Aerobic exercise acutely increases the production of reactive oxygen species (ROS), which creates an imbalance between free radicals and the body’s antioxidant defenses, resulting in increased oxidative stress. Oxidative stress levels are reportedly higher in males compared to females, however there is limited knowledge regarding the role of gender in the antioxidant response following an acute bout of aerobic exercise.

Purpose: To determine whether changes in serum antioxidant levels after an acute aerobic exercise bout differ between genders. Methods: The study comprised of 15 healthy adults (9 females, 6 males; age 27±8 years; BMI 24±3 kg/m²) enrolled in the NIH Fatigue in Healthy Individuals Protocol (NCT00885853). During the first visit, subjects completed a treadmill cardiopulmonary exercise test (CPET) to volitional exhaustion. On a separate visit, subjects performed a vigorous-intensity continuous work rate (WR) test, to volitional exhaustion on the treadmill. Serum samples were collected before and immediately after the exercise bout. A Human Oxidative Stress Multiplex panel was used to determine serum peroxidase (PRX2) and catalase levels. Student’s t-tests were performed between genders for WR and antioxidant levels.

Results: Males performed vigorous-intensity exercise at a higher WR than females (p=0.0001). No difference was found in baseline PRX2 and catalase levels between males and females. Relative change in PRX2 (+32% in males; -17% in females) and catalase (+18% in males; -11% in females) was different between genders after a vigorous bout of aerobic exercise (p=0.0136, p=0.0344, respectively). This difference became insignificant when WR was accounted for. Conclusion: This study suggests that higher levels of oxidative stress in males may be explained by higher work rates. However, response to exercise-induced oxidative stress demonstrated that males (6 of 8) increased anti-oxidant levels, while females (8 out of 9) showed decreased levels. Previous studies have suggested that gender differences in oxidative stress may be related to an increased production of ROS by NADPH-oxidase in males, or antioxidant properties of estrogen which may assist in minimizing oxidative stress in females.

Funding: National Institute of Nursing Research, Division of Intramural Research

Thursday, May 30, 2019

1586 Chair: Saori Hanaki. Weber State University, Ogden, UT. (No relevant relationships reported)

1587 Board #1 May 30 1:30 PM - 3:30 PM Role Of Gender In Anti-oxidant Response To A Bout Of Aerobic Exercise In Healthy Adults

Anam Ahmad1, Zoe Morris1, Lisa M.K. Chin1, Rebekah Feng1, Leo Saligan1, Leighton Chan1, Randall Keyser, FACSM2.

1National Institutes of Health, Bethesda, MD. 2George Mason University, Fairfax, VA.

Email: anam.ahmad@nih.gov (No relevant relationships reported)

1588 Board #2 May 30 1:30 PM - 3:30 PM Sex Differences in Anabolic Regulators during Development of Atrophic Pathology in Hindlimb-Unloading-Induced Disuse

Lisa T. Jansen1, Megan E. Rosa-Caldwell1, Wesley S. Haynie1, Seongkyun Lim1, Kirsten Dunlap1, Jacob L. Brown1, David E. Lee2, Richard A. Perry1, Michael P. Wiggs2, Tyrone A. Washington1, Nicholas P. Greene1. 1University of Arkansas, Fayetteville, AR. 2University of Texas at Tyler, Tyler, TX. (Sponsor: Stavros A. Kavouras, FACSM)

Email: ljansen1@uark.edu (No relevant relationships reported)

Muscle atrophy is a comorbidity in many disease conditions, contributing to accelerated disease progression/terminal outcomes. Muscle wasting results alterations in the ratio of protein synthesis to degradation, with wasting conditions favoring degradation. Atrophic conditions differentially affect muscle types. For many diseases, onset and progression of muscle atrophy presents differently between muscle fiber types and sex.

PURPOSE: To assess gene content outcomes of three established anabolic regulators Pgc-1α4, IGF-1, and Deptor, in female and male mice during initiation and progression of disuse atrophy across multiple fiber types. METHODS: 100 female and male C57BL6J mice were hindlimb unloaded for 0h, 24h, 48, 72 and 168h, to induce muscle atrophy. At assigned endpoints, soleus and gastrocnemius muscles were excised and processed for mRNA analysis of Pgc-1α4, IGF-1, and Deptor using RT-PCR. Data were analyzed by one-way ANOVA within each sex, α=0.05. Pre-planned contrast comparisons determined sex differences at each time point, α=0.01. RESULTS: Soleus and gastrocnemius masses presented lower at 24h in female (+11.8%, -9%; p<0.05) and 48h in male (-16%, +3%; p<0.05) compared to control. In predominantly type 1 soleus, Pgc-1α4 mRNA content showed a decline from control across time in females, while spiking >9; >6-fold in males at 72h and 168h (p<0.05). In contrast, IGF-1 showed higher content in females at 72h and 168h (+77%, +27%; p<0.05) than males. In gastrocnemius, a more mixed fiber type, Pgc-1α4 content was 3-fold higher in females at 24h (+9%; p<0.05). Female IGF-1 content was significantly elevated compared to male at 72h (p<0.05). Deptor content in gastrocnemius was >3-fold from baseline at 24h in females and >2-fold from baseline at 48h in males (p<0.05) depicting the only mRNA content change aligning with the observed time course for appearance of loss in muscle mass. CONCLUSION: Anabolic regulator responses to atrophic stimuli differ across sex, muscle tissue and time course of muscle atrophy. These early findings could suggest Deptor as a novel therapeutic target to ameliorate muscle wasting conditions.

Supported by NIH Grant R15 AR069913/AR/NIAM. Sponsorship Fellow: Stavros A. Kavouras; stavros.kavouras@asu.edu

Thursday, May 30, 2019

1589 Board #3 May 30 1:30 PM - 3:30 PM Similar Central and Peripheral Fatigue in Men and Women after Running


Email: lbg@nismat.org (No relevant relationships reported)

PURPOSE: Women may be less fatiguable than men during prolonged endurance exercise. There are a paucity of studies which have compared fatigue in both sexes after moderately long duration running typical of marathon-type training.

METHODS: We compared sex differences in peripheral and central fatigue in 8 men and 6 premenopausal women runners. Volunteers [38±2 and 32±2 yrs, p=0.017; VO2peak 59±3 and 54±3, ml/kg/min, p=0.202, men vs women respectively] ate a standardized breakfast [6 Kcal/kg] 90 minutes prior to commencing testing. Water was provided at 1% of body mass/hr, during a 2-h run at their ventilatory threshold [-65% VO2peak] followed by a self-paced 2-km time trial. RPE and respiratory measures were determined every 20 minutes. Strength was tested in a semi-reclined position [75° hip flexion, to facilitate femoral nerve stimulation] pre-exercise, after the 2-h run and post-time trial as follows: voluntary isometric quad strength was measured on the Biodex with the knee flexed 60°, and with superimposed peripheral magnetic stimulation [PMS] of the femoral nerve to determine central activation [CAR]. PMS was also applied in a 3-second pulse train on a relaxed muscle to measure peripheral fatigue.

Changes in strength and in metabolic measures were analyzed with repeated measures ANOVA.

RESULTS: Following running, voluntary strength declined by ~16% in both sexes [effect of time p<0.001; sex X time p=0.206]. CAR also decreased in both men and women [effect of time p=0.020, time X sex p=0.762]. PMS-stimulated forces, our measure of peripheral fatigue, were unchanged after running: there was no effect of time [p>0.10] in men or women [time X sex, p=0.322]. Substrate use and RPEs did not differ between sexes.

CONCLUSIONS: We found that both sexes fatigued similarly after a 2-h run plus a 2-km time trial, and that all of the fatigue was central in nature. While women may be more fatigue-resistant than men, those differences might not be apparent until a greater duration of running is engaged in, e.g. ultramarathon distances.

Thursday, May 30, 2019

1590 Board #4 May 30 1:30 PM - 3:30 PM The Effects Of Swimming On Bone Density In Female Collegiate Swimmers

Margaret Miller, Sarah Kojetin, Lesley M. Scibora. University of St. Thomas, St. Paul, MN. (No relevant relationships reported)

Swimming provides numerous health benefits, but as a non-weight bearing activity research suggests it provides no constructive benefits on bone strength at dual energy x-ray absorptiometry (DXA)-measured hip and lumbar spine sites. However, little research has focused on skeletal sites stressed during swimming such as the upper arm. Purpose: To determine potential site-specific bone strength adaptations at the humerus among collegiate swimmers compared to sedentary controls.

Methods: Bone geometry and strength were assessed by peripheral quantitative computed tomography (pQCT) in ten collegiate female swimmers (BMI 23 kg/m²; mean 13.9±1.5 pool hours/week) and ten sedentary controls (BMI 24 kg/m²; <150 minutes/week of physical activity) ages 18-23 years. Total volumetric bone mineral density (vBMD, mg/mm³) and total bone area (ToA, mm²) were assessed at the distal (4%) tibia. Cortical bone area (CoA, mm²), cortical density (vBMD), cortical thickness...
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THURSDAY, MAY 30, 2019

Our results showed that swimming does not appear to improve bone microarchitecture by maximal voluntary contraction force, MVC; and voluntary activation, VA) and remaining force values. However, our lab has recently shown that central (as measured first 2 of 6 electrical stimulation sets in recovery and have reported the average of the five measurements. It is possible that this technique could be used to supplement with weight-bearing and resistance exercises to preserve bone strength.

Table 1: pQCT-derived Outcomes.

<table>
<thead>
<tr>
<th></th>
<th>Swimb</th>
<th>Control</th>
<th>Significance (p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius 33%</td>
<td>78.4±3.4</td>
<td>85.0±3.6</td>
<td>0.215</td>
</tr>
<tr>
<td>Cortical Area (CoA, mm²)</td>
<td>1193.3±8.6</td>
<td>1163.6±9.1</td>
<td>0.051</td>
</tr>
<tr>
<td>Cortical Thickness (CoTh, mm)</td>
<td>3.1±0.1</td>
<td>3.5±0.1</td>
<td>0.097</td>
</tr>
<tr>
<td>SSip (mg/mm²)</td>
<td>215.4±13.2</td>
<td>227.0±14.0</td>
<td>0.574</td>
</tr>
<tr>
<td>Humerus 50%</td>
<td>178.0±6.8</td>
<td>172.5±7.2</td>
<td>0.596</td>
</tr>
<tr>
<td>Cortical Area (CoA, mm²)</td>
<td>1170.5±12.3</td>
<td>1173.0±13.0</td>
<td>0.890</td>
</tr>
<tr>
<td>Cortical Thickness (CoTh, mm)</td>
<td>4.1±0.1</td>
<td>4.0±0.2</td>
<td>0.856</td>
</tr>
<tr>
<td>SSip (mg/mm²)</td>
<td>886.0±55.2</td>
<td>868.5±58.4</td>
<td>0.835</td>
</tr>
<tr>
<td>Tibia 66%</td>
<td>270.1±13.5</td>
<td>313.2±14.2</td>
<td>0.045</td>
</tr>
<tr>
<td>Cortical Area (CoA, mm²)</td>
<td>1074.4±18.0</td>
<td>1143.1±18.4</td>
<td>0.100</td>
</tr>
<tr>
<td>Cortical Thickness (CoTh, mm)</td>
<td>4.6±0.2</td>
<td>5.0±0.2</td>
<td>0.179</td>
</tr>
<tr>
<td>SSip (mg/mm²)</td>
<td>2121.5±134.2</td>
<td>2178.6±134.3</td>
<td>0.764</td>
</tr>
</tbody>
</table>

Conclusion: Our results showed that swimming does not appear to improve bone microarchitecture or strength, even at loaded sites such as the humerus. This data suggests that swimming should be supplemented with weight-bearing and resistance exercises to preserve bone strength. Future research should investigate whether site-specific bone adaptations occur at skeletal sites not yet measured.

1592 Board #6 May 30 1:30 PM - 3:30 PM

Skeletal Responses To An All-female Unsupported Antarctic Expedition

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Email: thomas.oleary100@mod.gov.uk

No relevant relationships reported

Arduous training can result in an energy deficit, the consequences of which include impaired bone health and increased stress fracture risk, as determined by acute interventional or cross-sectional studies. Women are more prone to stress fractures than men, and possibly more susceptible to metabolic perturbations associated with reduced energy availability. No study has longitudinally examined the effect of a prolonged severe energy deficit on bone in women. Purpose: To investigate the skeletal effects of the first all-female trans-Antarctic expedition. Methods: Six women (mean ± SD, age 32 ± 3 years, height 1.72 ± 0.07 m, body mass 72.1 ± 3.8 kg) each hauled an 80 kg sled over 1700 km in 61 days from coast-to-coast across the Antarctic. Whole-body areal bone mineral density (aBMD) (dual energy x-ray absorptiometry) and trabecular volumetric BMD (vBMD), geometry, microarchitecture and mechanical properties (high-resolution peripheral quantitative computed tomography) were assessed 39 days before (pre-expedition) and 15 days after (post-expedition) the expedition. Results: There were no significant betweengroup differences in DXA outcomes at any site.

RESULTS: Q10 and MVC significantly decreased following severe and extreme exercise (p<0.01). However, VA was not different across severe or extreme exercise. VA was not different across recovery following severe or extreme exercise. MVC was not different following severe, however, had increased following extreme exercise (p=0.02). Conclusion: Our results suggest that the measurements typically used to represent the condition of the muscle are taken too far post-exercise such that much of the recovery of the muscle has already occurred, especially following extreme exercise.

1593 Board #7 May 30 1:30 PM - 3:30 PM

BMI as a Predictor of Bone Mineral Density Among Premenopausal Women

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Email: sott0@gustavus.edu

No relevant relationships reported

Bone mineral density is an important women’s health topic. Osteoporosis is one of the most common bone diseases and is expected to affect more than 61 million people in the U.S. by the year 2020. According to the International Osteoporosis Foundation, low body weight is associated with greater bone loss and increased fracture risk. Body Mass Index is a commonly assessed physical characteristic which has also been linked with bone health and could be a useful tool in osteoporosis prevention (Asomaning, Bertone-Johnson, Philip, Hooven, Pekow, 2006). Much of the existing research has historically focused on postmenopausal groups. Purpose: The purpose of this study was to assess whether BMI was a significant predictor of bone mineral density (BMD) among a group of premenopausal women. Methods: A total of 42 premenopausal women (38.67 ± 7.95 years) participated in this study. Anthropometric

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data were collected and BMD (g/cm²) was measured at the hips and lumbar spine with a Hologic dual energy x-ray absorptiometry (DEXA) machine. RESULTS: Significant correlations (p < .05) were found between lumbar spine and hip BMD, and BMI (r = .33, p = .031), (r = .35, p = .022) respectively. Regression analysis confirmed that BMI was a statistically significant predictor of BMD for both the hips F(1,41) = 5.71, MSE = .02, p = .022, Adj. R² = .10 and lumbar spine F(1,41) = 5.02, MSE = .03, p = .031, Adj. R² = .09. CONCLUSIONS: Among this group of premenopausal women, BMI was positively correlated with, as well as being a significant predictor of BMD at the hips and lumbar spine. Medical and fitness professionals may find it useful to advise clients about the importance of having a healthy BMI value not only for the management and prevention of obesity but also for healthy bone mineral density and osteoporosis prevention. Future research might establish more clear guidelines for the use of BMI as it relates to osteoporosis risk among men and women. IRB# 1213-0223

D-09 Thematic Poster - Physical Activity & Behavioral Science during Pregnancy and Motherhood

Thursday, May 30, 2019, 1:30 PM - 3:30 PM
Room: CC-102B

1595 Chair: Sofiya Alhassan, FACSM. University of Massachusetts, Amherst, MA.

1595 Board #1 May 30 1:30 PM - 3:30 PM
Baseline Correlates Of Sedentary Behavior In The Health In Pregnancy And Postpartum (HIPP) Study
Sara Wilcox, FACSMM, Jihong Liu1, Brent Hutto1, Ellen Wingard1, Gabrielle Turner-McGrievy1, Judith Burgess2, Alycia Boutte1, Lara Schneider1. 1University of South Carolina, Columbia, SC. 2University of South Carolina School of Medicine, Columbia, SC.
Email: wilcoxs@mailbox.sc.edu

Despite the benefits of physical activity and the potential risks of sedentary behavior (SB), few studies have examined sensor-measured SB in pregnant women.

PURPOSE: To report SB in a sample of women in early pregnancy and examine associations with sociodemographic and psychological variables.

METHODS: We analyzed baseline data from the HIPP trial, a RCT enrolling SC women who are <16 wks gestation, overweight or obese, white or African American, 18 to 44 yrs old, and without exercise contraindications. Participants wore a SenseWear Armband ≥ 20 hrs/d for ≥ 5 days (including ≥ 1 weekend day). SB was defined as MET values < 1.5. Total time in non-sleep SB, # of SB bouts ≥ 30 min, and total time in SB bouts ≥ 30 min were calculated. Differences in SB by parity, race, education, marital status, and employment (t-tests), as well as BMI, age, depressive symptoms, perceived stress, and satisfaction with body function and appearance (Pearson rs) were tested.

RESULTS: To date, participants (n=202) randomized with usable armband data are 15±5 yrs old, 44% African American, 61% obese, 59% college educated, 67% married, and 61% employed full-time. On average, participants spent 12.0±1.7 hrs/d in non-sleep SB, representing 51% of total wake time and 75% of wake time. They averaged 6.2±1.9 SB bouts/d that were ≥ 30 min and spent 5.7±2.3 hrs/d in these bouts. Total SB time, SB time in ≥ 30 min bouts, and # of SB bouts ≥ 30 min were positively associated with depressive symptoms (rs = .15, p<.05) and negatively associated with satisfaction with body function (rs = .17 p<.05). SB variables did not differ by parity, employment, age, perceived stress, or satisfaction with body appearance.

CONCLUSIONS: Total SB time, SB time in ≥ 30 min bouts, and # of SB bouts ≥ 30 min appear to be high in early pregnancy, with these behaviors of particular concern in several demographic subgroups. SB was also related to more negative psychological experiences. Interventions to target SB could benefit pregnant women.

Funded by NIH/NICHD.
vigorousexercise (MVPA), daily steps, and meeting MVPA guidelines (≥150 min/wk of MVPA in ≥10 min bouts). PA was presented as median (interquartile range). Subgroup differences in medians were examined with quantile regression models. Correlations of PA measures with perceived stress, depressive symptoms, PA social support, PA self-efficacy, and PA self-regulation were studied. A logistic regression model was used to examine correlates of meeting MVPA guidelines.

RESULTS: Participants (mean of 12.4 weeks gestation) had a median of 203 (154, 258) min/d LA, 34 (20, 47) min/d MVPA, and 570 (376, 6590) steps/d. LA, MVPA, and steps were lower in African American and obese women (p<0.05). LA was lower in nulliparous women (p=0.05). Participants with less than college education had lower MVPA and steps (p<0.05). Further, LPA, MVPA, and steps were positively associated with PA self-efficacy (r ranging from 0.13 to 0.16, p<0.05) and PA goal setting (r ranging from 0.16 to 0.21, p<0.05). MVPA was positively associated with PA planning (r=0.16, p<0.05). Only 10.4% of met MVPA guidelines, which was more prevalent in white (17.1%) vs African American (2.2%) women and in overweight (17.9%) vs obese women (3.7%) (p<0.05). After adjusting for age, parity, and marital status, white women and overweight women had higher odds of meeting MVPA recommendation than their counterparts: white: 5.8 (1.2–26.6); overweight: 5.2 (1.6–16.9).

CONCLUSION: Sensor-measured PA was low in overweight and obese pregnant women in early pregnancy with significant differences by race, education, parity, and pre-pregnancy weight status. Programs targeting PA are needed for this population. Funded by NIH/NICHD.

1599 Board #4 May 30 1:30 PM - 3:30 PM
Self-regulation Capacity Of Low-income Mothers in Community-based Nutrition Program
Alyssa Abreu1, Eric J. Jones1, Dustin Joubert1, Mark D. Farries2. 1Stephen F. Austin State University, Nacogdoches, TX. 2Texas AM AgriLife Extension, College Station, TX. (Sponsor: Thomas J. Pujol, FACSM)

Diet is strongly associated with many risk factors for chronic disease. Educational programs such as the Expanded Food and Nutrition Education Program (EFNEP) are designed to improve dietary behaviors among low-income populations. Although EFNEP has seen improvements, they do not yet meet recommendations. Self-regulation is the process of guiding thoughts, feelings, and behaviors to stay in line with perceived goals. Previous studies have been successful in eliciting behavior change when improving self-regulation in conjunction with dietary education.

PURPOSE: The purpose of this study was to examine self-regulation in EFNEP participants and its relationship to participants change in dietary behavior.

METHODS: All participants were currently enrolled in EFNEP and were asked to complete an additional self-regulation survey. This survey included five questions on a Likert scale from 1-5, with 5 indicating high self-regulation. These were averaged to assess overall self-regulation capacity pre- and post-program. Fruit and vegetable intake were measured using EFNEP’s current diet-recall survey.

RESULTS: On average, the participants had low levels of self-regulation both pre- and post-intervention (2.74 ± 0.71 and 2.59 ± 0.78, respectively). Regarding vegetable intake, there was no statistically significant change from pre- to post-program (1.51 ± 1.36 and 1.42 ± 1.32 cups, respectively). However, there was a statistically significant different regarding fruit intake, increasing from 0.86 ± 0.94 to 1.39 ± 1.39 cups per day. Neither fruit nor vegetables increased to MyPlate recommendations.

CONCLUSIONS: Participants self-regulation capacity was on average low; and did not increase from pre- to post-program. Results also indicate that fruit and vegetable intake did not reach MyPlate recommendations. From these results, we can conclude that self-regulation training may be a necessary supplement to the program to see improvements in the participants dietary behavior.
Pregnancy-related anxiety (PRA) is experienced by many women, given the physical and psychosocial challenges common during pregnancy and the prospect of childbirth. Some health behaviors, such as physical activity and quality of sleep (QS), are related to decreased PRA, but their joint influence is unclear. PURPOSE: We examined the individual and joint influences of physical activity behaviors and QS on PRA among pregnant women at two locations. METHODS: Third-trimester pregnant women (N=33) participated in a series of measurements between 28-36 weeks gestational age. Participants answered questions regarding their moderate and vigorous physical activity (min/wk) for prepregnancy, in the first and second trimesters, and concurrently. Moderate to vigorous physical activity (MVPA) was calculated for prepregnancy and for each trimester. Participants also wore a validated physical activity monitor (Modus StepWatch) for one week, and average steps/day were calculated. QS was evaluated with the Pittsburgh Sleep Quality Index (PSQI), calculating a global score. The Pregnancy Related Anxiety Questionnaire (PRAQ-R) was used to assess women’s anxiety regarding childbirth and the health of the baby. Median split was used to categorize PRA as “high” (>15.0 PRA scale) or “low” (<15.0). Mann-Whitney U-tests were used to compare the distribution of MVPA for all timepoints, step/day, and also QS between high and low PRA participants. Hierarchical logistic regression determined the joint influence of MVPA and quality of sleep on PRA. RESULTS: Mann-Whitney U-tests showed lower PRA participants had significantly superior third trimester global QS scores (p=0.048). Likewise, global QS scores were related to increased odds of high PRA (β=1.34, 95% CI: 0.99-1.80). Steps/day and self-reported MVPA prior to pregnancy and at all pregnancy timepoints were not related to PRA. Hierarchical analyses did not reveal an interactive effect of steps/day and QS or MVPA and QS on PRA as hypothesized. CONCLUSIONS: Lower QS is related to higher PRA during the third trimester of pregnancy. Physical activity was not related to PRA and interactive effects with QS on PRA were not found. Larger samples are needed to confirm these findings.
decline in dietary habit (p=0.01), and 20.4% decline in stress levels (p=0.01). There were no significant group by time interactions, indicating that students had similar outcomes regardless of what behavior they were targeting.

CONCLUSIONS: HC seems to be an effective strategy for promoting healthy lifestyles in college students. Students had similar gains in PA and similar declines in stress, regardless of the behavior they reported focusing on. It is not clear why confidence in sticking with dietary changes decreased over time, but this may be due to participants possibly becoming more sensitized to their dietary habits through the HC sessions. Additional research is needed to understand student reactions to peer-led HC in college settings.

1606 Board #3 May 30 1:30 PM - 3:30 PM
Per-protocol Analysis Of BAILAMOS™ Dance Program On Self-reported And Device-assessed Physical Activity In Older Latinos
Guilherme M. Balbim1, Susan Aguiñaga2, Priscilla Vazquez2, Isabela G. Marques3, Jaqueline Guzman4, Deborah Salvo5, David X. Marquez, FACSM1.
1University of Illinois at Chicago, Chicago, IL. 2University of Illinois at Urbana-Champaign, Champaign, IL. 3University of California San Diego, San Diego, CA. 4University of Victoria, Victoria, BC, Canada. 5Washington University in St. Louis, St. Louis, MO. (Sponsor: David X. Marquez, FACSM)
Email: gbalbi2@uic.edu

PURPOSE: To test the impact of the BAILAMOS™ dance program on PA levels in older Latinos.

METHODS: Older Latino adults (n=333; M=64.89±7.08) were randomized into a dance (n=167) or health education (HE) (n=166) group. For purposes of per-protocol analysis, participants with attendance ≥75% in dance and HE classes, respectively, were included. The final analytic sample was 145 participants (dance = 63, HE = 82). The dance group participated in four months of Latin dancing, two times per week for one hour per session. The HE group participated in classes once per week for two hours per session for four months. Participants completed the CHAMPS PA Questionnaire and wore an ActiGraph™ GT3X+ accelerometer for seven consecutive days on their non-dominant wrist. Data was used if the participant wore it for at least 10 hours/day over three days. Wrist cut-points utilized were proposed by Kannada (2016) (moderate-to-vigorous PA (MVPA) ≥7500 counts per minute). We performed a fixed-intercept mixed model (p &lt;0.05), adjusting for baseline covariates of age, sex, education, income, and health status. Cohen’s d effect sizes were computed.

RESULTS: Self-reported MVPA (minutes) increased significantly (t(1,120)=3.2, p=0.002) from baseline (dance: M=140.81±211.35, HE: M=115.48±182.65) to month-4 (Dance: M=280.50±285.35, HE: M=231.21±182.72). accelerometer assessed PA increased significantly from baseline to month-4 (Dance: M=29.11±20.45, HE: M=23.21±18.27), but no group*time interaction was demonstrated (t(1,121)=1.33, p=0.19, d=0.22. Total leisure-time PA (LTPA) (minutes) increased significantly from baseline (Dance: M=280.50±285.35; HE: M=360.71±361.05) to month-4 (Dance: M=579.72±346.10; HE: M=500.34±483.04). With significant group*time interaction (t(1,121)=2.16, p=0.03, d=0.33. Accelerometer-assessed MVPA did not increase significantly from baseline (Dance: M=24.43±2.67, HE: M=22.51±17.91) to month-4 (Dance: M=29.11±20.45; HE: M=23.21±18.27) and there was no group*time interaction (t(1,121)=1.53, p=0.13, d=0.43.

CONCLUSIONS: The BAILAMOS™ dance program showed a positive impact on self-reported LTPA. This impact was not observed in device-assessed PA, however, there was a moderate effect. Supported by NIH Grant 1R01NR013151-01.

1607 Board #4 May 30 1:30 PM - 3:30 PM
Reducing the Uncertain Geographic Context Problem in Physical Activity Research: The Houston TRAIN Study
Deborah Salvo1, Casey P. Durand, Erin E. Dooley1, Ashleigh M. Johnson1, Abiodun Oluyomi1, Kelley P. Gabriel, FACSM1, Alexandra E. van den Berg1, Adriana Perez, Harold W. Kohl III, FACSM1, 1Washington University in St. Louis, St. Louis, MO. 2The University of Texas Health Science Center at Houston, Houston, TX. 3The University of Texas Health Science Center at Houston, Austin, TX. 4Baylor College of Medicine, Houston, TX. Email: dsalvo@wustl.edu

PURPOSE: The Uncertain Geographic Context Problem (UGCP) arises when studying the effect of static area-level factors (e.g. parks within walking distance from home) on individual-level outcomes, like physical activity. The UGCP is largely due to temporal uncertainty, as people may spend significant portions of the day outside of the geographic area captured by static spatial measures. The aim of this study was to determine if spatial exposure indicators for physical activity research are improved by including measures of both the home and work neighborhood environments.

METHODS: Baseline data from the Houston TRAIN Study were used (n=153). Participant home and work addresses were geocoded, and two spatial exposure indicators were built per location: transit stops within 1.25 Km, and parks within 2.25 Km (counts). A categorical variable was built for each feature, with four levels based on median student & work home & low access at work, high access at home & low access at work, low access at home & high access at work, and low access at both locations. Weekly minutes of moderate to vigorous physical activity (MVPA) were measured with wGT3X-BT Actigraph monitors using Freedson cut-points. Linear regressions estimated the association between the combined ‘home plus work’ access variables and MVPA. Models were adjusted for sex, age, education, and race/ethnicity.

RESULTS: Relative to the ‘low’ group, having high access to transit in both the home and work neighborhood was associated with 3.7±1.2 additional weekly minutes of MVPA (p=0.039). Similarly, those having high access to parks both in their home and work neighborhood had 2.5±1.9 (p=0.044) more weekly minutes of MVPA than those with low access in both locations. Having high transit or park access only in one of the two studied neighborhood locations was not significantly associated with MVPA (p=0.05).

CONCLUSIONS: When examining the effect of both transport and leisure related urban infrastructure on MVPA, the UGCP is improved by incorporating measures of both the home and work environment. Pending confirmatory studies, our results suggest that approaches exclusively focused on improving the built environment of residential neighborhoods may have limited impact on physical activity. A citywide, systems level approach may be warranted. Supported by NIH R01DK101593

1608 Board #5 May 30 1:30 PM - 3:30 PM
Developing a National Network of Physical Activity Promotion: The Case of Germany
Stefan Peters1, Hagen Wäschte2, Alexander Wolf3, Gerhard Huber4, 1DVGS e.V., Hürth-Efferen, Germany. 2Karlsruher Institute of Technology, Karlsruhe, Germany. 3Heidelberg University, Heidelberg, Germany. Email: stefan.peters@dvgs.de

PURPOSE: Physical activity supports the health of human beings of every age group in various ways. However, the worldwide prevalence of physical inactivity is high and many people do not reach the amount of physical activity that is recommended by physical activity guidelines. National Action Plans (NAPS) and Initiatives try to counteract this situation but have not always been successful. To support targeted measures in such NAPS, it is necessary to gain knowledge of relevant actors, professional groups and multipliers as well as their structural connection in Germany, an exploratory study addressed 2 goals accordingly: (1) the identification of relevant actors, professional groups and multipliers of physical activity promotion, and (2) the analysis of structural relations among these actors as well as the formulation of recommendations for the sustainable development of a national network of physical activity promotion.

METHODS: Qualitative expert interviews, a subsequent network visualization and an analysis for network development were carried out.

RESULTS: It became apparent that the field of actors in the area of physical activity promotion is very heterogeneous and extensive with regard to different forms of actors, such as professionals, non-professionals, and multiplications as well as their structural connection. In Germany, an exploratory study addressed 2 goals accordingly: (1) the identification of relevant actors, professional groups and multipliers for physical activity promotion, and (2) the analysis of structural relations among these actors as well as the formulation of recommendations for the sustainable development of a national network of physical activity promotion.

CONCLUSIONS: For carrying out a network development of physical activity promotion, various prerequisites, benefits, and barriers were revealed. Subsequently, recommendations that contribute to the development and effective governance are presented. The study provides a first detailed consideration of the structure of physical activity promotion in Germany and thereby offers a perspective, which can also inform NAPS around the globe.

1609 Board #6 May 30 1:30 PM - 3:30 PM
Exercise Interventions Improve Drug Abstinence at an In-Patient Rehabilitation Center
Emily L. Roessel1, J. Mark VanNess1, Mercedes K. Steidley1, Ryan C. Bain2, Courtney D. Jensen1. 1University of the Pacific, Stockton, CA. 2Tree House Rehabilitation, Orange County, CA.

PURPOSE: To test the effect of exercise training likely enhances coping skills and sobriety among patients with substance use disorder. Better examination of the mechanisms producing these changes may help identify more effective interventions.

No relevant relationships reported.

S348 Vol. 49 No. 5 Supplement
of a vigorous exercise prescription on drug abstinence in voluntary rehabilitation patients. METHODS: 25 male subjects in a drug treatment program underwent a 12-week intervention, which included cardiovascular exercise, resistance training, and supportive psychotherapy. Five days a week, subjects were asked to participate in either yoga with mindfulness practices or action-based induction therapy lasting two hours; there was also a 90-minute exercise boot camp. Data collected were exercise adherence, exercise performance, sobriety and relapse rates, and an assessment of emotional coping skills. Chi-squared tests and t-tests compared exercisers to non-exercisers; logistic and linear regressions tested the effect of exercise behavior on measurements of coping and sobriety. RESULTS: Subjects had experienced frequent relapse (5±8 episodes) prior to the current admission. Across the sample, 84% were sober on completion of the program, 8% relapsed during treatment, and 36% relapsed after treatment. During the program, 84% exercised regularly, 68% practiced yoga, and 66% followed a disciplined diet. Bench press max improved over the program (39%; P<0.001), as did squat max (55%; P<0.001) and deadlift max (70%; P=0.001).

Among patients who exercised regularly, 91% were sober on completion compared to 50% of patients who did not engage in regular exercise (P=0.043). Owing to a similar intensity of patients in the HIIT group (N=2), moderate intensity continuous training (MCT) and none exercisers who relapsed during treatment (5%) and non-exercisers who relapsed (25%) was not significant (p=0.171). Following treatment, 29% of exercisers and 75% of non-exercisers relapsed (p=0.076). The odds of successfully managing adverse emotional states when they arose increased 20-fold in subjects who exercised regularly (P<0.036). Each additional session of yoga per week predicted a 20-day increase in the length of the duration training program (p=0.016). CONCLUSION: Exercise appears to exert a positive effect on drug and alcohol sobriety and coping skills in a population that struggles with frequent relapse.

1610 Board #7
May 30 1:30 PM - 3:30 PM
Effectiveness Of Aerobic Exercise Programs For Health Promotion In Metabolic Syndrome
Felix Morales Palomo, Miguel Ramirez-Jimenez, Juan Fernando Ortega, Ricardo Mora-Rodriguez. UCLM, Toledo, Spain.

The effects of different modalities of aerobic training on cardiorespiratory fitness (CRF) and metabolic syndrome (MetS Z-Score) have been previously studied in patients with different cardiometabolic diseases. Continuous (Jonshon et al., 2007) and interval (Mora-Rodriguez et al., 2014) training have been shown to be effective to improve MetS Z-Score. On the other hand, a recent metaanalysis suggest that high-intensity interval training (HIIT) may be superior to traditional moderate-intensity continuous training (MCT) to improve CRF (Milanovic et al., 2015) even when exercise groups improved similarly their VO2PEAK (4HIIT 11%; MICT 12% and 1HIIT 16%; all P<0.001).

To compare the improvement in CRF and MetS -Score of three modalities (HIIT, MCT and CONT) to improve MetS Z-Score decreased -41% to -24% (P<0.001) whereas we did not change in 1HIIT and CONT group (-24%; P=0.21 and 20%; P=0.22, respectively). However, the three exercise groups improved similarly their VO2peak (4HIIT 11%; MICT 12% and 1HIIT 14%; all P<0.001). CONCLUSION: Our findings suggest that in sedentary individuals with MetS and low initial CRF level any of the three aerobic training modalities which were compared, provide sufficient stimulus to raise CRF. However, the more intense and shorter 1HIIT training program is not effective on improving MetS Z-Score and thus, its recommendation for health promotion purposes in this population should be done with caution.

D-11 Thematic Poster - Running Injuries
Thursday, May 30, 2019, 1:30 PM - 3:30 PM
Room: CC-101B

1612 Chair: Allison H. Gruber. Indiana University Bloomington, Bloomington, IN.

1613 Board #1
May 30 1:30 PM - 3:30 PM
Increased Ground Reaction Force Load Rates In Runners With Active Patellofemoral Pain
Caleb D. Johnson, Jereme Outerleys, Julia M. Reilly, Adam S. Tenforde, Irene S. Davis, FACSM. Harvard University, Cambridge, MA. (Sponsor: Dr. Irene Davis, FACSM)
Email: cdj9825@gmail.com

Increased vertical ground reaction force load rates have been associated with running injuries, and specifically with tibial stress fractures and plantar fasciitis. Inconsistent findings have been reported regarding the role of load rates in runners with patellofemoral pain (PFP), one of the most common injuries in runners. Limited studies in this patient population have been performed and prior investigators did not examine components of load rates beyond the vertical component. PURPOSE: To compare vertical, resultant, posterior, medial and lateral load rates, and peak vertical forces in runners with active patellofemoral pain (PFP) and healthy runners. METHODS: 30 runners with active PFP (16F, 14M, 40.2±12.8 yrs, 67.5±10.0 kg) and 30 healthy controls (CON) (18F, 12M, 34.8±10.9 yrs, 70.4±14.0 kg), all habitual rearfoot strikers, completed an instrumented treadmill assessment at a self-selected speed. Controls were matched for speed (PFP<2.50 m/s, CON<2.51 m/s). Load rates (vertical average and instantaneous

Abstracts were prepared by the authors and printed as submitted.
Effects Of Running Biomechanics On The Occurrence Of Iliotibial Band Syndrome- A Prospective Study

Qi Peng Song, Peixin Shen. Shandong Sport University, Jinan, China.

PURPOSE: This prospective study aimed to determine the gait characteristics that are associated with the occurrence of iliotibial band syndrome (ITBS).

METHODS: 15 ITBS-stricken runners (I group) and matched 15 healthy runners (C group). All participants underwent two gait trials, namely, before the first day of running (trial1) and after 8-week running (trial2). An eight-camera motion capture system was used to collect kinematic data. Sub-group comparisons were assessed via respective 95% confidence intervals of mean difference.

RESULTS: In trial2, the ITBS group exhibited greater peak anteior pelvic tilt and increased reliance on visual information. While standing in a weight-bearing, subtalar neutral position, diagnostic eyes closed/eyes open. Larger negative values indicate greater reliance on visual information. While standing in a weight-bearing, subtalar neutral position, diagnostic eyes closed/eyes open. Larger negative values indicate greater reliance on visual information.

CONCLUSIONS: Gait and posture are considered one of the factors. Most of studies on ITBS were retrospective cross-sectional in design and could not elaborate on the pathogenesis of ITBS. It remains unknown if FHB morphology is associated with an increased reliance on visual information. Evidence is needed to improve clinical decisions.

Flexor Hallucis Brevis Morphology is Associated with Visual Reliance While Balancing in Previously Injured Runners

Erik A. Wikstrom, FACSM, Aliza K. Nedimyer, Brittney A. Luc-Harkey, Brian G. Pietrosimone, FACSM. UNC - Chapel Hill, Chapel Hill, NC.

PURPOSE: To determine if FHB morphology is associated with increased reliance on visual information while balancing relative to uninjured runners. However, it remains unknown if FHB morphology is associated with an increased reliance on visual information.

METHODS: Twenty-four runners with foot and/or leg running injuries within the past three years but were currently asymptomatic (age: 21.66±2.44 yrs, height: 171±10cm; mass: 70±12kg; VISA-A score: 71±10; current mileage: 40±29km/wk). Participants ran for 3 minutes at their endurance pace (2.9±0.3m/s) on an instrumented treadmill with retroreflective markers affixed to their lower limbs and feet. After a 6-minute familiarization period, marker trajectories and ground reaction forces were sampled during the 7th and 29th stride. Data was reduced to 10 gait cycles bilaterally. Sagittal plane ankle joint angles, moments and powers were calculated and a previously described musculoskeletal model was used to estimate Achilles tendon loads. Tautness Scale for Kinesthesiophobia (TSK) quantified the degree of kinesiophobia.

RESULTS: On the injured side, there was a significant decrease in peak concentric ankle power (7thmin=4.9±1.0W/kg; m=29min=4.7±1.1W/kg m; p=0.02) and peak dorsiflexion (7thmin=23.4±3.9º; 29min=22.7±3.7º; p=0.02), but no changes in peak plantarflexion moment, peak eccentric power, Achilles tendon peak load, loading rate or, impulse (p=0.12-0.65). No changes occurred on the uninjured side (p=0.17-0.90). There were significant relationships between the TSK scores (32±7) and changes in Achilles tendon impulse, peak concentric ankle power, and peak plantarflexion moment (r=0.66-0.60; p=0.02-0.04), indicating increased unloading of the injured side during the 30-minute run in patients with higher degree of kinesiophobia.

CONCLUSIONS: Lin ation power and motion change during a 30-minute steady-state run in patients with Achilles tendinopathy. Additionally, changes in loading patterns are associated with kinesiophobia.

Achilles tendinopathy is an overuse injury that commonly sidelines runners. During rehabilitation, return-to-sport (RTS) decisions are made with minimal guiding evidence. With reinjury rates as high as 44%, evidence is needed to improve clinical decisions. Abrerrant loading patterns while running may partially explain reinjury rates.

PURPOSE: To determine if Achilles tendon loading patterns change during a 30-minute steady-state run in patients with Achilles tendinopathy and explore relationships between loading patterns and kinesiophobia.

METHODS: 12 runners (7M) with Achilles tendinopathy were included (age: 44±11 yrs; height: 171±10cm; mass: 70±12kg; VISA-A score: 71±10; current mileage: 40±29km/wk). Participants ran for 30 minutes at their endurance pace (2.9±0.3 m/s) on an instrumented treadmill with retroreflective markers affixed to their lower limbs and feet. After a 6-minute familiarization period, marker trajectories and ground reaction forces were sampled during the 7th and 29th stride. Data was reduced to 10 gait cycles bilaterally. Sagittal plane ankle joint angles, moments and powers were calculated and a previously described musculoskeletal model was used to estimate Achilles tendon loads. Tautness Scale for Kinesthesiophobia (TSK) quantified the degree of kinesiophobia.

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CONCLUSIONS: Gait and posture are considered one of the factors. Most of studies on ITBS were retrospective cross-sectional in design and could not elaborate on the pathogenesis of ITBS. It remains unknown if FHB morphology is associated with an increased reliance on visual information. Evidence is needed to improve clinical decisions.
CONCLUSIONS: Table 1

RESULTS: Between the injured and non-injured leg.

Parameters were determined for the injured and non-injured leg at 1-min. intervals. Power (POP) (linear velocity at toe off, TO) and internal rotation (IR) of the tibia (at TO). Angle at IC (VLL), peak tibial impact (PTA), peak sacral impact (PSA), push-off stance (MS). Additional parameters that were calculated were the vertical lower leg and sternum. Ankle and knee angles were determined at initial contact (IC) and midstance. A 2x3 (limb x condition) ANOVA was used to evaluate interlimb differences across conditions with post-hoc Bonferroni adjustments.

RESULTS: There was no significant limb x condition interaction or main effect of limb, but there was a significant main effect of condition. Knee joint moment contributions were 35% greater in decline running when compared to incline running (50-15%), and 31% greater when compared to flat running (50-19%). Ankle joint contributions were 39% less in decline running when compared to incline running (24-63%) and 26% less in decline running when compared to flat running (24-50%).

CONCLUSIONS: Knee and ankle joint moment contributions are altered with flat, incline, and decline running in persons with ACLR. Individuals with ACLR did not display asymmetries in joint moment contributions between the involved and uninvolved limb.

MID-PORTION Achilles tendinopathy (AT) is a common injury in runners. Overloading the tendon results in pain, swelling, and impaired running performance. Recovery involves rest and a gradual build up. Determining whether patients can resume training is difficult and currently rather qualitative. To provide quantitative data to the physician to assist clinical decision-making, we studied the between leg differences in running kinematics for AT patients using inertial sensors in the clinical setting.

PURPOSE: To investigate lower limb kinematics in AT patients during 5 minute treadmill running. To assist clinical decision-making, we studied the between leg differences in running kinematics in AT patients using 3d optical motion capture systems or an instrumented treadmill to quantify running kinematics. AT strongly affected ankle mechanics, possibly as a compensatory strategy for the injured uninvolved limb.

