, Scottsdale, AZ.*
Email: elly.hitt@gmail.com
(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 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.

1780 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. *University of Alberta, Edmonton, AB, Canada.*
Email: dongwoo.kang@ualberta.ca
(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 prostatE cancer (ERASE) trial.
METHODS: ERASE is a two-armed, single centre, 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% VO_{2peak}, respectively. The target sample size is 66 to detect a significant between-group difference in VO_{2peak} 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%; mean 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.

C-52 Free Communication/Poster - **Healthy Equity - Mixed Bag**

Thursday, May 28, 2020, 9:30 AM - 12:00 PM
Room: CC-Exhibit Hall

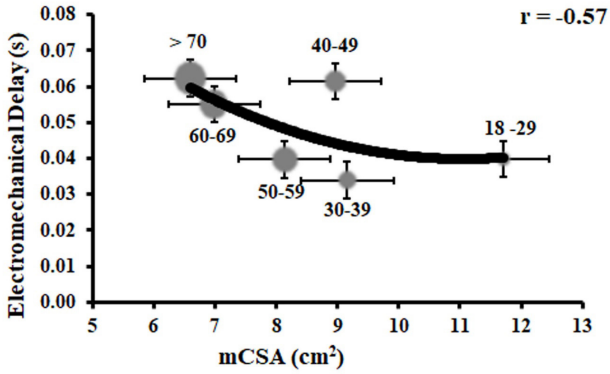
1781 Board #375 May 28 9:30 AM - 11:00 AM

Quantifying The Relationship Between Contraction Efficiency And Muscle Size Across The Adult Lifespan

Alejandra Barrera - Curiel[1], Ryan J. Colquhoun[2], Jesus A. Hernandez - Sarabia[1], Jason M. DeFreitas[1]. *[1]Oklahoma State University, Stillwater, OK. [2]University of South Alabama, Mobile, AL.*
Email: ale.barrera_curiel@okstate.edu
(No relevant relationships reported)

The neuromuscular system undergoes a natural structural and functional degradation associated with aging. Since the size of a muscle affects its stiffness, the age-related reduction in muscle mass may result in decreased contraction speed and efficiency.
PURPOSE: To quantify the relationship between muscle size and contraction efficiency, as measured by electromechanical delay (EMD), across the adult lifespan.
METHODS: Seventy-five adults between 18 and 84 yrs. old were included in this study. Panoramic ultrasound images were taken from each participants' rectus

femoris (RF). Muscle cross-sectional area was defined and measured as the area of interest that included as much muscle as possible (mCSA; cm^2). In addition, surface electromyographical (EMG) signals were recorded from the RF while ten tendon taps were delivered to the patellar tendon. EMD was calculated as the time (s) between EMG onset and torque onset during the evoked reflex contractions. Bin widths were utilized to condense data, where subjects were grouped based on their age as follows: 18 - 29 yrs. (n = 37), 30 - 39 (n = 7), 40 - 49 (n = 4), 50 - 59 (n = 9), 60 - 69 (n = 5) and ≥ 70 (n = 4). Polynomial regression (2nd order) was performed to fit the apparent curvilinear relationship between EMD and mCSA. **RESULTS:** As can be appreciated in the figure below, EMD slowed and mCSA decreased with age. However, the relationship between EMD and mCSA was not significant (r = -0.57, p-value = 0.55). **CONCLUSION:** Surprisingly, EMD was not significantly related to mCSA. It is possible that this may be due to the middle-aged groups being underpowered, which led to an outlier bin (40-49 yrs. old). Additionally, a reflex contraction was used to measure EMD which might differ from the properties of a voluntary contraction. Further analyses might be needed to study the relationship between EMD and mCSA.



1782 Board #376 May 28 9:30 AM - 11:00 AM

Examination Of Neighboring Built Environment Related To Physique In Adolescent Japanese Children

Kan Oishi, Takumi Aoki, Yuki Ito, Takeru Sato, Kojiro Ishii.
Doshisha University, Kyoto, Japan.
Email: ctvd0005@mail4.doshisha.ac.jp

(No relevant relationships reported)

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 (β =-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 (β =-0.081; p<0.005) was independently related in the 5th grade and 6th grade (r=0.081), whereas the number of family restaurants (β =0.168; p<0.001) and supermarkets and department stores (β =-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 supermarlets and department stores may also affect the weight status.

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Sports Participation And Changes In High-density Lipoprotein Among Lean Adolescents: Abcd Growth Study

Romulo Araujo Fernandes[1], Jamile Sanches Codogno[1], Bruna Camilo Turi-Lynch[2], Suziane Ungari Cayres[1]. [1]*Sao Paulo State University - UNESP, Presidente Prudente, Brazil.* [2]*Lander University, Greenwood, SC.*

(No relevant relationships reported)

PURPOSE: To analyze the effect of sport participation with different cardiorespiratory fitness demands on changes in high-density lipoprotein (HDL-c) levels of lean adolescents. **METHODS**: Longitudinal study with 1-year of follow-up (ABCD Growth Study). In all, 189 adolescents (mean age 15.6 ± 2.1) were followed from 2017 to 2018. Only lean adolescents were considered, whose were stratified according to engagement in sports with different cardiorespiratory fitness demands: Control (CT [n= 66]), low cardiorespiratory fitness demand (Low-CRF: gymnastics, baseball, karate, judo and kung-fu [n= 35]) and high cardiorespiratory fitness demand (High-CRF: swimming, tennis, basketball and track & field [n= 59]). HDL-c was assessed in fasting conditions. Absolute changes over time (Δ) and its 95%CI were used in ANCOVA models adjusted by covariates (p-value <0.05). **RESULTS**: The High-CRF group was the only one with significant improvements for HDL-c (2.57 mg/dL [95%CI: 0.50 to 4.65]), which were significantly higher than CT (-2.87 mg/dL [95%CI: -4.97 to -0.78]) and Low-CRF (-1.47 mg/dL [95%CI: -3.95 to 1.01]) (ANCOVA, *p*-value= 0.017). **CONCLUSIONS**: Engagement in sports of high cardiorespiratory fitness demand seems to be beneficial for improvements in HDL-c levels in adolescents, even when childhood obesity is not present.