METHODS: 9 patients (4 males, 5 females, mean age 22 ± 2 years) provided consent to participate. Participants ran during flat (0°), incline (10°) and decline (-10°) treadmill conditions, with predetermined speeds of 2.5 m/s (0°) and 1.8 m/s (10° and -10°). Kinematic and kinetic data were collected during the final 30s of each condition using 17 cameras (Vicon) and an instrumented split-belt treadmill (Bertec). Joint moment contribution percentages at the hip, knee and ankle were determined by dividing the peak, sagittal, external joint moments (N.m/kg) by the sum of all three joint moments during stance. A 2x3 (limb x condition) ANOVA was used to evaluate interlimb differences across conditions with post-hoc Bonferroni adjustments.

CONCLUSIONS: Knee and ankle joint moment contributions are altered with flat, incline, and decline running in persons with ACLR. Individuals with ACLR did not display asymmetries in joint moment contributions between the involved and uninvolved limb.

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CONCLUSIONS: Knee and ankle joint moment contributions are altered with flat, incline, and decline running in persons with ACLR. Individuals with ACLR did not display asymmetries in joint moment contributions between the involved and uninvolved limb.
predicting injury risk in runners as the test does not predict variables previously linked to running injuries. However, further prospective studies tracking occurrence of actual injuries as well as internal loading at common running injury sites are required to fully clarify whether the Y balance test is suitable for screening runners.

Table 1. Linear regression models relating Y-balance scores to gait variables previously linked to running injuries; BW = bodyweight (kg), p < 0.05.

<table>
<thead>
<tr>
<th>Variable</th>
<th>p-value</th>
<th>R²</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip adduction (%)</td>
<td>0.08</td>
<td>0.004</td>
<td>-0.14</td>
<td>0.81</td>
<td>-2.50</td>
</tr>
<tr>
<td>Hip Internal Rotation (%)</td>
<td>0.21</td>
<td>0.035</td>
<td>-0.33</td>
<td>0.79</td>
<td>-12.99</td>
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<tr>
<td>Knee Flexion (%)</td>
<td>0.01*</td>
<td>0.12</td>
<td>3.15</td>
<td>34.44</td>
<td>18.80</td>
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<tr>
<td>Knee Adduction (%)</td>
<td>0.46</td>
<td>0.01</td>
<td>-0.24</td>
<td>0.17</td>
<td>-6.67</td>
</tr>
<tr>
<td>Peak Eversion (%)</td>
<td>0.93</td>
<td>0.001</td>
<td>-0.13</td>
<td>0.14</td>
<td>0.57</td>
</tr>
<tr>
<td>Eversion ROM (%)</td>
<td>0.21</td>
<td>0.035</td>
<td>-0.20</td>
<td>0.73</td>
<td>-9.76</td>
</tr>
<tr>
<td>Peak Eversion Velocity (mm/s)</td>
<td>0.21</td>
<td>0.06</td>
<td>-0.10</td>
<td>0.47</td>
<td>183.66</td>
</tr>
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<td>Vertical landing rate (mm/kg)</td>
<td>0.52</td>
<td>0.009</td>
<td>-51.76</td>
<td>101.61</td>
<td>24.92</td>
</tr>
<tr>
<td>Hip Adductor Moment (Nm/kg)</td>
<td>0.52</td>
<td>0.009</td>
<td>-0.94</td>
<td>1.81</td>
<td>0.43</td>
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<tr>
<td>Hip Adductor Impulse (Nms/kg)</td>
<td>0.96</td>
<td>0.0007</td>
<td>-0.23</td>
<td>0.22</td>
<td>-0.01</td>
</tr>
<tr>
<td>Knee Adductor Moment (Nm/kg)</td>
<td>0.13</td>
<td>0.05</td>
<td>-0.35</td>
<td>2.54</td>
<td>1.09</td>
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<tr>
<td>Knee Adductor Impulse (Nms/kg)</td>
<td>0.58</td>
<td>0.007</td>
<td>-0.29</td>
<td>0.52</td>
<td>0.11</td>
</tr>
</tbody>
</table>

D-12 Thematic Poster - Soccer

Thursday, May 30, 2019, 1:30 PM - 3:30 PM
Room: CC-101A

1621 Chair: Douglas J. Casa, FACSM. University of Connecticut, Storrs, CT.

No relevant relationships reported

1622 Board #1

May 30 1:30 PM - 3:30 PM
The Effect Of Acute Chronic Training Load Rating On Daily Stress, Fatigue, And Soreness Level In A NCAA Division I Soccer Players

Yasuki Sekiguchi1, Ryan M. Curtis1, Robert A. Huggins1, Courtney L. Benjamin1, William M. Adams2, Shawn M. Arent, FACSM3, Rajat K. Jain4, John S. Miller5, Christopher A. West1, James R. Hale6, Douglas J. Casa, FACSM1. 1University of Connecticut, Storrs, CT; 2University of North Carolina at Greensboro, Greensboro, NC; 3Rutgers University, New Brunswick, NJ; 4Northwestern University, Evanston, IL; 5Penn State University, University Park, PA. (Sponsor: Douglas Casa, FACSM)

Email: yasuki.sekiguchi@uconn.edu

No relevant relationships reported

PURPOSE: To investigate the effect of acute chronic work load rating (ACWL) on daily stress, fatigue, and soreness throughout a collegiate men’s soccer season.

METHODS: Sixty-four male collegiate soccer players (mean±SD; age, 20±2y; body mass, 77.3±6.7kg; height, 179.9±6.3cm; VO2max, 53.0±5.0ml•kg-1•min-1) participated in this study, which took place during the 2016 and 2017 NCAA soccer seasons. During each training session and match, players donned a heart rate and GPS enabled chest strap to measure training impulse (TRIMP). Daily stress, fatigue, and soreness levels were measured using the Daily Stress, Fatigue, and Soreness (D-12) questionnaires. A Y-balance test was used to assess lower limb strength and balance.

RESULTS: Mean difference (MD), 95% confidence interval (CI), effect size (ES), and p-value are reported for each outcome measure. T-tests were used to compare differences between a fixed sleep quality factor. Individual and time point were added as random intercepts to account for variance associated with these factors. Statistical significance was set a priori p<0.05. Results are reported as mean difference (MD) and effect size (ES). RESULTS: 47.4% of PSQI results yielded scores ≥ 5. Individuals with poor sleep quality had significantly lower levels of depression (MD=-2.68, ES=-0.39; p<0.001), tension (MD=-1.36, ES=-0.33; p<0.001), anger (MD=-2.09, ES=-0.33; p<0.001), fatigue (MD=-1.95, ES=-0.45; p<0.001), confusion (MD=-1.26, ES=-0.38; p<0.001) and total mood disturbance (MD=-9.11, ES=-0.39; p<0.001) than those who reported good sleep quality. Individuals who reported good sleep quality had significantly less concentration disruption (MD=0.45, ES=0.25; p<0.05) than those who reported poor sleep quality. Individuals who reported good sleep quality scored significantly lower on the DPA (MD=-2.73, ES=-0.26; p<0.01), indicating improved physical function and well-being, compared to those who reported poor sleep quality. CONCLUSION: Poor sleep quality is prevalent (almost 50%) in this sample of collegiate soccer players. Athletes with poor sleep quality appear to have increased negative mental health outcomes and higher ratings on a disability scale. Establishing student-athlete wellness monitoring programs may provide a tailored approach to improve the collegiate athlete experience.

1624 Board #3

May 30 1:30 PM - 3:30 PM
The Influence of Match Congestion, Load and Wellness on Injury Risk in Collegiate Men’s Soccer

Robert A. Huggins1, Ryan M. Curtis1, Courtney L. Benjamin1, Yasuki Sekiguchi1, Erin B. Wasserman2, David A. Klossner3, Rajat K. Jain4, John S. Miller5, Christopher A. West1, James R. Hale6, Douglas J. Casa, FACSM1. 1Korey Stringer Institute, University of Connecticut, Storrs, CT; 2Dataryl Center for Sports Injury Research and Prevention, Indianapolis, IN; 3University of Maryland, College Park, MD; 4University of North Carolina at Greensboro, Greensboro, NC; 5Rutgers University, New Brunswick, NJ; 6Northwestern University, Evanston, IL; 7Penn State University, University Park, PA; 8University of North Carolina at Greensboro, Greensboro, NC; 9University of Connecticut, Storrs, CT; 10University of North Carolina at Greensboro, Greensboro, NC. (Sponsor: Douglas J. Casa, FACSM)

Email: robert.huggins@uconn.edu

No relevant relationships reported

The impact of match congestion, training load (TL), perceived stress, fatigue and soreness on the odds of injury remains unclear. PURPOSE: To examine the influence of 1) days rest between matches on injury rate (IR) and odds of injury and; 2) TL on injury, perceived stress, fatigue and soreness. METHODS: A prospective multi-site study tracked daily athlete exposures, TL (distance and duration), injury and perceptual data from six Division I NCAA men’s soccer teams in one season. Overall and non-contact (NC) IRs expressed per 1000 athlete exposures (AEs), and odds ratios (OR) were determined by days before and after matches. Associations between injury and changes in both TL and perception were analyzed using a multilevel logistic regression.

RESULTS: 132 players experienced 116 injuries in 125 matches and 75 injuries in 301 practices. Overall match and practice IRs (per 1000AEs [97%CI]) were 47.9 [39.1,
The regular execution of neuromuscular training has been shown to reduce injuries of the lower extremities in young soccer players. However, the importance of sports-specific cognitive and perceptual skills in soccer has already been examined in various studies (Ward & Williams, 2003). However, the role of general perceptual-cognitive abilities and the relation of position is not clarified in detail (Schumacher et al., 2018).

**PURPOSE**: To analyze the relation of position to peripheral performance, selective attention and reaction abilities in highly talented soccer players.

**METHODS**: 147 highly talented male soccer players (14.8 ± 2.6 yrs, age range 11 to 23 years) were involved. The subjects performed computer-based selective attention, peripheral perception and reaction tests (using Vienna Test System). In the peripheral perception test stimuli were presented left and right sided. The soccer players were subdivided into offensive player group (OPG: striker, midfielder) and defensive player group (DPG: goalkeeper, defender). They were recruited from a youth academy of a professional soccer club and played at the highest and 2nd highest national soccer competition for their age. Group differences were tested using the student t-test.

**RESULTS**: Significant differences for position groups were observed, with regard to correct reaction times (OPG: 216.0 ± 120.2 ms; DPG: 231.3 ± 260.0 ms in second of sprints [ms]), and distance covered while running >14.4 km h⁻¹ [mι] were monitored in 31 male NCAA Division 1 male soccer athletes (mean ± SD; age, 20 ± 2 y; body mass, 79.92 ± 6.69 kg; height, 181.48±6.35 cm; VO₂max: 50.87 ± 4.38 ml kg⁻¹ min⁻¹) using GPS-enabled player tracking devices during the Fall 2016 soccer preseason (PRE), regular season (REG), and post-season (POST) phases (0.001 < p < 0.01). A 5-week field test intervention significantly improved sprinting performance and broad jump in collegiate soccer players irrespective of magnitude of resistance, which suggests that both light and heavy RS is efficacious to enhance these outcomes.

**CONCLUSIONS**: Our results indicate that defender and goalkeeper outperform striker and midfielder in general selective attention tasks and in peripheral reaction tasks left sided. Additional research is needed to further clarify position-specific differences between left and right peripheral reaction time of highly talented soccer players.
Elite professional soccer players have high aerobic requirements throughout a game and extensive anaerobic demands during periods of a match leading to major metabolic and thermodynamic changes. Assessing skin temperature (Tsk); blood lactate concentration ([La-]), fat and carbohydrate oxidation (FATox; CHOox) might provide an indirect method to assess metabolic flexibility and oxidative capacity during exercise. Purpose: To study the relationship between Tsk; [La-] and substrate oxidation patterns. Methods: We used indirect calorimetry and [La-] measurements, and monitored the Tsk to study the metabolic and thermodynamic response to exercise in twenty professional male soccer players (age 24.5±3.4 yrs.; VO₂peak 53.2±4 ml/kg/min) during a maximal incremental treadmill test. Results: The maximal FATox rate was 0.47±0.16 g min⁻¹, reached at 62.5±6.5% of the VO₂peak. A significant inverse correlation was found between average values of Tsk and FATox rates (p<0.006). Maximal values reached of FATox and CHOox rates were 0.80±0.006 and 6.82 g.min⁻¹ respectively.

Conclusions: These results indicate that FATox rates are inversely associated with blood lactate production, which may be due to a higher adrenergic activation that limits the increase of Tsk and the FATox capacity. Our data also show relationships between the Tsk and FATox rates, which may be associated to an increase of tissue blood flow. More research is required to determine how the thermodynamic and metabolic responses to affect performance in soccer.
sleep constant was associated with a one-year BMI decrease of 0.26 kg/m², while the replacement of SED with LPA and sleep were associated with smaller decreases in BMI (0.06 kg/m² and 0.12 kg/m², respectively).

**CONCLUSION:** Findings suggest that targeting all movement behaviors throughout the day may be an effective approach for weight loss, especially among men.

1632  May 30 1:45 PM - 2:00 PM  
**Cardiorespiratory Fitness and Years Lived Free of Cardiovascular Disease: Cardiac Lifetime Risk Pooling Project**

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(No relevant relationships reported)

**PURPOSE:** Quantifying cardiorespiratory fitness (CRF) with years lived free of cardiovascular disease (CVD) allows for contextualization of the population burden of CVD and provides a metric for clinician-patient communication.

**METHODS:** CRF was measured with graded exercise treadmill tests in 8,129 adults in the Coronary Artery Risk Development in Young Adults and Framingham Offspring studies. Individual-level data were pooled. Cohort-specific z-scores for CRF were categorized into sex- and age-specific quintiles. We defined low CRF as quintile 1, moderate (mod) CRF as quintiles 2-3, and high CRF as quintiles 4-5. Rates (person-years) of incident CVD and death were summed for participants up to age 85 years, or the oldest age of observation. Irwin’s restricted mean was used to calculate years lived free from CVD and overall survival stratified by sex.

**RESULTS:** At baseline the mean age was 32.5±11.6 years, 43.6% women, and 30.8% black. Over 219,812 person-years of follow-up, 762 CVD events were observed. For total survival time, high fit men lived 2.1 years longer and mod fit men lived 1.4 years longer vs low fit men. Additionally, high fit men lived 3.3 more healthy years and mod fit men lived 2.3 more healthy years free of CVD vs the low fit group. Among men, relative follow-up time spent with CVD was 5.0% for high fit, 5.7% for mod fit, and 6.3% for low fit. This is similar across three levels of LTPA. Watching less TV compared to more viewing was associated with longer overall and disease-free life expectancy of 0.8 years each. These findings were similar for CHD, stroke, and HF.

**CONCLUSIONS:** Engaging in more LTPA and less TV viewing was associated with longer and nonfatal CVD-free life expectancy. Increasing LTPA levels and limiting TV viewing could potentially increase longevity and years lived CVD-free.

1634  May 30 2:15 PM - 2:30 PM  
**Cardiorespiratory Fitness Incidence and Mortality from Lung Cancer in Male Smokers**

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(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is an established prognostic marker for many chronic diseases including lung cancer but, this association has not been assessed among smokers. **PURPOSE:** To evaluate the association between CRF, lung cancer incidence and cancer mortality in former and current male smokers.

**METHODS:** Maximal treadmill exercise testing was performed in 2,979 men (former smokers (n=1,602), current smokers (n=1,377)), aged 59.2±17.3 years, who were free from malignancy at baseline. Cox hazard models adjusted for confounders (age, gender, race by study center, education, smoking, ethanol intake). Missing data were imputed with multiple imputation.

**RESULTS:** Over 21,467 person-years of follow-up, 99 lung cancers were diagnosed (46 [2.9%] among former smokers and 53 [3.8%] among current smokers). Seventy-nine of those died from cancer (40 in former and 39 in current smokers) after 3.6±4.6 years from diagnosis. Among former smokers each 1-MET increase and categories of moderate and high CRF were associated with 16% (p=0.002), 60% and 83% (p trend=0.001) reductions in lung cancer incidence, respectively. Among current smokers who were later diagnosed with lung cancer, 1-MET increase and categories of moderate and high CRF were associated with 18% (p=0.008), 81% and 82% (p trend <0.001) reductions in cancer mortality, respectively. The PAR% for lung cancer incidence was 12.5% among former smokers and 21.5% for cancer mortality among current smokers. **CONCLUSIONS:** Higher CRF is associated with lower lung cancer incidence in former smokers. Current smokers who were diagnosed with lung cancer and were more fit exhibited reduced cancer mortality. These results suggest potential protective benefits of higher CRF for prevention of lung cancer outcomes among both former and current smokers.

Eliminating low CRF as a risk factor could potentially reduce considerable lung cancer morbidity and mortality.
1635 May 30 2:30 PM - 2:45 PM
Is Leisure-time Physical Activity Before Pregnancy Associated With Risk Of Hyperemesis Gravidarum During Pregnancy?
Katrine M. Owe1, Nathalie Steur2, Borgny H. Wold1, Maria C. Magnus1, Wenche Nystad2, Åse V. Vikanes1. 1Oslo University Hospital, Oslo, Norway. 2Norwegian University of Science and Technology, Trondheim, Norway. 3Norwegian Institute of Public Health, Oslo, Norway. Email: owekam@outlook.com

(NO relevant relationships reported)

Hyperemesis gravidarum (HG) is characterised by excessive nausea and vomiting often leading to maternal weight loss, dehydration, electrolyte imbalance, and vitamin deficiencies. HG is the most common reason for hospitalisation in the first half of pregnancy and its prevalence varies depending on maternal country of birth. Women who experience excessive nausea and vomiting in early pregnancy are less likely to participate in leisure-time physical activity (LTPA) during pregnancy. Whether LTPA before pregnancy is associated with hyperemesis gravidarum has not yet been studied. Prepregnancy LTPA may lessen the risk of gestational diabetes, pelvic girdle pain, and hypertensive disorders including preclampsia, all of which are associated with HG.

PURPOSE: To estimate associations between prepregnancy LTPA and HG in pregnancy.

METHODS: We present data from 37,442 primiparous women with singleton pregnancies enrolled in The Norwegian Mother and Child Cohort Study. Prepregnancy LTPA was self-reported by questionnaire in pregnancy week 17. HG was defined as prolonged nausea and vomiting in pregnancy requiring hospitalisation before the 25th gestational week. We estimated the crude and adjusted associations between LTPA and HG using multiple logistic regression. We assessed effect modification by prepregnancy BMI or smoking by stratified analysis and interaction terms.

RESULTS: A total of 398 (1.1%) women developed HG. Before pregnancy 76.4% conducted LTPA at least 3 times weekly, while only 7.3% of women conducted LTPA less than once a week. Compared to women reporting LTPA 3 to 5 times weekly, no LTPA or a frequency of 1 to 3 times a month had an increased risk of HG (adjusted odds ratio [aOR] 2.58; 95% confidence interval [CI], 1.29 to 5.18, and aOR 1.35; 95% CI, 0.95 to 1.92, respectively). LTPA-HG associations differed by prepregnancy BMI but not by prepregnancy smoking. The increase in risk of HG was more than 4-fold for women with BMI≥25 kg/m2 reporting no LTPA pregnancy (aOR 4.89; 2.13 to 11.22, test for trend, P<0.05).

CONCLUSIONS: Lack of LTPA before pregnancy was associated with an increased risk of HG. Inactive women with overweight or obesity before pregnancy may have the highest risk of HG during pregnancy.

1636 May 30 2:45 PM - 3:00 PM
Is Midlife Quadriceps Muscular Strength Protective Against Later Life Osteoarthritis and Subsequent Total Joint Replacement?
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(NO relevant relationships reported)

Abstract:
We have previously shown a relationship between cardiorespiratory fitness/physical activity and the likelihood of developing hip/knee osteoarthritis (OA) later in life. Another possible predictor of hip/knee OA weakness is the quadriceps strength. Because it is unknown whether or not midlife quadriceps strength predisposes to OA and hip/knee total joint replacement (HJR) later in life, the current study was undertaken.

Purpose: The purpose of this study was to examine the relationship between midlife quadriceps muscle strength and the likelihood of developing OA and undergoing a HJR later in life.

Methods: We linked strength and clinical data from 3944 (3431 men and 513 women) participants in the Cooper Center Longitudinal Study from 1981-1989 to Medicare claims from 1999-2009 (13 women, mean age 49 years). Quadriceps muscle strength was measured via 1-repetition maximum (1-RM) leg press assessment and expressed individually relative to body weight. Outcome measures for OA and HJR were obtained using Medicare administrative data. Proportional hazards regression was used to estimate the risk of incident OA and subsequent risk of HJR after developing OA.

Results: During 20,672 person years of Medicare follow up, 1100 OA events (913 events in men, 187 events in women) were observed. After controlling for age, sex and year of muscle strength assessment, a significant relationship was observed between 1-RM leg press and the likelihood of developing OA later in life (HR 0.76, 95% CI 0.59 - 0.98). Among those who developed OA, we observed 293 hip/knee total joint replacements (244 joint replacements in men, 49 joint replacements in women) during 4947 subsequent person years of observation. When adjusted for the same covariates, higher 1-RM leg press suggested a protective role against HJR, but the findings were not statistically significant (HR 0.80, 95% CI 0.49 - 1.29).

Conclusion: Midlife quadriceps muscular strength may play a protective role against onset of OA later in life. More research is needed to determine if increasing quadriceps muscle strength leads to a reduction in risk of undergoing HJR.

1637 May 30 3:00 PM - 3:15 PM
Measures Of Adiposity And Its Association To Physical Activity In Adults: The Tromsø Study
Edvard H. Sagelv1, Ulf Ekelund, FACSM2, Jonas Johansson3, Boye Welde4, Camielle Grimsgaard4, Nina Emaus4, Anna Nordström1, Soren Brage5, Alexander Horsch1, Laila A. Hopstock1, Bente Morsbed1, 1UiT the Arctic University of Norway, Tromso, Norway. 2Norwegian School of Sport Sciences, Oslo, Norway. 3Umea University, Umed, Sweden. 4University of Cambride, Cambride, United Kingdom. Email: edvard.h.sagelv@uit.no

(NO relevant relationships reported)

Purpose: The purpose of this study was to examine the relationship between measures of adiposity and its association to physical activity. We have previously shown a relationship between cardiorespiratory fitness and the low likelihood of developing hip/knee OA (95% CI, -0.72-0.90 %). The association between MVPA and percentage body fat (standardized β=-0.280, 95%CI: -0.363 to 0.296) was significantly considered larger than for WC (standardized β=-0.236, 95%CI: -0.358 to 0.298). The association between MVPA and percentage body fat (standardized β=-0.300, 95%CI: -0.399 to 0.249) was significantly considered larger than for WC (standardized β=-0.270, 95%CI: -0.326 to 0.298). The association between MVPA and percentage body fat (standardized β=-0.270, 95%CI: -0.326 to 0.298) was considered significantly larger than for WC (standardized β=-0.220, 95%CI: -0.319 to 0.235) and BMI (standardized β=-0.200, 95%CI: -0.236 to 0.219). MVPA explained 6%, 20%, and 44% of the variance in BMI, WC and percentage total body fat, respectively, after adjustment for potential confounders.

Conclusion: Adiposity measured with DXA, explained more of the variation in the association with MVPA and BMI, indicating that the association between adiposity and physical activity depends on the accuracy of the measurement. As DXA distinguishes between fat and fat-free mass, whereas BMI and WC acts as proxy measures of adiposity, DXA may be the best choice for expressing adiposity. Due to the cross-sectional design of our analyses, we cannot establish causality in the association between MVPA and adiposity.

1638 May 30 3:15 PM - 3:30 PM
Associations Between Steps Per Day And Mortality In A Representative Sample Of US Adults
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(NO relevant relationships reported)

Purpose: Walking is the most popular form of physical activity among adults, but it’s still unknown how many steps per day are necessary to reduce mortality risk. This study examined the relationship between objectively measured steps/day and mortality using NHANES data. METHODS: Participants were a representative sample of US adults (n=4,840 adults; ≥40 years) assessed for physical activity in 2003-06 using an accelerometer and followed through 2015 for mortality status and cause of death using ICD-10 codes. Accelerometer-derived steps/day were modelled against triaxial acceleration counts and defined as >2690 counts per minute. In order to compare the magnitude of the association between MVPA and the three adiposity measures, the associations were considered significantly different if the 95% CI of the standardized β’s overlapped by <50%. RESULTS: After adjustment for age, sex, body height, smoking and educational level, for every 10-minute increase in MVPA, BMI decreased with -0.29 kg·m-2 (95% CI: -0.25-0.33 kg·m-2), WC decreased with -0.94 cm (95% CI: -0.83-1.04 cm) and percentage total body fat decreased with -0.81% (95% CI: -0.72-0.90 %). The association between MVPA and percentage body fat (standardized β=-0.270, 95%CI: -0.326 to 0.298) was significantly larger than for WC (standardized β=-0.220, 95%CI: -0.319 to 0.235) and BMI (standardized β=-0.200, 95%CI: -0.236 to 0.219) (p<0.05). MVPA explained 6%, 20%, and 44% of the variance in BMI, WC and percentage total body fat, respectively, after adjustment for potential confounders.

Conclusion: Adiposity measured with DXA, explained more of the variation in the association with MVPA than WC and BMI, indicating that the association between adiposity and physical activity depends on the accuracy of the measurement. As DXA distinguishes between fat and fat-free mass, whereas BMI and WC acts as proxy measures of adiposity, DXA may be the best choice for expressing adiposity. Due to the cross-sectional design of our analyses, we cannot establish causality in the association between MVPA and adiposity.
with reduced mobility, poor/very poor health condition, and excluding the first two years of follow-up. NHANES population sample weights and adjustments for the complex survey design were employed.

**RESULTS:** A total of 1,165 deaths occurred during follow-up (406 from CVD, and 283 from cancer). The relation between steps/day and mortality was non-linear (p<.01). When compared to our reference ~4000 steps/day, an increase of 2,000 steps/day was associated with 36% lower risk for all-cause mortality (HR=0.64, 95% CI: 0.59, 0.70), 46% lower CVD mortality (HR=0.54, 95% CI: 0.20, 1.43), and 21% lower cancer mortality (HR=0.79, 95% CI: 0.69, 0.91). There were negligible reductions in risk beyond 10,000-12,000 steps/day. Results from sensitivity analyses did not alter the activity-mortality associations.

**CONCLUSIONS:** Modest increases in steps/day (2000 steps/day) are associated with reduced risk for mortality with no extended benefits beyond 10,000-12,000 steps/day. The step/day-mortality associations described here can help setting public health/clinical goals.

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**D-14 Free Communication/Slide - Physical Activity/Exercise in Clinical Populations**

**Room**: CC-105B

1639 **Chair**: Cemal Ozemek, FACSM. University of Illinois Chicago, Chicago, IL.

(No relevant relationships reported)

**PURPOSE:** Heart Failure (HF) is a major cause of morbidity and mortality worldwide. Ventilatory responses to acute exercise have important prognostic value in HF patients. This study examined baseline ventilatory measures to determine if obesity further impacts ventilatory responses in normal subjects and heart failure patients with preserved ejection fraction (HFrEF).

**Methods:** All participants performed a cardiopulmonary exercise test to maximal effort to quantify ventilatory responses (tidal volume [TV], breathing frequency [BF], and minute ventilation [VE]) at submaximal (25 watts) and peak exercise. Ventilation efficiency was determined by assessing VE/ VCO2 at submax and the VE/VCO2 slope. Obese vs. non-obese HFpEF participants were categorized based on BMI >30 kg/m2. One-way ANOVA was performed to determine if there were significant (p<0.05) differences between groups. Results: The obese HFpEF group had higher VE during peak exercise than the non-obese group (p<0.05), which was mainly due to greater BF (p<0.08) versus TV (p=0.24). The VE/ VCO2 at submaximal workload and VE/VCO2 slope were significantly higher in the non-obese HFpEF group. Conclusion: As hypothesized, obese HFpEF participants exhibited worse ventilatory function than the non-obese HFpEF patient at similar levels of exercise. However, obese HFpEF participants demonstrate a similar degree of ventilatory inefficiency compared to normal weight HFpEF participants. Since ventilatory efficiency was not abnormal in obese HFpEF it appears that their prognosis was no worse than normal weight HFpEF participants.

1640 **May 30 1:30 PM - 1:45 PM**

**Examining the Impact of Obesity on Ventilatory Responses During Acute Exercise in Patients with HFpEF**

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(No relevant relationships reported)

**PURPOSE:** High-intensity interval training (HIIT) has been used to reduce risk factors for conduit artery dysfunction characterized by decreased brachial artery flow-mediated dilation (FMD). Reduced FMD of 1% is associated with an 8-13% increased risk of future cardiovascular events1, and thus interventions designed to improve FMD in patients with CAD are warranted. Short-term supervised exercise training may improve FMD, however whether improvements are maintained longer term following cessation of supervised cardiac rehabilitation (CR), is unclear. We compared the short- and long-term effect of High Intensity Interval Training (HIIT) and Moderate Intensity Continuous Training (MICT) on FMD in patients with CAD commencing a 4-week CR program in a real world hospital-based setting.

**METHODS:** Patients with angiographically-proven CAD (Age: 64±7; 35 males, 3 females) completed 3 sessions per week (2 supervised, 1 home-based) for 4-weeks, randomized to either 1) HIIT (n=21): 4 x 4 minute high intensity intervals at a rating of perceived exertion (RPE) 15-18 interspersed with 3 minute active recovery periods or 2) MICT usual care (n=17): 40 minutes moderate intensity continuous exercise at an RPE 11-13.

**RESULTS:** Baseline FMD was not different between groups [HIIT: 3.1% (2.2 to 4.0); MICT: 2.9% (1.9 to 3.9), p=0.657]. FMD increased from baseline at 4 weeks, 6 months and 12 months in the HIIT group [4 weeks: +1.8% (0.8 to 2.7), p=0.001; 6-months: +1.6% (0.7 to 2.6), p=0.001; 12-months: +1.4% (0.4 to 2.3), p=0.007], with negligible changes in the MICT group [4 weeks: +0.4% (1.1 to 1.0), p=0.94; 6 months: +1.0% (0.0 to 2.1), p=0.063; 12 months: +0.3% (0.7 to 1.3), p=0.52].

**CONCLUSIONS:** A 4-week CR program of HIIT, but not MICT (usual care), improved conduit artery function in patients with CAD. Improved FMD with HIIT was maintained long-term at 6- and 12 months with home-based training.

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**THURSDAY, MAY 30, 2019**

**May 30 1:45 PM - 2:00 PM**

**Comparison of Two High-Intensity Interval Training Modalities on Cardiometabolic Health in Overweight/Obese Women**

Ozgur Alan, Emily W. Flanagan, Lafayette T. Watson, Andrew N.L. Buskard, Demet Tekin, Arlette Perry, FACSM. University of Miami, Coral Gables, FL. (Sponsor: Arlette Perry, FACSM)

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(No relevant relationships reported)

High-intensity interval training (HIIT) has been used to reduce risk factors for diabetes, obesity, cardiovascular diseases and metabolic syndrome (MetS). Few studies have compared resistance-HIIT (R-HIIT) to aerobic-HIIT (A-HIIT) in a worksite wellness program designed to reduce risk factors for the MetS. **PURPOSE:** To compare the effects of A-HIIT and R-HIIT to that of a control group (CON) on physical characteristics, cardiometabolic health, and self-reported well-being in women employees attending a worksite wellness program. **METHODS:** A total of 48 overweight/obese women possessing one or more MetS risk factors were randomly assigned to one of three groups with 15 women completing all testing and training procedures: A-HIIT (n=10), R-HIIT (n=10), and CON (n=11). A-HIIT and R-HIIT groups trained 3x/wk for 25 minutes in an 8-week program at an average training intensity of 81.0 ± 1.0 %HRmax and 81.9 ± 1.0 %HRmax, respectively. ANCOVA was used to determine differences among groups on all dependent variables at post-testing after adjusting for baseline values. Post-hoc analyses were performed using Bonferroni adjustments.

**RESULTS:** Both A-HIIT (Mdiff = 23.9 m, p=0.029) and R-HIIT (Mdiff = 23.8 m, p=0.029) had higher aerobic fitness than CON (Mdiff = 190.9 m SEM=6.3) using the 2-minute walk test following training. Only R-HIIT (Mdiff = 45.3 W, p=0.002) showed increases in upper body power over CON (Mdiff = 949 W SEM=8.2) while displaying lower fasting insulin (Mdiff = 5.6 µU/ml p=0.036) compared to CON (Mdiff = 17.4 µU/ml, SEM=1.4). R-HIIT also showed greater reductions in HOMA2-IR (Mdiff = -0.7, p=0.046) than CON (Mdiff = -2.2, SEM=0.2). Furthermore, HOMA2-IR was lower in R-HIIT compared to both CON (Mdiff = -159.3%, SEM=8.8, Mdiff = -38.5%, p=0.017) and A-HIIT (Mdiff = -172.2%, SEM=9.4, Mdiff = -51.4%, p=0.002). Finally, R-HIIT had significantly higher scores on the physical function domain of Patient Reported Outcome Measurement System (PROMIS®)57 well-being questionnaire compared to the CON group (Mdiff = 51.8 SEM=1.4, Mdiff = 5.7, p=0.035).

**CONCLUSIONS:** Our study showed that R-HIIT can be considered as part of a risk reducing worksite-wellness strategy for improving physical characteristics, cardiometabolic health, and well-being in women possessing one or more components of the MetS. Supported by UM Citizens Board Grant
OPTIMIZING UTILIZATION OF A CARDIAC REHABILITATION FACILITY FOR CHRONIC DISEASE PREVENTION.

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PURPOSE: Cardiac rehabilitation (CR) involves delivery of structured exercise, education and risk reduction, in a cost-effective manner. Despite its benefits, and clinical practice guideline recommendations, CR programs are grossly underused due to multiple barriers. A large study of 2,674,427 patients showed that CR was used in 13.9% of patients hospitalized for AMI and in 31.0% of those who underwent CABG surgery. To help optimize utilization of resources, at our hospital, we utilised our cardiac rehabilitation facility to include other disease groups such as cancer, respiratory and stable cerebrovascular diseases, since the principles of exercise prescription for these disease groups are similar to CR and require similar infrastructure. The purpose was to utilise a cardiac rehabilitation centre as a chronic disease prevention centre for oncology, and pulmonary patients. To also assess the effects of the comprehensive program on physical fitness levels of these patients using the 6-minute walk test.

METHODS: 319 patients, which included those with cardiac disease (185), pulmonary disease (36) and cancer (98) were assessed as part of this study over a period of 3 years. The program comprised aerobic exercises, resistance training, yoga, and disease specific rehabilitation. The aerobic capacity was assessed before and after one month of rehabilitation by means of the 6 Minute Walk Test (6MWT).

RESULTS: The 6-minute walk test distance (6MWTD) in the cardiovascular group improved from 331.56 (± 99.68) to 413.99 (± 104.43) meters, 24.86% increase from baseline (p<0.0001); pulmonary group improved from 313.17 (± 100.90) to 339.31 (± 116.92) meters, 8.35% increase from baseline (p=0.0002) and oncology group improved from 380.29 (± 97.24) to 431.20 (± 96.44) meters, 13.39% increase from baseline (p<0.0001).

CONCLUSIONS: A comprehensive CR facility can be successfully used to include other chronic disease group patients. It helps to improve overall aerobic capacity as indicated by significant increase in 6-minute walk test distance in cardiac, pulmonary and oncology patients. This can help hospitals deploy their rehabilitation services in an efficient and cost-effective manner.

BIDIRECTIONAL RELATIONSHIPS OF DAILY PHYSICAL ACTIVITY AND SLEEP AMONG PATIENTS WITH HEART FAILURE AND INSOMNIA

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Physical activity is associated with better sleep quality across a wide range of populations, but the causal direction of this relationship is unclear due to lack of longitudinal and experimental studies. Patients with heart failure (HF) bear particular risk of poor sleep and low physical activity.

PURPOSE: Examine the relationships between within-person day-to-day fluctuations in physical activity and sleep quality among patients with stable NYHA Class I-IV HF and insomnia (insomnia severity index > 7).

METHODS: Patients wore a uniaxial wrist accelerometer (Actiwatch) for 14 consecutive days and nights to measure total daytime activity counts, total sleep time, sleep onset latency and sleep continuity (sleep efficiency and wake time after sleep onset) (WASO). Two-level multilevel models with daily and individual variation predicted daytime activity outcomes and sleep outcomes, separately. We adjusted for covariates within (day of the week) and between subjects (age, Charlson Comorbidity Index (CCI), NYHA HF Class, and body mass index (BMI)). Significance p < 0.05.

RESULTS: Participants (n=114, M = 62.4 ± 12.1 years, female 43%, black 22%, white 22%, NYHA Class 1.9 ± 0.8) on average obese (BMI 31.4 ± 7.6 kg/m²) with multiple comorbidities (CCI 3.2 ± 2.0). Daytime activity (177 ± 82 x 10³ counts/day) was associated with younger age (β = -1.32 ± 0.50), fewer comorbidities (β = -10.57 ± 3.26), lower NYHA class (β = -17.99 ± 7.30), and a tendency for lower BMI (β = -1.58 ± 0.83; p = 0.06). Comorbidity was associated with poorer sleep efficiency (β = -0.98 ± 0.48) and more WASO (β = 5.94 ± 2.05). After adjustment for all significant covariates, daytime activity was not associated with sleep characteristics the next night, but every minute less total sleep time (β = -0.075 ± 0.015) or WASO (β = -0.114 ± 0.042) was associated with ~70 - 100 more activity counts the next day.

CONCLUSIONS: Similar to studies in other chronic diseases, less WASO and less total sleep time both was associated with more activity the next day, but these were not bidirectional relationships since activity the previous day was not associated with sleep characteristics. Future research should confirm these results by polysomnography and hip accelerometry and evaluate mechanisms.

MEASURING PHYSICAL ACTIVITY IN PEOPLE WITH HEART FAILURE - AN ACCELEROMETER CALIBRATION STUDY

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PURPOSE: To estimate acceleration values corresponding to light and moderate to vigorous intensity physical activity (PA) in people with heart failure via calibration with oxygen consumption (VOⱽ). METHODS: 21 adults with heart failure undertook a range of typical lifestyle activities (including laying down, and walking at different speeds) whilst wearing three accelerometers (each wrist and the left hip) and a portable gas analyser. Resting metabolic rate (RMR) was established and participants also undertook an incremental shuttle walk test (ISWT) to estimate fitness. Location specific activity intensity thresholds were established via Receiver Operator Characteristic (ROC) curve analysis. RESULTS: Participants had an average age of 71.1 ± 14.3 years, the majority were male (24% female) and average BMI was 28.2 ± 4.4 kg/m². Average distance and time walked on the ISWT was 279 ± 192 m, and average RMR was 0.76 ± 0.19 METS. The measured metabolic cost of slow paced walking (average pace 2.6 kph) was 4.09 ± 1.08 METS - higher than estimates based on standard methods (i.e. VOⱽ /3.5 ml/kg/min (3.03 ± 0.63 METS) or the Compendium of PA (2.0 METS). Similarly, moderate paced walking (average pace 3.5 kph) averaged 4.65 ± 1.08 METS using measured RMR compared to 3.46 ± 0.78 METS via the standard methods and 2.8 METS via the Compendium. ROC curve analysis will be used to estimate acceleration values corresponding to light and moderate to vigorous intensity PA.

CONCLUSIONS: Using single accelerometer values for estimating PA intensity assumes energy expenditure is the same for specific activities irrespective of fitness level, which risks underestimating the PA levels of low fit populations such as people with heart failure. It may also risk prescripning PA intensities that are too high for this population. Results of this study indicate that the measured metabolic cost of activities such as walking at a light pace are much higher than estimated METs reported in the PA compendium. Population specific accelerometer thresholds for estimating light and moderate to vigorous intensity PA will permit more precise measures of the prevalence of PA in people with heart failure.

THE EFFECT OF A PERSONALIZED MULTI-COMPONENT LIFESTYLE INTERVENTION PROGRAM IN STAGE 3 & 4 CKD PATIENTS.

Samuel A. Headley, FACSM1, Jasmin Hutchinson2, Brian Thompson3, Marissa Ostroff4, Courtney Doyle-Campbell5, Allen Cornelius6, Kristen Dempsey7, Jennifer Siddall8, Emily Miele9, Elizabeth Evans10, Brianna Wood11, Cherilyn Sirois12, Brett Winston13, Michael Germain13. 1Springfield College, Springfield, MA. 2Western New England University, Springfield, MA. 3University of the Rockies, Denver, CO. 4Renal and Transplant Associates of New England, Springfield, MA. Email: sheadley@springfieldcollege.edu

PURPOSE: We studied the effect of a comprehensive lifestyle intervention (nutrition, physical activity, pharmacy, and behavioral counseling) on health related outcomes in 42 stage 3 & 4 (eGFRs 15-59 ml/min/1.73m²) CKD patients (age 60.2 ± 9.2, BMI 34.5 ± 7.8). METHODS: Patients were assigned randomly to a treatment (T, n = 27) or usual care (UC, n = 15) group, and asked to attend four test sessions: baseline (BL), month 1 (M1), month 3 (M3) and month 6 (M6). Anthropometrics, medication use, three-day dietary intake, nutrition (ESBP/BDBP) & brachial blood pressures (ESBP/ BDBP), augmentation index (Alx@75), Short Physical Performance Battery (SPPB) test, the six-minute walk test (6MWT), leg strength & power, self-efficacy to adhere to diet and physical activity (PA) recommendations, and the KDQOL were assessed at each visit. PA levels and inflammatory markers (IL-6 & InsR) were assessed at BL and M6. Patients in T received individual counseling at BL, M1, M3 & M6 with biweekly follow-up phone contact. Patients in UC were asked to follow the instructions their nephrologist. RESULTS: All data are presented as means ± SD. Primary outcome variables were analyzed by 2 x 2 mixed factor ANOVAs. See table for some of the findings:
Chest Pain in a Football Strength Coach

HISTORY: A 29-year-old adopted, African American male football coach traveled with the football team to Colorado to hike Pikes Peak. At 14,000 feet, he developed mid-sternal chest pain that radiated to his left upper abdomen and left shoulder. The pain worsened with deep breathing and exertion. He presented to a local ED, where a CT abdomen/pelvis revealed splenomegaly. Routine labs revealed a mild anemia and thrombocytopenia. Upon returning home, the pain continued for 2 days so he presented to clinic. There, he denied calf pain, extremity swelling, fever, nausia, palpitations, vomiting, hematuria, and syncope. He denied taking medications, supplements, and alcohol/drugs. He reported developing similar symptoms in 2015, also when hiking. At that time, he was diagnosed with pericarditis with symptom resolution in a few days.

PHYSICAL EXAMINATION:
Temp 36.9F, BP 132/61, HR 67, RR 16, O2 sat 97%
At rest, he was alert and comfortable. Breathing comfortably with symmetric aeration; no wheezing or crackles. Heart had regular rate and rhythm, without murmur.

Abdomen was soft and non-distended, though he was tender to palpation in the left upper quadrant. No lower extremity edema; calves were symmetric and non-tender to palpation.

DIFFERENTIAL DIAGNOSIS:
Pulmonary Embolus
Pericarditis
Mononucleosis
Sickle cell crisis in a patient with sickle cell trait

TEST AND RESULTS: A CT angiography chest, chest radiograph, and abdominal ultrasound were obtained and were notable for splenomegaly (14.3cm); otherwise unremarkable. An EKG revealed sinus bradycardia with sinus arrhythmia. Labs were obtained including CBCP, CMP, CK, haptoglobin, LDH, and hemoglobin electrophoresis, and notable for a mild anemia (hemoglobin 22.1); thrombocytopenia (platelets 52), mild transaminists (AST 42, ALT 37), and evidence of hemolysis (haptoglobin < 10, LDH 486, CK 384). Hemoglobin electrophoresis was consistent with sickle cell trait.

FINAL WORKING DIAGNOSIS: Sickle cell crisis in a patient with sickle cell trait.

TREATMENT AND OUTCOMES:
1. Tended labs for 2 weeks.
2. Avoid strenuous activity until pain resolved.
3. Provide counseling regarding hydration, heat illness, and training especially at altitude.
4. Follow up with hematology.
5. Consider screening NCAA coaches/athletic trainers given NCAA athletes are screened for sickle cell.

D-15 Clinical Case Slide - Chest Pain
Thursday, May 30, 2019, 1:30 PM - 3:10 PM
Room: CC-304E

1647 Chair: Paolo Emilio Adami. Universita Degli Studi Di Roma “Foro Italico”; Rome, Italy.
(No relevant relationships reported)

1648 Discussant: Hallie Labador. NorthShore University HealthSystem, Gurnee, IL.
(No relevant relationships reported)

1649 Discussant: Shelley Street Callender. Navicent Health System, Macon, GA.
(No relevant relationships reported)

1650 May 30 1:30 PM - 1:50 PM
Chest Pain in a Football Strength Coach
Michael Anacker, Keri Denay, FACSM. University of Michigan, Ann Arbor, MI. (Sponsor: Keri Denay, FACSM)
(No relevant relationships reported)

HISTORY: 21-year-old collegiate football defensive lineman complained of rib pain after a road game in Tennessee. Aside from a mild ankle sprain, he denied any specific injury to his torso/ribs. Pain began on the left side and then migrated to the right side with radiation to flank and sternum areas bilaterally. Had pain with deep breathing and sensation of tightness in the rib area. Took naproxen with some relief of his symptoms. Denied chest pressure, shortness of breath, palpitations, fevers or chills.

PMH: HTN, ADD
Med: Amlodipine, Adderall
SH: No tobacco, social ETOH, no illicit drugs
FH: Non contributory

PHYSICAL EXAMINATION:
Well gastrules in mild distress due to pain
Blood pressure 140/90, pulse 72, RR 14.
Neck: No JVD
CV: RRR, normal heart sounds. No gallop or rub. No murmur.
Pulmonary: No respiratory distress. Breath sounds normal. Good air movement. No wheezes or rales.

Chest: Tenderness to palpation along the flank areas greatest over ribs 5-7 bilaterally. No true focal pain noted.

Ext: DP and PT +2. No edema.
No true focal pain noted.

Differential Diagnosis:
1. Costochondritis
2. Rib fracture
3. Chest wall strain
4. Pneumothorax
5. Pulmonary Embolism

Interim History: Treated for chest wall injury with varying response over the next 4 days. Re-presented 2 hours before the next home game with shortness of breath, tachypnea, and worsening chest discomfort. Transferred to ER.

TEST AND RESULTS:
Chest x-ray: focal right lower lobe opacification
D-Dimer 774
CT PA- acute bilateral segmental and sub-segmental pulmonary emboli, without evidence of right heart strain
Factor V Leiden, Anti-Cardiolipin, and Prothrombin negative
Lupus anticoagulant, Protein S, Protein C and Antithrombin III pending

FINAL WORKING DIAGNOSIS: Acute bilateral segmental and sub-segmental pulmonary emboli, unclear etiology.

TREATMENT AND OUTCOMES:
1. Anticoagulation therapy with Apixaban for minimum of 3 months with considerations for lifetime treatment
2. No contact sports or activities while on anticoagulation.
3. Provide counseling regarding hydration, heat illness, and training especially at altitude.
4. Follow up with hematology.
5. Consider screening NCAA coaches/athletic trainers given NCAA athletes are screened for sickle cell.

Abdomen was soft and non-distended, though he was tender to palpation in the left upper quadrant. No lower extremity edema; calves were symmetric and non-tender to palpation.

Differential Diagnosis:
Pulmonary Embolus
Pericarditis
Mononucleosis
Sickle cell crisis in a patient with sickle cell trait

Test and Results: A CT angiography chest, chest radiograph, and abdominal ultrasound were obtained and were notable for splenomegaly (14.3cm); otherwise unremarkable. An EKG revealed sinus bradycardia with sinus arrhythmia. Labs were obtained including CBCP, CMP, CK, haptoglobin, LDH, and hemoglobin electrophoresis, and notable for a mild anemia (hemoglobin 22.1); thrombocytopenia (platelets 52), mild transaminists (AST 42, ALT 37), and evidence of hemolysis (haptoglobin < 10, LDH 486, CK 384). Hemoglobin electrophoresis was consistent with sickle cell trait.

Final Working Diagnosis: Sickle cell crisis in a patient with sickle cell trait.

Treatment and Outcomes:
1. Tended labs for 2 weeks.
2. Avoid strenuous activity until pain resolved.
3. Provide counseling regarding hydration, heat illness, and training especially at altitude.
4. Follow up with hematology.
5. Consider screening NCAA coaches/athletic trainers given NCAA athletes are screened for sickle cell.

1651 May 30 1:50 PM - 2:10 PM
Rib Pain - Football
Christopher Hicks. University of Virginia. CHARLOTTESVILLE, VA. (Sponsor: John M. MacKnight, M.D., FACSM)
Email: c.hickstwo@gmail.com
(No relevant relationships reported)
1652 May 30 2:10 PM - 2:30 PM
10 Months of Dyspnea Following Long Runs in Marathon Athlete
Jay Shah, Jose Velasquez, James Pearson, Hamed Shalikar. Citrus Valley Health Partners, West Covina, CA. (Sponsor: Dr. Aaron Rubin, FACSM)
Email: jashah80@gmail.com
(No relevant relationships reported)

HISTORY: A 51-year-old male marathon runner presented with pleuritic chest pain and increasingly progressive shortness of breath at the end of his runs. At baseline, he was running a marathon in 3 hours, but his runs were reduced to less than 15 miles. He completed a 15k in 1 hour and 30 minutes but with severe dyspnea on exertion. Patient was referred to the Sports medicine clinic for further evaluation.

PHYSICAL EXAMINATION:
Vitals within normal limits
NAD, speaking in full sentences, no chest wall tenderness. CV: regular rate and rhythm, no edema. Pulmonary: normal respiratory effort without distress, absent of wheezes or rales.

DIFFERENTIAL DIAGNOSIS:
1) Overtraining syndrome
2) Asthma/Exercise induced bronchospasm
3) Viral syndrome
4) Pulmonary embolism

TESTS AND RESULTS:
8/2017: EKG nonspecific/chest X-ray reported small bilateral pleural effusion
8/2017: Non contrast chest CT - no pleural effusion
8/2017: TTEcho: EF 60-65%, unremarkable valves & chambers
8/2017: Treadmill test unspecific, high exercise tolerance
9/2017: CXR - persistence of bilateral pleural effusion.
1/2018: Myocardial perfusion scan - no evidence of stress induced ischemia
3/2018: Non Contrast chest CT - Diminished right lung pleural opacity, probably represented inflammatory change
9/2018: D-dimer 564
9/2018: CT-A - small embolus in a subsegmental branch of the pulmonary artery to the left lower lobe. Second pulmonary embolus in a segmental branch of the pulmonary artery to the right lower lobe.

FINAL WORKING DIAGNOSIS:
Bilateral unprovoked pulmonary embolism

TREATMENT AND OUTCOMES:
1. Refrained from rugby for several months
2. Started on regular daily meloxicam 7.5mg for 1 month
3. Unremarkable CBC, ESR and CRP
4. - Unremarkable CIB, ESR and CRP
5. Pulmonary embolism
6. Anticoagulation with Warfarin vs. Direct Oral Anticoagulant such as Pradaxa with patient in extensive detail. Patient opted for Pradaxa.

1654 May 30 2:50 PM - 3:10 PM
Focal Chest Pain- Rugby
Joshua Martin, Prakash Jayabal, Joseph Ihm, FACSM. Shirley Ryan AbilityLab/ Northwestern, Chicago, IL. (No relevant relationships reported)

HISTORY: A 21-year old rugby-playing male presented with a one year history of worsening anterior chest wall pain. Pain was associated with a popping sensation in the anterior chest. Additionally, symptoms were aggravated by overhead movements and chest exercises. Pain was focal, without discomfort in the ribs or thoracic back. He denied shortness of breath, pain while coughing, and all other systemic symptoms.

PHYSICAL EXAMINATION: Local examination revealed a tender swelling at the manubriosternal joint (MSJ). Chest expansion was full and deep breaths did not elicit pain. Full painless range of motion at the shoulder, with strength intact to manual muscle testing throughout

DIFFERENTIAL DIAGNOSIS:
1. Strain of pectoralis major
2. Costochondritis
3. Inflammatory arthritis
4. Osteoarthritis of the MSJ
5. Pulmonary embolism
6. Pneumothorax
7. Pericarditis

TEST AND RESULTS: Prior cardiology work-up did not reveal an eliciting cause

Lateral x-ray of the chest (sternal view)
- Bone resorption on both sides of the MSJ, and soft tissue swelling anterior to the joint.
Chest MRI
- Irregularity at the sternal and manubrial articular surfaces, along with a small effusion, compatible with osteoarthritis.
Further rheumatological workup for inflammatory markers
- Unremarkable CIB, ESR and CRP

FINAL WORKING DIAGNOSIS: Manubriosternal osteoarthritis

TREATMENT AND OUTCOMES:
1. Refrained from rugby for several months
2. Started on regular daily meloxicam 7.5mg for 1 month
3. Significant improvement in symptoms

1653 May 30 2:30 PM - 2:50 PM
Chest Injury-football
Kendrick I. Watkins, Rehal A. Bhojani. University of Texas Health Science Center, Houston, TX. (Sponsor: Charles Chassay, FACSM)
(No relevant relationships reported)

HISTORY: 17 year old high school football wide receiver presented with left back and rib pain. He sustained a hit in that region during a football game the night before. He was taken out of the game due to pain and difficulty breathing which ultimately kept him from finishing the game. After the game he continued to have pain for which he took a muscle relaxant that he had from a previous injury and over the counter pain medication with minimal pain relief. The pain persisted through the night and into the following morning. His pain was worse with deep breathing and any pressure on his chest. He denied any shortness of breath, dyspnea with exertion, cough, wheezing or hemoptysis.

PHYSICAL EXAMINATION: Appeared in no acute distress.
Echocardiography over the posterior lateral aspect of left lower ribs with tenderness to palpation, No crepitus, No palpable deformity, Symmetric chest expansion, posterior rib/to back pain reproduced with deep inspiration, Equal bilateral breath sounds, No hyper-resonance to percussion, Normal respiratory rate, Negative anterior posterior compression test, Positive lateral compression test, Full AROM of the back

DIFFERENTIAL DIAGNOSIS: Rib fracture, Pneumothorax, Pulmonary contusion, Pulmonary embolism

TEST AND RESULTS: X-ray Rib series: Small left apical pneumothorax involving approximately 20% of the hemi thorax. Suspected nondisplaced fractures involving the posterolateral left eighth and ninth ribs with small linear lucencies within these regions. Chest CT scan: Small left-sided pneumothorax approximately 20%. No acute osseous injury.

FINAL WORKING DIAGNOSIS: Pneumothorax
PHYSICAL EXAM: Hi 4’ 6” (1.372 m) | Wt 69 lb (31.3 kg) | BMI 16.64 kg/m2 (56 percentile), Healthy and NAD. Accompanied by her mother.

Examination:
Inspection: Neutral foot type. Normal alignment of both extremities. There was no redness, swelling, or skin changes.
Palpation: moderate tenderness on the right plantar mid foot.
Range of motion: there was full active range of motion of the ankle, without significant pain.

Strength: Muscle strength (ankle plantarflexion, dorsiflexion, inversion, eversion) full.
Special tests: Fracture test (tap, percussion, bump) negative, squeeze test negative, anterior drawer test negative, Talar tilt test negative, Stress test negative, Thompson test negative.

DIFFERENTIAL DIAGNOSIS:

1. Navicular bone stress injury
2. Talar coalition
3. Anterior tibialis tendinopathy
4. Posterior tibialis tendinopathy
5. Bone tumor

6. Nerve entrapment
7. Heel pad syndrome
8. Sever disease

TEST AND RESULTS:
1. Ankle X-ray: No obvious fracture or callus
2. MRI- Ankle: bone marrow edema in the neck of the calcaneus
3. DXA- Normal bone density

FINAL DIAGNOSIS: Calcaneus bone stress injury

TREATMENT AND OUTCOMES:

1. Decreased activity level
2. Non-weight bearing on crutches for 2 weeks
3. Walking boot for 3 weeks with partial weight bearing on crutches
4. PT 1-2x/ week for 2-3 weeks
5. Vitamin D 2000 IU everyday

6. Partial weight bearing to full weight bearing as tolerated
7. Gradual return to sports after 8 weeks of injury, when she did not have pain with ambulation, and repeat MRI showed no evidence of residual bone marrow edema.

HISTORY: Our patient is a healthy 17 year old female basketball and softball player who had been treated for bilateral Achilles tendinitis. Two weeks prior to presentation, she jumped and created a moment of extreme plantar flexion of her left foot. She had immediate posterior ankle pain without edema or erythema. A physical therapist recommended heel cups. She did not consistently rest. Her basketball performance was poor over the next two weeks.

PHYSICAL EXAMINATION: Normal gait and inspection. Tender deep to the Achilles tendon and musculotendinous junction. No tenderness of the calcaneus, medial or lateral malleolus, or midfoot. Active ROM preserved. Passive ROM limited a few degrees in both dorsiflexion and plantar flexion compared to the contralateral foot. 5/5 plantar flexion and dorsiflexion strength. Resisted plantar flexion and hopping on left foot caused significant discomfort. Normal Achilles squeeze test.

DIFFERENTIAL DIAGNOSIS:

1. Achilles tendinitis
2. Retrocalcaneal bursitis
3. Fracture of os trigonum
4. Tendinitis of flexor hallucis or flexor digitorum tendon
5. Posterior facet arthritis of the subtalar joint

TEST AND RESULTS:

1. X-ray: Originally radiologist read as normal, but sports medicine interpretation was that there appeared to be a lucency extending through the lateral tubercle of the posterior process of the talus consistent with acute fracture.
2. MRI: Displaced fracture of the Stieda process of the talus consistent with acute fracture.

FINAL WORKING DIAGNOSIS: Fracture of Stieda process of talus

TREATMENT AND OUTCOMES:

1. After two weeks of rest in a boot, she began isometric exercises without the boot and stationary cycling in the boot.
2. After four weeks in the boot, she progressed to one week of light activity before returning to full activity with orthotic in cleats. P2 required an additional 2 weeks in boot for slow fracture remodeling but then started RTP with full return by 8 weeks.

Abstracts were prepared by the authors and printed as submitted.
**1661**

**May 30 2:30 PM - 2:50 PM**

**Atypical Ankle Pain In A 10-year-old**

Robyn C. Knutson Bueling, TRIA Orthopedics, Woodbury, MN.

Email: robyn.knutsonbueling@parknicollet.com

(No relevant relationships reported)

**HISTORY:** Active 10-year-old non-athlete with acute onset of severe ankle pain and swelling for two days. Occurred while at school but can’t recall injury during PE or recess. Taken to Children’s hospital ER and treated with ice. Presented to Acute Injury Clinic for further evaluation.


**DIFFERENTIAL DIAGNOSIS:** Occult injury. Lymph disease. Joint infection. Post-infectious septic joint. Tumor.

**TEST AND RESULTS:** - Aspirate normal CBC, elevated uric acid, normal CRP, negative culture, negative crystals, substantial RBC and some WBC, lyne negative. - MRI with large tibiotalar joint effusion with multiple large intra-articular masses consistent with polyvillous nodular sclerosis or other synovial metaplasia.

**FINAL WORKING DIAGNOSIS:** PVNS R ankle


**Differential Diagnosis:** Stress fracture Bipartite navicular Osteochondritis dissecans Avascular necrosis Avulsion fracture Morton’s Neuroma

**TEST AND RESULTS:** Normal CBC, elevated uric acid, normal CRP. No rash. No fever. L ankle exam normal.

**FINAL WORKING DIAGNOSIS:** PVNS R ankle


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**1664**

**Discussant**

Emily Kraus. Stanford University, Palo Alto, CA.

(No relevant relationships reported)

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**1665**

**Discussant**

Irene S. Davis, FACSM. Harvard Medical School Spaulding-Cambridge, Cambridge, MA.

(No relevant relationships reported)

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**1666**

**May 30 1:30 PM - 1:50 PM**

**A Rare Cause Of Pain In A Runner: The “Nail-Patella Syndrome”**

Kenneth Vitale, Evelyne Fliszar. University of California San Diego, School of Medicine, La Jolla, CA.

(No relevant relationships reported)
malleolar, decreased left dorsiflexion range of motion, decreased left plantarflexion and inversion strength, a flexible flatfoot deformity, and pain with any attempt to run recreationally.

DIFFERENTIAL DIAGNOSIS:
1. Posterior Tibialis Tendon Dysfunction
2. Eversion Ankle Sprain
3. Foot/ankle fracture

TEST AND RESULTS:
Stiffness: Manual muscle testing 3+/5 with pain on left foot plantarflexion and inversion

Range of motion: Left talocrural dorsiflexion 2° with knee extended and 5° with knee flexed to 90°

Ligamentous testing: Negative external rotation test, anterior drawer, and talar tilt

Neural testing: Negative sciatic nerve tension test with tibial nerve sensitization

Foot fracture: Negative Ottawa ankle rules

Functional Outcomes:
- LEMS 49/80
- Single leg Heel Rise Test: 0 reps

FINAL WORKING DIAGNOSIS: Stage II posterior tibialis tendon dysfunction

TREATMENT AND OUTCOMES:
1. Strengthening
   a. Barefoot short-foot exercise - 3 sets of 10 reps 1x/day
   b. Inversion strengthening with red resistance band - 150-600 reps for 3 sets per day
   c. Double heel rise with unilateral descent - 3 sets of 10 reps 1x/day
e. Gluteal Strengthening
2. Stretching
   a. Barefoot gastroc and soleus stretches. 3 sets of 30 seconds 1x/day
3. Joint Mobilization
   a. Modified Mulligan technique into dorsiflexion for 3 sets of 30 seconds
4. Outcomes
   a. LEFS score improved from 49/80 to 71/80
   b. Single leg heel rise test improved from 0 to 16 reps
c. Range of motion with left dorsiflexion improved from 2° to 10° with full knee extension and from 5° to 15° with 90° of knee flexion
d. Strength improved from 3+/5 to 5/5 with PF and inversion
e. Patient reported 3 consecutive days of running 2 miles without pain

1668 May 30 2:10 PM - 2:30 PM

Ankle Injury -- Running

Jaire N. Saunders MPH, MD, Kevin Mullins MD, Brandee Waite MD. UC Davis, Sacramento, CA. (Sponsor: Brian Davis MD, FACSM)

(No relevant relationships reported)

HISTORY
57yr old female with pmhx HTN, T2DM, HLD, previously seen in clinic for right knee OA secondary to remote injury. Presenting with 3-week history of acute onset right ankle pain. Occurred while running on treadmill after prolonged decrease in activity level due to BUE injuries. Receiving viscosupplementation in right knee with good pain decreased. However, when she attempted to run or walk long distances, she experienced medial lower leg pain, L>R, that progressed to a 7/10 on the L. Despite being told she wouldn’t be able run anymore, her goal was train for another half-marathon.

PHYSICAL EXAM:
1. callus formation L 5° metatarsal, suggesting increased lateral loading
2. Pain’ tendency noted on the medial lower leg BIL, L>R
3. Limited calcaneal eversion on the L and ankle DF on the R
4. Weakness of the inverters, everters, and plantarflexors BIL
5. Weakness of the Hip ABD, EXT and ER L>R. Lower abdominals were also very weak.
6. Running Gait (w/custom orthotics and a cushioned running shoe)

OUTCOME: Pt was discharged March 2018 running 30 min 3x/wk pain-free in a Rearfoot striker BIL.

Increased hip ADD, IR and pelvic drop BIL.
L inverted and-toed-in at foot strike
Increased L arch drop during mid support
Point was 3/10 on the L. When cued to toe out on the L, symptoms reduced and shifted to the calf.

WORKING DIAGNOSIS
Posterior tibialis tendinosis L>R due to weakness and reduced mobility in foot/ankle, along with medialization of the leg due to Hip ADD and IR.

TREATMENT:
1. Weaned pt. slowly out of orthotics to reduce lateral loading
2. Transition to minimal shoes for walking to promote foot/ankle strength
3. Increase mobility of foot/ankle
4. Promote foot/ankle function and control with balance and plyometrics
5. Gait retraining to reduce toe in, inv at foot strike and improve alignment proximally

OUTCOME: Pt was discharged March 2018 running 30 min 3x/wk pain-free in a low profile partial minimal cushion shoe w/o orthotics. She exhibited improved foot alignment and reduced hip add, IR and CPD. Pt continued to wear full minimal shoes during her cross-training. She was able to wear high heels for the first time since her amputations without pain. In Sept 2018, she completed her half marathon pain-free.

1670 May 30 2:50 PM - 3:10 PM

Knee Pain -- Running

Adam K. Willson, Joshua Berkowitz. UNC Chapel Hill, Chapel Hill, NC.

(No relevant relationships reported)

HISTORY: 19 year old female who developed right knee pain over two years ago during mile 23 of a marathon without specific, focal injury. She then consistently developed severe right posterior lateral knee pain after running around 2 miles, significant enough that she cannot continue running. Pain is improved with rest. She was a college athlete (running) but had to quit due to this pain. She had completed 3 courses of physical therapy without improvement. She did not report any other symptoms. She has no pain with activities other than running, or with running distances up to 1.5-2 miles. Prior MRI is normal with the exception of some slight signal in the distal biceps femoris tendon.

PHYSICAL EXAMINATION: Right knee – no erythema, swelling or ecchymosis. Mild to moderate tenderness to palpation at the posterior lateral fibular head and just proximal. No other abnormalities.

DIFFERENTIAL DIAGNOSIS:
1. Biceps femoris tendinopathy
Medicine & Science in Sports & Exercise

2. Proliferative tendinitis
3. Proliferative neurotrophic syndrome
4. Common postoperative nerve entrapment

Test and results:

- PVL articular duplices: No change in PT and AT laminae with plantar and dorsiflexion. Not suspicious for proliferative knee entrapment
- MRI right knee: Suggestive of mild trochlear dysplasia. Visualized posteroanterolateral corner right knee structures were normal. Right intact knee ligaments and menisci
- US-guided diagnostic (anealonic) injection to the biceps femoris tendon sheath yielded no improvement in symptoms

- US-guided corticosteroid injection to the posterior lateral corner (deep to the biceps femoris tendon) provided weeks of complete symptomatic relief and she was able to run 5 miles without symptoms

Final/working diagnosis:

- Low-grade posteroanterior corner injury only symptomatic with prolonged exertion

Treatment and outcomes:

- Clinically has characteristics localizing to the posterior lateral corner, deep to the biceps femoris tendon, possibly related to scar tissue formation or dynamic entrapment
- Ultrasound-guided corticosteroid injection deep to the distal biceps femoris tendon provided relief but only for 3 weeks
- Plan for PRP injection to the posterior lateral corner for further treatment and evaluation
- Possible consideration of exploratory arthroscopy if even transient response to posterior lateral corner treatment can be reproduced

D-18 Rapid Fire Platform - Acute Hypoxia and Aerobic Performance

Thursday, May 30, 2019, 1:30 PM - 2:40 PM
Room: CC-Hall WA2

Chair: Nisha Charkoudian, FACSM. USAIRIEM, Natick, MA.

No relevant relationships reported

The ability to increase exercise ventilation to defend arterial oxyhemoglobin saturation during hypoxic exercise is commonly viewed as an important factor contributing to large individual variations in the degree of performance impairment in hypoxia. While the hypoxic ventilatory response (HVR) could provide insight into the underpinnings of performance impairment in acute hypoxia.

Methods: Sixteen endurance-trained men (VO2 peak: 62.6 ± 6.2 ml kg-1 min-1) performed two poikilocapnic HVR tests: 1) during seated rest (HVRREST) where inspired O2 fraction (FiO2) was progressively reduced; and 2) while cycling at 40% cycle resistance at 75% of age predicted heart rate max for each condition. The two measures were comparable, and 2) to determine whether HVREST is related to the degree of performance impairment in acute hypoxia.

Purpose: 1) to determine in a cohort of highly trained athletes whether the integrated ventilatory response to progressive hypoxia at rest (HVRREST) and during exercise (HVREST) are correlated, and 2) to determine whether HVREST is correlated to the degree of performance impairment in acute hypoxia.

Results: HVRREST was significantly (p < 0.05) greater than HVREST (1.51 ± 0.45 and 0.22 ± 0.14 l·min-1, respectively) and the two measures were not correlated (r = 0.22, p = 0.19). The percentage change in time to complete the TT between normoxia and hypoxia (ΔTT) was calculated as the percentage change in time to complete the TT between normoxia and hypoxia (ΔTT). ΔTT was not correlated with HVRREST or HVREST.

Conclusions: 1) HVREST may not be an appropriate or applicable measure to utilize when studying ventilatory and other physiological responses to exercise and/or exercise performance; and 2) Although HVREST may explain little to the degree of performance impairment in acute hypoxia, (adequate) ventilatory response is likely essential for mitigating these expected hypoxia-induced impairments in performance, at least to some degree.

1671 Chair: Nisha Charkoudian, FACSM. USAIRIEM, Natick, MA.

No relevant relationships reported

1672 May 30 1:30 PM - 1:40 PM
The Role of Ventilatory Responsiveness During Exercise in Performance Impairment in Acute Hypoxia
Keren Constantini, Anna C. Bouilllet, Bruce J. Martin, Robert F. Chapman, FACSM. Indiana University, Bloomington, IN.
Email: keconsta@indiana.edu

No relevant relationships reported

Aerobic performance in hypoxia is often viewed as an important contributor to exercise performance in hypoxia. The ability to increase exercise ventilation to defend arterial oxyhemoglobin saturation during hypoxic exercise is commonly viewed as an important factor contributing to large individual variations in the degree of performance impairment in hypoxia. While the hypoxic ventilatory response (HVR) could provide insight into the underpinnings of performance impairment in acute hypoxia.

Methods:

- Hypoxic ventilatory response (HVR) is comparable, and 2) to determine whether HVREST is related to the degree of performance impairment in acute hypoxia.

Purpose: 1) to determine in a cohort of highly trained athletes whether the integrated ventilatory response to progressive hypoxia at rest (HVRREST) and during exercise (HVREST) are correlated, and 2) to determine whether HVREST is related to the degree of performance impairment in acute hypoxia.

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Conclusions: 1) HVREST may not be an appropriate or applicable measure to utilize when studying ventilatory and other physiological responses to exercise and/or exercise performance; and 2) Although HVREST may explain little to the degree of performance impairment in acute hypoxia, (adequate) ventilatory response is likely essential for mitigating these expected hypoxia-induced impairments in performance, at least to some degree.

1673 May 30 1:40 PM - 1:50 PM
Sex Differences In Respiratory And Circulatory Cost And Arterial Oxygen Saturation During Hypoxic Walking
Masahiro Horiiuchi1, Yoko Hando Kihitaka1, Yoshiyuki Fukuoka1, Herman Pontzer2. Mt. Fuji Research Institute, Fuji-yoshida, Japan. 1Doshisha University, Kyotanabe, Japan. 2Duke University, Durham, NC.

No relevant relationships reported

Purpose:

Since women have smaller lungs and a decreased capacity for lung diffusion compared to men, these differences may increase the work required for women to maintain a given rate of pulmonary ventilation (Vt), resulting in greater exercise-induced arterial hypoxemia (EIAH). Previous studies have ignored the energy expenditure (EE) on circulation (i.e., heart rate; HR) and ventilation during exercise.

Methods:

We sought to investigate sex differences in EE during exercise in women and men. We hypothesized that women would experience greater EIAH, and that the contribution rate of EE, Vt, and HR in response to changes in SpO2 would be different between the sexes. We measured EE during walking at a level gradient under normoxia (room air, 21% O2) and moderate hypoxia (13% O2). Ten healthy young men and ten healthy young women walked on a treadmill at seven speeds (0.67-1.67 m·s-1). Each walking speed lasted for four minutes. EE was calculated using pulmonary oxygen uptake and carbon dioxide output. RESULTS: During walking, reductions in SpO2 trended slightly greater in women under hypoxia (71.5 ± 4.5 % for men and 67.7 ± 6.1 % for women at the fastest gait speed, P < 0.05). Hypoxia-induced elevation in EE, Vt, and HR were calculated by the difference between values in hypoxia and normoxia. Using a multivariate model that correlated EE, Vt, and HR to predict ΔSpO2, ΔSpO2 (hypoxia-induced reduction), we obtained a very strong fit model both for men (r2 = 0.900, P < 0.001) and for women (r2 = 0.957, P < 0.001). We also tried to estimate the relative contributions of ΔEE, ΔVt, and ΔHR to predict ΔSpO2. Using standard partial regression coefficients. The contribution rate to predict ΔSpO2 was markedly different between men and women. In women, the effect of ΔEE and ΔVt were greater (EE: 28.1% in women vs. 15.8% in men; Vt: 41% in women vs. 1.7% in men). Conversely, in men the contribution of ΔHR was greater (82.5 % in men and 67.9 % in women). Moreover, significant sex differences in breathing frequency and tidal volume were observed (P < 0.05, respectively).

Conclusions:

These findings suggested that high-altitude adaptation in response to hypoxemia has different underlying mechanisms between men and women. Our results can help to explain how men and women adapt high-altitude environments.

1674 May 30 1:50 PM - 2:00 PM
Hypoxia Reduces Steady State Cycling Workload
Charli D. Aguilar. University of Nevada Las Vegas, Las Vegas, NV. (Sponsor: James Navalta PhD., FACSM)
Email: audrey.coffee@unlv.edu

No relevant relationships reported

Training in hypoxia is growing in popularity among athletes. Exercise in hypoxic conditions produces decrements in steady state and maximal workload capacity.

Purpose:

The purpose of this pilot study was to characterize the differences in steady-state exercise power between hypoxic and normoxic conditions.

Methods:

- Ten healthy adults (5 males, 5 females) mean age of 23.8 ± 4.5 years volunteered to participate in the study. Pretesting included a graded exercise test to determine the ventilatory threshold.
- Intervention days were at least 72 hours apart but no more than one week. A single blinded and counterbalanced model was used. Steady state exercise was performed on a cycle ergometer (Watt bike Pro, Waukesha, WI, USA) at a rate of 60 RPM for 30 min. Heart rate (HR), blood oxygen saturation (SPO2), cycling watts and mean power were recorded every minute.

Results:

- SPO2: Significantly lower in hypoxic conditions (80.58 ± 4.3 vs. 95.23 ± 0.97 in normoxia, P < 0.001). Average cycle watts was also significantly decreased during hypoxic exercise (110.7 ± 34.5 compared to 125.9 ± 49.6 kcal; P < 0.044). Mean HR was not significantly different between the two conditions.

Conclusions:

Mean power output in normoxia to wattage in hypoxia, r2 = 0.7576. Pearson’s correlation was 0.9699. P < 0.001. CONCLUSION: Hypoxia reduced steady state power without changes in relative intensity. Mean cycling power in normoxic conditions and hypoxic positively correlate. These preliminary findings suggest that a predictive equation could be possible with further data collection.
PURPOSE: There has been recent debate on the potential difference in physiological response between exposure to simulated altitude (normobaric hypoxia) and terrestrial altitude (hypobaric hypoxia). Therefore, the purpose of this research was to determine the difference in the physiological response to normobaric and hypobaric hypoxia during exercise. METHODS: Eight recreationally active subjects (age: 27 ± 5 y; body weight: 73.3 ± 7.4 kg; height: 170.6 ± 6.7 cm; body fat: 19.3 ± 9.2 %) completed incremental cycling exercise to volitional fatigue in three separate environments, normobaric normoxia (NN; 350 m), normobaric hypoxia (NH; simulated 3094 m) and hypobaric hypoxia (HH; 3094 m). Heart rate, blood oxygen saturation, and muscle tissue oxygenation were measured at rest and continuously throughout the exercise trials. RESULTS: Blood oxygen saturation (SpO2) was ~10% higher in NN compared to the two hypoxic conditions (p < 0.001) at rest and all exercise stages, with no difference between NH and HH (p > 0.05). Heart rate was highest at rest in HH (98 ± 13 bpm) compared to NN (83 ± 15 bpm, p > 0.011) and NH (84 ± 14 bpm, p > 0.001) which persisted until 165 watts at which point no difference was observed (p > 0.05). Muscle tissue oxygenation was 17% higher in HH compared to NN and 19% higher than NH throughout exposure (p < 0.05). CONCLUSIONS: This data indicates that the hypoxic stress resulting from normobaric and hypobaric hypoxia are not the same and that hypoxic hypoxia may not result in hypoxia at the level of the tissue.

At altitude, impairments in pulmonary oxygen diffusion and oxygen delivery have a detrimental effect on exercise capacity. Therefore, it is important to determine the impact of altitude on exercise performance, particularly during rapid ascent to moderate or high altitudes. However, its diuretic effect could have a negative impact on physiological responses during steady-state exercise; these potential influences are poorly understood. PURPOSE: To evaluate the impact of AZ on heart rate (HR), rate of perceived exertion (RPE), and oxygen saturation (SaO2) during steady-state treadmill walking after ~24 hours exposure to hypobaric hypoxia equivalent to 3500 m altitude.

RESULTS: There were no differences in time to complete 2 miles between the AZ and placebo trial (22.3 ± 3.7 vs 22.0 ± 2.6 min, respectively; p > 0.05). Furthermore there were no differences in final TT HR (186 ± 13 vs 182 ± 16, P > 0.05) or RPE (17 ± 3 vs 17 ± 2, P > 0.05) between trials. SaO2 was significantly higher at the end of the AZ TT vs the placebo TT (83 ± 4 vs 80 ± 4, P < 0.05). CONCLUSION: Our results suggest that AZ (500 mg/day) does not negatively impact endurance exercise performance at 3500 m and that its stimulatory effect on ventilation helped maintain higher levels of oxygen saturation. Funded by USAMRMC; author views not official US Army or DOD policy.

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D-38 Thematic Poster - Biomechanics after ACL Reconstruction

Thursday, May 30, 2019, 3:45 PM - 5:45 PM
Room: CC-102A

1741 Chair: Robin Queen, FACSM, Virginia Tech, Blacksburg, VA.
(No relevant relationships reported)

1742 Board #1 May 30 3:45 PM - 5:45 PM
Effect of Lower Extremity Static Alignment on Dynamic Valgus in Adolescents Following ACL Reconstruction
Tisha Wren1, Daniel Feifer2, Natalya Sarkisova2, Mia Katz2, Curtis VandenBerg2, James L. Pace1, Nicole Mueske1. 1Children’s Hospital Los Angeles, Los Angeles, CA. 2Connecticut Children’s Medical Center, Hartford, CT.
Email: twren@chla.usc.edu
(No relevant relationships reported)

PURPOSE: Knee abduction moments may lead to valgus collapse, potentially causing ACL rupture. The contribution of static lower extremity alignment to knee abduction moments is unknown. This study assessed relationships among lower extremity static alignment and dynamic kinematics and kinetics during side-step cutting in uninjured adolescent athletes.

METHODS: This retrospective study included 8 adolescents with recent unilateral ACL reconstruction (mean age 14.8 yr, SD 1.2; 3/8 female). Frontal plane hip to ankle imaging (EOS) was used to measure mechanical axis deviation (perpendicular distance from the center of the femoral condyles to the mechanical axis line connecting the center of the femoral head to the center of the talar dome) and tibial-femoral angle. 3D motion capture provided lower extremity kinematics and kinetics during quiet standing and loading (initial contact to peak knee flexion) of an anticipated 45° side-step cut; 2-3 trials per limb were averaged for analysis. Relationships among imaging, static motion capture and dynamic motion capture measures were investigated using correlation, and backward stepwise linear regression was used to evaluate potential predictors of average dynamic knee abduction moment.

RESULTS: Regardless of surgical status, standing knee abduction angle was correlated with standing hip abduction (r=0.60, p<0.02) and ankle evasion (r=0.85, p<0.001) along with larger mechanical axis deviations (r=0.83, p<0.0001) and higher knee abduction on EOS (r=0.44, p<0.09). Dynamic knee abduction moment was best predicted by a combination of EOS knee abduction angle, standing ankle evasion, standing knee abduction, standing knee rotation, ankle evasion during cutting, along with ground reaction force and age (R²=0.94, p<0.004). There was no significant relationship between knee abduction moment and side (surgical vs. contralateral) (p=0.63).

CONCLUSIONS: In this small group of adolescent athletes with recent ACLR, knee abduction moment during side-step cutting was related to age and anatomic lower limb alignment in addition to dynamic factors such as ankle positioning and ground reaction force. Anatomic alignment or standing posture with greater hip abduction, knee abduction, and ankle eversion may indicate a higher risk for injury during dynamic activities.

1743 Board #2 May 30 3:45 PM - 5:45 PM
Wearable Sensor-based Classification Of ACL Reconstructed Limbs During Exercise In Male And Female Patients
Joseph M. Hart, FACSM1, Varun Mandalapu2, Stephan Bodkin1, John Lach1, Nutta Homdee1, Jaqi Gong1. 1University of Virginia, Charlottesville, VA. 2University of Maryland, Baltimore County, Baltimore, MD.
Email: jmh3zf@virginia.edu
(No relevant relationships reported)

Purpose: Early identification of subtle, sub-clinical, aberrant motion characteristics in patients with ACL reconstructed knees can inform rehabilitation and return to sports decision making. Wearable sensors enable characterization of movement in native sport and activity environment. The purpose of the study was the ability of a machine learning algorithm to accurately classify male and female participants’ reconstructed limb from the contralateral healthy limb using inter-limb movement variability from sensor data during walking and jogging.

Methods: We evaluated 109 patients (23.5±10.2yr, 172.6±9.6cm, 73.4±16.7kg) with primary, unilateral and uncomplicated ACLR at approximately 6 months from index surgery. All participants walked for 5 minutes at 3 mph and jogged for 3 minutes at 6mph on a treadmill. Subjects were fitted with 5 wireless sensors (Shimmer3 IMU Unit, Dublin, Ireland) secured bilaterally on the wrists and ankles and around the waist at the sacrum. Accelerations from the sensors were continuously monitored during the walking and jogging study. The multi-dimensional time-varying biomechanical data captured by the sensors were processed to generate a graphical model and matrices to represent the cause-and-effect relationship in inter-limb movement. The matrices extracted from the sensor data were used to train machine learning algorithms and then these trained algorithms were evaluated to classify participants’ ACLR limb from their contralateral healthy limb. The performance of these trained algorithms was calculated to generate the individual classification accuracy.

Results: While walking, the trained algorithms were able to classify the ACLR limb in males with 81.5% accuracy and females with 73.7% accuracy. While jogging, ACLR limbs were classified with 76.7% accuracy in males and 83.0% accuracy in females. Conclusion: Cause-and-effect analysis of inter-limb movement variability demonstrated a high level of accuracy in classifying an injured ACLR limb from a healthy contralateral limb during exercise. The accuracy of classification may be influenced by gait speed and sex.

1744 Board #3 May 30 3:45 PM - 5:45 PM
The Impact of a Functional Knee Brace on Sports Performance Following ACL Reconstruction.
William E. Garrett, Jr, FACSM1, Abigail C. Schmitt1, Robin M. Queen, FACSM2, 1Duke University Medical Center, Durham, NC. 2Virginia Tech, Blacksburg, VA.
Email: william.garrett@duke.edu
Reported Relationships: W.E. Garrett: Industry contracted research; Don Joy Orthopedics.

Up to 250,000 anterior cruciate ligament (ACL) injuries occur in the United States annually with most athletes undergo an ACL reconstruction. No literature has examined physical performance during return to sport (RTS) and the impact of a functional knee brace. Braces have been shown to improve mechanics, but compliance remains an issue due to performance concerns.

Purpose: To determine differences in performance between braced (B) and non-braced (NB) tasks across time (RTS and six weeks following RTS (RTS+6)). We hypothesize that performance will improve across time with no differences between brace conditions.

Methods: ACL patients (n=40; 20 male, 20 female) were enrolled after being RTS. Participants were provided a custom fit knee brace and instructed to wear the brace for all activities more dynamic than walking. A series of tasks (40 yard dash, 5-10-5 shuttle run, vertical jump, broad jump, and a triple hop) were completed at RTS and RTS+6. Each participant completed practice trials and two recorded trials.

Results: Participants (height: 1.7±0.1 m, weight: 75±15 kg, age: 18.6±3.3 yr) demonstrated improvements in ACL-RSI (p<0.05) and IKDC (p<0.01) with no difference in VAS pain (p=0.27). Performance declined during the 40yd Dash, vertical jump, and broad jump in the B condition. Performance improved across time for the broad jump and triple hop (Table 1).

Conclusions: Brace condition differences were small (40yd Dash: 0.1 sec, Vertical Jump: 0.5 in, Broad Jump: 0.9 in) or nonexistent and would not likely lead to noticeable sport deficits. Performance concerns should be minimal in ACL patients looking to RTS when wearing a knee brace.

Acknowledgements: This work was supported by a DonJoy Orthopedics grant.

Table 3: Physical performance results for the braced and non-braced conditions and between two time points (No = Surgical, S=Surgical)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Brace</th>
<th>Non-Braced</th>
<th>Interaction</th>
<th>ME Time</th>
<th>ME Brace</th>
</tr>
</thead>
<tbody>
<tr>
<td>40yd Dash (sec)</td>
<td>6.3±0.7</td>
<td>6.2±0.6</td>
<td>6.1±0.7</td>
<td>6.1±0.7</td>
<td>0.068</td>
</tr>
<tr>
<td>5-10-5 shuttle run (sec)</td>
<td>5.9±0.3</td>
<td>5.9±0.3</td>
<td>5.9±0.3</td>
<td>5.9±0.3</td>
<td>0.421</td>
</tr>
<tr>
<td>Vertical Jump (inches)</td>
<td>17.3±3.4</td>
<td>17.0±3.6</td>
<td>18.2±3.7</td>
<td>18.4±3.9</td>
<td>0.797</td>
</tr>
<tr>
<td>Broad Jump (inches)</td>
<td>69.0±10.4</td>
<td>71.2±11.4</td>
<td>70.5±11.5</td>
<td>71.5±11.7</td>
<td>0.213</td>
</tr>
<tr>
<td>Triple Hop (inches)</td>
<td>162.8±30.0</td>
<td>172.7±35.7</td>
<td>162.0±30.3</td>
<td>174.4±32.7</td>
<td>0.653</td>
</tr>
<tr>
<td>Triple Hop (5 inches)</td>
<td>147.9±32.0</td>
<td>157.3±38.4</td>
<td>143.3±32.4</td>
<td>158.3±38.9</td>
<td>0.073</td>
</tr>
</tbody>
</table>

THURSDAY, MAY 30, 2019

ACSM May 28 – June 1, 2019
Orlando, Florida
Lower Extremity Kinetic and Kinematic Asymmetries 4, 6, and 9 Months Post-ACLR Reconstruction In Elite Collegiate Athletes


Email: cobian@pt.wisc.edu

(No relevant relationships reported)

Abnormal lower extremity (LE) biomechanics post-anterior cruciate ligament reconstruction (ACLR) may increase re-injury risk and reduce sports performance. Although most athletes return to sport (RTS) within 1 year from ACLR, the timeline for recovery of LE kinetics and kinematics during athletic tasks is not well defined. Identifying specific movement deficiencies will guide rehabilitation efforts to promote successful RTS and reduce re-injury risk. PURPOSE: To evaluate vertical ground reaction forces (vGFR) and hip, knee, and ankle kinematics during running and jumping in elite collegiate athletes 4, 6, and 9 months post-ACLR.

METHODS: Twelve Division 1 athletes (age 20.5 ± 1.2, BMI 25.9 ± 3.6, 6 female) performed maximal countermovement jumps (CMJ) and treadmill running at a maximally comfortable speed 4.0 ± 0.3, 6.1 ± 0.5 and 8.9 ± 1.5 months post-surgery while whole body kinematics were recorded. vGFR impulses, knee flexion excursion, and peak sagittal plane hip, knee, and ankle joint angles were obtained during the stance phase of running (RUN) and the eccentric, concentric (CON), and landing (LAND) phases of running. LE kinetic asymmetries (LEKAI) were compared for all intervals and effect sizes (ES) were calculated. LSIs at each interval were evaluated using the Wilcoxon Signed-Ranks test.

RESULTS: At 4 months post-surgery, all CMJ and RUN asymmetries were significant (LSI: 69.5-95.9%, p < .023, ES: 46-62). Involved limb CMJ CONC phase and RUN vGFR impulses were significantly less than uninvolved limb values at all intervals (LSI: 85-79.4%, p < .005, ES: 58-63). RUN peak joint angle and knee flexion excursion asymmetries were significant at all intervals (LSI: 69.5-94.7%, p < .013, ES: 51-62). Involved limb CMJ CONC phase knee (LSI: 90.6-98.6%, p < .041, ES: 42-62) and ankle (LSI: 80.2-86.1%, p < .010, ES: 53-62) angles were reduced throughout, while no CMJ LAND phase asymmetries were detected 9 months post-surgery.

CONCLUSIONS: Despite excellent surgical care and high volumes of rehabilitation, elite collegiate athletes present with LE kinetic and kinematic asymmetries 9 months post-surgery, after or close to typical RTS. In particular, knee joint kinematics during the stance phase of running and the CONC phase of the CMJ are categorically asymmetric and should be addressed with targeted interventions.

Purpose

The aim of this study was to identify strength, power and biomechanical differences between male athletes who made a pain free return to play (RTF) and those that did not at 9 month post ACLR reconstruction.

Methods

Nine months after ACLR, 158 males athletes who had returned to pre-injury sport participation (64 reporting knee symptoms/94 reporting none) carried out strength testing using isokinetic dynamometry on quadriceps and hamstrings and 3D biomechanical analysis of single countermovement jump, single leg drop jump and planned and unplanned 90° testing using isokinetic dynamometry on quadriceps and hamstrings and 3D at 9 month post ACLR reconstruction.

This study demonstrates strength, power and biomechanical differences in those that RTP with knee symptoms after ACLR with those achieving >90% LSI in all 4 strength and jump tests almost 7 times more likely to make a pain free RTP.

A Long-term Follow-up Of Patients With Physio-sparing Inter-fragment Band ACL Reconstruction: Kinetic Analyses

Dai Sugimoto1, Amy White2, Jeff Broder2, Kathryn Williams1, Kocher Mininder1, Lyle Micheli, FACSM1, Benton Heyworth1

1Boston Children’s Hospital, Waltham, MA. 2Boston Children’s Hospital / The Micheli Center for Sports Injury Prevention, Waltham, MA. (Sponsor: Lyle J. Micheli, MD, FACSM)

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(No relevant relationships reported)

Female athletes face significant risk of musculoskeletal injury when playing collegiate level sports. Sustaining injury, particularly to the ACL, can end an athlete’s career. Prior research has evaluated individuals’ movement profiles and patient reported outcomes (PROs) following ACL injury; however, there is a dearth of evidence evaluating the movement profile and PROs of those who successfully return to sport at an elite level following ACL injury. PURPOSE: To compare the movement profile and PROs of Division 1 women’s college athletes who successfully return to sport following ACL injury to healthy athlete Controls. METHODS: We conducted a cross-sectional analysis of baseline data on 66 participants collected as part of standard injury screening for Division 1 women’s soccer, lacrosse, and field hockey teams (mean ± SD; Age = 19.9 ± 1.3 yrs, Ht = 166.6 ± 5.8 cm, Wt = 64.1 ± 8.1 lbs). We used health history and survey data to identify those who had previously sustained an ACL injury as well as single assessment numeric evaluation (SANE) scores for the knee. The Landing Error Scoring System (LESS) was used to evaluate each athlete’s movement pattern while completing a jump landing task. The LESS and SANE scores for the injured and non-injured groups were compared using T-Tests with pooled variance.
Altered postural control is a significant gap remaining in understanding altered postural control strategies in ACLR (Kerksiek et al., 2016). Conflicting reports of impaired postural control are evident between those who return to sport and those who do not. A motor dual-task approach to postural control has been shown to elicit a greater response in ACLR compared to healthy controls (Burr et al., 2019). This may indicate a more attentionally-focused approach to postural control.

METHODS: The purpose of this study was to observe the combined effect of a whole body vibration (WBV) warm up and Blood Flow Restriction (BFR) on muscle size, flexibility, and perceived pain. Thirteen young (21±1 yr) males were recruited to perform 2 protocols of upper body warm-up protocol under 5 conditions. The conditions were: 5-min treadmill walking (C1), 5-min WBV at a low amplitude (C2), 5-min WBV at a low amplitude with BFR (C3), 5-min WBV at a high amplitude (C4), 5-min WBV at a high amplitude with BFR (C5). For the BFR sessions, cuffs were placed on the uppermost portion of the thighs. Cuffs were then inflated to 120 mmHg, and then increased in increments of 20 mmHg until the final pressure was achieved. Final pressure was found via thigh circumference and capillary refill time. The vibration plate was set at a frequency of 50 Hz. During the four interventions, the subjects performed 3 lower-body exercises (squat, sumo squat, calf raises) for 60 seconds each, with 30 seconds of rest between exercises. Thigh temperature was measured between exercises. Total training time with BFR was 30 min.

RESULTS: The ACC group had increased CoP dispersion (e.g., ln(EA)): ACLR: 7.74 ± 0.78 mm², CON: 7.47 ± 0.91 mm², P = 0.003) and increased CoP signal regularity (SEn: ACLR: 0.78 ± 0.20, CON: 0.86 ± 0.23, P = 0.001). Significantly interactions were also observed for SEn, EA, and RMS_ml that suggest the ACLR group impairments are most pronounced during the DC condition (e.g., 95% confidence interval for CON – ACLR for DC SEn: (0.03, 0.35), P = 0.01). CONCLUSION: Anterior cruciate ligament reconstruction (ACLR) results in greater ACLR-specific balance alterations compared to closing eyes or a motor dual-task. These findings are consistent with ACLR individuals adopting a more attentionally-focused approach to postural control.

Conclusions: Based on our findings, the high amplitude WBV condition with or without BFR improved flexibility, but the effects of conditions on estimated V0.95 were different for each gender. The findings indicate that gender of individuals performing tests may be important and should be considered for testing different health/fitness variables.
Purposes: Hypoxia (Hyp) increases O2 delivery to the working muscles together with an improved lactate metabolism, power output and endurance compared to normoxia (Norm) (Cardinale & Ekblom, 2017). Considering the O2 delivery limitation and the exercise induced hypoxemia at exercise intensities near to maximum it was hypothesized that muscle mitochondrial oxidative phosphorylation (OXPHOS) capacity would be upregulated along with a higher endurance performance following endurance interval training with Hyp compared to Norm. Method: 23 trained cyclists, age 35.3 ± 6.4 years (mean ± standard deviation (SD)) body mass 75.2 ± 9.6 kg, height 179.8 ± 7.9 m, and VO2max 4.5 ± 0.7 L min-1 performed 6 weeks endurance training on a cycle ergometer consisting of supervised HIIT sessions 3 days/week (3 × 180 s) and additional long slow distance training 2 days/week. Cyclists were randomly assigned to either Hyp (FO2 0.30; n=12) or Norm (FO2 0.21; n=11) breathing condition during training in a single blinded study design. VO2max, OXPHOS capacity in permeabilized fibers and in isolated mitochondria, and 20 min cycle performance were tested pre and post intervention. Results: Over the intervention change in VO2max (Hyp 1.1 ± 3.8%, Norm 0.0 ± 3.7%; p = 0.55, ES = 0.08), mass-specific mitochondrial respiration (Hyp 27.3 ± 46.0%, Norm 16.5 ± 49.1%; p = 0.21, ES = -0.06), intrinsic mitochondrial respiration (Hyp 26.1 ± 80.1%, Norm 15.9 ± 73.3%; p = 0.66, ES = 0.69) and mean power output during 20 min trial (Hyp 6.0 ± 3.7%, Norm 2.4 ± 5.0%; p = 0.073, ES = 0.32) did not statistically significantly differ between the groups. Conclusions: These data showed that 6 weeks hypoxic-supplemented high-intensity interval-training on a cycle ergometer was not superior to conventional training at sea level in improving VO2max, intrinsic and mass-specific mitochondrial respiration and cycle performance in already trained cyclists. Despite, the small meaningful positive effect in cycling performance that might be relevant in sport, considering the cost-benefit of performing hypoxic-supplemented HIIT, it is questionable whether this strategy is worthwhile in maximizing endurance performance in already trained cyclists.

**Acute Effects of Blood Flow-restricted Exercise on Microcirculation, Neuromuscular Activation and Metabolite in Underweight Women.**

Ying Pan1, Yan Zhao1, Xiaohuan Ma1, Yixin Tian1, Aicui Lin1, Yanli Yan2, Qiang Sun1.

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**Purpose:** This investigation measured local microcirculation, neuromuscular activation and metabolic changes during blood flow restriction (BFR; (HL), low load (30% 1RM) without BFR (LL) and low load (30% 1RM) with 40% BFR (HLB), 60% BFR (HLB), 80% BFR (HLB). of arterial occlusion for five conditions. METHOD: A total of 18 moderately active underweight women (17.6 ± 0.8 kg/m2) performed four sets of knee extension to failure with the other conditions. RESULTS: SO2 in HL and LL were similar during whole process (HL: 79.2 ± 19.1%, LL: 72.41 ± 20.8%) which were significantly higher than the other three conditions (P < 0.05). Flow was highest in BFR, with the other conditions were similar (e.g., set3: 213.1 AU for BFR vs 196.3 AU for other conditions). After exercise, velo in BFR (56.8 ± 1.2 AU) was higher than the other conditions (51.8 ± 1.5 AU, P < 0.05). Hb was similar in all conditions, LL and HL resulted in greatest activation during the first two sets when exercise is taken to failure (e.g., set 1: 69.3% MVC in LL vs 47.9% MVC in other conditions). After exercise, WBL for BFR (56.8 ± 1.2 AU) and lowest in HL (BFR < LL < BFR + BFR + HL). Changes in SO2 and muscle activation were similar between pressures, while higher pressure led to fewer repetitions during exercise. CONCLUSIONS: Low-load exercise to failure results in a greater neuromuscular response to that of high-load exercise in

**THE EFFECT OF BLOOD FLOW RESTRICTION AND WHOLE-BODY VIBRATION AS A WARM-UP STRATEGY.**

Jonathan Salinas, Natalie Castillo, Aaron Garcia, Jessica Martinez, Ricardo Parra, Murat Karabulut, FACSM. University of Texas Rio Grande Valley, Brownsville, TX.

**Purpose:** The purpose of this study was to examine the effects of blood flow restriction (BFR) and whole-body vibration (WBV) on hemodynamics, muscle temperature, flexibility, and explosive power. **Methods:** Twenty-five subjects (14 females (age = 24 ± 2.7 years) and 11 males (age = 24.5 ± 3.5 years) completed the study, which involved following 6 sessions: a 5-min (5-WBV) and a 10-min (10-WBV) lower-body warm up on a vibration platform, a 5-min (5-BFR) and a 10-min (10-BFR) lower-body warm up before blood flow restriction cuffs, and a 5-min (5-CYC) and a 10-min (10-CYC) warm up on a cycle ergometer. For the BFR session, cuffs were placed on the uppermost portion of the thigh. Inflation began at 200 mmHg and progressively increased to the target pressure, which was based on the subject’s thigh circumference and capillary perfusion. Squat exercises were performed between the knee angle of 90-180 degrees for 5 or 10 sets (each set lasted 60 s with a 60 s rest in between sets) on a vibration platform at 30 Hz with low amplitude or a flat surface while wearing BFR cuffs. Pre and post-exercise heart rate, hemodynamics, quad and hamstring temperature, flexibility, and explosive power index were recorded. Explosive power was measured using a jump mat, where 60 maximal exertion jumps were performed, with mean ground contact time (GCT), mean vertical jump height (MVJ), and explosive power index (EPI) for the first 15 and last 15 jumps. Hemodynamics, muscle temperature, and flexibility were again recorded following the explosive power index test. **Results:** There was no condition*time interaction or condition main effect for GCT, MVJ, and EPI, but there was a time main effects for all three variables (p < 0.01). There were significant condition and time main effects and condition*time interaction for heart rate (p < 0.01), time main effect for systolic blood pressure (p < 0.01) and flexibility (p < 0.01). Significant time main effect and condition*time interaction were detected for quadriceps (p < 0.01) and hamstring muscle temperatures (p < 0.01). **Conclusions:** Our findings indicate that all the conditions and durations investigated resulted in similar responses in flexibility and jump performance. Future studies should examine different pressure settings of BFR and/or frequency/amplitude setting of WBV on the variables tested in the study.

**Physiological Responses to Intermittent Endurance Exercise with Blood Flow Restriction in the Moderate Intensity Domain.**

Austin Moran1, Meral Culver1, Justin Guilkey1, Timothy R. Rotarius2, Jakob D. Lauver1. 1Coastal Carolina University, Conway, SC. 2Adrian College, Adrian, MI.

**Purpose:** The purpose of this investigation was to examine the physiological responses, as well as the perceived exertion in responses to a range of BFR endurance protocols. **Methods:** Participants randomly performed 7 exercise protocols: 50% of the difference between peak oxygen uptake (VO2) and ventilatory threshold (VT) (A50%), 90%, 90% + 90% of VO2 with and without BFR. Each protocol consisted of two sets of five work intervals (2 minutes work, 1 minute rest) separated by 5 minutes of recovery. Pulmonary VO2 was recorded breath-by-breath, muscle activation (vastus medialis (VM), vastus lateralis (VL)) was assessed by surface electromyography (sEMG), microvascular oxygenation (tissue oxygenation index (TOI)) was assessed by near-infrared spectroscopy (NIRS), and level of perceived exertion (RPE) was assessed using the Borg scale. The last 30 seconds of intervals 5 and 10 were used for analysis. sEMG data were normalized to baseline cycling (20 watts). TOI during each condition was analyzed compared to baseline cycling and then expressed as change from baseline (arbitrary units) to compare between conditions. **Results:** The A50% protocol resulted in a higher end exercise interval 10 VO2, compared to all other conditions, no other differences in VO2 were observed. No sEMG differences were observed between conditions (VL p = 0.24, VM p = 0.33) or between interval 5 and 10. All BFR conditions resulted in a decrease in TOI from baseline. TOI was greater for all BFR conditions (70% BFR = -36.4 ± 2.9, 80% BFR = -40.4 ± 6.5, 90% BFR = -44.7 ± 2.5)
hypoxic training has been shown to improve aerobic capacity because hypoxia stimulates erythropoiesis due to increased erythropoietin (EPO) production. However, it takes several weeks to increase hemoglobin mass during endurance training in hypoxia. In the present study, we have focused on the combined effects of “hypoxia” and other factors like “heat” or high-intensity training. In the present study, we have combined exercise under hypoxic condition with heat stress during endurance exercise in confinement conditions.

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contribute to apparent task-specific responses. PURPOSE: To examine the isolated and combined effects of ambient temperature [cool (18°C, 20% rh) vs hot (35°C, 20% rh)] and inspired oxygen content [normoxia (FO₂=0.21) vs hypoxia (FO₂=0.16)] on neuromuscular function in response to a cycling TT. METHODS: Five physically active male athletes (23 ± 6 y) performed four 20-km cycling TTs in different environmental conditions [cool/normoxia (COOL); hot/normoxia (HOT); cool/hypoxia (HYP); hot/hypoxia (H-H)]. Neuromuscular responses of the soleus, as indicated by changes in isometric MVC (iMVC), M-wave twitch force (Qₜw) and voluntary activation (VA), were assessed pre to and following each time-trial. Linear mixed model analyses were used to examine the neuromuscular responses, with fixed effects for each condition and a random intercept for participants. RESULTS: Time-trial performance was impaired during HOT (2211±35s; 192±27W), HYP (2213±122s; 192±27W), and H-H (2214±117s; 192±27W) compared to COOL (2090±54s; 2214±114W, p=0.02). Similar reductions in MVC (−9.0% ± 12.6%) and VA (−14.0% ± 9.6%) were observed across all conditions (p<0.05); however, no significant differences were observed in M-wave (p=0.09) or Qₜw (p=0.43). CONCLUSION: Neuromuscular impairments following 20-km cycling TT are attributed to central mechanism(s) (i.e., VA); however, neuromuscular adaptations were similar in conditions where heat stress and hypoxia were combined, to conditions where each environmental stressor was examined in isolation.

1762 Board #3 May 30 3:45 PM - 5:45 PM Physiological Responses to Repeated Sprint Exercise under Combined Heat and Hypoxic Conditions Kechi Yamaguchi, Nobukazu Kasai, Nanako Hayashi, Haruka Yatsutani, Kazushige Goto. Ritsumeikan university, Kusatsu, Japan. (Sponsor: Robert Kraemer, FACSM) Email: shb114ef@ed.ritsumei.ac.jp (No relevant relationships reported)

During sprint exercise in hypoxia, anaerobic energy supply is increased with augmented blood volume in muscle. Exposure to heat stress also increases anaerobic energy supply and blood volume in the muscle. Therefore, the combined treatments of “hypoxic exposure” and “heat stress” may cause further increases in anaerobic responses. PURPOSE: To determine the effect of combined heat and hypoxic conditions on physiological responses to repeated sprint exercise. METHODS: Ten male athletes (19.6 ± 0.3 yrs, 173 ± 2.2 cm, 71.6 ± 1.8 kg) completed repeated sprint exercise (three sets of 3 × 10 s maximal pedaling exercise) under four different conditions: 1) control condition (CON, 20°C, FO₂=20.9%), 2) hypoxic condition (HYP, 20°C, FO₂=14.5%), 3) heat condition (HOT, 35°C, FO₂=20.9%), 4) combined hot and hypoxic conditions (HH, 35°C, FO₂=14.5%). Power output, muscle oxygenation in vastus lateralis (evaluated by near infrared spectroscopy (NIRS)), respiratory variables and arterial oxygen saturation (Sao₂) were continuously monitored throughout the exercise. We also measured skin and muscle temperature, heart rate, and blood variables (blood lactate, glucose, pH, PO₂, PCO₂ levels). RESULTS: HYP and HH showed significantly lower average oxygen uptake (CON: 2.3 ± 0.1 L/min, HYP: 1.9 ± 0.1 L/min, HOT: 2.4 ± 0.1 L/min, HH: 2.0 ± 0.1 L/min) and average Sao₂ (CON: 94.8 ± 0.6 %, HYP: 89.5 ± 0.5 %, HOT: 94.8 ± 0.5 %, HH: 89.5 ± 0.4 %) compared with CON and HOT (p<0.05). Muscle temperature was significantly higher in HOT and HH compared with CON and HYP throughout the exercise (p<0.05). Furthermore, HOT and HOT presented significantly greater peak power output in the first set of the exercise compared with CON and HYP (p<0.05). No significant difference among trials was observed for changes in blood variables, and muscle oxygenation in vastus lateralis. CONCLUSIONS: Peak power output was higher in HOT and HH, although HH showed lower oxygen uptake and Sao₂. These results suggest that combined heat and hypoxic conditions (HH) would cause greater power output than control condition in spite of decreased aerobic energy supply.

1763 Board #4 May 30 3:45 PM - 5:45 PM Downhill Running: An Effective Countermeasure To Limitations Of Exercise In Acute Hypoxia? Trevor Gillum, Felip Gorini Pereira. California Baptist University, Riverside, CA. Email: tigillum@calbaptist.edu (No relevant relationships reported)

Exercise stress that results in increased expression of heat shock protein 72 (Hsp72) is linked to physiologic adaptations. Adaptations to one environmental stressor, such as heat, increase Hsp72 and induce cross adaptations to other stressors (i.e. hypoxia). Previously, two bouts of downhill running (DHR) conferred classic markers of heat acclimation (lower Te, earlier onset of sweating). We sought to increase Hsp72 through repeated DHR to potentially expedite the acclimation process. PURPOSE: To analyze the effect of DHR on exercise performance in normoxic hypoxia. METHODS: 8 males (23.8 ± 5.8 years, VO2max 54.1 ± 5.1 ml kg⁻¹ min⁻¹, 13.6 ± 5.2% body fat) performed two 45-minute DHR bouts (-12.5% grade) separated by 5-7 days in the speed that elicited V̇E while running downhill. Pre and post blood samples were collected to quantify monocyte Hsp72. Muscle soreness (DOMS) was assessed 24 and 48 hours after each downhill bout using a Likert scale. Two normobaric hypoxic (16% FO₂) 5 km time trials (TT) were performed: one before any DHR and one 5-7 days after the last bout. Hydration was assessed before the TT while blood lactate was measured pre and post TT. During the TT, heart rate, RPE and O₂ saturation (Sao₂) were recorded every 1 km. RESULTS: Monocyte Hsp72 showed no change across time (p=0.53). Specifically, basal concentration from DHR 1 to DHR II were not different (3.5 ± 2.3 to 2.9 ± 1.5 AU). TT performance was similar between conditions (1377 ± 192, 1364 ± 174 sec). Hydration (1.018 ± 0.007, 1.013 ± 0.009 urine specific gravity), RPE (14:9 ± 1.1; 14:6 ± 1.3), HR (178 ± 8 (±78 ± 8), and blood lactate (post TT 11.6 ± 1.8; post TT 2.2 ± 3.1% ml/kg) were similar in both TTs. However, Sao₂ significantly increased from TT1 to TT2 (84.5 ± 4.0; 87.2 ± 2.3%, p<0.05). DOMS was significantly lowered 24 (5.1 ± 0.8 to 3.5 ± 1.4, p = 0.00) and 48 (4.6 ± 1.0 to 2.6 ± 1.5, p = 0.00) hours following the second DHR trial when compared to the first trial. CONCLUSIONS: While no change in Hsp72 or TT time were observed, this could be due to large variations found in the data with these variables. The increase in Sao₂ after DHR may improve exercise capacity at elevation during moderate exercise intensities.

1764 Board #5 May 30 3:45 PM - 5:45 PM Heat Acclimation Mediated Crosstolerance In C2C12 Myotubes Garrett W. Hill¹, Ben J. Lee², Trevor L. Gillum³, Roger A. Vaughan¹, Matthew R. Kuennen¹. ¹High Point University, High Point, NC. ²University of Chichester, Chichester, United Kingdom. ³California Baptist University, Riverside, CA. (No relevant relationships reported)

Background. Heat acclimation enhances animal and human tolerance during subsequent novel hypoxic stress exposure. This heat-acclimation-mediated crosstolerance (HACT) is attributed to shared cellular stress response pathways. Although skeletal muscle is the largest organ (by mass) in the mammalian body, to our knowledge no research has been conducted examining HACT in skeletal muscle cells. PURPOSE: The timeframe of HACT and the mechanisms behind this response were examined in differentiated C2C12 myotubes. METHODS: Heat acclimation (HA) was established by heating (40°C) C2C12 myotubes for 6 consecutive days (2h/d). Control myotubes were maintained for the same duration under control conditions (37°C). Control and HA myotubes were subsequently challenged with Hypoxia (1% FO₂) or Hypoxia + LPS (1% FO₂ + 500 ng/ml LPS) for 2h. Cell lysates were collected immediately post (+0h) and 12h post (+12h) challenge. Western blot was used to assess protein markers of the heat shock response (HSR), inflammation, and apoptosis. Data were analyzed with two-way ANOVA with Newman-Keuls post-hoc. RESULTS: HA myotubes exhibited increased phosphorylation of HSF-1 [+5% (p=0.03) and reduced phosphorylation of IKBo [+56%, p<0.01] at +0h. Control myotubes exhibited reduced SIRT1 at +0h following challenge with Hypoxia [+36%, p=0.04] and Hypoxia + LPS [+47%, p=0.02]. By +12h Control myotubes that had been challenged with Hypoxia or Hypoxia + LPS exhibited increased phosphorylation of HSF-1 [+86%(p<0.01) and +77%(p=0.01); respectively] and HSP70 content [+158%(p<0.01) and +153%(p=0.04); respectively]. However, these changes occurred too late to affect cytoprotection, as Control myotubes that were challenged with Hypoxia + LPS also exhibited increased TLK4 [+77%, p<0.01] and NFkB [+117%, p=0.03], in conjunction with elevated phosphorylation of JNK [+55%, p=0.03] and Caspase 3 content [+25%, p=0.02]. Conclusion: We present evidence of HACT in C2C12 myotubes. We speculate that through elevations in SIRT1 and activation of the HSR, HA confers lower inflammatory and apoptotic drive in skeletal muscle cells. We note that HACT is not evident until +12h following challenge, suggesting studies that do not follow an extended timeframe for cell lysate collection could potentially miss benefits associated with this response.
1765 Board #1 May 30 3:45 PM - 5:45 PM
Pre-intervention Endothelial Function and Hyperglycemia Modifies Flow-mediated Dilation Following Short-term Exercise Training in Adults with Prediabetes
Stephanie L. Miller, Natalie Z.M. Eichner, Nicole M. Gilbertson, Emily M. Heiston, Arthur D. Weltman, FACSM, Steven K. Malin, FACSM, University of Virginia, Charlottesville, VA. (Sponsor: Steven K Malin, FACSM)
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Purpose: Impaired glucose tolerance (IGT) elevates type 2 diabetes and cardiovascular disease (CVD) risk above and beyond impaired fasting glucose (IFG) alone. Hyperglycemia can impair endothelial function through increased inflammatory responses. However, it is unknown whether exercise training vascular function differently among prediabetes phenotypes. We examined whether improvements in endothelial function following 2-weeks of aerobic training is affected different in adults with IFG+IGT compared to those with IFG alone. Methods: Middle-aged, obese adults with IFG (n=11; 58.3±9.3 yrs; 34.2±7.9 kg/m²; FPG: 106.5±6.1 mmol/L; 2-hr glic: 127.0±31.7 mg/dl) and IFG+IGT (n=13; 61.6±1.8 yrs; 32.8±3.1 kg/m²; FPG: 104.2±10.6 mmol/L; 2-hr glic: 162.2±29.6 mg/dl) were randomized to 12-match aerobic exercise bouts (~70% HRpeak, 60 min/d) over 2-weeks. A 2-hr 75g OGTT was performed and post-intervention to determine glucose tolerance. Endothelial function was determined by brachial artery flow mediated dilation (FMD) prior to the OGTT. Aerobic fitness (VO2peak), body composition (BIA), and vascular inflammation (VCAM, ICAM) were also assessed before and after training. Results: Training significantly increased VO2peak (P=0.03), fat-free mass (P~0.001) and VCAM (P~0.01) in both phenotypes. There was no effect of training on FMD in either IFG+IGT or IFG (0.33±3.9 vs. 1.13±4.7%, P=0.66 respectively). However, pre-intervention FMD (r=0.45, P=0.04) and glucose total area under the curve (r= -0.56, P=0.007) were associated with increased FMD in response to training. Moreover, increased FMD adaptation was linked to decreased circulating VACM after training (r=-0.52, P=0.02). Conclusion: These data highlight that impaired endothelial function and hyperglycemia prior to exercise treatment may affect improvements in endothelial function following short-term training in people with different prediabetes phenotypes. The mechanism by which people with prediabetes respond to exercise-induced vascular adaptation may regulate the reduced vascular inflammation and warrants further investigation.

1766 Board #2 May 30 3:45 PM - 5:45 PM
Low-Calorie Diet With or Without Interval Exercise Reduces Post-Prandial Aortic Waveform in Obese Women
Emily M. Heiston, Nicole M. Gilbertson, Natalie Z.M. Eichner, Steven K. Malin, FACSM, University of Virginia, Charlottesville, VA. (Sponsor: Steven Malin, FACSM)
Email: emh5bh@virginia.edu

Purpose: Impaired glucose tolerance (IGT) elevates type 2 diabetes and cardiovascular disease (CVD) risk above and beyond impaired fasting glucose (IFG) alone. Hyperglycemia can impair endothelial function through increased inflammatory responses. However, it is unknown whether exercise training vascular function differently among prediabetes phenotypes. We examined whether improvements in endothelial function following 2-weeks of aerobic training is affected different in adults with IFG+IGT compared to those with IFG alone. Methods: Middle-aged, obese adults with IFG (n=11; 58.3±9.3 yrs; 34.2±7.9 kg/m²; FPG: 106.5±6.1 mmol/L; 2-hr glic: 127.0±31.7 mg/dl) and IFG+IGT (n=13; 61.6±1.8 yrs; 32.8±3.1 kg/m²; FPG: 104.2±10.6 mmol/L; 2-hr glic: 162.2±29.6 mg/dl) were randomized to 12-match aerobic exercise bouts (~70% HRpeak, 60 min/d) over 2-weeks. A 2-hr 75g OGTT was performed and post-intervention to determine glucose tolerance. Endothelial function was determined by brachial artery flow mediated dilation (FMD) prior to the OGTT. Aerobic fitness (VO2peak), body composition (BIA), and vascular inflammation (VCAM, ICAM) were also assessed before and after training. Results: Training significantly increased VO2peak (P=0.03), fat-free mass (P~0.001) and VCAM (P~0.01) in both phenotypes. There was no effect of training on FMD in either IFG+IGT or IFG (0.33±3.9 vs. 1.13±4.7%, P=0.66 respectively). However, pre-intervention FMD (r=0.45, P=0.04) and glucose total area under the curve (r= -0.56, P=0.007) were associated with increased FMD in response to training. Moreover, increased FMD adaptation was linked to decreased circulating VACM after training (r=-0.52, P=0.02). Conclusion: These data highlight that impaired endothelial function and hyperglycemia prior to exercise treatment may affect improvements in endothelial function following short-term training in people with different prediabetes phenotypes. The mechanism by which people with prediabetes respond to exercise-induced vascular adaptation may regulate the reduced vascular inflammation and warrants further investigation.
Nutritional Intervention Increases the Likelihood of Menses in Exercising Women with Menstrual Disturbances

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No relevant relationships reported

Exercising women in whom energy intake is inadequate for energy expenditure may develop low energy availability (EA) and poor bone health. The first line of treatment is an increased energy intake to reverse low EA. REFUEL is the first randomized controlled trial (RCT) to assess the effectiveness of 12 months of increased energy intake on menstrual function and bone health in women with exercise-associated menstrual disturbances (EAMD).

PURPOSE: To determine if an intervention of increased energy intake improves menstrual regularity among women with EAMD.

METHODS: Young, exercising women with EAMD were randomized into two groups. The treatment group (EAMD+Cal, n=32) increased energy intake 20-40% above baseline energy needs; whereas, the EAMD Control group (n=30) maintained exercise and eating habits. Menstrual function was tracked throughout the intervention with baseline energy needs; whereas, the EAMD Control group (n=30) maintained exercise to being randomized to the moderate (MOD: 60-65% HRmax) or vigorous (VIG: 80-85% HRmax) intensity training group. During the intervention, participants exercised 4 days per week (45 minutes/session) in their target heart rate range. Continuous glucose monitors (CGM) were worn for 1 week at baseline and during the 12th week of supervised exercise training. Daily glycemic control was quantified over 24 hour periods (00:00 to 23:29) for each day the CGMs were worn during the week at baseline and after exercise training. We calculated mean, total area under the curve (trapezoidal method), and duration of hyperglycemia (percent time glucose >140 mg/dL). Using linear mixed models with repeated measures, we determined the effect of exercise training and whether the effect of training varied by exercise intensity group.

RESULTS:

- Exercise training had a modest effect on the likelihood of experiencing menses vs. the Control group (p<0.001).
- The EAMD+Cal group increased energy intake 20-40% above baseline energy needs; whereas, the EAMD Control group maintained exercise and eating habits. Menstrual function was tracked throughout the intervention with baseline energy needs; whereas, the EAMD Control group maintained exercise.
- Exercise training had a modest effect on the likelihood of exercising women with EAMD who moderately increased energy intake were twice as likely to experience menses vs. EAMD women who maintained their usual exercise and eating habits. The intervention was associated with a modest increase in body weight. This study is the first RCT to demonstrate the effectiveness of a nutritional intervention for the improvement of menstrual function in women with EAMD.

Supported by US DoD (PR054531)

Energy deficiency in exercising women can lead to menstrual disturbances (MD). There is no gold standard to accurately estimate energy deficiency. Ratios of measured to predicted resting metabolic rate (RMR) have been used as a proxy to categorize women as energy deficient. PURPOSE: To evaluate whether measured to predicted RMR ratios are a predictive indicator of amenorrhea or other MD. METHODS: We performed a cross-sectional comparison of 223 exercising women (>2 hrs/wk, age 18-35 yrs, BMI 16-30 kg/m2) who were ovulatory (OV), amenorrheic (AMEN), or subclinical MD (sMD) (including oligomenorrhea, anovulation, and luteal phase defects). Menstrual status was determined using urinary measures of reproductive hormones and menstrual calendars. Body composition was measured with DXA and RMR with the SensorMedics Vmax. Harris-Benedict, Cunningham, and DXA equations were used to calculate predicted RMR, RMR, and indexed RMR and to calculate the measured to predicted RMR ratio. ANOVA and Kruskal-Wallis tests determined group differences and logistic regression determined predictors of AMEN or any MD. Calculations of sensitivity, specificity and positive predictive value (PPV) assessed accuracy of predictions. RESULTS: Groups did not differ in lean or fat free mass. AMEN had lower body mass (p<0.01) than sMD, and lower BMI, percent body fat, mass (p<0.001) and measured RMR (1172 ± 21 kcal/d) (p<0.05) than OV (1227 ± 20 kcal/d) and sMD (1233.68 ± 17 kcal/d). AMEN RMR was lower in AMEN (1402 ± 8 kcal/d) vs sMD (1434.9 ± 9 kcal/d) (p<0.05). RMR ratio (0.84 ± 0.01) was lower in AMEN vs OV (0.88 ± 0.01) (p=0.05), but indexed RMR ratio (0.90 ± 0.01) was lower in AMEN vs both OV (0.96 ± 0.01) and sMD (0.95 ± 0.01) (p<0.01). Each ratio predicted AMEN (r²=0.4822, p<0.05; r²=0.708, p=0.01; r²=0.948, p<0.001), but only indexed RMR ratio predicted any MD (r²=0.7895, p<0.001). indexed RMR ratio correctly identified the most women with AMEN (ppv=0.5; specificity=0.94; sensitivity=0.74) and with any MD (AMEN+sMD; ppv=0.75; specificity=0.39; sensitivity=0.75). CONCLUSIONS: Each ratio may be used to predict AMEN, but only indexed RMR significantly predicts MD, regardless of severity. Similarly, indexed RMR ratio correctly identified the most subjects. indexed RMR ratio can be utilized to correctly identify women with AMEN or MD to secondary energy deficiency.

Effect of Interval Exercise Plus a Low-Calorie Diet on Endothelial Function in Obese Women

Nicole M. Gilbertson, Stephanie L. Miller, Natalie ZM Eichner, Steven K. Malin, FACSM, University of Virginia, Charlottesville, VA. (Sponsor: Steven K. Malin, FACSM)

Email: nm4sk@virginia.edu

No relevant relationships reported

PURPOSE: Low caloric diet (LCD) and interval exercise (INT) both improve endothelial dysfunction, in part, by reducing hyperglycemia. Whether adding INT to LCD raises endothelial function compared with LCD under energy available matched conditions is unknown. METHODS: Obese women (47±2.6y, 37.5±1.3kg/m²) were randomized to 2-wks of an LCD (n=12; mixed meals of 1000-1200kcal/d) or LCD+INT (n=12; 560±70kcal/d of unprocessed INT at 90% of 50% HRmax for 3 min each). LCD+INT subjects received 35kcal post-exercise to equate energy availability with LCD. A 75g OGTT was performed pre- and post-test to examine fasting, 1 and 2h post-meal glucose, and insulin incremental area under the curve (IAUC) and insulin sensitivity (IS; Matsuda Index). Fitness (VOpeak), body composition (BodPod), and vascular inflammation (VCAM, ICAM) were also determined. RESULTS: LCD+INT increased VOpeak (P<0.02) compared to LCD, and both treatments improved fasting energy expenditure (P<0.01). LCD+INT and LCD had no effect on fasting or iAUC FMD, but there was notable variation. In fact, low baseline fasting and iAUC FMD was linked to enhanced fasting and iAUC FMD post-treatment (r=0.71, P<0.001; r=0.89, P<0.001, respectively). When comparing subjects who increased fasting endothelial function after each treatment (<50% LCD n=5, LCD+INT n=7), LCD+INT increased fasting FMD more than LCD (6.3 vs. 2.8%, P=0.04), and LCD+INT attenuated fasting FMD iAUC compared to LCD (499 vs. 64, P=0.02). Enhanced fitness related to increased fasting FMD (r=0.43, P=0.03) and attenuated fasting iAUC (r=0.44, P=0.05). Attenuated FMD iAUC correlated with reduced glucose (r=0.55, P=0.004), as well as increased fasting and iAUC FMD (r=0.55, P=0.004 and r=0.42, P=0.04, respectively). CONCLUSIONS: There was large FMD variation post-treatment. However, INT enhanced the effect of LCD on fasting FMD in those with low endothelial function, and this was mirrored by low post-prandial FMD stimulation. Low post-prandial FMD was linked to improved glucose tolerance and carbohydrate metabolism, suggesting INT enhanced nutrient delivery and utilization to lower type 2 diabetes and CVD risk.
Female athletes in similar or same sports sustain more concussions than males. The reason for this is unclear. Few studies have directly compared the number of impacts and head acceleration in boys and girls sports at the high school level. One previous study compared boys and girls' hockey and also found that boys had a higher number of impacts but girls had a slightly higher average PLA, which is similar to our findings.

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<tr>
<td>For Practice</td>
<td>19.7</td>
<td></td>
</tr>
<tr>
<td>Peak Angular Acceleration (rad/s²)</td>
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<tr>
<td>Total</td>
<td>1208.3</td>
<td>1166.2</td>
</tr>
<tr>
<td>For Game</td>
<td>1089.2</td>
<td></td>
</tr>
<tr>
<td>For Practice</td>
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<td>1442.5</td>
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</tbody>
</table>

**CONCLUSIONS**

Irrespective of the diurnal timing of exercise performance, 12-weeks of multi-modal exercise training significantly increased PPG and PPI responses in both overweight non-T2DM and T2DM individuals.

**METHODS**

Exercise training reduced (main effect of time, \( p < 0.01 \)) PPG and PPI concentrations during the MMTT, with no group differences observed (\( p = 0.69 \)). A significantly greater reduction in PPG (I-AUC) was observed for the evening exercise group (78.56 mmol/L) when compared to the morning group (-33.22 mmol/L) at post-intervention (\( p = 0.03 \).) Reductions in PPI I-AUC (main effect of time, \( p = 0.01 \)) were observed at post-intervention, with no group differences reported (\( p = 0.18 \)).

**RESULTS**

The study demonstrated that exercise training significantly increased PPG and PPI responses in both overweight non-T2DM and T2DM individuals.
Youth flag football has been proposed as a safe alternative to tackle football due to rising concerns of neurodegeneration from repetitive blows, but the true head impact (HI) burden in youth flag football is unknown.

**Purpose:** To examine overall and age-specific HI exposure and magnitude in youth flag football.

**Methods:** Five youth flag football teams (n = 35, age = 8.5 ± 1.1 yrs, height = 138.5 ± 10.5cm, mass = 33.5 ± 8.8kg) comprised of two age groups (7-8Us and 9-10Us) wore HI sensors (Triax Sim-G) during practice and game sessions over one season. Sensors recorded HI frequency, linear (g), and rotational acceleration (rad/s²). Athlete exposure was calculated as one player participating in one practice or game session. Impact rates (IR) were calculated as impacts per 10 athlete exposures. Impact rate ratios (IRR) compared session type and age groups. Acceleration values were placed into low- and high-magnitude categories via median splits. Magnitude category frequencies were compared between age groups using z-tests (p<0.05).

**Results:** A total of 203 overall flag football HIs (127 game, 76 practice; 5.8 impacts/player, 0.6 impacts/exposure) were observed. Median linear acceleration was 32.7g (16.0g - 100.9g) and angular acceleration was 4,300 rad/s² (1,000 rad/s² - 12,500 rad/s²). The 90th percentile accelerations were 63.0g and 8,400 rad/s² during games and 49.5g and 8,200 rad/s² during practices. Players experienced significantly higher IRs during practices than games (IRR = 1.54, 95% CI: 1.16-2.05). There were no age group HI differences overall (IRR = 1.12, 95% CI: 0.83-1.51) or for games (IRR = 1.15, 95% CI: 0.80-1.64). Practices resulted in a 1.80 times the IR (95% CI: 1.02 - 3.17) in the 9-10Us compared to the 7-8Us. No significant associations between age groups were observed for low- and high-magnitude HIs for linear (p = 0.73) or angular acceleration (p = 0.32).

**Conclusions:** Flag football players experienced a low-frequency of HIs and relatively high-magnitude magnitudes, but whether high-frequency or magnitude HIs contribute to neurodegeneration is unknown. Practices had greater odds for HI frequencies than games, suggesting practice modifications can further decrease total HI. The 9-10Us experienced higher HI frequencies, potentially indicating more aggressive or risky game play with age.

**Impact of a Dynamic Dual-Task Paradigm and Concussion History On Motor and Cognitive Performance**

Maria Talarico, Christopher Ballance, Laura Boucher, James Onate. The Ohio State University, Columbus, OH. (No relevant relationships reported)

Prior to and following a concussion, athletes exhibit deficits in gait and cognitive performance between single-task (ST) and dual-task (DT) paradigms. Current motor tasks used in these divided attention paradigms may not be challenging enough to detect long-term changes following injury. **Purpose:** To determine if differences exist between ST and DT paradigms while performing a multi-directional gait task and Stroop test. **Methods:** Fifteen male Big Ten Universities Rugby Conference athletes (20.5±3.16 yrs; 1.79±0.07 m; 87.2±12.8kg) volunteered to participate. Two tasks were performed: 1) recite the color of the stimulus and 2) walk around a 3.05 x 3.05 m (10 x 10 ft) box while maintaining forward gaze. Tasks were completed independently (ST) and concurrently (DT). Attempted responses were calculated as a percentage of attempted out of total possible responses (56 stimuli). The number of incorrect responses were calculated as (incorrect responses / attempted responses)*100. Dual-task effect (DTE) was calculated as [(DT performance – ST performance) / DT performance * 100] for Motor and Cognitive measures. Dual-task effect (DTE) was calculated as (incorrect responses / attempted responses) * 100 for Motor and Cognitive measures. A paired samples t-test was performed to determine if differences in DTE existed between motor and cognitive performance. For all remaining outcome variables, 2 (paradigm) x 2 (concussion history) mixed-model ANOVAs were performed. Alpha level was set a priori at p<0.05.

**Results:** Participants walked a shorter distance under DT (10.49 m) compared to ST (11.66 m) (p<0.01). Athletes with a concussion history had a higher percentage of incorrect responses (2.73%) compared to those without a history of concussion (0.58%) (p<0.01). There were no differences in attempted responses between paradigms (p=0.38) or concussion history (p=0.66). DTE for box distance (-12.45%) and attempted responses (-3.80%) DTE were different (p=0.02).

**Conclusions:** Motor and cognitive differences existed under a DT paradigm whereby DT elicited a greater degree of change from ST for motor performance than cognitive performance. Establishing a normative healthy DT baseline performance is warranted to better inform clinicians on appropriate return-to-play decisions following injury.
the ML direction were significantly different between groups. Furthermore, in the EC condition, CI (p=0.026; CONC=-14.08±0.63, NORM=-15.93±0.52: Cohen’s d=3.2) in the ML directions was significantly different between groups. No other significant differences were observed. **CONCLUSION:** These results indicate that a prior history of SRC is associated with a greater incidence of LE injury and postural control differences can be detected prior to injury occurrence using postural control variability.

**METHODS:**

An instrumented th Percentile Male Hybrid III head and neck (headform; HF). A linear impactor impacted the HF at seven sites and four velocities (1.7, 2.7, 4.7, and 6.4 m/s). Each impact was not consistent with the occurrence of a significant impact large enough for the SIM-G to detect, thus 155 impacts (77 headband, 78 water polo cap) were analyzed. Peak linear acceleration (PLA), rotational velocity (PRV), rotational acceleration (PRA) were recorded for all impacts. SIM-G reliability was tested using a series of regression analyses to compare PLA, PRA, and PRV to HF values. Differences in the regression coefficients were tested by the interaction term (i.e., magnitude x headgear). Accuracy was tested using a mixed model ANOVA with sensor (HF, SIM-G) as a repeated measure and headgear (cap, headband) as a between-trial factor. Interactions were decomposed with post hoc Bonferroni-corrected t tests.

**RESULTS:**

The SIM-G sensor demonstrated sufficient reliability for quantifying in the water polo cap and headband. However, due to sensor inaccuracy, relative metrics, rather than absolute impact magnitudes, are advised when calculating head impact exposure.

**CONCLUSION:**

Preliminary results show ± 1747 rad/s²) Involuntary impacts accounted for 147 impacts for M (20g ± 9g; 1934 ± 1511 rad/s²) and 42 for F (21g ± 11g; 2095 ± 1603 rad/s²). For both M and F, the average linear and angular accelerations of the head caused by heading techniques were associated with higher values than involuntary impacts (p < 0.05). For both M and F, the most frequent heading technique was the jump and player-to-player contact was the most frequent for involuntary impact. **CONCLUSION:** Preliminary results show that heading techniques can cause higher values of head accelerations than involuntary impacts and therefore, could cause a higher risk of head injury in two different populations of players. Grant funding: this study was funded using NSERC and FRQNT research grants.

**RESULTS:**

There were no significant differences on Stroop effects (136.25 ± 125.67 vs. 137.10 ± 137.10, p = 0.19) between SIT and ACTIVE conditions. The global switch costs, local switch costs and Stroop effects were derived and used as the behavioral outcomes of the two tasks. Cortical activation during the two conditions was monitored using a 38-channel fNIRS (NIRx Medical Technologies LLC, USA).

**RESULTS:**

The SIM-G sensor was fitted to a 50th Percentile Male Hybrid III head and neck (headform; HF). A linear impactor impacted the HF at seven sites and four velocities (1.7, 2.7, 4.7, and 6.4 m/s). Each impact was not consistent with the occurrence of a significant impact large enough for the SIM-G to detect, thus 155 impacts (77 headband, 78 water polo cap) were analyzed. Peak linear acceleration (PLA), rotational velocity (PRV), rotational acceleration (PRA) were recorded for all impacts. SIM-G reliability was tested using a series of regression analyses to compare PLA, PRA, and PRV to HF values. Differences in the regression coefficients were tested by the interaction term (i.e., magnitude x headgear). Accuracy was tested using a mixed model ANOVA with sensor (HF, SIM-G) as a repeated measure and headgear (cap, headband) as a between-trial factor. Interactions were decomposed with post hoc Bonferroni-corrected t tests.

**RESULTS:**

The results suggest that the performances on Stroop task and task-switching were not impaired by self-paced cycling on a workstation. Importantly, cycling led to greater recruitment of sub-region of prefrontal cortex indicated by a greater cortical activation related to Stroop effects in the left-DLPFC.
RESULTS: Analysis of variance was conducted to determine the effects of group on information processing speed. For regular foreperiods (consistent time), the interaction between group and time for PMT, F(2, 51) = 4.194, p = .021, partial ƞ² = .020, was likely due to a simple main effect of time (pre to post) and not group allocation. This interaction was significant while the interaction for MT was not (p > .05). The interaction for CRT, Congruent RT and Incongruent RT decreased (p's<0.005), Incongruent RT was (p < .01) and TMT-B (57±2 vs 53±2, p < .01) was improved at 15EX and 45EX compared to Baseline (p's<0.005). While CRT and MT were not significantly different at Baseline, they were significantly different at 15EX and 45EX. The results suggest that acute HIIT-A and HIIT-AR can significantly improve information processing speed in young adults.

Abstract: Age-related cognitive decline affects several aspects of cognitive performance, including processing speed, inhibition, executive function, and visual scanning. Aerobic exercise is a potential solution to mitigate age-related cognitive decline. Furthermore, older adults are more susceptible to benefits from the effects of both chronic and acute aerobic exercise compared to younger adults. PURPOSE: To determine the associations of life-long aerobic exercise as well as the effects of acute aerobic exercise on cognitive function among healthy older adults (65-84 years old). METHODS: Model-based cluster analysis were conducted using 18 parameters of the participant’s cardiovascular health: (1) age; (2) VO2max; (3) Carotid Augmentation Index; (4) Carotid-femoral pulse wave velocity (cPWV); (5) Aortic systolic blood pressure (SBP); (6) Carotid intima-media thickness (IMT). A cross-sectional design was utilized to compare 27 active (A) with 31 inactive (I) older adults (70:30). Cognitive function was measured at rest and after 15 minutes of moderate intensity exercise (55-65% HRmax) via the trail-making test (TMT Form A and Form B). A series of one-way ANOVAs was performed on dependent variables. A repeated measures MANOVA was used to test differences on the TMT-A and TMT-B at rest compared to an acute bout of exercise. Pearson’s correlation analysis tested the associations among VO2max, age, carotid IMT, cPWV, and cognitive performance.

RESULTS: VO2max was not related to carotid IMT (r = -0.15, p = .27) or cPWV (r = -0.12, p = .38). Time to complete TMT-A (261±1 vs 231±1 seconds, F(1,57) = 15.12, p < .001 ) and TMT-B (57±2 vs 53±2, F(1,57) = 7.20, p < .05) increased after an acute bout of exercise compared to at rest. VO2max (r = -0.16, p = .23), carotid IMT (r = -0.17, p = .21), and cPWV (r = -0.15, p = .26) were not significantly correlated with cognitive performance on the TMT-A and TMT-B. Age was correlated with cognitive performance on the TMT-A and TMT-B (r = -.60, p = .01). CONCLUSION: An acute bout of aerobic exercise may diminish cognitive function among healthy older adults.

Abstracts were prepared by the authors and printed as submitted.
More competent decision makers report greater success in avoiding negative decision outcomes irrespective of general cognitive ability. While physically active young adults show more optimal executive functions, the relationship between daily moderate-to-vigorous physical activity (MVPA) patterns and decision-making competence (DMC) remains under-examined.

**METHODS:** We analyzed pre-intervention data from 220 participants (115 (52%) females, Mage=24.3 ±5.4 yrs, BMI=24.4 ± 4.0 kg/m²) from the INSIGHT randomized controlled trial. MVPA was measured over 7 days with a hip-worn wGT3X-BT accelerometer. Valid wear time was defined as ≥4 days, ≥10 hr/day, Daily (min/d), bouts of sporadic activity (≥10 consecutive min; frequency and min/d) were estimated using NHANES cut points. DMC was measured with the Adult-Decision Making Competence (A-DMC) battery and expressed as individual subtest scores and an A-DMC index (z-score). The relationships between MVPA and A-DMC variables were assessed with Spearman’s ρ controlling for wear time, age, sex, education, intelligence, fat free VO₂max, BMI and sedentary time (ST; <100 counts/min).

**RESULTS:** After controlling for daily MVPA, frequency and time spent in sustained MVPA bouts were positively related to the ability to recognize social norms (ψ=0.15; 0.16, P<0.04) and ignore unrecoverable costs when considering future decision outcomes (ψ=0.14; 0.15, P<0.04). In contrast, neither sporadic nor daily MVPA was associated with DMC in young adults. Participants in group-based high intensity functional training (HIFT) maintained exercise enjoyment and intentions; those training ≥5 days/week report highest intrinsic and extrinsic motivators. Yet, overtraining and overreaching concerns exist. A promising monitoring method is heart rate variability (HRV), which tracks cardiac autonomic nervous system activity. **PURPOSE:** To examine differences in daily training cognitions for HIFT participants. Participants with workouts modulated based on HRV status were expected to report significantly better daily training cognitions.

**METHODS:** Participants included 55 healthy adults randomized to HIFT-HRV (intervention) or HIFT (comparison). HIFT-HRV participants (n = 26) were 23.7 ± 4.5 years, 46% female, body fat percentage (BF%) = 27.3 ± 9.8%, and VO₂max = 44.4 ± 4.4 mL/kg/min. HIFT participants (n = 29) were 34.1 ± 4.1 years, 56.8% female, BF% = 32.4 ± 10.7%, and VO₂max = 42.1 ± 6.8 mL/kg/min. The 11-week study included 2 weeks baseline waking HRV, baseline testing week, 3 HIFT weeks (5 sessions/week), mid-point testing week, 3 HIFT weeks (5 sessions/week), and post-intervention testing week. HRV was recorded daily via photoplethysmography using a smartphone app. Self-reported motivation to train and fatigue, during HIFT weeks, were collected prior to training with performance satisfaction (PS) and perceived effort (RPE) collected immediately following. The training-related cognitions were assessed using the Visual Analog Scale and RPE using Borg’s (6-20) scale.

**RESULTS:** No significant differences were found between groups at baseline. HIFT-HRV participants reported cognitions more in line with daily motivation for 674 daily training sessions and HIFT participants reported cognitions for 763. Average motivation was significantly higher for the HIFT-HRV than the HIFT group, t(1435) = 2.41, p = .016. Average fatigue [t(1361) = 3.22, p < .001] and RPE [t(1271) = 5.68, p < .001] were significantly lower for the HIFT-HRV than the HIFT group. No significant differences were found for PS. **CONCLUSIONS:** HRV modulation during HIFT training resulted in greater daily motivation and lower daily fatigue and perceived exertion. HRV status is a promising method to monitor and modulate HIFT training and may facilitate adherence; future work could focus on applied interventions for existing HIFT populations.

**CONCLUSIONS:** Acute aerobic exercise improves cognitive performance in trained athletes. These effects are more pronounced when exercising for longer durations (~1 hr), employing higher exercise intensities and/or more complex cognitive tasks.
activity (waist-worn ActiGraph GT3X-BT) were assessed in women for ≥ 4 days with ≥ 10 hours, in each trimester of pregnancy. This preliminary analysis (59% recruited) included women with available birth records and valid activity data for 21 trimester (n=56). Birthweight (BW) and GAD were abstracted from medical records. BW was categorized as LGA if ≥ 90th percentile (n=18, 31%). Mean (SD) percent time spent sedentary was calculated in each trimester and differences across trimesters were tested using linear mixed models. The association of SB with continuous GAD and odds of LGA were estimated in separate regression models for each trimester. All beta coefficients were standardized (std β) per SD and adjusted for pre-pregnancy body mass index. If SB was associated with outcomes, further models estimated the effect of replacing SB with light physical activity (LPA) or moderate to vigorous physical activity (MVPA). RESULTS: Women spent a high percentage of time sedentary across trimesters: 1st (n=53) 64.0±9.0 (10.9), 2nd (n=56) 63.5±9.5 (9.3), and 3rd (n=47) 63.8±10.4. SB did not differ across trimesters (p=0.792). Higher percent time spent sedentary in the first trimester was associated with lower GAD (std β=-0.24, p=0.038). Replacing first trimester SB with LPA (std β=-0.24, p=0.031) or with MVPA (std β=-0.12, p=0.058), was associated with greater GAD. SB was not significantly associated with GAD in the 2nd (std β=-0.24, p=0.241) or 3rd (std β=-0.22, p=0.264) trimester. Odds of LGA was not significantly associated with SB in the 1st trimester (OR=0.75, p=0.389), 2nd (OR=0.80, p=0.503), or 3rd (OR=1.03, p=0.932) trimester. CONCLUSIONS: Women in this study were highly and consistently sedentary across pregnancy. Higher LPA and lower SB during the first trimester may be advantageous for greater GAD, though risk for LGA offspring did not appear to be associated with SB.

1794 May 30 4:00 PM - 4:15 PM Structured Exercise as a Potential Treatment Option for Prenatal Depression

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PURPOSE: Up to 20% of pregnant women experience prenatal depression and up to 19% will continue to have depressive symptoms in the postpartum. Previous research supports exercise during pregnancy as an effective way to prevent prenatal depression, however evidence is lacking regarding exercise as a potential treatment for women who enter pregnancy already at risk for depression. Therefore the purpose was to determine if exercise during pregnancy is an effective option to treat depression during pregnancy. METHODS: This is a secondary analysis of two randomized controlled trials that followed the same exercise protocol and study methodology in Madrid, Spain. Women <16 weeks pregnant were randomized to an exercise group (EG) or standard care control group (CG). The EG participated in group fitness classes three times per week. The classes included moderate intensity aerobic and resistance training in accordance to the American College of Obstetrics and Gynecology guidelines. All participants completed the Centre for Epidemiologic Studies Depression scale (CES-D) at baseline and at the end of the intervention (36-38 weeks gestation). Women who scored ≥16 on the CES-D at baseline (at risk for depression) were included in the current study. A One-Way ANOVA was performed to determine if there was a difference in post CES-D scores between the EG and CG. A Chi-Square Analysis was performed to determine if there was a difference between the two groups for the number of women who had a decrease in their score at the end of the intervention and also scored below 16 post-intervention. Results: Thirty-six women in the EG and 25 women in the CG scored ≥16 on the CES-D at baseline. Post-intervention, the EG had a significantly lower mean CES-D score (14.4±8.6) than the CG (19.4±11.1; p=0.05). Additionally, more women decreased their score in the EG (n=30, 83.3%) than the CG (n=14, 56%; p=0.05) however there was no difference in the number of women who went below the 16 point cut-off between the two groups. CONCLUSION: A structured exercise program offered during pregnancy may reduce depressive symptoms among women who begin pregnancy already at risk for prenatal depression. Therefore exercise may be a viable treatment option for prenatal depression.

1795 May 30 4:15 PM - 4:30 PM Effects Of Breaking-up Prolonged Sitting With Stair-climbing On Vascular-metabolic Function After A High-fat Meal

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Frequent high-fat meal intake and prolonged sedentary time are prevalent in our modern society and associated with increased risk of cardiovascular disease. Alternatively, breaking up prolonged sitting is introduces health benefits, although not always practical.

PURPOSE: To test whether stair-climbing could be an effective way of breaking up prolonged sitting. METHODS: Twelve healthy adults (male=7) participated in two trials after a high-fat meal: 1)4-h uninterrupted sitting, 2)4-h sitting interrupted with 5-min of stair-climbing every hour (interrupted sitting). We measured triglycerides, glucose, brachial artery flow-mediated dilation, popliteal artery blood flow and shear rate. All variables were measured five times (before and every hour after high-fat meal). Results indicated that stair-climbing was associated with lower triglyceride, glucose and increased popliteal artery blood flow and shear rate. RESULTS: The intensity of 5-min stair-climbing was 66% of heart rate reserve. High fat meal increased triglycerides and glucose concentrations, without any significant differences between trials. Brachial artery flow-mediated dilation decreased in sitting trial, but increased in the interrupted sitting trial (uninterrupted sitting: 9.2±2.16 to 9.0±1.23, interrupted sitting with stair-climbing: 7.9±2.55 to 10.3±1.89, p=0.009). Popliteal blood flow and shear rate were increased in the interrupted sitting trial with a significant interaction effect (blood flow: p<0.001, shear rate: p=0.006). Also, interrupted sitting attenuated the prolonged sitting-induced increase of systolic blood pressure and pulse pressure. CONCLUSION: Stair-climbing appears to be an effective way of breaking up prolonged sitting to improve vascular function with easy accessibility in various settings.

1796 May 30 4:30 PM - 4:45 PM Associations of Fast Walking with Sleep Quality and Duration in Older Adults

Angelique Brellenthin, Duck-chul Lee, FACSM, Iowa State University, Ames, IA. (Sponsor: Duck-chul Lee, FACSM) (No relevant relationships reported)

Purpose: Poor sleep has been associated with negative health outcomes in older adults. Since walking is the most popular form of physical activity in older adults, we examined the effects of daily steps and fast walking on sleep quality and duration.

Methods: This cross sectional study included 402 older adults (56% women; 72 years old). Participants wore an accelerometer-based pedometer (Omron) during waking hours for 7 days. We used total average daily steps and average daily fast walking steps defined as ≥100 steps/min. Sleep duration and quality were measured using the Pittsburgh Sleep Quality Index (PSQI). Poor sleep quality (PSQ) was defined as a PSQI global score of >5, and inadequate sleep duration (ISD) was defined as <7 hours/night. Odds ratios (ORs) and 95% confidence intervals (CIs) for PSQ and ISD were calculated among 4 groups: no daily fast steps and tertiles (thirds) of fast steps. Covariates were sex, age, body mass index, smoking, heavy alcohol intake, depression, anxiety, diabetes, hypertension, hyperlipidemia, and sleep apnea.

Results: On average, participants took 5,764 steps, 1,598 fast steps (70% had at least 1 daily fast step), had a PSQI score of 4.6, and a sleep duration of 7.1 hours. Total steps were not associated with quality or quantity (both p>0.05). However, fast walking was associated with sleep quality with ORs (95% CIs) of 0.47 (0.24-0.90), 0.53 (0.27-1.04), and 0.82 (0.35-1.92) for <940 (lower third), 941-2600 (middle third), and >2600 (upper third) of fast steps, respectively, compared with no fast steps, adjusting for the confounders including total daily steps. Obtaining any fast steps was associated with 0.92 (0.30-0.90) reduced odds of PSQ compared with no fast steps. However, no associations were observed between fast steps and ISD. In a joint analysis, compared with those who took <5,000 daily steps and 0 fast steps, there were reduced odds of PSQ among those with <5,000 steps and >1 fast steps (0.42 [0.24-0.74]), suggesting the benefits of fast walking on sleep quality regardless of total daily steps.

Conclusion: These results indicate that even small amounts of fast walking, rather than total daily steps, are associated with better sleep quality in older adults. Supported by unrestricted research grant by Biospace.
PC-DA model of UPLC-MS metabolomics data for different cardiorespiratory fitness PDM.

1797 May 30 4:45 PM - 5:00 PM

Differences of Plasma Metabolites in Prediabetes with Different Cardiorespiratory Fitness and the Effects of Exercise

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(Please note relationships reported)

POURPOSE: To indentify the most significant plasma metabolites for higher and lower cardiorespiratory fitness (CRF) in pre-diabetes mellitus (PDM), and the effect of aerobic exercise training on these metabolites. METHODS: All 80 PDM subjects were selected [age: (51.62±10.03) yrs; body mass index: (26.17±3.60) kg/cm²; 24 males]. CRF was measured directly with a graded exercise test. Exercise intervention program: 3 times/week, 50 min per session at 46%-64% VO2max, 3 month. Body composition was measured by dual-energy x-ray absorptiometry. Plasma metabolites were detected by ultra high performance liquid mass spectrometry(UPLC-MS), and were detected by ultra high performance liquid mass spectrometry(UPLC-MS), and analyzed by PCA and OPLS-DA. RESULTS: 1) Compared with lower CRF group, HOMA-IR, HOMA-β, LDL-C, BMI and Fat% of higher CRF group were lower, and the amount of low intensity activity was more. 2) There were different expressions of 7 metabolites in different CRF groups, including PC (20:1/14:1), PC(18:3/16:0), LysoPC(16:0), Valine, isocitric acid, Octyl carnitine and Linoleyl carnitine. 3) After 3-month exercise training, the fasting and OGTT-2h blood glucose of 61.11% of PDM subjects turned to normal; PDM subjects' VO2max increased significantly( 6.84%); but the amount of low intensity activity was more. RESULTS: Women were 46 years old, on average, at study entry. Forty-seven percent were non-Hispanic white; 28% were black; 9% were Japanese; 8% were Chinese, and 8% were Hispanic. Each additional one-unit increase in the sports and exercise physical activity index score was not associated with total cholesterol (mean difference=-0.3; 95% CI: -0.4, 1.0) or LDL (mean difference=-0.2; 95% CI: -0.8, 0.4).

CONCLUSIONS: Moderate to vigorous physical activity is longitudinally associated with lower triglyceride levels and higher HDL levels in midlife women.

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1798 May 30 5:00 PM - 5:15 PM

Longitudinal Associations of Physical Activity and Blood Lipid Levels in Midlife Women in SWAN

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(Please note relationships reported)

Decreasing levels of estrogen production, combined with the detrimental effects of aging, lead to large increases in cardiovascular disease (CVD) risk among midlife women. Physical activity has the potential to attenuate this increase in CVD risk; however, longitudinal associations of physical activity and blood lipid levels, important contributors to CVD, have not been studied in midlife women.

PURPOSE: To estimate the longitudinal associations of physical activity with blood lipid levels in midlife women.

METHODS: We used data from 3,230 participants in the Study of Women’s Health Across the Nation (SWAN), a longitudinal cohort study spanning 14-17 years of nearly annual follow up. Women reported physical activity using the Kaiser Physical Activity Survey at 7 study visits. We used the sports and exercise physical activity index score to estimate leisure-time moderate to vigorous intensity physical activity. SWAN measured total cholesterol, triglycerides, HDL, and LDL in blood collected at 8 study visits. We used generalized estimating equations to estimate longitudinal associations of moderate to vigorous intensity physical activity with each blood lipid biomarker, adjusted for age, race/ethnicity, education, and body mass index category.

RESULTS: Women were 46 years old, on average, at study entry. Forty-seven percent were non-Hispanic white; 28% were black; 9% were Japanese; 8% were Chinese, and 8% were Hispanic. Each additional one-unit increase in the sports and exercise physical activity index score was associated with an average 1.9 mg/dl lower triglyceride level (95% CI: -3.5, -0.2) and 0.6 mg/dl greater HDL level (95% CI: 0.4, 0.9). The sports and exercise physical activity index score was not associated with total cholesterol (mean difference=-0.3; 95% CI: -0.4, 1.0) or LDL (mean difference=-0.2; 95% CI: -0.8, 0.4).

CONCLUSIONS: Moderate to vigorous physical activity is longitudinally associated with lower triglyceride levels and higher HDL levels in midlife women.

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1800 May 30 5:30 PM - 5:45 PM

The Use Of Resistance Exercises To Interrupt Sitting: Acceptability And Impact On Sleepiness, Discomfort, And Fatigue

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(Please note relationships reported)

Emerging research suggests cardiometabolic benefit from using simple resistance exercises to interrupt prolonged sitting, yet it is unclear if such programming is acceptable and can affect discomfort, fatigue, and sleepiness.

PURPOSE: To examine the acceptability of hourly, brief resistance exercise bouts and the effects on subjective
ratings of discomfort, sleepiness, and fatigue. Methods: Fourteen adults (age 53.4±9.5 years, BMI 30.9±4.8 kg/m²) completed two 4-hour randomized simulated laboratory-based work conditions on separate days: prolonged sitting (SIT) and sitting with hourly resistance exercise breaks (REX). Acceptability was assessed after REX in 5 domains: 1) willingness to use REX, 2) confidence to use REX unsupervised, 3) co-worker acceptance of REX, 4) employer acceptance of REX, and 5) feasibility of frequency and amount of REX. During each 4-hr protocol, ratings of sleepiness (Karolinska Sleepiness Scale), discomfort, and fatigue (Physical Discomfort and Fatigue Questionnaire) were assessed at baseline and then hourly. Linear mixed models evaluated overall condition effects and differences at each hour following Bonferroni adjustment. Cohen’s d estimated magnitude of effects. Results: A majority of participants reported high to very high acceptability on the 5 domains of REX (Table). Physical discomfort (β=0.15 log-points, p=0.074, d=0.34), mental fatigue (β=0.23 log-points, p=0.016, d=0.18), physical fatigue (β=0.30 log-points, p=0.016, d=0.20), and sleepiness (β=0.33 log-points, p=0.106, d=0.14) did not differ by condition. Mental fatigue was significantly lower (better) at 4 hours in favor of REX (β=0.48 log-points, p=0.020, d=0.37). Conclusion: Hourly simple resistance breaks were rated as an acceptable method to interrupt prolonged sitting during work; however, REX did not improve discomfort, fatigue, or sleepiness compared to SIT. Investigating adaptations and acceptability with chronic usage are warranted.

Table. Acceptability of Simple Resistance Exercise Breaks to Interrupt Sedentary Behavior

<table>
<thead>
<tr>
<th>Acceptability Questionnaire</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Question 1: Willingness to Use REX</td>
<td>Very low or Low</td>
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<tr>
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<td>Neither low nor High</td>
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<tr>
<td></td>
<td>High or Very High</td>
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<tr>
<td></td>
<td>Neither low nor High</td>
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<tr>
<td></td>
<td>High or Very High</td>
<td>10</td>
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<tr>
<td>Question 3: Coworker’s Acceptance of REX</td>
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<td>1</td>
</tr>
<tr>
<td></td>
<td>Neither low nor High</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>High or Very High</td>
<td>9</td>
</tr>
<tr>
<td>Question 4: Supervisor’s Acceptance of REX</td>
<td>Very low or Low</td>
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</tr>
<tr>
<td></td>
<td>Neither low nor High</td>
<td>2</td>
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<td></td>
<td>High or Very High</td>
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</tr>
<tr>
<td>Question 5: Feasibility of Frequency and Amount of REX</td>
<td>Very low or Low</td>
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</tr>
<tr>
<td></td>
<td>Neither low nor High</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>High or Very High</td>
<td>9</td>
</tr>
</tbody>
</table>

unremarkable. On secondary survey, head, neck and spine were normal. Ribs and abdomen were also normal. Examination of upper extremity revealed deformity of the right shoulder girdle with tenderness and swelling over the proximal right clavicle. The neuro-vascular exam of the upper extremities were normal and symmetrical. She was not able to move the right shoulder due to severe pain. The lower extremities were normal. Neurological examination was normal as was examination of the skin.

DIFFERENTIAL DIAGNOSIS:
1. Clavicle fracture
2. Sterno-clavicular (SC) dislocation
3. Rib fracture
4. Pectoralis muscle tear

TESTS AND RESULTS:
Chest Xray, Clavicle Xray, Shoulder Xray - fracture medial right clavicle and possible dislocation of SC joint
CT of Head and Cervical spine - unremarkable and without acute injury
CT of Abdomen and Pelvis - unremarkable and without acute injury
CT of Chest - fracture and posterior dislocation of the right SC joint with compression of the brachiocephalic artery and vein

FINAL WORKING DIAGNOSIS:
Fracture and posterior dislocation of the right SC joint with compression of the brachiocephalic artery and vein

TREATMENT AND OUTCOMES:
1. Evaluation by Trauma Surgery, Cardio-Thoracic Surgery with admission to Orthopedics for operative repair
2. Taken to OR and under general anesthesia and fluoroscopic visualization, reduction of SC dislocation
3. Reduction was unstable and ORIF performed with trans-osseous sutures and reconstruction of capsule
4. Discharged next day on Xarelto for 8 weeks and no weight bearing of right upper extremity
5. Physical therapy for 8 weeks begun 2 weeks post op.
6. Patient has returned to riding and experiences only minimal stiffness at right SC joint

HISTORY: 37 y/o African American female with history of anemia presented to ED with severe abdominal pain, tachycardia and rapidly progressive bilateral upper and lower extremity paralysis. She reported recently starting Boot Camp style workouts with the last session two days prior to first admission. Patient admitted to using diet pills and intermittent fasting. She was admitted for 3 weeks initially and readmitted four days after being discharged with recurrence of symptoms.

PHYSICAL EXAMINATION: Vitals were within normal range. Normal respiratory effort but only able to speak 3-4 words per breath. Diffuse abdominal tenderness. Paralysis of upper and lower extremities bilaterally with minimal motor function of fingers and toes, full sensation intact, CN 2-12 intact, DTRs +2.


TEST AND RESULTS: MRI Head and Spine negative for lesions, nerve root compression or myelopathy. Creatine Kinase levels were mildly elevated. CT Abdomen/Pelvis was unremarkable and without acute injury. CT of Abdomen and Pelvis was normal. No improvement with IVIG. Labs that were sent out during first admission came back during her second admission (4 weeks later) with dramatically elevated Urine porphobilinogens at 1529 mg/L (ref: <2mg/L). Stool porphobilinogens were also elevated.

FINAL WORKING DIAGNOSIS: Variegate Porphyria

TREATMENT AND OUTCOMES: The patient was started on high volume D10 IV (125ml/hr) for 2 days until IV Hemin was obtained from the only lab in the US. She was started on high volume D10 IV (125ml/hr) for 2 days until IV Hemin was obtained from the only lab in the US. She was discharged home after two months and moved out of town to live with family.

THURSDAY, MAY 30, 2019

Abstracts were prepared by the authors and printed as submitted.
1806
May 30 4:25 PM - 4:45 PM
Muscle Weakness: Boxing
Belmarie Rodriguez-Santiago, David Atkins, Brenda Deliz-Roldan, William Micheo, FACSM. University of Puerto Rico, San Juan, Puerto Rico.

History: A 50-year-old right-handed retired male boxer with no past medical history presented progressive weakness and muscle wasting of bilateral upper extremities. He denied any numbness, tingling or paresthesia, bowel or bladder incontinence, lower extremity weakness or dysphagia. Three weeks before symptoms started, he suffered a fall with impact in the forehead. The patient has a 17-year history of boxing career with a total of 250 combats.

Physical Examination: Generalized muscle atrophy and fasciculations observed in bilateral upper extremities. Full passive range of motion in bilateral upper extremities but limited active shoulder flexion and abduction and incomplete handgrip bilaterally. Strength was 2/5 in shoulder abduction, 3/5 in elbow flexion and extension, and in right wrist flexion and 0/5 in wrist extension. Sensation was intact to pinprick, soft touch and vibration. Deep tendon reflexes 1+ throughout upper and lower extremities.

Differential Diagnosis:
1. Cervical Polyradiculopathy
2. Central Cord Syndrome
3. Motor Neuron Disease: Brachial Amyotrophic Diplegia
4. Chronic Traumatic Encephalopathy

Tests and Results:

Electrodiagnostic Study: Normal sensory nerve conduction study (NCS). Motor NCS showed low amplitude in the right Median and Ulnar nerves. Electromyographic study revealed active denervation and reinnervation potentials in bilateral upper extremities. Fibrillation and positive sharp waves were observed in cervical and thoracic paraspinal muscles. Brain MRI: Mild cerebral cortical atrophy. No other intracranial abnormality.

Final Working Diagnosis:
Motor Neuron Disease: Brachial Amyotrophic Diplegia

Treatment and Outcomes:
1. Physical therapy for light strengthening and aerobic training.
2. Occupational therapy for assistive device and activities of daily living evaluation and training.
3. Referred to Neuromuscular Clinics for multidisciplinary management.
4. Started in Riluzole.
5. Referred to Speech and Swallow evaluation.
6. Followed up every 3 months to monitor neurological symptoms and remained stable with no signs of neurological deterioration.

1808
May 30 5:05 PM - 5:25 PM
Assisted Breathing Manual Therapy for Soccer Chest-Trap Anterior Chest Wall Injury
John C. Hannon, private practice, San Luis Obispo, CA.

Chest wall injury—Soccer
John C. Hannon, private practice, San Luis Obispo, CA
HISTORY: A17 year-old high school senior soccer left back, during the last quarter of a late-season game, chest-trapped a long and hard soccer ball experiencing instant breathlessness and incapacitating anterior chest pain aggravated by deep breathing, head, spine and arm movement. At the ED, she experienced less intense symptoms. Later, she, and her parents, worried her continued chest pain (which increased with exertion, coughing, and difficulty breathing when running) would ruin her chances to be seen favorably by college soccer scouts. The next day she presented for manual therapy.

PHYSICAL EXAMINATION: Examination revealed a mild pectus excavatum with bilaterally painful 2nd and 3rd sterno-chorndal joints and diminished respiratory excursion, accessory breathing muscle activity and elevated shoulders. Muscle splinting interfered with overhead reaching and spinal twisting. Interestingly, marked pain relief occurred with manual skin stretch tangentially applied in the left midaxillary line along the path of the 5th rib with the stretch directed posterior-to-anterior. Similar relief was obtained by firm pressure over the left costal diaphragm muscle attachments. Pain-free palpation of spinal, costo-chorndal and costo-vertebral joints. SC, AC and GH joint-play intact.


TEST AND RESULTS: Normal AP and Lateral chest-xray
Fibromyalgia 12. Seronegative spondyloarthropathies

1807
May 30 4:45 PM - 5:05 PM
Syncope On The Green - Golf
Noor Alzarka, Mark Chassay, FACSM. University of Texas Health Science Center at Houston, Houston, TX.

HISTORY: 22-year-old female collegiate Division I golfer presents with intermittent dizziness, palpitations, and pre-syncope symptoms. She reports a history of syncope as well. She also describes episodes of palpitations or subjective tachycardia at rest and in association with exertion. Symptoms worsen during strenuous weight training exercises. She does not use any prescription medications, supplements, or recreational drugs. Her father has a history of a cardiac arrhythmia and cardiac arrest. She seeks a cardiology referral for diagnostic evaluation.


Test and Results: EKG: normal sinus rhythm. 3-day Holter monitor. Average HR 93 BPM. No ventricular or supraventricular ectopics noted. Tilt Table Test: Passive phase is non-diagnostic. Drug provocation phase with nitroglycerin challenge is positive for syncope, a HR decrease from 136 to 40, and then sinus arrest with a 6.1 second pause while blood pressure remains stable.

Final Working Diagnosis: Vasovagal syncope with sinus arrest consistent with cardio-inhibitory component.

Treatment and Outcomes: 1. The cardiac electrophysiologist cleared her for participation in golf and to work out with activity modifications in order to moderate her physical workload and avoid excessive strain that might trigger vasovagal syncope. 2. She was advised to self-monitor for pre-syncopal symptoms; to modify activities as needed, including using lighter weights, taking more breaks, and laying down to recover when needed; and to avoid pushing through symptomatic episodes. 3. The cardiac electrophysiologist also recommended optimizing hydration, including increased salt and electrolyte intake. 4. She was counseled about the possibility of serious injury resulting from syncope.
D-46  Clinical Case Slide - Knee II
Thursday, May 30, 2019, 3:45 PM - 5:25 PM
Room: CC-105B

1809  Chair: Matthew R. Gammons. VT Ortho Clinic/Killington Medical Center, Rutland, VT.
(No relevant relationships reported)

1810  Discussant
Mary Lloyd Ireland, FACSM. University of Kentucky, Lexington, KY.
(No relevant relationships reported)

1811  Discussant
Pierre L. Viviers, FACSM. Stellenbosch University, Stellenbosch, South Africa.
(No relevant relationships reported)

1812  May 30 3:45 PM - 4:05 PM
Knee Pain and Effusion in a Medically Complex Patient
Aubrey Armento. University of Colorado Denver; Denver, CO.
(Sponsor: John Hill, FACSM)
Email: aubrey.armento@childrenscolorado.org
(No relevant relationships reported)

HISTORY: An 8-year old female presents with a chief complaint of left knee pain and swelling. The pain started one month ago with no acute inciting injury. The pain is located over the anterior knee and is exacerbated with running and bike riding and alleviated with rest and ice. The knee swelling worsens after activity. She has no warmth or erythema of the joint. She denies fever, rash, or other joint complaints. The patient has a history of isolated Langerhans cell histiocytosis of the pituitary stalk and diabetes insipidus, which was diagnosed a year ago. She takes an oral steroid burst and receives vinblastine for chemotherapy every three weeks.

PHYSICAL EXAMINATION: There is a palpable joint effusion of the knee without erythema or warmth. There is diffuse peripatellar tenderness to palpation. She has limited knee flexion to 110 degrees but full extension. Patellar grind test is negative. There is no patellar apprehension. The Lachman test, anterior and posterior drawer tests, varus and valgus stress testing, and McMurray’s test are all negative.

DIFFERENTIAL DIAGNOSIS:
1. Musculoskeletal lesion of Langerhans cell histiocytosis
2. Osteochondritis dissecans of the knee
3. Septic arthritis of the knee in an immunocompromised patient
4. New-onset juvenile idiopathic arthritis (JIA)

TESTS AND RESULTS:
- X-rays of the knee showed no acute bony abnormality.
- MRI of the left knee with and without contrast revealed a large joint effusion with enhancing synovitis but otherwise no abnormality.
- Labs including a complete blood count (CBC), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) were within normal limits other than the slightly elevated CRP.
- The patient had an ophthalmologic evaluation and was diagnosed with right anterior uveitis, so she was referred to Rheumatology.
- Knee joint aspiration was performed, with synovial fluid analysis consistent with an inflammatory arthritis. Cultures had no growth.

FINAL WORKING DIAGNOSIS: Juvenile idiopathic arthritis

TREATMENT AND OUTCOMES: The patient underwent a steroid injection of the left knee. Hopefully, her arthritis can be managed with naproxen and intermittent steroid injections. If not, further discussion must be had between Rheumatology and the Oncology teams about the risk and benefits of disease modifying anti-rheumatic drugs (DMARDs).

Title: Knee Pain - Swimming in Dangerous Waters

Author: Lauren Nadkarni, MD and Kate Quinn, DO (sponsored by Heather Gillespie, MD, MPH, FACSM)

History:
A 17-year-old male with a non-contributory past medical history developed acute pain in his left knee while swimming 3 days prior to presentation. He experienced a popping sensation with hyperextension of his knee while treading water and throwing a rope swing to his friends on the bank of a river. He had immediate swelling and felt pressure on the lateral and posterior parts of his knee, associated with sharp and stabbing pain when straightening his knee. His pain was worse with flexion beyond 90 degrees, straightening his leg, or walking, but was improved with rest and ice. He did not have any give-way or locking episodes.

Physical Exam:
Office examination of his left knee was limited by guarding but demonstrated a very subtle posterior sag sign and a positive effusion. There were no overlying skin changes. His range of motion was 5 degrees of hyperextension to 110 degrees flexion actively his flexion increased to 120 degrees passively. He also had mild posterior lateral joint line tenderness, negative patellar testing, and positive posterior drawer and lateral flexion pinch testing. His anterior drawer testing was negative, although he did exhibit guarding. His contralateral knee, ipsilateral hip/ankle, and neurovascular exams were unremarkable.

Differential diagnosis:
- PCL injury
- ACL injury
- Lateral meniscus injury
- Posterior lateral corner injury
- Patellar subluxation
- Lateral tibial plateau contusion or fracture
- Lateral femur contusion or fracture

Tests and results:
- Knee x-ray:
  - Normal anatomy with small effusion
  - No acute fracture
  - Isolated PCL rupture

Final working diagnosis:
- Isolated PCL rupture

Treatment and Outcomes:
- Knee immobilizer for 3-4 weeks
- Physical therapy with initial avoidance of hamstring activation for the first 4 weeks
- Over the counter analgesics as needed
- Return to sport progression

1814  May 30 4:25 PM - 4:45 PM
Osteochondritis Dissecans With Loose Body In A Golfer
Krishna Israni, Daniel Montero. Mayo Clinic, Jacksonville, FL.
(Sponsor: George Pujialte, FACSM)
Email: israni.krishna@mayo.edu
(No relevant relationships reported)

Title: Knee Pain - Swimming in Dangerous Waters

Author: Lauren Nadkarni, MD and Kate Quinn, DO (sponsored by Heather Gillespie, MD, MPH, FACSM)

History:
A 63-year-old gentleman with no significant past medical history presented in sports medicine clinic due to left knee pain that began 3 months prior. He states that he stays physically active. Four months prior, he was on the golf range and noticed mild discomfort. He then noticed worsening discomfort with running. His symptoms improved with rest but then would return with activity. Mild pain relief with ibuprofen. Soon after, he started to have painful clicking and catching of the left knee. He returned to Montana where he saw an orthopedist who prescribed meloxicam and ordered x-rays that had essentially normal findings. He then underwent magnetic resonance imaging (MRI) which revealed cartilage defects. His pain improved but then described occasional, sharp, left lateral knee pain, and less commonly, medial knee pain. He described the pain as aching, sometimes sharp, and measuring 4/10 on the pain scale. Running and walking exacerbated his symptoms; straightening his leg worsened the pain. He had occasional night pain also.

Physical Exam:
Heathy-appearing gentleman, had muscular legs, able to rise from a seated position without difficulty, with nonantalgic gait. Normal range of motion without restriction, minimally tender over the left lateral joint line, no ligament instability, no obvious effusion, positive McMurray, negative Lachman.

Differential Diagnosis:
Meniscal tear
Osteoarthritis
Plica syndrome
Osteochondritis dissecans

Tests and Results:
X-rays grossly unrevealing.

Abstracts were prepared by the authors and printed as submitted.
MRI: Large osteochondral defect in the left lateral femoral condyle, measuring approximately 1 cm across, with apparent loose body in the posterior fossa. Smaller osteochondral defect seen in the medial femoral condyle which appeared stable. Associated bony edema on the lateral femoral lesion.

**Final Working Diagnosis:** Osteochondritis dissecans with loose body

**Treatment and Outcomes:**
- Patient was very active and wanted to return to playing golf. His daily activities were much improved but still limited compared to prior level of activity.
- Recommended modified activities and possible steroid injection if pain continued to limit activities.
- Repeat MRI to reassess bony edema and loose body with further consideration of knee scope and other procedures, based on clinical response and imaging.

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**1815** May 30 4:45 PM - 5:05 PM

**Bilateral Knee Pain in Pregnancy**

Michelle Sriwongtong, UCLA, Santa Monica, CA. (Sponsor: Aurelia Nattiv, FACSM)

Email: msriwongtong@mednet.ucla.edu

(No relevant relationships reported)

**HISTORY:** A 21-year-old female NCAA Division 1 soccer defender sustained a non-contact right knee injury while chasing a ball in the 70th minute of an international season game. Her right foot caught on the turf and she felt a “pop” before falling. No previous history of knee injuries.

**PHYSICAL EXAMINATION:** Examination on the field by an ATC revealed no effusion or deformity, non-tender to palpation, full pain free ROM, a positive Lachman’s and anterior drawer test, and no laxity of the MCL or LCL.

**DIFFERENTIAL DIAGNOSIS:**
- 1. Isolated ACL tear
- 2. ACL with collateral ligament and/or meniscal injury
- 3. Transient knee dislocation

**TEST AND RESULTS:**
- Right Knee MRI: Full-thickness ACL tear with intact collateral ligaments and meniscus
- Subchondral edema present in lateral femoral condyle and lateral tibial plateau

**FINAL WORKING DIAGNOSIS:** Isolated complete ACL tear

**TREATMENT AND OUTCOMES:**
- 1. ACL reconstruction with BTB Patellar Tendon graft
- 2. Full ROM was achieved by week 3 post-op. Rehabilitation progression included traditional rehabilitation models. Additional focus on neurological rehabilitation was initiated week 3 and maintained throughout.
- 3. Triphasic training and movement progressions with concurrent sensory inputs and cognitive interference were employed, resulting in a multidisciplinary 3-fold rehabilitation model designed to target 3 injury-associated areas (motor, sensory, neuromuscular). Triphasic training utilizes block periodization of multi-joint movements to target each action of the stretch shortening cycle. Isometric movements increase motor unit recruitment and rate coding while eccentric increases corticospinal signal. The resulting program combats the motor inhibition while simultaneous sensory overload and cognitive interference oppose neuroplastic changes through neural resource competition and may accelerate return to play.
- 4. Cleared to play 5.5 months following ACL reconstruction by orthopedic surgeon.

**1816** May 30 5:05 PM - 5:25 PM

**Bilateral Knee Pain in Pregnancy**

Michelle Sriwongtong, UCLA, Santa Monica, CA. (Sponsor: Aurelia Nattiv, FACSM)

Email: msriwongtong@mednet.ucla.edu

(No relevant relationships reported)

**HISTORY:** 37F G1P2 @32w4d presents with nontraumatic right knee pain for 1 week. Right knee outside MRI showed extensive marrow edema in the medial femoral condyle, consistent with avascular necrosis. She was made non-weight bearing. Her pain progressed and she became wheelchair bound. She delivered a baby girl @39w5d via C-section. She came to our clinic 3 weeks postpartum for persistent right knee pain and 3 weeks of new left knee pain.

**PHYSICAL EXAMINATION:**
- BMI 30. Unable to bear weight due to pain. Bilateral knee exam with tenderness to palpation on her proximal tibia, medial and lateral joint lines, ROM 0-135 degrees, no effusion.
- Quadriceps and hip abductor strength 3/5 bilaterally. No tenderness to palpation on her proximal tibia, medial and lateral joint lines.

**DIFFERENTIAL DIAGNOSIS:**
- Transient osteoporosis of pregnancy
- Avascular necrosis of the femoral condyle
- Stress fractures with minimal trauma
- Stress fractures with insufficiency fractures

**TEST AND RESULTS:**
- Osteoporosis with insufficiency fractures
- Associated bony edema on the lateral femoral lesion.
- MRI R knee (initial) 5/2018: Extensive marrow edema present in the medial femoral condyle extending over 2.5 cm possibly related to stress reaction or early avascular necrosis. No subchondral or cortical fracture.
- 2. XR knee bilateral 7/2018: patchy demineralization around the right knee. When correlating clinical history with outside MRI, findings suggest transient osteoporosis.
- 3. MRI L knee 7/18: Small subchondral insufficiency fracture of medial femoral condyle with very mild surrounding bone marrow edema. Faint bone marrow edema in the lateral femoral condyle without fracture.
- 4. MRI R knee (fu) 7/21/18: Subchondral insufficiency fracture of the lateral femoral condyle with moderate surrounding bone marrow edema. Resolution of medial femoral condyle bone marrow edema.

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**D-47**

**Clinical Case Slide - Shoulder and Elbow**

Thursday, May 30, 2019, 3:45 PM - 5:45 PM

Room: CC-306

**1817**

**Chair:** David Jewison, University of Minnesota Orthopaedics, Maple Grove, MN.

(No relevant relationships reported)

**1818**

**Discussant:** Jason Pothast, MedStar National Rehabilitation Network, Washington, DC.

(No relevant relationships reported)

**1819**

**Discussant:** Robert H. Lutz, Davidson College, Davidson, NC.

(No relevant relationships reported)

**1820** May 30 3:45 PM - 4:05 PM

**Elbow Pain - Recreational Athlete**

Shawn D. Felton,1 Arie J. van Duijn2. 1Florida International University, Miami, FL. 2Florida Gulf Coast University, Ft. Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)

Email: sfelton@fiu.edu

(No relevant relationships reported)

**HISTORY:** 21-year-old recreational athlete (185.4cm, 93.44 kg) with no prior history of injury was participating at an extreme sports center performing acrobatic type activities when he completed a back flip on the trampoline and landed on his left outstretched arm. Athlete noted an audible "pop" and the inability to fully extend or flex his arm. He self referred to ED for immediate evaluation and stabilization.

**PHYSICAL EXAMINATION:** Athlete was examined in sports medicine research lab by licensed physical therapist and athletic trainer. Gross swelling was present on exam. Athlete unable to perform active ROM and complained of intense pain 6/10 on VAS. Athlete pt. tender along medial joint line and specifically distal attachment of the medial collateral ligament. Valgus Stress test performed revealing extreme laxity compared bilateral with minimal stress. Neurological examination and circulatory exam = WNL. Physical examination discontinued due to pain and point of care ultrasound imaging continued of the medial elbow.

**DIFFERENTIAL DIAGNOSIS:**
- 1. Medical Collateral ligament sprain
- 2. Medical Collateral Ligament Disruption
- 3. Common Flexor Tendon Tendon Pathology
- 4. Pronator Teres Strain
- 5. Medial Epicondylitis Avulsion

**TEST AND RESULTS:** Elbow AP/Lateral/Oblique Radiographs: WNL; MRI w/o contrast: Complete tear of the proximal ulnar collateral ligament, Avulsion flexor tendon with bone marrow edema, Nondisplaced fracture of the radial head associated joint.
Right Elbow Pain in a Teenage Softball Player

Shelby E. Johnson, Edward R. Laskowski, FACSM. Mayo Clinic, Rochester, MN.
Email: johnson.shelby@mayo.edu
(No relevant relationships reported)

HISTORY:
A 16-year-old right-hand dominant softball player presented with right elbow pain after an overhead throw two months prior. During the initial throw she felt a pop and acute pain, swelling, and ecchymosis at her posteromedial elbow. Her pain improved with rest and range of motion exercises. However, two days prior to presentation, she performed an overhead throw and again felt a pop with immediate pain and recurrent ecchymosis. She had tingling in her fourth and fifth fingers immediately after the throw but denied ongoing sensory symptoms.

PHYSICAL EXAMINATION:
Inspection revealed ecchymosis at the medial elbow. She was tender to palpation over the ulnar nerve along the cubital tunnel and over the medial triceps with mild tenderness of the ulnar collateral ligament. Range of motion, strength, and sensation were normal. Resisted elbow extension reproduced her pain. Valgus stress testing was painful with slight asymmetric opening compared to the left. Dynamic elbow flexion and extension produced dislocation of the ulnar nerve and medial triceps. Tinel’s sign at the cubital tunnel was positive.

DIFFERENTIAL DIAGNOSIS:
1. Ulnar neuritis secondary to dislocating ulnar nerve
2. Snapping medial triceps
3. Ulnar collateral ligament injury
4. Medial epicondylitis
5. Triceps tendinopathy

TESTS AND RESULTS:
Elbow X-ray: Negative for effusion, fracture, or osseous abnormality.
Elbow MRI: Nonspecific increased T2 signal of the ulnar nerve within and just distal to the cubital tunnel. Collateral ligaments intact.

FINAL WORKING DIAGNOSIS:
Right ulnar neuritis with a dislocating ulnar nerve and snapping medial triceps

TREATMENT AND OUTCOMES:
The patient initially tried rest and physical therapy. Due to progressive pain the patient decided to pursue more definitive treatment and underwent a right ulnar nerve transposition with partial resection of the medial triceps. One month post-operatively her symptoms had largely resolved and she gradually returned to softball.

Final Working Diagnosis: Right Ulnar Neuritis with Dislocation and Snapping Medial Triceps
PHYSICAL EXAMINATION

1. Valacyclovir prescription: 1g tablet by mouth TID for 7 days
2. Pain control with Hydrocodone-acetaminophen 5-325mg per tablet QID PRN for pain
3. Rheumatology follow-up for discussion of modification of her immunosuppression regimen
4. Primary Care follow-up

HISTORICAL REVIEW

A 33-year-old female professional dancer presents to training room with three weeks of right-sided neck pain. The pain is located at base of the right neck and worsens with flexion. She denies an inciting trauma, but recently began performing new choreography involving repetitive overhead lifting. Associated symptoms include swelling in her right upper extremity and a prominence of her chest wall veins. She denies weakness or paresthesias.

PHYSICAL EXAMINATION

1. Deep venous thrombosis
2. Vascular thoracic outlet syndrome
3. Cervical muscle strain

TEST AND RESULTS

1. VAS Duplex Upper Extremity Veins: No DVT
3. Vascular Functional Maneuvers Upper Extremity: Absent digital pulsatilidy with the right arm at 180 degrees.

DIFFERENTIAL DIAGNOSIS


TREATMENT AND OUTCOME

1. Prescribed Medrol Dosepak and NSAIDs.
2. Started physical therapy and restricted arm motions in practice.
3. Consultation with cardiothoracic surgeon recommended right first rib resection.
4. Prior to surgery, developed new occlusive DVT in right subclavicular and axillary veins.
5. Underwent transaxillary first rib resection, subclavian tenolysis and arteriolysis.
6. Returned to sport 6 weeks post-operatively and completed physical therapy.
7. Underwent right upper extremity venogram with angioplasty for chronic occluded central right subclavian vein 3 months post-operatively.
Muscular adaptations in the upper limb from training are associated with hypertrophy, inflexibility, and diminished vascular perfusion. Despite these findings in upper extremity athletes, no studies have examined the relationship between peripheral vascular adaptations and muscle flexibility in the lower legs of runners. Through a better understanding of blood flow and muscle flexibility adaptations, clinicians can more accurately counsel patients with running injuries.

**Purpose:** To examine the relationship between blood flow in the posterior tibial artery and sagittal plane ankle angle of motion (ROM) among a sample of collegiate runners.

**Methods:** Blood flow in the posterior tibial artery and sagittal plane ankle ROM were measured bilaterally on 25, asymptomatic collegiate track athletes (16 males, 9 females, age = 20.0 ± 1.2 years, height = 171.5 ± 10.2 cm, mass = 66.7 ± 13.7 kg). Pearson correlation analysis was used to analyze the relationship between blood flow in the posterior tibial artery and ROM of the talocural joint.

**Results:** Findings revealed no significant relationship between blood flow in the dominant leg’s posterior tibial artery and dorsiflexion (r = −.14, P > .05) or plantarflexion (r = −.32, P < .02) and no significant relationship between blood flow in the non-dominant leg’s posterior tibial artery and dorsiflexion (r = −.02, P > .93) or plantarflexion (r = −.02, P > .92).

**Conclusion:** Although muscle inflexibility contributes to compromised blood flow in other body regions, findings of this study demonstrated no relationship between flexibility of the plantarflexor muscles and blood flow in the posterior tibial arteries of competitive runners. Future research should continue examining blood flow in the lower limb as one, among many, physical adaptations runners may experience from training.

**1846**

**Effect of Increased Respiratory Muscle Activation on Blood Flow to Inactive and Active Limb Muscles**

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*(No relevant relationships reported)*

It is unclear whether blood flow to inactive and active limb muscles are altered when the respiratory muscle activation is increased during submaximal exercise. **PURPOSE:** The purpose of this study was to clarify the effect of increasing inspiratory muscular work on blood flow to inactive and active limbs. **METHODS:** Healthy young men (n=7, 20 ± 2 yrs) performed two mild bilateral dynamic knee-extension and -flexion exercises for 10 min. The trials consisted of spontaneous breathing for 5 min followed by voluntary hyperventilation either with or without inspiratory muscle contraction. **RESULTS:** Blood flow to the brachial artery (inactive limb) and in femoral artery (active limb) were recorded using Doppler ultrasound. **RESULTS:** MAP during exercise was higher (P<.05) with inspiratory resistance (12130±1460 and 12070±1544 mmHg) than without resistance (9515±1574 mmHg, p<.05). Brachial artery blood flow increased during exercise without inspiratory resistance (127±38 ml/min) as compared with resting level, while it decreased with inspiratory resistance (69±31 ml/min). Femoral artery blood flow increased at the onset of exercise and had significantly negative correlation with the changes of MCA Vmax. **CONCLUSIONS:** These results suggest that sympathetic control of blood redistribution to active limbs is promoted, partly, by respiratory muscle-induced metaboreflex.

**1847**

**The Effects of Recumbent Angle on Cardiac Responses and Hemodynamics during Bicycle Ergometer Exercise in Patients with Atrial Fibrillation**

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*(No relevant relationships reported)*

Recumbent cycling is well-established mode of exercise that is used in patients with cardiovascular disease to rehabilitate. However, through more hemodynamic researches for pathological fibrillation, the necessity to establish the safety and availability of recumbent bicycle exercise has been required. **PURPOSE:** To determine the effects of recumbent bicycle ergometer exercise on hemodynamics in patients with atrial fibrillation. **METHODS:** In randomized, double-blind, crossover study, three female and eight male patients with atrial fibrillation (63±3.6 yrs) were asked to perform the incremental bicycle ergometer exercise three times in the upright, 60° recumbent (R), and 30°R postures with a week interval, respectively. Exercise intensity was set initially at 10W and increased by 15W every 2 minutes to 70W. Cardiac output (CO) and systemic vascular resistance (SVR) were measured at rest, 5 minutes during exercise and 10 minutes during exercise using electrical cardiometry. Rate pressure product (RPP) was calculated by systolic blood pressure (SBP) and heart rate (HR).

All data were analyzed using two-way ANOVA (3 postures x 3 times) with repeated measures. **RESULTS:** HR in 30°R and 60°R was significantly lower than in upright postures at 5 minutes during exercise (88±6 and 84±2 vs. 98±16 bpm, p<.05) and 10 minutes during exercise (95±1.1 and 94±1.3 vs. 113±2.18 bpm, p<.05). RPP in 30°R and 60°R was significantly lower than in upright postures at 5 minutes during exercise (10414±1480 and 10620±2754 vs. 11515±5174 bpm × mmHg, p<.05) and 10 minutes during exercise (11415±1430 and 11495±1600 vs. 12195±2367 bpm × mmHg, p<.05). However, CO, SVR and stroke volume were not significant different between three postures. **CONCLUSIONS:** These results suggest that recumbent bicycle exercise have the advantage of reducing myocardial workload by regulating HR and SBP in patients with atrial fibrillation.

**1848**

**The Influence of EMG-based MVC Intensity on Middle Cerebral Artery Velocity, Cardiac Output and Respiratory Variables**

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It has been reported that cerebral blood flow velocity (CBFV) might be reduced according to the increase of exercise intensity determined by %EMG-based maximal voluntary contraction (MVC) during a static exercise test. But, how %MVC induced-changes of CBFV might be associated with cardiac output (CO) and respiratory response remains unclear. **PURPOSE:** To evaluate the influence of %MVC on middle cerebral artery velocity (MCA Vmax), CO and respiratory variables during isometric strength type exercise. **METHODS:** Eight healthy male (21.3±0.9yrs) were asked to perform the 45° knee extension isometric contraction during 60 seconds. All participants performed four times in random order at the isometric intensity of 100%, 90%, 80% and 70% MVC with a week interval. The intensity of %MVC was determined by root mean square (RMS) of EMG at right rectus femoris muscle. Each participant was asked to conduct and maintain the predetermined intensity of %MVC confirming the figures on a monitor. MCA Vmax was measured at rest, 30 and 60 seconds during exercise, 30 seconds recovery, 150 seconds recovery using transcranial-Doppler sonography. CO and respiratory variables were measured by electrical cardiometry monitor and gas analyzer. All data were analyzed using two-way ANOVA (4 intensities x 5 times) with repeated measures. **RESULTS:** MCA Vmax in 70% MVC was significantly higher than MCA Vmax in 100% and 80% MVC at 60 seconds during exercise (92±1 vs. 68±15 and 78±11 cm/s, p<.05). On the other hand, CO were not significant different between 100%, 90%, 80% and 70% MVC in %MVC in CO at 60 seconds during exercise (0.49±0.22 vs. 1.23±0.86 L/min, p<.05) and had significantly negative correlation with the changes of MCA Vmax (r = −.52, p<.01). **CONCLUSIONS:** These results suggest that MCA Vmax might have the tendency of decrement over the intensity of 70% isometric MVC, and negatively relate to VCO2.

**1849**

**Blood Flow Patterns during Flow-Mediated Dilation**

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*(No relevant relationships reported)*

**PURPOSE:** Flow mediated dilation (FMD) has been the most common assessment of endothelial function in research but it has failed in obtaining a widespread use in clinical setting due to a lack of standardization and a large inter-subject variability. Normalization of FMD to endothelial shear stress (ESS) has been proposed to solve its technical limitations. However, studies have not considered the characteristic of the blood flow during FMD under pulsatile conditions in their ESS estimations. Therefore, the aims of this study were to quantify the magnitude of FMD-induced ESS and to characterize the blood flow under pulsatile conditions during FMD testing.

**METHODS:** A total of 26 young healthy subjects (15 females and 11 males) underwent FMD testing. Microhematocrit measurement was used to determine blood density (p) and viscosity (μ). ESS was calculated by Womersley’s approximation, $\varepsilon = \frac{p}{2} * 2k * \text{Velocity} / \text{Diameter}$, where k is a function of Womersley’s parameter (n). The presence of turbulent flow was determined by comparing Reynolds number (Re
RESULTS: The mean (SD) FMD% and time to peak dilation were 7.4 (3.1)% and 35 (9.3) seconds, respectively. ESS was significantly reduced from ischemia release until peak dilation, (F(3.83, 80.43) = 6.51, p < 0.001, two-tailed). Turbulent blood flow was the only type of flow observed until peak dilation in 96.15% of the sample (Figure).

CONCLUSIONS: Peak dilation of the brachial artery during FMD testing in a young healthy population is triggered mostly by antegrade, high-ESS under turbulent flow conditions. Due to the pulsatile nature of blood flow and the appearance of a turbulent pattern during FMD, ESS should be estimated by Womersley’s approximation rather than Poiseuille’s law.

Uncustomed eccentric contractions (ECs) induce muscle force reduction and increased resting muscle blood flow. Whereas muscle force reduction has been well accepted as an index of exercise-induced muscle damage (EIMD), physiological meaning of increased resting muscle blood flow is not fully understood. PURPOSE: The purpose of the present study was to assess the relationship between the increased resting muscle blood flow and muscle force reduction after repeated ECs.

METHODS: Eight young healthy men (age, 20.9 ± 1.7 years; height, 172.1 ± 3.9 cm; weight, 64.5 ± 5.2 kg; body mass index, 21.8 ± 1.7 kg/m²) participated in this study. Maximal voluntary contraction (MVC) force of isometric elbow flexion at elbow joint angle of 90°, heart rate, and blood pressure were measured before and after 24 h of repeated ECs task. Resting forearm blood flow as an index of muscle blood flow was also measured by plethysmography. Subjects performed five sets of 20 repetitions of eccentric contractions of elbow flexors (no contractions at concentric phase) with a load equal to 60% of MVC force with the use of dumbbells. Each action was performed through the same range of motion at a rate of 4 s.

RESULTS: MVC force significantly decreased by 44% (17.4 ± 2.2 kg to 9.7 ± 3.2 kg, p < 0.01) after 24 h of repeated ECs. Resting forearm blood flow increased by 22% (5.8 ± 1.2 ml/min/100 g to 7.4 ± 1.9 ml/min/100 g, p < 0.05) after 24 h of repeated ECs. Resting heart rate and blood pressure were not significantly different before and after 24 h of ECs. The change of resting forearm blood flow was negatively correlated with the change of MVC force (r = -0.88, p < 0.01).

CONCLUSION: Increased resting muscle blood flow was associated with muscle force reduction after repeated ECs. Our results suggested that increased resting muscle blood flow could result from EIMD-induced inflammatory vasodilation after repeated ECs.

Given the high rates of cardiovascular disease morbidity and mortality in the United States, and worldwide, finding strategies that might mitigate CVD is paramount. Vascular dysfunction is a critical component and likely precursor measure to CVD. Recently, the passive leg movement (PLM) method has been developed to assess nitric oxide (NO)-dependent vascular function. The nutraceutical Capsaicin has been shown to have cardiotrophic effects, enhancing vasorelaxation and attenuating sympathetic vasoconstriction in an endothelium-dependent manner. The present study aimed to determine the potential effects of capsaicin-induced improvement of leg blood flow in response to PLM.

METHODS: Femoral artery blood flow and microvascular perfusion of the vastus lateralis were examined in 12 young, healthy men, using Doppler ultrasound and multi-distance frequency domain based near-infrared spectroscopy. Central hemodynamics (stroke volume, SV; heart rate, HR; cardiac output, CO; and mean arterial pressure, MAP) were measured using finger photoplethysmography. Hemodynamic measurements were continuously taken at rest and during a single bout of PLM (sPLM), a variant of PLM which minimizes the central hemodynamic response.

RESULTS: A significant hyperemic response was recorded in response to PLM under both conditions (Capsaicin and Placebo); however, the microvascular perfusion response to PLM was not significantly altered (p > 0.05) under Capsaicin (Capsaicin: 362 ± 119% Placebo: 295 ± 61% in response to PLM). Expectedly, there were no significant differences in basal microvascular perfusion, femoral blood flow, and central hemodynamic responses (HR, SV, CO, MAP) between hemifemoral perfusion (p > 0.05).

CONCLUSION: These results indicate that Capsaicin does not further augment hyperemia in response to sPLM in young healthy males. Further study of this nutraceutical is warranted in populations at high risk, or prevalence, of cardiovascular disease.
PURPOSE: Passive leg movement (PLM)-induced hyperemia is used to assess the function of the vascular endothelium. This study sought to determine the impact of movement speed and ROM on the hyperemic response to PLM and determine if the currently recommended protocol of moving the leg through a 90° ROM at 180°/s provides an optimal peak hyperemic response to PLM.

METHODS: 11 healthy adults underwent multiple bouts of PLM, in which either movement speed (60-240°/s) or ROM (30-120° knee flexion) were varied. Femoral artery blood flow (Doppler Ultrasound) and mean arterial pressure (MAP; photoplethysmography) were measured throughout.

RESULTS: Movement speed generally exhibited positive linear relationships with the hyperemic response to PLM, eliciting ~20-30% increase in hyperemia and conductance for each 60°/s increase in speed (P<0.05). However, increasing the movement speed above 180°/s, which was physically difficult, did not elicit significant increases in hyperemia in many cases. ROM exhibited curvilinear relationships (P<0.05) with hyperemia and conductance, which peaked at 90°, such that a 30° increase or decrease in ROM from 90° resulted in a 10-40% attenuation (P<0.05) in the hyperemic response. Alterations in the balance of antegrade and retrograde flow appear to play a role in this attenuation.

CONCLUSIONS: Movement speed and ROM have a profound impact on PLM-induced hyperemia, as well as the feasibility of the test. When using PLM to assess vascular endothelial function, it is recommended to perform the test at the traditional 180°/s with 90° ROM, which offers a large hyperemic response, while maintaining test feasibility.

AUTISM SPECTRUM DISORDER (ASD) is a complex neurological disorder identified in early childhood and is characterized by impaired social interaction and atypical behaviors. A very few studies reported that children with ASD tend to have higher heart rate (HR) and blood pressure (BP) at rest compared to typically developing children (TDC). Although structural abnormalities have been identified in the brain stem where cardiovascular control center is located, the physiological basis for ASD has not been established. Furthermore, whether there are alterations in cardiovascular responses to exercise in ASD is unidentified. PURPOSE: To determine differential cardiovascular responses to acute handgrip exercise in children with ASD.

METHODS: Total of 23 adults, TDC and children with ASD participated in the study. HR from ECG, blood to beat arterial BP, from Finapres and brachial BP, and respiration from pneumohelmet were continuously measured before, during and after 2 minutes of dynamic handgrip exercise at 50% of maximal voluntary contraction. In addition, diameter, blood flow velocity, and flow of the brachial artery were measured using Doppler Ultrasound on the contracting arm throughout the experiment. RESULTS: Mean BP was significantly increased from rest to exercise in all groups (P<0.05); however, there was no change in HR to exercise from rest in children with ASD (77±4 at rest, 78±5 exercise bpm), while in TDC it increased from 72±3 at rest to 78±6 exercise bpm (P<0.05). HR did not change in children with ASD. It suggests that higher total peripheral resistance may contribute to increase BP during exercise in ASD. Such increase in BP can be attributed to exercise-induced arterial vasoconstriction and mobilization of contractile elements in contracting skeletal muscles during exercise in children with ASD.

Forceful and repetitive motions in sport lead to adaptations in various tissues. Hypertrophy and inflexibility of muscle tissue are common adaptations associated with decreased vascular perfusion and injury. Such findings have been validated in the upper limbs of throwers over the course of competitive seasons. To date, no studies have examined the influence of a competitive season of running on blood flow in the lower legs of runners. A more comprehensive understanding of blood flow adaptations may advance clinicians’ abilities to predict and prevent running related injuries. PURPOSE: To examine blood flow in lower legs of collegiate runners over the course of a competitive season.

METHODS: Blood flow in the posterior tibial artery was measured bilaterally on 25 male asymptomatic collegiate track athletes (15 males, 10 females, age= 20.0±1.2 years, height= 171.5 ± 10.2 cm, mass= 66.7 ± 13.7 kg). Measurements were performed in one session at pre-season and immediately following the season. An independent t-test was used to compare blood flow in dominant versus non-dominant limbs at the start of season. Repeated measures t-tests were used to compare differences in blood flow from pre- to post-season in the dominant and non-dominant limbs.

RESULTS: Pre-season, blood flow in the dominant (123.3±43.73) and non-dominant (112.6±34.10) posterior tibial arteries was not significantly different (t19= -0.373). Blood flow in the dominant legs, however, significantly decreased to exercise from rest in all groups (P<0.05). The decrease in blood flow velocity during exercise compared to rest (Δ76.4±32.2 adult vs. Δ15.3±5.22 TDC cm/s; P<0.05). However, blood flow velocity in ASD did not change from rest to exercise (Δ0.6±2.2 ASD cm/s). CONCLUSION: While HR increased to exercise in both adult and TDC groups in similar fashion, HR did not change in children with ASD. It suggests that higher total peripheral resistance may contribute to increase BP during exercise in ASD. Such increase in BP can be attributed to exercise-induced arterial vasoconstriction and mobilization of contractile elements in contracting skeletal muscles during exercise in children with ASD.
Infrared thermography (IR-T) is a non-invasive and mobile tool to measure and portray changes of the back of the legs during an exercise test, between endurance athletes and patients with cystic fibrosis (CF). METHODS: 7 CF patients (G1) and 14 male endurance athletes (G2) performed a step-wise incremental exercise test on a treadmill. T\textsubscript{IR} was measured via IR-T with a high-resolution detector. T\textsubscript{IR} was calculated as the difference in temperature (°C) between the 10% of the darkest and 10% of the lightest pixels in the region of interest. T\textsubscript{IR} data were analyzed at “resting condition” (rest), “individual anaerobic threshold” (IAT) and “maximum load” (max), by repeated measures ANOVA. RESULTS: By looking at the complete optical information of temperature patterns over time in high-resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their important because endothelial dysfunction is a precursor of atherosclerosis and may short periods of time (~30 min) has been shown to cause endothelial damage. This is Pressure applied by the compression garments varies widely with some garments in a randomized order. There was a 5 min recovery period between conditions. Each compression garments is used to measure and portray changes of the back of the legs during an exercise test, between endurance athletes and patients with cystic fibrosis (CF). METHODS: 7 CF patients (G1) and 14 male endurance athletes (G2) performed a step-wise incremental exercise test on a treadmill. T\textsubscript{IR} was measured via IR-T with a high-resolution detector. T\textsubscript{IR} was calculated as the difference in temperature (°C) between the 10% of the darkest and 10% of the lightest pixels in the region of interest. T\textsubscript{IR} data were analyzed at “resting condition” (rest), “individual anaerobic threshold” (IAT) and “maximum load” (max), by repeated measures ANOVA. RESULTS: By looking at the complete optical information of temperature patterns over time in high-resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their important because endothelial dysfunction is a precursor of atherosclerosis and may short periods of time (~30 min) has been shown to cause endothelial damage. This is Pressure applied by the compression garments varies widely with some garments in a randomized order. There was a 5 min recovery period between conditions. Each compression garments is used to measure and portray changes of the back of the legs during an exercise test, between endurance athletes and patients with cystic fibrosis (CF). METHODS: 7 CF patients (G1) and 14 male endurance athletes (G2) performed a step-wise incremental exercise test on a treadmill. T\textsubscript{IR} was measured via IR-T with a high-resolution detector. T\textsubscript{IR} was calculated as the difference in temperature (°C) between the 10% of the darkest and 10% of the lightest pixels in the region of interest. T\textsubscript{IR} data were analyzed at “resting condition” (rest), “individual anaerobic threshold” (IAT) and “maximum load” (max), by repeated measures ANOVA. RESULTS: By looking at the complete optical information of temperature patterns over time in high-resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their resolution, we were able to recognize the anatomy of subcutaneous arterioles and their
a significant predictor of both walking economy and gait speed in older adults, suggesting that better overall vascular health is related to enhanced walking economy and gait speed. Therefore, interventions aimed at improving vascular health in the aging population may be beneficial in maintaining gait speed and mobility with age.

**1861 Board #17**
**May 30 2:00 PM - 3:30 PM**
**Racial Differences In Vascular Function And Blood Flow Responses During Upper And Lower Limb Exercise**
Austin Hogwood, Virginia Commonwealth University, Richmond, VA.
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**No relevant relationships reported**

**PURPOSE:** Recently, it has been shown that young African American males display lower hyperemic responses, but preserved shear-induced dilation, in response to dynamic handgrip exercise when compared to Caucasian American counterparts; however, it is unknown whether this blunted exercise hyperemia is also present in the lower limbs.

**METHODS:** Young African American (AA) (n = 4) and Caucasian American (CA) (n = 3) males performed two separate incremental exercise bouts of rhythmic handgrip and plantar flexion exercise while blood flow and diameter were evaluated in the brachial and superficial femoral arteries, respectively. Mean arterial pressure (MAP) and blood flow/vascular function variables (blood flow, shear rate, flow-mediated dilation) were measured in the last minute of each 3-minute workload.

**RESULTS:** The data revealed no significant group differences during handgrip exercise when examining blood flow (e.g. 24 kg: AA: 66 ± 52; CA: 71 ± 60 mL/min; p = 0.5), MAP (e.g. 24 kg: AA: 109 ± 5; CA: 99 ± 6 mmHg; p = 0.3), or vascular conductance (e.g. 24 kg: AA: 6.2 ± 0.7; CA: 7.4 ± 0.8 mL/min.100.mmHg-1; p = 0.3) across all workloads. During plantar flexion exercise, no group differences were reported when evaluating blood flow (e.g. 32 kg: AA: 993 ± 83; CA: 713 ± 97 mL/min; p = 0.2), MAP (e.g. 32 kg: AA: 104 ± 4.9; CA: 106 ± 4.8 mmHg; p = 0.3), or vascular conductance (e.g. 32 kg: AA: 9.6 ± 0.8; CA: 7.1 ± 0.8 mL/min.100.mmHg-1; p = 0.6) across all workloads. Slopes derived from the relationship between shear rate and arterial dilation across all exercise workloads were not different between groups when examined in the brachial (AA: 0.00136 ± 0.00034; CA: 0.00004 ± 0.00083; p = 0.7) or superficial femoral artery (AA: 0.0013 ± 0.00003; CA: 0.0002 ± 0.0007; p = 0.6).

**CONCLUSIONS:** Preliminary data revealed no differences in exercise-induced blood flow or vascular responses in the upper or lower limbs when comparing young African American and Caucasian American males.

**1862 Board #18**
**May 30 2:00 PM - 3:30 PM**
**Improved Maximal Oxygen Uptake Following High-Intensity Interval Training Relates To An Increase In Blood Volume**
Email: mirko.mandic@ki.se

**No relevant relationships reported**

**Improved maximal oxygen uptake following high-intensity interval training relates to an increase in blood volume**

High-intensity interval training (HIIT) is an effective training mode for improving maximal oxygen uptake (VO\textsubscript{max}). As past research has focused on peripheral adaptations to HIT, little is known about central factors governing cardiac output and thus VO\textsubscript{max}. **PURPOSE:** The aim of this study was to test the hypothesis that HIT-induced improvements in VO\textsubscript{max} are accompanied by increases in blood volume (BV) and cardiac stroke volume. Further, we investigated if inter-individual differences in the increase in VO\textsubscript{max} could be attributed to changes in BV. **METHODS:** Twenty-five older adults (60 ± 6 years; 30 ± 5 kg/m\textsuperscript{2}) completed body composition assessments via dual x-ray absorptiometry (Lunar iDXA, GE, Waukesha, WI). Absolute LM, FM, and BF values were obtained and also made relative to total body weight, i.e. LM (kg)/total body weight (kg). Mean MCA velocity (MCACV) was assessed using a 2-MHz transcranial Doppler ultrasound probe on the right temporal window: Mean MCA conductance (MCACOND) was calculated as MCACV/mean arterial pressure (MAP), with MAP obtained from finger photoplethysmography. **RESULTS:** The range of values for this sample were: MCAV (30 - 105 cm/s), MCAC (0.30 - 1.05 cm/s/mmHg), MAP (79 - 116 mmHg), LM (30.73 - 68.80 kg), FM (15.55 - 63.25 kg), VF (202 - 3. kg), and body weight (51 - 123 kg). Absolute LM and VF were negatively associated with MCACV and MCACOND; however, only VF remained after controlling for body weight (p < 0.05; Table). No relationship was observed for relative LM or VF (either absolute or relative). **Conclusion:** These results indicate that increased visceral adiposity is negatively related to cerebral blood flow in older adults, whereas whole body fat mass was not as sensitive. This suggests the importance of visceral adipose interacting with cerebrovascular physiology in contrast to whole body fat mass among older adults.

**D-55 Free Communication/Poster - Cardiorespiratory Disease**

**Board #19**
**May 30 2:00 PM - 3:30 PM**
**Visceral Adiposity Is Associated With Lower Cerebral Blood Velocity in Older Adults**
Natalia S. Lima¹, Alexander J. Rosenberg², Georgios Grigoriodis³, Elizabeth C. Schroeder¹, Wesley K. Lefferts¹, Tracy Baynard, FACSM¹. University of Illinois at Chicago, Chicago, IL. ¹University of North Texas Health Science Center, Fort Worth, TX. (Sponsor: Tracy Baynard, FACSM)
Email: nlima3@uic.edu

**No relevant relationships reported**

Aging is associated with an increased prevalence of obesity and preferential increase in visceral adiposity. Visceral adiposity has detrimental effects on vascular function, which may contribute to reductions in brain blood flow with aging, thereby contributing to stroke risk and cognitive decline. The impact of visceral adiposity on other components of body composition (total body fat, lean mass) on cerebral blood velocity in older adults has yet to be elucidated. **PURPOSE:** To evaluate the effects of lean mass (LM), fat mass (FM), and visceral fat (VF), on middle cerebral artery (MCA) mean velocity and conductance in older adults. **METHODS:** Twenty-five older adults (60 ± 6 years; 30 ± 5 kg/m\textsuperscript{2}) completed body composition assessments via dual x-ray absorptiometry (Lunar iDXA, GE, Waukesha, WI). Absolute LM, FM, and BF values were obtained and also made relative to total body weight, i.e. LM (kg)/total body weight (kg). Mean MCA velocity (MCACV) was assessed using a 2-MHz transcranial Doppler ultrasound probe on the right temporal window: Mean MCA conductance (MCACOND) was calculated as MCACV/mean arterial pressure (MAP), with MAP obtained from finger photoplethysmography. **Results:** The range of values for this sample were: MCAV (30 - 105 cm/s), MCAC (0.30 - 1.05 cm/s/mmHg), MAP (79 - 116 mmHg), LM (30.73 - 68.80 kg), FM (15.55 - 63.25 kg), VF (202 - 3. kg), and body weight (51 - 123 kg). Absolute LM and VF were negatively associated with MCACV and MCACOND; however, only VF remained after controlling for body weight (p < 0.05; Table). No relationship was observed for relative LM or VF (either absolute or relative). **Conclusion:** These results indicate that increased visceral adiposity is negatively related to cerebral blood flow in older adults, whereas whole body fat mass was not as sensitive. This suggests the importance of visceral adipose interacting with cerebrovascular physiology in contrast to whole body fat mass among older adults.

**Board #20**
**May 30 2:00 PM - 3:30 PM**
**An Exaggerated Muscle Metaboreflex In Diabetic Rats Is Mediated By Potentiated Skeletal Muscle Afferent Responsiveness**
Rie Ishizawa¹, Han Kyul Kim¹, Norio Hotta¹, Gary A. Iwamoto², Wanpen Yongpatsanit¹, Jere H. Mitchell, FACSM³, Scott A. Smith¹, Masaki Mizuno¹. ¹University of Texas Southwestern Medical Center, Dallas, TX. ²Chubu University, Kasugai, Japan.

**No relevant relationships reported**

Patients with type 2 diabetes (T2D) exhibit an excessive increase in blood pressure during exercise. Evidence suggests that the skeletal muscle metaboreflex is exaggerated in T2D. However, the underlying mechanisms remain poorly understood. Metaboreflex sensory signals from exercising muscle are generated by activation of chemically-sensitive group IV afferent neurons. It is logical to suggest that heightened metaboreflex function in T2D may be caused by enhanced muscle afferent responsiveness to chemical stimulation. **PURPOSE:** The purpose of this study was to...
1) examine whether the heightened cardiovascular response to exercise in T2D results from muscle metaboreflex activity in vivo, and 2) investigate the impact of T2D on neuronal responses to chemical stimulation in skeletal muscle afferents in vitro. 

METHODS: For 14-16 weeks, rats were given either a normal diet (control group) or a high fat diet in combination with a low dose (35 mg/kg) of streptozotocin (T2D group). In vivo, we measured changes in renal sympathetic nerve activity (RSNA) and mean arterial pressure (MAP) in response to capsaicin administration (0.3 and 1.0 μg/100 μl) in the hindlimb arterial supply. In vitro, the function of chemically (1 μM capsaicin) activated group IV neurons were assessed by obtaining single-fiber recordings using a muscle-nerve preparation. RESULTS: T2D rats exhibited hyperglycemia after overnight fasting (104±5 vs. 161±10 mg/dL, P<0.05). Control, capsaicin administration evoked significantly greater increases in RSNA (0.3 μg: 36±25 vs. 92±17 %, 1.0 μg: 55±26 vs. 246±72 %, P<0.05) and MAP (0.3 μg: 15±8 vs. 45±9 mmHg; 1.0 μg: 23±8 vs. 70±5 mmHg, P<0.01) in T2D rats. The discharge of group IV muscle afferents to 1 μM capsaicin exposure was likewise significantly greater in T2D rats compared to control (0.8±0.3 vs. 2.9±0.7 Hz, P<0.05). CONCLUSIONS: These findings suggest that the heightened cardiovascular response to exercise in T2D may be caused by an exaggerated muscle metaboreflex made overactive via a potentiation in muscleafferent responsiveness to chemical stimulation. Supported by Lawson & Rogers Lacy Research Fund in Cardiovascular Disease and the Southwestern School of Health Professions Interdisciplinary Research Grant Program.

1865  | Board #21 | May 30 2:00 PM - 3:30 PM | Effects Of High Intensity Resistance Training on Cardiac Autonomic Modulation in Hypertensive Women | Arthur Vale1, Juliana C. Alves1, Paulo César V. Jardim1, Thiago V. Jardim1, James Steel2, James P. Fisher3, Paulo V. Gentil1. 1Federal University of Goias, Goiania, Brazil. 2Southampton Solent University, Southampton, United Kingdom. 3University College London, United Kingdom. Email: arthur_vale27@hotmail.com (No relevant relationships reported)

Individuals with arterial hypertension often have an autonomic nervous system (ANS) imbalance with predominance of sympathetic ANS. This predominance can lead to injury of several organs affecting its functioning. There is evidence that performing high intensity resistance training (RT) with heavier loads and a lower number of repetitions results in lower cardiovascular stress when compared with lighter loads and a higher number of repetitions. However, the effects of different protocols of RT in autonomic modulation are not known specially using nonlinear analyses methods.

PURPOSE: Analyze and compare the effects of different protocols of high intensity of effort RT on autonomic cardiac modulation of hypertensive women using nonlinear methods. METHODS: A randomized crossover design clinical trial was conducted with 15 postmenopausal hypertensive women who underwent a control session and two high intensity RT protocols involving 6 and 15 repetition maximum (RM). The nonlinear variables that compose Heart Rate Variability (HRV) were collected pre, immediately post, 1 h post, and 24 h post each protocol. Repeated-measures ANOVA were used.

RESULTS: The SD1 indices that represent parasympathetic activity in the system were lower in 15RM protocol immediately after the exercise (9.32±11.40) when compared with 6RM (16.38±13.15) and control (19.39±13.40) (p<0.05). The SD2 indices that represent a global variability in the system also were lower in 15RM protocol especially immediately after (13.84±9.57) the exercise when compared with 6RM (24.17±17.23) and control (22.32±17.41) (p<0.05). For the 6RM protocol no relevant clinical changes were observed.

CONCLUSIONS: Performing high intensity RT with lower loads and a higher number of repetitions decreases parasympathetic ANS activity, which may be related to an increased cardiovascular stress. On the other hand, heavier load and lower repetition RT did not have a significant impact upon autonomic modulation when compared to a control session.
Exercise did not affect phosphorylation at mTOR<sub>S2448</sub>, TSC2<sub>S1387</sub>, TSC2<sub>S939</sub>, or AMPK<sub>α</sub><sub>1</sub> at 2 hours after exercise in resistance-trained men. Supported in part by grants from the National Strength and Conditioning Association Foundation and the Texas Chapter of the American College of Sports Medicine

Autophagy is an evolutionary conserved cellular degradation system implicated in maintaining health and promoting longevity. Few human data exist investigating the autophagic response to exercise; however, acute moderate-intensity, continuous exercise (MICT) has been shown to stimulate autophagy in skeletal muscle. Presently, it is unknown whether high-intensity interval training (HIIT) exercise induces autophagy. PURPOSE: The purpose of this study was to compare the autophagy response of an acute bout of HIIT exercise (treadmill running) to MICT exercise in human skeletal muscle. METHODS: Using a crossover design, ten recreationally-active males (n=5) performed a bout of MICT (60 minutes at 80% of max velocity [V<sub>max</sub>]) and HIIT (6 bouts of 1 minute at 100% V<sub>max</sub> and 1 minute at 3 MPH, followed by 5 minutes at 3 MPH, followed by 6 bouts of 1 minute and 100% Vmax and 1 minute at 3 MPH). Muscle biopsies from the vastus lateralis were taken pre- and 3 hours post-exercise. Exercise bouts were separated by ≥72 hours and performed after abstaining from alcohol for ≥24 hours and food and caffeine for ≥8 hours. Subjects also refrained from food, energy-containing beverages, and caffeine during the 3-hour post-exercise period prior to the muscle biopsy. Muscle tissue was analyzed for protein expression of markers of autophagy (LC3I, LC3II, and autophagic flux). RESULTS: No differences were detected for LC3I, LC3II, or autophagic flux measured 3 hours post-exercise compared to pre-exercise in both HIIT and MICT bouts (p>0.05). LC3I/LC3II ratio increased 3 hours post-exercise in HIIT (162.4 ± 45.9%), which was significantly higher than MICT at 3 hours post-exercise which decreased from pre-exercise (48.8± 9.4%; p<0.05). CONCLUSION: Our findings show that despite disparate durations and intensities, HIIT stimulates autophagy in human skeletal muscle, however, in a distinct fashion compared to MICT. We also add to the current literature demonstrating that autophagy is activated by continuous (≥ 60 minutes), moderate-intensity (55 – 70% VO<sub>2max</sub>) exercise.

Introduction: Cellular senescence is a state of irreversible cell cycle arrest associated with aging that occurs in many cell types including endothelial cells (EC) and skeletal muscle satellite cells (SC). Senescent cells exhibit an increase in secretion of cytokines and chemokines, often referred to as the senescence associated secretory phenotype (SASP). SASP's SCs and ECs co-exist in the muscle niche and cross-talk occurs between the two cell types. Small extracellular vesicles (exosomes) have been implicated as important contributors to the SASP. PURPOSE: Determine if exosomes from human, primary, senescent muscle satellite cells impact human endothelial cell growth, angiogenesis, and senescence. METHODS: Senescence in primary human skeletal muscle satellite cells (n=6) was induced via incubation with 200μM hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). Exosomes were collected from normal and H<sub>2</sub>O<sub>2</sub> treated satellites cells (NML-EXOS and SEN-EXOS, respectively). Human umbilical vein endothelial cells (HUVECs) were treated with 50 μg/ml of NML-EXOS or SEN-EXOS. HUVEC growth and senescence was evaluated using EdU and β-galactosidase staining. HUVEC angiogenesis was measured via a matrigel tube formation, wound healing and transwell migration assays. RESULTS: After 48-hours, there was a decrease in proliferation (NML-EXOS: 22% vs SEN-EXOS: 18% EdU+) and an increase in senescence (NML-EXOS: 40% vs SEN-EXOS: 53% β-gal+) in the SEN-EXOS treated HUVECs. SEN-EXOS also impaired HUVEC wound healing following a scratch assay by 32.4%. There were no differences in transwell migration. SEN-EXOS also inhibited HUVEC treatment. Conclusion: Exosomes harvested from senescent muscle satellite cells appear to transfer a senescent phenotype to HUVECs, resulting in impaired growth and angiogenesis.

Obesity is associated with chronic inflammation characterized by increased levels of inflammatory cytokines. Exosomes are small microvesicles secreted by cells that contain a variety of molecules including microRNAs (miR), mRNAs, and proteins. Typically, miRs act through post-transcriptional regulation of mRNA targets via miRNA degradation and/or translational repression. Exercise training reduces chronic inflammation. PURPOSE: The current study examined if obesity and concurrent exercise training altered skeletal muscle: (1) exosomal miR content, and (2) inflammatory signaling. METHODS: Vastus lateralis biopsies were obtained from sedentary lean (LN) and obese (OB) men and women for analysis of targeted whole skeletal muscle mRNA, miR, and protein; and skeletal muscle derived exosomal miR (via small RNA-seq) before and after seven days of concurrent aerobic and resistance training. Significance at p ≤ 0.05. RESULTS: Pathway analysis of skeletal muscle derived exosomal miR indicated: 1) obesity increases miR targeting cancer, Wnt/β-catenin, and neuroinflammation in which transforming growth factor β receptor 1 (TGFβR1) is common; 2) exercise training decreases miR targeting IL-10, IL-8, and NF-κB pathways in which RELA, an NF-κB subunit, is common. In whole skeletal muscle, IL-8 mRNA was reduced 50% (LN: Pre=1.0, Post=0.57; OB: Pre=0.89, Post=0.37) and Jun mRNA was reduced 25% after exercise training (LN: Pre=1.0, Post=0.77; OB: Pre=0.75, Post=0.37) and Jun mRNA was reduced 25% after exercise training (LN: Pre=1.0, Post=0.77; OB: Pre=0.75, Post=0.37) and Jun mRNA was reduced 25% after exercise training (LN: Pre=1.0, Post=0.77; OB: Pre=0.75, Post=0.37) and Jun mRNA was reduced 25% after exercise training (LN: Pre=1.0, Post=0.77; OB: Pre=0.75, Post=0.37). CONCLUSION: These data suggest that obesity and seven days of exercise training both alter skeletal muscle exosomal content. The targets for skeletal muscle derived exosomes and the physiological relevance requires further investigation.
migation. This study provides evidence that exosomes function as part of the SASP in satellite cells and may propagate a senescent phenotype to neighboring endothelial cells in skeletal muscle with aging.

**1872 Board #28**
May 30 2:00 PM - 3:30 PM

**Effects Of Different Doses Of D-galactose On Skeletal Muscle In C57Bl/6j Mouse**

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**PURPOSE:** Pharmacologically inducible models of aging could help to understand the pathogenesis of sarcopenia and to establish better exercise prescriptions for the elderly. Administration of D-galactose (50-150 mg/kg) has been used to induce aging phenotype including accumulation of oxidative stress, muscle atrophy, and cognitive impairment. A recent paper has shown that a higher dose of D-galactose (500 mg/kg/day) accumulated greater oxidative stress, compared with the commonly used dose (100 mg/kg/day). These observations suggest that there might be room to reconsider the optimal dose of D-galactose. We hence examined whether higher dose of D-galactose (above 100 mg/kg/day) exacerbate skeletal muscle atrophy.

**METHODS:** Male C57BL/6J mice (8 weeks old) were divided into 4 groups as follow: 1) Control (0 mg/kg/day, n=10), 2) D-Galactose (150 mg/kg/day, n=10), 3) D-Galactose (1000 mg/kg/day, n=10), and 4) D-Galactose (2000 mg/kg/day, n=10). We intraperitoneally injected D-galactose solution at indicated dose every day for 8 weeks. On the day before tissue collection, we performed grip strength measurement. Twenty-four hours after the final injection, we collected and weighed gastrocnemius muscle, and then conducted histochimical analysis to measure cross-sectional area.

**RESULTS:** We first confirmed that body weight and food intake during the intervention were not different among any doses of D-galactose. There were also no-detectable changes in muscle mass and grip strength among groups. We found that D-galactose injection decreased muscle fiber cross-sectional area at 150 mg/kg/day (p<0.03), but not at 1000 mg/kg/day (p<0.01) and 2000 mg/kg/day (p<0.001) compared with the commonly used dose (100 mg/kg/day). Exercise along with D-galactose at indicated dose led to significant reduction in muscle mass and grip strength among any doses of D-galactose. There were also non-detectable changes in muscle fiber atrophy. Even if the dose was increased up to 1000 or 2000 mg/kg/day, the muscle fiber atrophy was not aggravated but rather alleviated.

**CONCLUSIONS:** To determine the regenerative mechanism of the muscle stem cell (MuSC) and its niche components in response to ischemic insults, we assessed interactions between MuSCs, vascular- and neural-network, and myofibers at different times points. METHODS: The femoral artery ligation mouse model of PAD on different reporter mice were used in the study. Immunofluorescence, single fiber staining, and biochemistry blotting from harvested hindlimb muscles were used for data analysis. One-way ANOVA with Tukey’s post hoc test and a paired two-tailed t-test were performed to determine differences following CLI injury. RESULTS: Skeletal muscle regeneration persisted up to 56 days while the number of eMHC fibers (p<0.01) was highest 14 days following CLI surgery compared to the contralateral sham control. In addition, muscle regeneration was accompanied by significant alterations in the motor unit, as demarcated by the presence of denervated synapses, regeneration of the neuromuscular junction (NMJ), and increased number of subsynaptic nuclei (p<0.05). Furthermore, the size of the myonuclear domain was decreased at 7 and 14 days (p<0.01), corresponding to greater RNA content (p<0.001) and MuSC frequency (p<0.05) while the mitochondrial domain was increased 28 days (p<0.01) following CLI injury. CONCLUSION: Overall, these data indicate that as a regenerative response to critical limb ischemia, the neuromuscular network of myofibers are remodelled and newly regenerated myofibers exhibit MuSC-derived myonuclear expansion to allow enhanced transcriptional support and an increase in mitochondrial content for a bioenergetic need of the energy-demanding tissue regeneration. Supported by NIH R21AR072287 (YJC) and Regenerative Engineering and Medicine research grant.

**1873 Board #29**
May 30 2:00 PM - 3:30 PM

**Exercise Activate Tendon Cells through HGFA**

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**No relevant relationships reported**

Regular exercise enhances the musculoskeletal systems including tendon strengthening. Tendon cells, consisting of tendon stem/progenitor cells (TSCs) and tenocytes, are essential for the maintenance and repair of tendinous tissues when injured. Previously, we showed that TSCs increase in their number and quality after injury and regeneration. The underlying the activation of tendon cells by exercise are unknown. Hepatocyte growth factor activator (HGFA) is known to be a systemic factor that can activate skeletal muscle stem cells.

**PURPOSE:** To test the hypothesis that HGFA is elevated and activates tendon cells in response to exercise.

**METHODS:** Total 18 mice were equally divided into cage control and exercise groups. Exercise was mimicked by one-time treadmill running (OTR), with which mice ran at 13 meter/min for 6 hrs. Twelve hours before OTR, both groups of mice were injected with 1 mg of bromodeoxyuridine (BrdU) per mouse to determine cell proliferation. One day after OTR, all mice were sacrificed and Achilles and patellar tendons were harvested. The HGFA levels in both tendons and serum were measured using ELISA, and BrdU incorporation was assayed by immunofluorescence staining. Student t-test was performed to assess statistical significance. **RESULTS:** OTR increased HGFA levels in both Achilles and patellar tendons of OTR mice compared to cage control mice (Fig. 1A). HGFA levels in serum were also significantly increased after OTR (data not shown). Moreover, more BrdU positive cells were present in patellar tendons in OTR group than control group (Fig. 1B), indicating that quiescent tendon cells were activated from G0 to G1/S by exercise, possibly through HGFA. **CONCLUSION:** Exercise-elevated HGFA possibly may be responsible for the activation of tendon cells. This new molecular mechanism may explain the beneficial effects of exercise on tendon strengthening by stimulating synthesis.

**1874 Board #30**
May 30 2:00 PM - 3:30 PM

**Ischemia-reperfusion Injury Remodels Skeletal Muscle Motor Unit, Myoneural-, And Mitochondrial-domains**

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**No relevant relationships reported**

Peripheral artery disease (PAD) is a significant medical condition caused by blockages in the arteries of the leg. Some PAD patients progress to critical limb ischemia (CLI) and major amputation. While recent regenerative medicine approaches on collateral vessel formation have made some progress, the myopathy and dysregulation of the skeletal muscle in CLI have not been thoroughly investigated. **PURPOSE:** To determine the regenerative mechanism of the muscle stem cell (MuSC) and its niche components in response to ischemic insults, we assessed interactions between MuSCs, vascular- and neural-network, and myofibers at different times points. METHODS: The femoral artery ligation mouse model of PAD on different reporter mice were used in the study. Immunofluorescence, single fiber staining, and biochemistry blotting from harvested hindlimb muscles were used for data analysis. One-way ANOVA with Tukey’s post hoc test and a paired two-tailed t-test were performed to determine differences following CLI injury. RESULTS: Skeletal muscle regeneration persisted up to 56 days while the number of eMHC fibers (p<0.01) was highest 14 days following CLI surgery compared to the contralateral sham control. In addition, muscle regeneration was accompanied by significant alterations in the motor unit, as demarcated by the presence of denervated synapses, regeneration of the neuromuscular junction (NMJ), and increased number of subsynaptic nuclei (p<0.05). Furthermore, the size of the myonuclear domain was decreased at 7 and 14 days (p<0.01), corresponding to greater RNA content (p<0.001) and MuSC frequency (p<0.05) while the mitochondrial domain was increased 28 days (p<0.01) following CLI injury. CONCLUSION: Overall, these data indicate that as a regenerative response to critical limb ischemia, the neuromuscular network of myofibers are remodelled and newly regenerated myofibers exhibit MuSC-derived myonuclear expansion to allow enhanced transcriptional support and an increase in mitochondrial content for a bioenergetic need of the energy-demanding tissue regeneration. Supported by NIH R21AR072287 (YJC) and Regenerative Engineering and Medicine research grant.

**1875 Board #31**
May 30 2:00 PM - 3:30 PM

**Increased Muscle Salpaha-dihydrotestosterone By Acute Resistance Exercise Contributes To Muscle GLUT4 Signaling In Diabetic Rats**

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**No relevant relationships reported**

Our previous study showed that 5α-dihydrotestosterone (DHT), an active androgen, can be synthesized in skeletal muscle by 5α-reductase. Recently, we revealed that the increase in muscle DHT level by resistance training was associated with improvement of glycemic control in type 2 diabetic rats. Acute resistance exercise activates signaling pathway such as AMPK/TBG/1D1 and Akt/AS160 in skeletal muscle, resulting in enhancement of GLUT4 translocation. However, it is still unclear whether an increase in muscle DHT secretion by acute resistance exercise contributes to up-regulation of GLUT4.
Supported by Grants-in-Aid for Scientific Research (#17H02182 and #16K13059, M. M. acute resistance exercise may partially contribute to enhancement of muscle GLUT4 translocation and Akt phosphorylation (p<0.05). In addition, muscle AMPKα2/Thr172 phosphorylation and GLUT4 translocation were significantly increased immediately and an hour after acute resistance exercise (p<0.05). However, the treatment of 5α-reductase inhibitor was significantly suppressed the up-regulations of GLUT4 translocation and Akt/AS160 phosphorylation (p<0.05), but did not alter the AMPK/TC1D1 phosphorylation.

CONCLUSIONS: These results suggest that the increase in DHT secretion due to acute resistance exercise may partially contribute to enhancement of muscle GLUT4 translocation via activation of Akt/AS160 phosphorylation in type 2 diabetic rats. Supported by Grants-in-Aid for Scientific Research (#17H02182 and #16K13059, M. Iemitsu).
CTCF binding, acting as a co-activator at the L1 promoter, but this hypothesis needs validation. Additionally, L1 promoter methylation, while not statistically significant, was numerically lower with stretching. This decrease contributes to increased expression in L1 gene. Thus, we provide novel insight as to how L1 gene regulation is altered with age, but more research is needed to test how L1 is affecting skeletal muscle health.

Follistatin inhibits the actions of the TGFβ family to oppose inhibitory action of skeletal muscle growth, whereas growth and differentiation factor (GDF-15) may inhibit muscle growth. The PURPOSE of this project was to determine if predominately aerobic exercise can induce changes in concentrations of circulating follistatin and GDF-15, and if these changes are dependent on exercise intensity and/or duration.

METHODS: Fifteen recreationally trained young (28.3±2.0 years) males (n=8) and females (n=7) participated in two bouts of treadmill running: a vigorous intensity/short duration (ViSd) bout at 25% ventilatory threshold for 30 minutes and a moderate intensity/long duration (MiLd) bout at 5% ventilatory threshold for 2 hours. Blood was collected pre-exercise, 15 minutes from the start of exercise, mid-exercise, and immediately, 1 hr, 2 hr, and 3 hr post-exercise. Serum was analyzed with commercially available ELISA kits for follistatin and GDF-15.

RESULTS: At 15 minutes into the exercise bout follistatin was higher (p<0.0001) in MiLd (8.1±2.4 ng/mL) than ViSd (5.28±4.3 ng/mL) and GDF-15 was higher (p<0.0002) in MiLd (209.3±40.8 ng/mL) than ViSd (183.7±31.2 ng/mL). Follistatin was higher in ViSd 1 hr post-exercise (MiLd 9.7±3.1 ng/mL vs. ViSd 12.1±7.3 ng/mL; p<0.0001), and higher in MiLd 2 hr post-exercise (MiLd 11.2±4.3 ng/mL vs. ViSd 7.6±4.2 ng/mL; p<0.0008) and 3 hr post-exercise (MiLd 10.1±3.3 mg/mL vs. ViSd 8.8±4.9 mg/mL; p<0.0001). GDF-15 was higher in MiLd immediately post-exercise (MiLd 335.0±75.9 units vs. ViSd 193.5±53.4 units; p<0.0001), 1 hr post-exercise (MiLd 461.0±84.7 ng/mL vs. ViSd 225.2±45.7 ng/mL; p<0.0001), and 3 hr post-exercise (MiLd 338.2±70.2 ng/mL vs. ViSd 224.3±44.8 ng/mL; p<0.0001).

CONCLUSIONS: The differences at the 15 minutes into exercise time point suggest that the exercise-induced follistatin and GDF-15 response is intensity-dependent. The differences post-exercise imply that there may also be a duration effect. Intensity and duration need to be considered to increase follistatin in response to running.

CONCLUSIONS: Uregulation of myogenic and anabolic factors, along with the downregulation of apoptotic and atrophy factors by mechanical loading suggests an amelioration of myogenic and survival ability of the aged myotubes.

Fifteen recreationally trained young (28.3±2.0 years) males (n=8) and females (n=7) participated in two bouts of treadmill running: a vigorous intensity/short duration (ViSd) bout at 25% ventilatory threshold for 30 minutes and a moderate intensity/long duration (MiLd) bout at 5% ventilatory threshold for 2 hours. Blood was collected pre-exercise, 15 minutes from the start of exercise, mid-exercise, and immediately, 1 hr, 2 hr, and 3 hr post-exercise. Serum was analyzed with commercially available ELISA kits for follistatin and GDF-15.

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CONCLUSIONS: Uregulation of myogenic and anabolic factors, along with the downregulation of apoptotic and atrophy factors by mechanical loading suggests an amelioration of myogenic and survival ability of the aged myotubes.

Purpose: Several studies have demonstrated that small nutrients, such as Caffeine (CAFF) and branched chain amino acids, especially Leucine (Leu), induce mitochondrial biogenesis through diverse mechanisms that converge in the activation of PGC-1α, leading to enhancing transcriptional activity and mitochondrial remodeling. Micro-RNAs (miRNAs) have been known to act as powerful negative modulators of gene expressions involved in essential cellular processes. Recent evidence suggests that miR-494, miR-696, and miR-761 are involved in mitochondrial biogenesis by negative modulation of PGC-1α signaling. However, it remains unclear whether these miRNAs are regulated individually or cooperatively by nutrients stimulation. Therefore, our study was focused on the effect of CAFF and obesity on these miRNAs functions and how it affected its downstream effectors, and ultimately, mitochondrial biogenesis.

METHODS: The process of myogenesis is gradually declined and cells apoptosis increases with aging. However, mechanical loading of aged differentiated myoblasts (myotubes) and then underwent a passive, cyclic stretching (2.2% elongation, at a frequency of 0.25Hz, for 12h). Phosphorylation of signaling proteins ERK1/2 and Akt and increase in MyoD protein levels (p<0.05). mRNA expression levels of Akt and Murf1 were decreased (p<0.05). Micro-RNAs (miRNAs) were increased (p<0.05). Micro-RNAs (miRNAs) were increased (p<0.05).

CONCLUSIONS: Upregulation of myogenic and anabolic factors, along with the downregulation of apoptotic and atrophy factors by mechanical loading suggests an amelioration of myogenic and survival ability of the aged myotubes.

Fifteen recreationally trained young (28.3±2.0 years) males (n=8) and females (n=7) participated in two bouts of treadmill running: a vigorous intensity/short duration (ViSd) bout at 25% ventilatory threshold for 30 minutes and a moderate intensity/long duration (MiLd) bout at 5% ventilatory threshold for 2 hours. Blood was collected pre-exercise, 15 minutes from the start of exercise, mid-exercise, and immediately, 1 hr, 2 hr, and 3 hr post-exercise. Serum was analyzed with commercially available ELISA kits for follistatin and GDF-15.

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CONCLUSIONS: The differences at the 15 minutes into exercise time point suggest that the exercise-induced follistatin and GDF-15 response is intensity-dependent. The differences post-exercise imply that there may also be a duration effect. Intensity and duration need to be considered to increase follistatin in response to running.
DOX durin treatment. Groups treated with DOX received 3 mg/kg DOX dosing regimen used in the current study had no effect on SOD1 and SOD2 expression observed in RRD (+3% and -3%, respectively vs SSS).

RESULTS: Thirty-six male Sprague-Dawley rats were randomly assigned to one of four groups: sedentary/saline (SSS), sedentary/DOX (SSD), resistance training/saline (RRS), or resistance training/DOX (RRD). The resistance training protocol incorporated a raised cage model where food and water were elevated progressively which provided hind limb loading 10 weeks prior to DOX injection and 4 weeks during DOX treatment. Groups treated with DOX received 3 mg/kg DOX weekly for 4 weeks (12 mg/kg cumulative), and saline-treated groups received 0.9% NaCl as a placebo. Five days following the final DOX or saline injection, EDL muscles were excised, and Western blotting was performed to quantify SOD1 and SOD2 expression.

RESULTS: Although no significant drug effects, activity effects, or drug x activity interactions were observed with SOD1 and SOD2 expression (P > 0.05), a trend toward SSD expressing less SOD1 and SOD2 than SSS was observed (-25% and -37%, respectively). This same trend in SOD1 and SOD2 expression, however, was not observed in RRD (+3% and -3%, respectively vs SSS). CONCLUSIONS: The DOX dosing regimen used in the current study had no effect on SOD1 and SOD2 expression in the EDL muscle, and the resistance training protocol also did not affect SOD1 and SOD2 expression. These results suggest that resistance exercise may play a limited role in modulating oxidative stress of DOX in type II skeletal muscle.


Mike Woodward, Edward P. Debold. University of Massachusetts Amherst, Amherst, MA.

RESULTS: Acidosis (pH 7.4 vs. 6.5) in a mini-ensemble laser trap assay reduced myosin’s average force production by 20% (p < 0.05) due to a slowed rate of actomyosin binding. This conclusion was supported by the observation that acidosis slowed myosin’s ability to hydrolyze ATP in an ATPase assay. Acidosis (pH 7.4 vs. 6.5) in a mini-ensemble laser trap assay reduced myosin’s average force production by 20% (p < 0.05) due to a slowed rate of actomyosin binding. This conclusion was supported by the observation that acidosis slowed myosin’s ability to hydrolyze ATP in an ATPase assay. Acidosis (pH 7.4 vs. 6.5) in a mini-ensemble laser trap assay reduced myosin’s average force production by 20% (p < 0.05).

RESULTS: Peripheral arterial disease is the third leading cause of death of atherosclerotic cardiovascular mortality in the United States and the incidence of PAD increases age. Previous studies have shown that PAD displays impaired mitochondrial respiration, decreased expression of mitochondrial enzymes, increased oxidative stress, and mitochondrial DNA mutations within their ischemic limb muscles. We identified a potential transcriptional regulator of mitochondrial gene expression, PGC-1/ERR-induced regulator in muscle (PERM1) which is reduced 85% in patients with severe PAD. Interestingly, PERM1 regulates the expression of only a subset of genes induced by PGC-1α or ERRα expression in C2C12 myotubes, suggesting that PERM1 selectively functions in specific PGC-1/ERR-driven pathways. Purpose: The purpose of this study is to determine whether PERM1 is a potential gene target to aid in tissue recovery and regeneration from hypoxia in C2C12 myotubes. Methods: We generated AA V-PERM1 resulted in a ~16-fold increase in mRNA expression which drove a ~20% increase in complex I-supported respiration compared to the control cells (P=0.05). Additionally, proteasome activity being upregulated with AR POSTDL may be a potential mediator. CONCLUSION: Our results indicate that PERM1 is a strong regulator of mitochondrial biogenesis in skeletal muscle cells, capable of increase both mitochondrial content and respiratory function. More research is needed to further investigate molecular signaling after degradation paradigms.

Molecular Implications of Active and Passive Recovery Following High Volume Resistance Training

Christopher Vann1, Cody Haun2, Shelby Osburn3, Matthew Romero1, Paul Roberson1, Petye Mumford1, Carlton Fox1, Jordan Moon1, Kaelin Young1, Michael Roberts1. University of Auburn, Auburn, AL. 2LaGrange College, LaGrange, GA. 3ImpediMed, Carlsbad, CA.

RESULTS: There was an effect of time for phosphorylated (p) 4EBP1 where PRE (p = 0.014) and POSTDL (p = 0.004) expression of p-4EBP1 were significantly higher than POST. CK activity also had an effect of time (p = 0.016) where CK at POST was significantly higher than at DL (p = 0.007). There was a significant group*time interaction of proteasome activity (p = 0.040) where post-hoc analysis revealed the AR group exhibited higher proteasome activity DL than the PR group (p = 0.051). Differences in protein expression for pan and phosphorylated mTOR, AMPK, 70S6k, and pan 4EBP1 were not significant (p > 0.05). Additionally there were no significant differences in serum testosterone and cortisol levels (p > 0.05)

CONCLUSION: AR may stimulate the PI3K/Akt pathway resulting in the phosphorylation of 4EBP1 potentially allowing hypertrophic adaptation to occur. Additionally, proteasome activity being upregulated with AR POSTDL may be beneficial in healing damaged protein structures. More research is needed to further investigate molecular signaling after degradation paradigms.

PERM1 Increases Mitochondrial Respiratory Capacity in Culture Muscle Cells


Peripheral arterial disease is the third leading cause of death of atherosclerotic cardiovascular mortality in the United States and the incidence of PAD increases age. Previous studies have shown that PAD displays impaired mitochondrial respiration, decreased expression of mitochondrial enzymes, increased oxidative stress, and mitochondrial DNA mutations within their ischemic limb muscles. We identified a potential transcriptional regulator of mitochondrial gene expression, PGC-1/ERR-induced regulator in muscle (PERM1) which is reduced 85% in patients with severe PAD. Interestingly, PERM1 regulates the expression of only a subset of genes induced by PGC-1α or ERRα expression in C2C12 myotubes, suggesting that PERM1 selectively functions in specific PGC-1/ERR-driven pathways. Purpose: The purpose of this study is to determine whether PERM1 is a potential gene target to aid in tissue recovery and regeneration from hypoxia in C2C12 myotubes. Methods: We generated AA V-PERM1 resulted in a ~16-fold increase in mRNA expression which drove a ~20% increase in complex I-supported respiration compared to the control cells (P=0.05). Additionally, proteasome activity being upregulated with AR POSTDL may be a potential mediator. CONCLUSION: Our results indicate that PERM1 is a strong regulator of mitochondrial biogenesis in skeletal muscle cells, capable of increase both mitochondrial content and respiratory function. More research is needed to further investigate molecular signaling after degradation paradigms.
RESULTS: Protein levels of XBP1 are increased in regenerating muscle fibers (1 ± 0.21 vs. 17.66 ± 13.9, p < 0.05). Moreover, genetic deletion of XBP1 inhibits regeneration due to reducing the number 2 or more centrally nucleated fibers (44.2 ± 2.8 vs. 30.7 ± 1.7, p < 0.05) and the number of satellite cells per 100 myofibers (26.5 ± 2.4 vs. 19.3 ± 1.4, p < 0.05). Furthermore, targeted ablation of XBP1 inhibits increases in cross-sectional area of myofibers and to a functional overload in adult mice (226.6 ± 304.4 μm² vs. 177.9 ± 150.9 μm², p < 0.05). Interestingly, XBP1 does not affect the rate of protein synthesis during muscle growth. Rather, deletion of XBP1 prevents skeletal muscle hypertrophy through reducing the total number of satellite cells per 100 myofibers (9.5 ± 1.1 vs. 5.8 ± 0.8, p < 0.05).

CONCLUSIONS: The results of the present study suggest that XBP1 is necessary for skeletal muscle regeneration and adult skeletal muscle hypertrophy. Furthermore, XBP1-mediated signaling in myofibers promotes satellite cell proliferation and fusion in a non-cell autonomous manner. More investigations are needed to further understand the mechanisms, especially gene network that XBP1 regulates during skeletal muscle development and growth.

CONCLUSION

The results of the present study suggest that XBP1 is necessary for skeletal muscle regeneration and adult skeletal muscle hypertrophy. Furthermore, XBP1-mediated signaling in myofibers promotes satellite cell proliferation and fusion in a non-cell autonomous manner. More investigations are needed to further understand the mechanisms, especially gene network that XBP1 regulates during skeletal muscle development and growth.

Obesity (OB) disrupts cellular communication consistent with lower skeletal muscle capillarization. Exosomes, small extracellular vesicles, transport and deliver mRNA, miRNA, and proteins in an endocrine manner and are released by muscle during aerobic exercise. The effects of resistance exercise (REx) on exosome biogenesis is unknown.

PURPOSE: Investigate if resistance exercise increases skeletal muscle exosome biogenesis pathways and if this response is impaired in obesity.

METHODS: Lean (LN) and obese (OB) (n = 9/group) sedentary men and women performed 3 sets of 8-12 repetitions/set of acute, single leg knee extension resistance exercise at 80% of 1-RM. Vastus lateralis biopsies were obtained at rest and at 15 min, and 3 hr post-exercise. Muscle mRNA, protein expression, fiber typing, and capillary staining were measured.

RESULTS: The gene expression of the exosome biogenesis components hepatocyte growth factor-regulated tyrosine kinase (HGS) and vascular protein sorting mutant (HPS1) were lower in OB than LN at rest (~25%) and at 15 min post (~20%), but not 3 hr post-exercise. Expression of exosome surface markers apoptotic linked gene-2 interacting protein X (Alix) was lower (OB ~35% and LN ~20% 15min post-exercise) and tumor susceptibility gene-101 (TSG-101) was higher in OB (~50% and LN ~40% 3hr post-exercise) in response to REx in both groups. Acute resistance exercise increased vascular endothelial growth factor (VEGF) mRNA similarly in LN and OB. Interestingly, anti-angiogenic thrombospondin-1 (TSP-1) mRNA was increased by ~40% 3hr post-exercise in response to REx in both groups. The number of exosomes increased in OB at rest and following exercise. Muscle mRNA, protein expression, fiber typing, and capillary staining were measured.

CONCLUSION: Obesity alters skeletal muscle exosome biogenesis, angiogenic, and muscle differentiation pathways possibly contributing to greater muscle fiber size and lower muscle capillarization. Resistance exercise alters skeletal muscle exosome marker expression similarly in both lean and obese.

Cancer Cachexia is a devastating syndrome that affects around 50-80% of cancer patients and is characterized by a rapid, drastic fat and muscle mass loss. The APC<sup>−/−</sup> mouse strain is a well-studied model mouse of human colorectal cancer and cancer cachexia. The branched-chain amino acid leucine is known to stimulate muscle growth/maintenance through activation of mTOR and protein synthesis.

PURPOSE: To examine the effects of chronic leucine supplementation on cancer cachexia development in APC<sup>−/−</sup> mice.

METHODS: 7 APC<sup>−/−</sup> mice (APC) and 11 wild-type (WT) were used for this study. The animals were assigned to the following groups: WT no leucine (WTNL, n=5), WT leucine (WTL, n=5), APC<sup>−/−</sup> no leucine (APCNL, n=5) and APC<sup>−/−</sup> leucine (APC, n=2). Mice were given ad libitum access to food and water. Mice in the leucine groups received 1.5% leucine-rich water. Plantaris muscles and tibias were excised at 20 weeks of age. Tissue was immediately frozen for morphology and gene expression analysis using RT-qPCR.

RESULTS: The number of polyps increased in APC<sup>−/−</sup> mice compared to WT (46.57 ± 2.44 vs. 0.00 ± 0.00). The number of polyphs < 1 mm was increased (14.33 ± 1.45 vs. 7.75 ± 2.05) in APC compared to APCNL (p<0.05). There was a main effect for APC<sup>−/−</sup> to have lower body mass than WT (p<0.001). There was a main effect of genotype to decrease plantaris weight/tibia length in APC<sup>−/−</sup> mice vs. WT mice (p<0.001) and a main effect for leucine to decrease plantaris weight/tibia length in APC<sup>−/−</sup> mice (p<0.05). There was an ~8-fold increase in atrogin-1 gene expression in APCNL compared to WTNL (p<0.05). Atrogin-1 gene expression was ~7-fold lower in APCNL compared to APCNL (p<0.05). There was a main effect of genotype to increase MuRF1 expression in APC<sup>−/−</sup> mice compared to WT (p<0.05) and a main effect of leucine to decrease MuRF1 expression (p<0.05), which appeared to be driven by the APC genotype (interaction p<0.056). No difference was found in MyoD or Myogenin gene expression. CONCLUSION: The preliminary data suggest deleterious effects of leucine in cancer cachexia, which need to be affirmed by further studies. Based on gene expression of the E3 ubiquitin ligases, this loss in muscle mass may be independent of muscle protein degradation.

Supported by the Arkansas Biosciences Institute.
c oxidase correlated (P=0.05) with SOD2 explaining 24, 31 and 17% of the variance, respectively. Finally, SOD2 protein expression correlated (P<0.05) to monocarboxylate transporter 4 (MCT4) and phosphofructokinase (PFK; r=0.62). No statistical relationship was observed between SOD2 protein and neither Na+/K-ATPase subunits, Na+/H+ exchanger, Acetyl-CoA carboxylase, PECAM-1, nor YYY1, YYIR1 and RST performance. SOD1 protein expression displayed an inverse correlation with MHCIIa (r=0.61; P<0.05), but did not correlate with any other variable assessed in muscle or physical capacity. CONCLUSIONS: Skeletal muscle antioxidant capacity associates with markers of endurance exercise such as maximal aerobic power, type I and Ila muscle fibers, and mitochondrial function. However, strong relationships were additionally observed between antioxidant profile and lactate production as well as transport capacity, supporting a link between lactate and ROS generation.

Satellite cells drive skeletal muscle regeneration in response to injury, a process regulated by factors released into the local muscle environment. However, the cellular sources of this trophic support are poorly defined. In this regard, recent work on skin and bone repair has revealed a surprising supportive role for cells termed “senescent cells” which are commonly associated with aging and pathology. However, the role of senescence in skeletal muscle repair is currently unknown. The purpose of this study is to determine the presence and contribution of senescent cells in skeletal muscle repair following acute injury. METHODS: The tibialis anterior (TA) of C57BL6 mice was injured with cardiotoxin (CTX) and collected 5, 7, 10, 14, and 21 post-injury for histological/immunohistochemical (IHC) and gene expression analysis. To examine the function of senescent cells during muscle repair, mice were treated with a senolytic compound (ABT-263) following injury to selectively ablate senescent cells. RESULTS: Senescence cell number (as revealed using the senescence-associated beta-galactosidase (SA-beta-gal) assay) increased significantly following injury (p <0.05) and returned to baseline by day 21 post-injury, a time-course that is coincident with the repair process. In agreement with this, qPCR analysis of putative senescence pathways including p16 and p21 and p53 as well as secreted factors commonly secreted by senescent cells such as IL1 and MMP13 were significantly upregulated in injured compared to control tissue (p<0.05). Preliminary IHC analysis demonstrated that at 5 days post-injury, 58% of senescent cells were positive for macrophage marker F480, while at 10 days post-injury, 43% of senescent cells were F480+ and 9% were CD31 positive; an endothelial cell marker. Identification of other cell types is under investigation. Senolytic therapy was effective at removing senescence cells as a significant 44% reduction in the number of SA-beta-gal+ cells was observed, the consequences of which on muscle repair are currently under analysis. CONCLUSION: Senescent cells are a newly identified component of the muscle repair environment which may influence skeletal muscle repair and satellite cell function. Supported by NSERC discovery grant and The Canadian Foundation for Innovation and ACOA.

Stress proteins protect skeletal muscle from internal and external stress. Heat shock proteins respond to temperature, exercise and oxidative stress. Cold shock proteins respond to temperature and hypoxia in animals or in cell cultures but have not been studied in humans. The response of cold shock proteins to exercise and physiologically-relevant environmental temperature in human skeletal muscle is not known. PURPOSE: The purpose of this study was to determine the early mRNA response of human cold shock and heat shock stress proteins to endurance exercise and environmental temperatures. METHODS: Seven recreationally trained males (age: 24 ± 2 years; height: 178 ± 1.7 cm; weight: 76.8 ± 1.9 kg; VO2peak: 4.5 ± 0.2 L·min-1; Wpeak: 290 ± 7.8 W) cycled for 1 hour at 60% Wpeak to pre-exercise (p = 0.002) but was not significantly different between temperatures (p = 0.103). HSP27, HSP90, and HSF1 mRNA did not change from pre- to post-exercise (p = 0.052, p = 0.324, p = 0.795) and were not different between temperatures (p = 0.247, p = 0.134, p = 0.808). CONCLUSIONS: These data indicate that exposure to mild heat and cold during aerobic exercise have limited effect on skeletal muscle mRNA expression of heat shock and cold shock proteins. However, this novel study found cold shock protein mRNA of skeletal muscle decreases, whereas HSP70 mRNA increases in response to a low to moderate intensity aerobic exercise bout. Supported by the National Institute for General Medical Science, Nebraska IDeA Networks for Biomedical Research Excellence (INBRE), and the University of Nebraska at Omaha Committee on Research and Creative Activity.

Cancer cachexia is a life-threatening paraneoplastic condition characterized by unintended weight loss and skeletal muscle atrophy. Recent frameworks describe cancer cachexia as a systemic disease in which several non-muscle organs are reprogrammed or remodeled. The liver exerts major control over systemic metabolism yet has been relatively unexplored in cancer cachexia. Previous reports indicate loss of oxidative phosphorylation efficiency in the cachectic liver, through currently underdefined mechanisms. PURPOSE: To investigate mitochondrial Ant2 and Ucp2 expression in the liver during colon-26 tumor-induced cachexia. Adrianna J. Castro, Gabriel J. Serna, Hector G. Paez, Jessica L. Hallie, Nishant P. Visavadiya, Michael C. Zourdos, Michael A. Whitehead, FACS, Andy V. Khambou. Florida Atlantic University, Boca Raton, FL. (No relevant relationships reported)
synthase activity was assayed as a proxy for mitochondrial density. The respiratory control ratio (RCR), an index of OXPHOS coupling efficiency, was determined in the complex I-linked state. RESULTS: RCR was -25.60% lower in all C26 groups compared to PBS-WS (p<0.05). C26-SEV also had lower RCR than C26-MOD (p<0.05). Together this may signify an early loss of liver OXPHOS coupling efficiency due to cancer, that subsequently worsens when severe cachexia develops. Citrate synthase activity was not different between groups (p>0.05), suggesting the impairment of respiratory function to be independent of mitochondrial mass. Ucp2 expression was not different between groups (p>0.05). However, Am2 expression was greater in C26-SEV compared to PBS-WS, C26-WS, and C26-MOD, by 15-30% (p<0.05). Am2 expression related inversely with RCR in the liver (r=-0.547, p<0.05), implying higher liver Am2 content to be associated with uncoupling of OXPHOS.

CONCLUSION: We highlight an under-recognized role of liver mitochondria in cancer cachexia, and suggest hepatic mitochondrial function to be a therapeutic target.

D-57 Free Communication/Poster - Body Composition and Integrative Physiology
Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

1896 Board #52 May 30 2:00 PM - 3:30 PM
Agreement Between Dual-Energy X-Ray Absorptiometry and a New Standing Bioimpedance Spectroscopy Device for Detecting Changes in Fat-Free Tissue
Emily L. Grandprey1, Katelyn P. Joubert1, Cody T. Haun2, Matthew A. Romero3, Shelby C. Osburn3, C Brooks Mobley3, Emily L. Grandprey1, Katelyn P. Joubert1, Cody T. Haun2, Matthew A. Romero3, Shelby C. Osburn3, C Brooks Mobley3, 1Edward Via College of Osteopathic Medicine-Auburn Campus, Auburn, AL. 2LaGrange College, LaGrange, GA. 3Auburn University, Auburn, AL. *ImpediMed Inc, Carlsbad, CA. (No relevant relationships reported)

Dual energy X-Ray absorptiometry (DXA) determined lean tissue mass has long been regarded as a critical method for determining and monitoring changes in whole body and appendicular skeletal muscle mass. However, its utility is limited and restrictive due to patient size limitations, cost, specialized operator training and patient radiation exposure. PURPOSE: Herein, we sought to compare measurements of whole-body fat free tissue mass (FFTM) determined by a new standing bioimpedance spectroscopy (BIS) device as well as DXA before and after six weeks of progressive resistance training. METHODS: Twenty-three resistance-trained males (mean ± SD, age: 21.6 ± 2.4, height: 178.4 ± 7.8 cm, weight: 80.9 ± 10.5 kg) underwent six weeks of resistance training. DXA (Lunar Prodigy DXA, GE) and BIS (SOZO, ImpediMed Inc.) were administered pre and post-intervention with participants in a fasted and normally-hydrated state wearing a t-shirt and athletic shorts for determination of whole body FFTM. Agreement between methods for determination of whole body FFTM at each time point and across time were determined by Bland and Altman plot analysis (mean difference and 95% limits of Agreement), bivariate linear regression analysis and dependent samples t-tests with statistical significance set at p<0.05.

RESULTS: Bland and Altman plot analysis revealed good agreement between methods producing a mean difference and 95% LOA of 1.9 ± 2.3 kg, respectively. Regression analysis revealed a strong and significant relationship (r=0.96, r²=0.92, SEE=2.2 kg, p<0.001) between DXA and BIS-derived FFTM. Both DXA and BIS-derived FFTM significantly (p<0.001) increased post-training (pre vs post, 63.2±7.9 vs 65.8±7.4 and 65.2±8.3 vs 67.6±7.2 kg, respectively). Importantly, mean FFTM delta scores were not statistically different between DXA and BIS (2.6±1.4 vs 2.4±2.6 kg, p=0.57). Furthermore, regression analysis revealed a significant relationship between DXA and BIS-derived FFTM delta scores (r=0.72, r²=0.52, SEE=1.01 kg, p<0.001). CONCLUSIONS: BIS-derived FFTM agrees well with DXA-derived FFTM for single measurements as well as following resistance training-induced skeletal muscle hypertrophy and is an accurate and acceptable alternative to DXA.

Funding provided by ImpediMed Inc

Rordan J. Moon is an employee of ImpediMed Inc

1898 Board #54 May 30 2:00 PM - 3:30 PM
Low Carbohydrate Diet On Body Composition Of Trained Crossfit Individuals
Andreia Naves, Mariane Iori, Renata Carneub, Ana Beatriz Baptista, VP Research Institute, Sao Paulo, Sao Paulo, Brazil, Brasil.
Email: andreia.naves@vponline.com.br (No relevant relationships reported)

Effects of low carbohydrate diet on body composition of trained Crossfit individuals
D-58 Free Communication/Poster - Musculoskeletal Mechanics and Modeling

Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

1900 Board #56 May 30 2:00 PM - 3:30 PM
Electromyographic Evidence of Excessive Achilles Tendon Elongation During Isometric Contractions After Achilles Tendon Repair
Email: mcmugh@nistas.org
(No relevant relationships reported)

PURPOSE: Increased tendon elongation after Achilles repair is thought to contribute to selective weakness in end-range plantarflexion (PF). Excessive tendon elongation during maximum voluntary contraction (MVC) means greater muscle fiber shortening. Since mean frequency (MF) of the electromyogram (EMG) increases with decreasing fiber length, it was hypothesized that MF would be higher on the involved (Inv) versus non-involved (Non) side during isometric PF MVCs. The purpose of this study was to examine MF during isometric MVCs in patients with Achilles tendon repairs.

METHODS: Isometric PF MVC was measured at 20°, 10°, 0° dorsiflexion (DF), and 10°, 20°, 30° in 17 patients (age, 39±9 years; 15 men, 2 women) ≥24 months after surgery. Surface EMG signals were recorded during MVCs. MF was calculated from Fast Fourier Transforms of median gastrocnemius (MG) lateral gastrocnemius (LG) and soleus (SM) EMG signals. Effect of weakness on MF was assessed using analysis of variance. RESULTS: Patients had weakness in 20° PF (deficit 28.18%; P<0.01; 14 of 17 deficit >20%) but no weakness in 20° DF (deficit 8.15%; P>0.20; 4 of 17 deficit >20%). MF increased moving from DF to PF (P<0.001) but was not different between Inv and Non (P=0.22). At 10° PF 8 of 17 patients had weakness <20% deficit. MF was significantly higher on Inv versus Non, across all angles, in patients with weakness versus no weakness at 10° PF (side by group P=0.014; Table 1). Inv was 13% higher on Inv versus Non in patients with weakness (P=0.012) versus 3% lower in patients with no weakness (P=0.47).

CONCLUSIONS: Higher MF for Inv versus Non in patients with PF weakness is consistent with greater muscle fiber shortening. This indicates that weakness was primarily due to excessive lengthening of the repaired Achilles tendon. If weakness were simply due to atrophy, a lower MF would have been expected.

Table 1

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THURSDAY, MAY 30, 2019

1901 Board #57 May 30 2:00 PM - 3:30 PM
Spatial Resolution Of The Media Gastrocnemius Mechanomyograph Resolved By Time-Frequency And Principle Pattern Analysis
William J. Armstrong. Western Oregon University, Monmouth, OR.
(No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the mechanomyograph of the medial gastrocnemius spatially using a grid of nine accelerometers during electrically-activated contractions. METHODS: 16 (8M, 8F) moderately-active volunteers (mean age = 21 ± 3 y) with measurable H-reflexes participated. The tibial nerve was stimulated in 2V increments with 10-second rest intervals, and data where the peak-to-peak M-wave amplitude exceeded the H-reflex were analyzed. Peak-to-peak MMG (MMGp-p) data were subjected to the intensity analysis, and total intensity, the peak-to-peak M-wave amplitude exceeded the H-reflex were analyzed. Peak-to-peak MMG (MMGp-p) data were subjected to the intensity analysis, and total intensity, the peak to total intensities (Max), and time to Max (TTMax) were determined. Maps of the dependent variables were plotted across a 9-accelerometer grid for each stimulus for each condition to be analyzed. The MMG intensity and angles were subjected to a principle pattern analysis (p-space) and p-values (P = n = 5) were compared between intra-subject. Pearson’s r among the dependent variables and repeated measures ANOVA were calculated for P, MMGp_p Max, and TTMax, by stimulus (Stim) and accelerometer (ACC) using R open source software (www.r-project.org). Statistical significance was set at α = 0.05. RESULTS: A significant correlation existed only for MMGp_p Max and Max (r = 0.9434, p < 0.0001). RM-ANOVA demonstrated significant effects of Stim for MMGp_p Max and ACC for MMGp_p Max, and TTMax; and Stim by ACC for TTMax (p < 0.001). Progression of the MMG acceleration maps varied across individuals and ACCs. P-space analysis revealed significant differences between p-values for all participants (p < 0.001), significant effects for ACC (p < 0.01) in
eight participants, and Stim (p < 0.05) in five participants. In addition, there were significant interactions for Stim by P (p < 0.01) and ACC by P (p < 0.01). CONCLUSIONS: The results support that spatially for CAI associated sensorimotor impairments. This lower plantar stiffness may influence ankle joint stiffness during activities, which may be a risk factor for recurrent ankle sprains.

1904 Board #60
May 30, 2019: 3:00 PM - 3:30 PM
Influence of Plyometric Training on Tendinous Tissue Elongation During Initial Phase of Explosive Power Exertion
Chihiro Edamatsu, Tomiko Odagaki, Kazuki Kusumoto. Kurashiki University of Science and the Arts, Kurashiki, Japan. Email: edamatsu@kus.ac.jp (No relevant relationships reported)

PURPOSE: The sharp rise of the ground reaction force due to high pre-activation of muscles upon drop jump (DJ) contributes to increases in the reactive strength index (RSI). In our previous studies, in a comparison between athletic long jumpers and general men, the long jumper showed a significant increase in Achilles tendon tissue elongation immediately after DJ contact due to high pre-activation of the gastrocnemius muscle. In this study, we aimed to clarify the influence of plyometric training on Achilles tendon tissue elongation dynamics immediately after DJ contact. METHODS: Five men (age, 21.0 ± 0.7 y; height, 172.2 ± 4.6 cm; weight, 67.6 ± 3.8 kg) volunteered to participate in this study. The subjects were asked to undergo plyometric training (maximum hopping 10 reps × 3 sets, 3 times a week, 12 weeks). Experiments were conducted before and after training and after 12 weeks of detraining. Changes in the Achilles tendon tissue length of the gastrocnemius medialis (the distance from the muscle tendon junction to the calcaneus along the line of action of the tendon) during DJs from a height of 0.3 m were measured using a high-speed camera and ultrasonography equipment. Electromyographic parameters and ground reaction force were measured in synchrony with the camera and ultrasonography equipment.

RESULTS: The RSI increased significantly after training (1.89 ± 0.35) and after detraining (1.78 ± 0.46) compared to that before training (1.49 ± 0.43). The elongation of Achilles tendon tissue immediately after the grounding of DJ was significantly increased by training (+ 2.99 ± 2.36 mm), and the training effect disappeared after detraining (-0.23 ± 2.50 mm). On the other hand, there was no significant effect on the maximum elongation of tendon tissue in the push-off phase. In other words, the elongation of tendon tissue during the initial phase of explosive power exertion is more important than the maximum elongation of the tendon tissue.

CONCLUSIONS: Plyometric training increases tendon tissue elongation immediately after the DJ grounding and increases the RSI. These results suggest that the increase in tendon tissue elongation during the initial phase is one of the factors to increase explosive power exertion.

The ratio of eccentric hamstring strength to concentric quadriceps strength has recently been suggested to potentially have utility for prospectively identifying risk for injury. However, there has been little research on the reliability of these ratios and furthermore, the differences and reliability of this ratio between different velocities, sex, and limbs. PURPOSE: To establish the reliability of eccentric hamstring to concentric quadriceps ratios, and to determine any differences between ratios at different angular velocities, sex, and limbs. METHODS: Following a standardized warmup, 20 women (23.3 ± 3.5 years) and 20 men (23.3 ± 3.5 years) performed eccentric (e120 and e200 degrees) and concentric (c30 and c120 degrees) knee flexion and extension protocols using both the dominant (D) and non-dominant (ND) limbs. Average peak force from each set was used to create two ratios of eccentric hamstring to concentric quadriceps: e120/c200 and e120/c240. RESULTS: For both sexes, the intraclass correlation coefficient (2,1) for the e120/c240 ratios were slightly higher than the e120/c200 ratios (♂ .62 - .71) were slightly higher than the e120/c200 ratios (♂ .62 - .71) and the effect size for the training effect was small for men (4.5-5.0%) compared to women (5.2-7.3%). The D (P < .001, 95% CI: -0.3 to -0.1) and ND (P < 0.035, 95% CI: 0.03 to 0.09) e120/c240 ratios for the women demonstrated a significant systematic decrease across the two sessions. There were no limb differences for either of the ratios (P > .05); however, the e120/c240 ratio for the women was significantly higher (P < .046) than the men (95% CI: 0.01 to 0.72).

Conclusion: No potent reliability differences appeared between the two ratios, which may be attributable to using average peak torque across repetitions without considering...
Bi-articular muscles play an important role to smooth movement in human. However, the biomechanics and physiological function of those muscles is unclear. Thus, this study investigates the function of rectus femoris as a famous bi-articular muscle in lower limbs.

**PURPOSE:** The purpose of this study is to unravel the compartment neuromuscular activation of rectus femoris during isometric knee extension and hip flexion in different knee angles.

**METHODS:** Subjects were eight healthy men. Knee extension with hip flexion were performed in isometric contraction. Knee angle was set up at 90, 60, 30, and 0 degrees. Also, there were three contractions as follow: Maximum voluntary contraction (MVC), 80%MVC, and 60%MVC. Muscle activation of rectus femoris was measured by using multi-channel surface electromyography, and calculated the average rectified value (ARV). We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment. We evaluated the ARV of rectus femoris divided into proximal, medium and distal compartment.

**RESULTS:** In the proximal region at 30 degrees knee angle, averaged ARV value in the MVC (0.113 mV) was significantly higher than that of the other two contraction groups (80%MVC: 0.071 mV, p<0.05 vs MVC; 60%MVC: 0.047 mV, p<0.01 vs MVC). There was no significant differences in ARV's both in medium and distal compartments.

**CONCLUSIONS:** Proximal region of rectus femoris has the role of knee extension and hip flexion in slightly flexed knee joint position. We conclude that the difference of knee angle affects the compartment neuromuscular activation in rectus femoris.

**INTRODUCTION**

Shoulder pain is a common orthopedic ailment, with multiple potential sources of pain and dysfunction. A combination of treatments may be used. While treatment has generally shown to be effective, it does not resolve the syndrome for all patients.

**PURPOSE:** To determine the effect of a standardized treatment protocol on the neuromechanics of the shoulder. It is hypothesized that rotator cuff activation will increase with both pain relief and physical therapy.

**METHODS**

Seven subjects, who were diagnosed with subacromial impingement, and seven healthy controls were recruited. At the first testing session, the subject was instrumented with six surface electromyography sensors and two fine-wire sensors. Subjects elevated their arm in the scapular plane, while kinematics and EMG were recorded. EMG data were normalized to a reference contraction. Following a subacromial injection, the subject repeated elevation motion. Following the testing session, the subjects completed six weeks of physical therapy. The subjects returned for additional testing following the same protocol. For patients, the three testing periods were designated T1 (before injection), T2 (after injection), and T3 (after physical therapy). For healthy controls, only the original time point was analyzed.

**RESULTS**

Figure 1 shows the supraspinatus activity of seven patients during humeral elevation in the scapular plane. At baseline, it appears that muscle activation in the patients is lower than controls, but in most cases, increases over time. There also are potential differences in activity between patients and control subjects at the three time points, as well as changes associated with the subacromial injection or with physical therapy.

**CONCLUSIONS**

Immediately following the subacromial injection, activation levels appear to have remained relatively constant. However, after physical therapy, activation levels show a pattern of increase. Data collection and analysis are continuing.
Exercise adherence and physical activity can be difficult to measure. Current methods often rely upon self-report surveys which are susceptible to error. Machine learning methods can be applied to biomechanical data to classify and identify activity. Each exercise has a unique “fingerprint” of biomechanical data in that there is a unique combination of motion in each joint. Inertial measurement units (IMU) can move biomechanical analysis from the lab to real-world environments allowing for more ecologically valid measurements. **PURPOSE:** The purpose of this study is to develop a machine learning algorithm for classifying nine different upper extremity exercises, based upon biomechanics captured from an IMU-based device. **METHODS:** 50 participants (mean age = 21.9 years) were recruited. Participants performed one compound and eight isolation exercises with their right arm while wearing the device. Each exercise was performed ten times for a total of 4500 trials. The device consists of a small, self-contained computer and four 3-axis IMUs. IMUs were placed on the hand, forearm, upper arm, and torso. Joint angles were calculated using relative rotations between pairs of IMUs. A modified Hampel filter and Savitzky-Golay filter were applied to remove outliers and noise. Random Forests were trained on 50% of the data and tested on the remaining 50%. **RESULTS:** The model performed well with an overall classification accuracy of 92.4%. Figure 1 shows the class confusion matrix where the numbers represent the proportion of true cases that were predicted. **CONCLUSION:** The results suggest upper extremity exercises can be classified using biomechanics data captured with a novel IMU-based device. These findings set the basis for more objective activity logs which can be used for measuring exercise adherence, physical therapy, and physical activity levels. Ultimately, the device may be used to create activity profiles for health screening and health status.

**Board #68 May 30 2:00 PM - 3:30 PM**

**Effect of a Period of Cervical Flexion on Upper Extremity Muscle Strength**

David T. Uher1, Gregory Anoufriev2, Michael E. Toczko2. 1Columbia University, New York, NY. 2Appalachian State University, Boone, NC. (Sponsor: Scott Collier, FACSM)

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(No relevant relationships reported)

**Results:** Significant changes in muscle strength were evident in the left biceps brachii (254.12±101.5 vs 239.87±103 N, p<0.05), right biceps brachii (270.67±96.23 vs 254.53±102 N, p<0.05), left middle deltoid (140.82±54.27 vs 125.42±51.27 N, p<0.05), and right middle deltoid (129.2±46.1 vs 122.8±49.76 N, p<0.05). No significant strength changes were measured in either triceps muscle. Paired Samples T-test was used to determine overall strength changes and percent strength decreases.

**Purpose:** The purpose of this study is to develop a machine learning algorithm for classifying nine different upper extremity exercises, based upon biomechanics captured from an IMU-based device. According to a MicroFET2 Hand Held Digital Muscle Tester to isometrically test each muscle. For each exercise, a MicroFET2 Hand Held Digital Muscle Tester was used to determine overall strength changes and percent strength decreases.

**Methods:** Twenty-four participants (12 male, 12 female) (n=24; height=173.1±9.3 cm; weight=73.33±22.58 kg) were measured before and after 30 minutes of cervical flexion in a seated position using a MicroFET2 Hand Held Digital Muscle Tester to isometrically test each muscle. Each exercise was performed ten times for a total of 4500 trials. The device consists of a small, self-contained computer and four 3-axis IMUs. IMUs were placed on the hand, forearm, upper arm, and torso. Joint angles were calculated using relative rotations between pairs of IMUs. A modified Hampel filter and Savitzky-Golay filter were applied to remove outliers and noise. Random Forests were trained on 50% of the data and tested on the remaining 50%. **RESULTS:** The model performed well with an overall classification accuracy of 92.4%. Figure 1 shows the class confusion matrix where the numbers represent the proportion of true cases that were predicted. **CONCLUSION:** The results suggest upper extremity exercises can be classified using biomechanics data captured with a novel IMU-based device. These findings set the basis for more objective activity logs which can be used for measuring exercise adherence, physical therapy, and physical activity levels. Ultimately, the device may be used to create activity profiles for health screening and health status.

**Board #66 May 30 2:00 PM - 3:30 PM**

**Muscle Thickness And Strength Relationships In Patients With Patellofemoral Pain Before And After Rehabilitation**

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(No relevant relationships reported)

**The gluteus maximus (Gmax) and medius (Gmed) have shown altered strength and activation in patients with patellofemoral pain (PFP) and have been addressed commonly in rehabilitation programs. However, the relationship between strength and a visual method of quantifying muscle activation through ultrasound imaging has not been explored. **PURPOSE:** To determine relationships between muscle thickness (at rest and during contraction) and strength using hand-held dynamometry of the Gmax and Gmed in various positions (side-lying, bipedal stance, unipedal stance) before and after a 4-week impairment-based rehabilitation program.**METHODS:** 19 patients with PFP (23.7±4.8yrs, 168.7±6.8cm, 69.6±15.1kg, 14F) completed 12 sessions of supervised impairment-based rehabilitation focused on lower extremity range of motion, strength, functional movement, and core stability. Ultrasound imaging and strength of Gmax and Gmed was performed before and after rehabilitation. Ultrasound images were collected at rest while side-lying, during side-lying hip abduction, bipedal stance, and unipedal stance. Both strength and thickness measures were normalized to body mass (kg). **RESULTS:** There were no significant relationships found between strength and muscle thickness at the pre-rehabilitation session. Following rehabilitation, both Gmax and Gmed exhibited significant relationships between strength and muscle thickness during side-lying positions. For Gmax, side-lying at rest, there was a moderate relationship (r=0.50, p<0.03) and during side-lying hip abduction (r=0.46, p<0.05). Gmed revealed similar relationships following rehabilitation with side-lying at rest (r=0.65, p<0.003) and during hip abduction (r=0.46, p<0.046). **CONCLUSION:** Muscle thickness, as captured with ultrasound imaging, increases as strength increases for both the Gmax and Gmed in individuals with PFP, while side-lying, and only following rehabilitation. The strongest relationship was found in the Gmed, which is supported by the positioning being the same for both thickness and strength measures. The concentric nature of the Gmed contraction during side-lying hip abduction could also be a major contributor to this relationship.

**Board #67 May 30 2:00 PM - 3:30 PM**

**Classifying Upper Extremity Exercises Using Biomechanics Captured with an Inertial Measurement Unit-based Device**

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**Effect of a Period of Cervical Flexion on Upper Extremity Muscle Strength**

David T. Uher1, Gregory Anoufriev2, Michael E. Toczko2. 1Columbia University, New York, NY. 2Appalachian State University, Boone, NC. (Sponsor: Scott Collier, FACSM)

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(No relevant relationships reported)
Improper posture including forward head, rounded shoulder posture and scapular dyskinesis have been linked to neck and shoulder pain. Treatment for forward head posture (FHP), rounded shoulder posture (RSP), and scapular dyskinesis has consisted of an exercise protocol. Kinesiote (KT) has recently emerged as a treatment method but there is a lack of research on the effectiveness, or whether exercise or KT is better than the other.

**PURPOSE:** To compare a KT intervention to a strengthening and stretching program for correction of FHP, RSP, and scapular dyskinesis in a healthy, non-athletic, college age population.

**METHODS:** Twenty healthy college-aged subjects with forward head, rounded shoulder posture and scapular dyskinesis completed the study. There were 10 subjects (7 females, 3 males, 20.3±0.82 yr, ht=171.0±7.11 cm, w=79.4±13.79 kg) in the exercise group and 10 subjects (7 females, 3 males, 20.40±1.43 yr, ht=166.61±11.99 cm, w=69.40±11.48 kg) in the KT group. Subjects were randomized into two intervention groups undergoing a four-week program. One group participated in a strengthening and stretching exercise protocol (EG) based on the current literature, while the other group had KT applied to the upper back and shoulders for a duration of five days with two days of no tape in a seven-day period.

Pre-and post-test measurements included the craniovertebral angle (CVA) in degrees, forward shoulder angle (FSA) in degrees, and scapular dyskinesis as assessed using scapular dyskinesis scoring (0-3, maximum combined score = 6) for each scapula.

**RESULTS:** There was a significant time main effect for the scapular dyskinesis score (SDS) as both groups improved pre-to-post intervention (F=12.5, P<0.01; EG=4.81±1.14 vs 5.3±1.94, KT=4.10±1.59 vs 4.9±1.01). Time effect sizes were small for moderate for CVA (KT=-13 to EG=53), RSA (EG=15 to KT=46) and SDS (EG=44 to KT=50) in both groups. Group effect sizes were small for CVA (0.24), RSA (0.25) and SDS (0.36). Minimal-detectable-change-scores were achieved for the CVA (EG=3.90, KT=80) and SDS (EG=50, KT=80) for both groups, indicating clinical improvement.

No other results were significant. **CONCLUSIONS:** Both groups improved pre-to-post intervention for the three measurements, even though only SDS was significant. Thus, either treatment could be used.

**D-60**
**Free Communication/Poster - New Insights in Children and Youth**
**Board #71 May 30 3:30 PM - 5:00 PM**
**The Comparison of Children Active Travel Mode Time Under the Different Air Quality**
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(No relevant relationships reported)

There are sufficient evidence to confirm the adverse effects of air pollution and the positive effects of active travel mode on the health. However, few studies have research on the impact of different air quality on children active travel mode time, especially in Asia country like China. **PURPOSE:** By comparing the active travel mode time of children under the different air quality areas to show the impact on air quality of children active travel mode time. **METHODS:** Through Beijing Municipal Environmental Protection Bureau to record the past year daily AQI (air quality index) data of different areas in Beijing, and according to the data to select two schools in good air quality (the AQI is 91 and 96) and two schools in poor air quality (the AQI is 102 and 120), all totals of 407 students (boys = 217, age = 10 78 ± 0.93 y). Using the questionnaire to record the children active travel mode time, including the time of children go to school or other places on foot during the weekdays and weekend, and the time of children go to school or other places by bike during the weekdays and weekend. The data were analyzed by using one-way ANOVA. **RESULT:** By comparing the active travel mode time of children in two schools with AQI of 91 and 96 (68.67±11.18 vs. 117.30±11.67mins, P<0.05). By comparing the active travel mode time of children in two schools with AQI of 91 and 102 (68.67±11.38 vs. 124.90±12.93 mins, P<0.05). **CONCLUSION:** Air quality may have an impact on children active travel mode time, the children in the best air quality areas have relatively less active travel mode time. Future studies should consider the more factors that may impact the children active travel mode time.

**1914**
**Board #70 May 30 2:00 PM - 3:30 PM**
**Stimulation Techniques used to Assess Corticospinal Excitability Alters an Attentional Focus Maximal Voluntary Contraction of the Elbow Flexors.**
Shawn A. Wiseman, Behzad Lahouti, Israel Halperin, Duane Button. Memorial University of Newfoundland, St. John’s, NL, Canada.

(No relevant relationships reported)

**PURPOSE:** To investigate the role of attentional focus on force output by assessing 1) force output during maximal voluntary elbow flexions contractions, 2) corticospinal excitability and 3) motor unit activation patterns.

**METHODS:** Seven healthy males completed two experimental sessions. Each session consisted of 12 maximum voluntary contractions (MVC) with 180s rest of recovery between MVC. Participants were given counter-balanced external and internal attentional focus conditions prior to each MVC to direct attention. Force output and electromyography (EMG) of the biceps brachii, triceps brachii, and brachioradialis were recorded for both sessions. Transcranial magnetic stimulation, transmastoid electrical stimulation, and brachial plexus electrical stimulation were used to produce motor evoked potentials (MEPs), cervicomedullary motor evoked potentials (CMEPs) and maximal M-waves (Mmax) in the biceps brachii during each MVC in one of the two sessions. All MEPS and CMEPs were normalized to Mmax.

**RESULTS:** Forces produced during the stimulation sessions were not significantly different between external and internal focus conditions (p=0.20). However, forces produced during the non-stimulation session were 19.9% higher with an external cue compared to internal cues (p<0.05). As well, forces produced with external cues were 13.2% greater during the non-stimulation session compared to the stimulation session. (p<0.05). EMG activity was not found to be significantly different between attention focus cues (p>0.1).

**CONCLUSIONS:** The usage of stimulation techniques likely distracted participants from the attentional focus cues provided during the stimulation session. Therefore, we were unable to successfully assess changes in corticospinal excitability between focus cues. However, we were still able to show that external cues directly greater production of the elbow flexors compared to internal cues.

**1915**
**Board #69 May 30 2:00 PM - 3:30 PM**
**Effects Of An Exercise And Kinesiote Intervention On Forward Head/Rounded Shoulder And Scapular Dyskinesis**
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(No relevant relationships reported)
influence of PA intensity and body composition on CRF appear to differ by sex, a
consideration for future PA interventions in this population. Supported in part by FIPPI-
DEU/UPRRP.

1917 Board #73 May 30 3:30 PM - 5:00 PM
Effects of Exergaming on Motor Skill Competence, Perceived Competence, and Physical Activity in Preschool Children
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(No relevant relationships reported)

PURPOSE: Few school settings offer structured physical activity (PA) opportunities for preschool children, with little study conducted examining exergaming’s effectiveness on health outcomes in this age group. This study’s purpose, therefore, was to examine a school-based exergaming intervention’s effect on preschool children’s perceived competence, motor skill competence and PA versus usual care (recess), as well as examine gender differences for these outcomes.

METHODS: Sixty-five preschoolers (33 girls; Mage = 4.45 ± 0.46; Mfitness = 59.05 ± 32.04) from 2 underserved urban elementary schools in a Midwestern U.S. state were enrolled and then assigned to 1 of 2 conditions, with school as experimental unit: (1) usual care recess group (8 weeks of 100 minutes [5 days x 20 minutes] recess/week); and (2) exergaming intervention group (8 weeks of 100 minutes [5 days x 20 minutes] school-based exergaming/week). All children underwent identical perceived competence, motor skill competence and moderate-to-vigorous PA (MVPA) assessments at baseline and at the end of the 8th week. A multivariate analysis of variance with repeated measures was employed to examine preschool children’s changes in perceived competence, motor skill competence and MVPA over time.

RESULTS: A significant Group by Time effect was observed for MVPA (F(1, 52) = 4.37, p = 0.04, ηp² = 0.04), but not perceived competence (F(1, 52) = 0.83, p = 0.37, ηp² = 0.02) or motor skill competence (F(1, 52) = 0.02, p = 0.88, ηp² = 0.00). Specifically, intervention children displayed significantly greater increased MVPA at 8 weeks than the comparison children (4.05 vs. -1.99 minute). Additionally, there was a significant Time effect for motor skill competence (F(1, 52) = 15.61, p < 0.01, ηp² = 0.23) and Gender effect for MVPA (F(1, 52) = 5.06, p = 0.02, ηp² = 0.09). In detail, while all preschoolers’ motor skill competence improved over time, boys demonstrated higher MVPA than girls at both time points.

DISCUSSION: Exergaming showed a positive effect in promoting preschool children’s MVPA at school and has the potential to enhance perceived competence and motor skill competence. More research with larger sample sizes and longer study durations is warranted.

1918 Board #74 May 30 3:30 PM - 5:00 PM
The Effect of Extracurricular Coordinated Physical Education on the Development of Basic Motor Skills of Children aged 7-9 Years Old
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(No relevant relationships reported)

PURPOSE: The purpose of this study was to analyze the effect of the extracurricular physical education program through a 12-week-coordination on the development of basic motor movements for children of 7-9 years.

METHODS: A sample of 120 children of the elementary school period, 58 of whom were in the experimental group and 62 of whom were in the control group, were enrolled and then assigned to 1 of 2 conditions, with school as experimental unit: (1) usual care recess group (8 weeks of 100 minutes [5 days x 20 minutes] recess/week); and (2) exergaming intervention group (8 weeks of 100 minutes [5 days x 20 minutes] school-based exergaming/week). All children underwent identical perceived competence, motor skill competence and moderate-to-vigorous PA (MVPA) assessments at baseline and at the end of the 8th week. A multivariate analysis of variance with repeated measures was employed to examine preschool children’s changes in perceived competence, motor skill competence and MVPA over time.

RESULTS: A significant Group by Time effect was observed for MVPA (F(1, 52) = 4.37, p = 0.04, ηp² = 0.04), but not perceived competence (F(1, 52) = 0.83, p = 0.37, ηp² = 0.02) or motor skill competence (F(1, 52) = 0.02, p = 0.88, ηp² = 0.00). Specifically, intervention children displayed significantly greater increased MVPA at 8 weeks than the comparison children (4.05 vs. -1.99 minute). Additionally, there was a significant Time effect for motor skill competence (F(1, 52) = 15.61, p < 0.01, ηp² = 0.23) and Gender effect for MVPA (F(1, 52) = 5.06, p = 0.02, ηp² = 0.09). In detail, while all preschoolers’ motor skill competence improved over time, boys demonstrated higher MVPA than girls at both time points.

DISCUSSION: Exergaming showed a positive effect in promoting preschool children’s MVPA at school and has the potential to enhance perceived competence and motor skill competence. More research with larger sample sizes and longer study durations is warranted.

1919 Board #75 May 30 3:30 PM - 5:00 PM
Comparisons Of In-school And Out-of-school Physical Activity Among Chinese Elementary School Children
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(No relevant relationships reported)

PURPOSE: Relatively little is known regarding children’s physical activity (PA) during school and outside of school. Therefore, the objective of this study was to compare in-school and out-of-school PA among Chinese elementary school children.

METHODS: A cross-sectional study was conducted among 360 (4th grade) children recruited from 3 elementary schools in Shanghai, China. PA was measured in 5 consecutive school days by accelerometers. Minutes per hour (min/h) of moderate-to-vigorous PA (MVPA) and total PA (TPA) were calculated using established cut points. Children’s in-school and out-of-school MVPA and TPA were compared using paired t test. Gender differences in MVPA and TPA across the two study settings were also examined using independent t test.

RESULTS: 242 participants (boys: 45.5%, mean age: 9.6±0.3 years, weight:35.0±7.6 kg, height:139.8±6.1 cm, body mass index: 17.8±2.9 kg/m²) provided valid accelerometer data (defined as ≥ 2 days, ≥10 h/day) and were included in the study. Results showed a higher level of in-school MVPA compared to out-of-school MVPA (3.1 min/h vs 2.3 min/h, P<0.001) and of in-school TPA compared to out-of-school TPA (17.3 min/h vs 15.1 min/h, P<0.001). There were no difference in out-of-school MVPA and TPA across gender but boys showed a higher level of in-school MVPA (3.1 min/h vs 2.3 min/h, P<0.001) and TPA (18.3 min/h vs 16.6 min/h, P<0.001) compared to girls.

CONCLUSION: Chinese elementary school children spent more time engaging in in-school PA compared to out-of-school PA with boys showing a higher level of in-school PA compared to their counterpart girls. Findings suggest that PA promotion strategies should focus on developing out of school, community-based programs and that maximizing in-school PA among young children is important.

1920 Board #76 May 30 3:30 PM - 5:00 PM
Predictors of Return to a Childhood Healthy Eating and Active Living Obesity Clinic
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(No relevant relationships reported)

PURPOSE: To identify predictors of program retention among children enrolled in a multifactorial obesity treatment clinic designed to support behavior change in physical activity and healthy eating to combat unhealthy weight levels.

METHODS: Children age 2-18 years old (n = 285) attended a baseline visit at a childhood healthy eating and active living (CHEAL) clinic. Parents completed a behavioral survey and height, weight, blood cholesterol and blood glucose were objectively measured. Weight status was reflected as the Percent Over the 50th Percentile for age and sex based on CDC reference values (BMI50). Survey items included questions about prenatal and infancy history, family medical history, and eating and activity behaviors as well as desire to make changes and discuss nutrition behaviors with a dietician. All survey and objective measures were first evaluated with univariate analysis (Chi-Square and t-test) to identify differences between Returners and Non-Returners. Variables identified as having a significant relationship with returning for a second clinic visit were then entered into logistic regression models using forward selection. Four different models were constructed, with Model 4 containing all variables that were significant in univariate analyses.

RESULTS: Significant variables in univariate analyses included BMI50, sex, age, baseline cholesterol, sugar sweetened beverage (SSB) consumption, willingness to meet with a dietician, and the mother gaining more than 35 pounds during pregnancy. In logistic regression, children who consumed SSB once per week were more likely to return for a second clinic visit than those consuming SSB every day (OR 4.5 [95% CI: 1.9 - 10.5]) and older children were less likely to return than younger children (OR 0.9 [95% CI: 0.8 - 0.99]).

CONCLUSIONS: The predictors identified supported theories associated with the importance of readiness for change (SSB consumption, willingness to meet with a dietician) and suggest that engaging families when children are young may improve retention rates for clinic-based interventions targeting healthy weight or energy-balance behaviors.
INTRODUCTION: Evidence for physical activity (PA) compensation (e.g., high PA leads to low PA in another part of the day) and synergy (e.g., building on times of high PA with additional high PA) in school-aged youth has been reported, but has not been studied in preschoolers. PURPOSE: To determine if preschoolers exhibit evidence of compensation or synergy in indoor and outdoor PA during child care.

METHODS: Children (N=44; 3-4 y) in three preschools wore an accelerometer on their right hip for two school days. PA intensity was determined using Pate cut-points (counts/15sec). A proximity tagging beacon was placed in each classroom, and children’s accelerometers acted as receivers. Lack of communication between beacons and receivers indicated that children were outdoors. Outdoor and indoor time (min/hr) in light, moderate, vigorous, or total PA was determined. Paired *t*-tests were used to identify if time in each intensity (for indoor/outdoor time) significantly differed between days (p=0.05). Difference in time in each intensity between days was calculated and Pearson correlations were performed to compare between-day changes in outdoor and indoor light, moderate, vigorous, and total PA (e.g., correlation between change in outdoor total PA vs. change in total indoor PA). Positive associations support synergy, while inverse associations support compensation. RESULTS: No differences in time in each intensity between days were found. Change in outdoor light (r=0.02, p=0.883), moderate (r=0.17, p=0.279), and total (r=-0.14, p=0.369) PA were not significantly related to change in indoor light, moderate, and total PA, respectively. Change in outdoor vigorous PA was positively related to change in indoor vigorous PA (r=0.40, p=0.007). For total PA, 59% of children exhibited evidence of compensation and 41% exhibited evidence of synergy. For vigorous PA, 45% of children exhibited evidence of compensation, and 55% exhibited evidence of synergy. CONCLUSION: Results suggest that vigorous intensity exercise may be more synergistic in nature. The weak-to-moderate, negative correlations among light, moderate and total PA warrant further investigation. Exercise intensity for preschoolers is not significant. HIIT showed a small but significant effect on BW (mean difference = 0.82 kg, 95%CI -1.902 to 4.826, p=0.0001). HIIT with greater improvement in cardiovascular risk factors in obese children, while HIIT with greater improvement observed in cardiorespiratory fitness.

Exercise training is mainly prescribed for obese children to decreased cardiometabolic risks, however, studies examining the difference between high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) are limited. PURPOSE: The purpose of this study was to determine if HIIT differentially impacted on cardiovascular risk factors compared with MICT in obese children. METHODS: The relevant literature was searched from the databases of PubMed, Web of Science, Embase, the Cochrane library, and CNKI, which was completed in September 2018. Only randomized controlled trials involving both HIIT and MICT on obese children were included, and studies involving only one intervention would be excluded. Two researchers independently performed literature screening, literature quality evaluation, and data extraction according to inclusion and exclusion criteria. RESULTS: A total of 9 study with 309 obese children were included. Compared with baseline, both HIIT and MICT can significantly reduce body weight (BW), body mass index, systolic blood pressure, diastolic blood pressure, and increase VO2peak. Similar results were also found with respect to fasting glucose (FG) and fasting insulin in HIIT, while MICT is not significant. HIIT showed a small but significant effect on BW (mean difference (MD): -0.79 kg, 95%CI -1.018 to 0.575, p = 0.0001), total cholesterol (standardized mean difference (SMD): -0.877, 95%CI -1.733 to -0.022, 0.044), HOMA-IR (MD = -0.620 mmol/L, 95%CI -1.234 to -0.006, 0.048), FG (MD = -0.391 mmol/L, 95%CI -0.608 to -0.173, 0.001) compared than MICT did. The main difference between HIIT and MICT is that HIIT is more effective for VO2peak (MD: 3.364 ml/kg/min, 95% CI 1.902 to 4.826, p = 0.0001). CONCLUSIONS: Our meta-analysis of randomized controlled trials indicates that both HIIT and MICT can significantly reduce cardiometabolic risk factors in obese children, while HIIT with greater improvement observed in cardiorespiratory fitness.
**1925**

**Board #81**

**May 30 3:30 PM - 5:00 PM**

**The Effects of Playground Zoning on Physical Activity During Recess in Elementary-Aged Children.**

Jillian Barnas, MS, Stephen Ball, PhD. University of Missouri, Columbia, MO. (Sponsor: Jill Kanaley, PhD, FACSM) (No relevant relationships reported)

While many factors contribute to the development of obesity, a sedentary lifestyle plays a significant role in this epidemic. Epidemiological data indicates that 50% of children aged 6-11 years old and approximately 92% of adolescents aged 12-18 years old are not meeting the recommended health guideline of 60 minutes of moderate-to-vigorous physical activity (MVPA) per day. Therefore, the most effective interventions for combating inactivity and childhood obesity should target children before inactivity develops in their adolescent years. Due to the increasing youth obesity rates, schools have been identified as ideal environments to promote physical activity (PA). PURPOSE: The purpose of this study was to compare changes in physical activity in youth, measured by accelerometry, during recess with a playground zoning intervention. METHODS: The sample included 453 third-, fourth-, and fifth-grade boys and girls from two elementary institutions. PA was observed during recess using systematic observation of play and leisure activity in youth (SOPLAY) and measured using Actigraph-GT3X accelerometers on a subset of students (n = 78). Baseline data were collected for one week prior to playground zoning. Afterwards, the playgrounds were zoned into six various activities for two weeks and PA data was observed and measured. RESULTS: A repeated measures ANOVA detected a significant main effect with the zoning and decreased time spent in sedentary activity (p = .013) and moderate activity (p = .027). A significant cross-over interaction was detected with zoning and an increase in time spent in vigorous activity (p = .017) and MVPA (p = .006) for third graders, whereas fifth graders significantly decreased the time spent in MVPA (p < .001). Furthermore, third grade boys accumulated 204 more steps on the zoned playground compared to baseline measurements (p = .001). A McNemar test revealed a 5% increase in observational PA on zoned playgrounds (p < .001). CONCLUSION: Zoned playgrounds are an applicable, manageable, and effective program that can help improve PA during recess for young children. However, a different intervention may be needed to improve PA in older children.

**1926**

**Board #82**

**May 30 3:30 PM - 5:00 PM**

**Influence of Parents’ Physical Activity on Children’s Physical Activity And Cardiopulmonary Endurance**

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It is reported that parents have important influences on the children’s physical activity (PA) and health fitness, but such research has hardly been found in China nowadays. PURPOSE: To investigate PA level, health fitness and economic status among the children of 7-9 yrs and their parents; to assess the influence of parents’ PA level, economic, educational condition and so on. METHODS: The subjects were selected from HuiLongguan Centre Primary School in Beijing. The children are 7-9 yrs and their parent who brought up them with age of 30-50 yrs. All children and parents were completed questionnaire for economics and educational status on the subject families, and the other main contents including medical history, family history, PA and sports. It was obtained the PA data of the children by the revised PAQ-A, and the parents’ PA level were measured by accelerometer (ActiGraph GT3X+). Health fitness examination adopted the national standard for pupil’s fitness measurements. RESULTS: 36 families completed the examination totally. According to daily average time of MVPA, whether one person or two of the couple, less than 20 mins was regarded as PA insufficient family (iPAf), and more than 30 mins was PA sufficient family (sPAf). (1)The data proved 20 sPAf and 16 iPAf in the study. (2) There were different in the children’s scores between sPAf(32.02±0.53)and insufficient family(26.1±0.58)(P<0.05) and the BMI of the two groups (15.63±1.95 vs17.77±3.67) showed greater difference( P<0.01). (3)The time of 50m*4 shuttle-run between the two children groups were different (119.35±29.42 vs 127.56±21.14, P<0.05). (4) The sedentary time everyday of the husband and wife in a family were moderately correlated(r=0.56,P<0.023) and the light PA time displayed low positive correlation(r=0.56,P=0.040), while the correlation was not found between the time of their moderate and more intensity PA(r=0.145, P=0.093). CONCLUSIONS: (1) The findings indicated that the higher PA level the parent had, the higher PA level their children did; and the children’s cardiopulmonary endurance are higher similarly, whereas with the lower obesity extent. (2) The PA level of the husband and wife were interdependent and interactive. Supported by Central Universities and Colleges Basic Scientific Research Funds Special Funding (2016ZD016).

**1927**

**Board #83**

**May 30 3:30 PM - 5:00 PM**

**Preschool Children’s Cognition is Associated With Motor Skill Competence and Cardiovascular Fitness**

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**PURPOSE:** While the early years are a critical window for the development of a healthy lifestyle, it is the period for which we know the least about evidence linking physical activity with health outcomes in this population. This cross-sectional study examined the associations among physical activity (PA), motor skill competence (MSC), perceived physical competence (PPC), cardiovascular fitness (CF), and cognition in preschool children.

**METHODS:** Sixty-five preschool children (33 girls; 27 White, 21 Hispanic, 7 other; Xage = 4.45 ± 0.46; XBMI = 59.05 ± 32.04) were recruited from two local elementary schools in Minneapolis, Minnesota. Children’s 3 days PA during school time included moderate-to-vigorous PA (MVPA) and steps were assessed via Actigraph Link; MSC was measured via the Test of Gross Motor Development-Second Edition; PPC was assessed via the Pictorial Scale of Perceived Competence and Social Acceptance; CF was assessed via a modified YMCA 3-Minute Step Test; and cognition was assessed via the computer-administered NIH Toolbox. Multiple linear regression was performed to determine the associations among outcome measures.

**RESULTS:** Preschool children’s MVPA was not significantly related to MSC (r = 0.182, p = 0.05), PPC (r = 0.121, p = 0.05), CF (r = 0.141, p < 0.05), cognition (r = 0.095, p = 0.05), but step counts were significantly positively related to MSC (r = 0.282, p < 0.05), and preschool children’s MSC was a significant predictor of step counts [F(4, 63) = 4.65, b = 0.19, p = 0.01]. PPC also emerged as a significant predictor of CF [F(4, 63) = 4.65, b = 0.19, p = 0.01]. CONCLUSIONS: Our results suggests that PA and motor skill competence may be differentially related to different components of cardio-metabolic fitness and cognitive function.
tasks involving object control. Similarly, over 20% of children in middle school lack competency in object control tasks. These areas need to be addressed in order to optimize long-term physical activity.

1929

Board #85

May 30 3:30 PM - 5:00 PM

Classroom-based Strategies to Reduce Disparities in Physical Activity Among Children with Asthma

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(Sponsor: Rebecca Hasson, FACSM)

(No relevant relationships reported)

PURPOSE: Children with asthma often experience physical activity (PA) induced symptoms 5-10 minutes following the start of exercise, with symptoms peaking 5-10 minutes post-activity. Classroom PA breaks provide shorter bouts of PA (4 minutes), and may represent a novel strategy to promote PA participation in this clinical population. Using a classroom-based PA intervention, we tested the feasibility of 5, 4-minute PA breaks to promote PA participation in children with asthma.

METHODS: Nine, 3rd-6th grade classrooms at an elementary school in Detroit, MI (79% Hispanic; 80% on free/reduced lunch; 31% prevalence of asthma and asthma-like symptoms) participated in the 20-week intervention. Asthma status was self-reported via the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire in conjunction with nurse documentation. PA participation, exercise intensity [sedentary (SED), low-intensity physical activity (LPA), moderate-to-vigorous intensity physical activity (MVPA)], and asthmatic symptom occurrence were assessed via direct observation.

RESULTS: All students accumulated approximately 19 total minutes (4.5±0.8 PA breaks x 246±8.0 seconds) of activity per day during PA breaks. Throughout the intervention, a greater percentage of children with asthma participated in MVPA during the PA breaks compared to children without asthma (asthma: 52.9±1.5% vs. non-asthma: 46.1±1.3%; p<0.001). In contrast, a greater percentage of students without asthma participated in LPA during PA breaks (non-asthma: 30.2±1.1% vs. asthma: 25.8±1.2%; p=0.006). There were no differences in the percentage of students who were SED during PA breaks (asthma: 21.3±1.7% vs. non-asthma: 23.7±1.9%; p=0.155). Out of 294 observations, six instances of asthmatic symptoms (coughing) were observed post PA break.

CONCLUSIONS: Classroom-based interventions that incorporate short bouts of PA represent safe exercises for children with asthma. Given the higher participation in MVPA among children with asthma, classroom interventions may be effective in reducing PA disparities in school settings.

1930

Board #86

May 30 3:30 PM - 5:00 PM

Wearable Activity Monitors as Part of a Childhood Obesity Treatment Program

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(No relevant relationships reported)

PURPOSE: It is well known that childhood obesity has become a common issue in the United States (1), and that obesity contributes to a multitude of chronic diseases and negative health conditions (2). One of the biggest challenges in the treatment and prevention of childhood obesity is that the goal of these programs is primarily to modify behaviors that occur outside of the program space. The purpose of this study was to summarize the findings from a 6-month program that used wearable activity monitors (WAM) as part of a clinical obesity treatment program for fifteen children in Arizona (USA) between December 2015 to November 2017.

METHODS: Obese children were referred to participate in this program by their pediatrician. Participants were provided a WAM that was used to monitor their physical activity (PA) levels, heart rate, and sleep habits. For the first week, participants were instructed not to change their behaviors so that baseline PA data could be collected. Subsequently, appropriate step and heart rate zone goals were set and progressively increased each week that a participant met their previous goal.

RESULTS: Adherence to wearing the WAM was high, with only about 1.3% of activity data and 3% of sleep data missing throughout the entire program. Three children dropped out of the study before the program was completed. For the children who completed the program, most improvements were noted for step count, and healthy sleep habits were found to be positively correlated with PA. In baseline data collection, the children walked on average 8,900 steps per day, representing approximately a 10% increase in the average number of steps taken.

CONCLUSIONS: Overall, childhood obesity treatment programs focus heavily on modifying behaviors that occur outside of the clinic setting. A WAM appears to be a feasible approach to continuously monitor and increase the PA of obese children. Including WAM and progressive goal setting in a clinical obesity treatment program for children may be an effective method to increase PA levels outside of the clinical setting. Further exploration of the link between healthy sleep habits and PA could yield additional findings useful to childhood obesity treatment and prevention.

1931

Board #87

May 30 3:30 PM - 5:00 PM

Association of Sports Participation with Intake of Fast Food for Family Meals Among Rural Children


(No relevant relationships reported)

After-school sports participation is common among children, and the busy lives of families could lead to challenges in preparing healthful family meals. This often results in families seeking the convenience of fast food for their evening meal. However, there is a scarcity of research, particularly among families in rural areas, examining whether children’s sports participation is associated with families’ intake of fast food as their evening family meal. PURPOSE: To examine associations between sports participation and fast food intake of rural children.

METHODS: Baseline data from the childhood obesity prevention, randomized controlled trial, NU-HOME, were analyzed. Children (n=60; age: 8.95±0.89 years; 62% female; 60% normal weight) and their parents reported on sociodemographics, child’s sports participation (activities in the last year and frequency after school and in evenings) and family’s intake of fast food as the evening meal. Logistic regression analyses were performed. RESULTS: Mean sports participation in the past year was 2.36±1.27 activities, with children reporting engaging in after-school and evening activities on 2.19±1.66 and 2.61±2.21 days, respectively, over the past week. Of their evening family meals in the past week, parents reported that 1.2±1.01 meals were considered fast food. Although sports participation in the past year was correlated with socioeconomic status, there was no statistically significant association between sport participation and fast food as evening family meal (p=0.05). CONCLUSION: Although sports participation was not associated with fast food intake as evening family meal in this study, future research should explore this relationship in other populations, particularly in larger studies. Furthermore, the possibility of lower availability of fast food options in rural areas compared to more urban settings could be an important caveat.

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Board #88

May 30 3:30 PM - 5:00 PM

The Association Between Sex and Directly Observed Physical Activity in Preschool-Age Children

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(No relevant relationships reported)

Sex disparities in physical activity (PA) are evident in preschool-age children (2.9 – 5 years old). Preschool-age boys have been reported to participate in more PA during free play. However, it is unknown if this disparity is evident when participating in a structured PA intervention. PURPOSE: To examine the association between sex and directly observed PA levels in preschool-age children while participating in a PA intervention.

METHODS: This study utilized data from the Short bouts of Exercise for Preschoolers (STEP) study. STEP was a 6-month cluster randomized controlled study that examined the effects of one 20-minute bout of structured PA implemented within the classroom setting as part of designated gross motor playtime in ten preschool centers. STEP consisted of structured PA during the first 10 minutes of gross motor playtime followed by 20 minutes of free playtime. PA levels during the 10-minute intervention session were measured using a modified Observational System for Recording Physical Activity in Children-Preschool Version. PA intensity was classified as sedentary, light, or moderate-to-vigorous (MVPA). This secondary analysis focused on the baseline and 3-month data of participants randomized to the intervention group (preschool centers, n = 5; participants, n = 75; age = 3.9 ± 0.67 years). Spearman correlations were used to examine the association between sex and PA intensity during the intervention. Repeated measures ANOVAs were used to examine the effect of sex on PA intensity.

RESULTS: Participants spent similar percent of intervals in MVPA at baseline (boys, 41.77±6.59; girls, 38.27±5.16) and 3-months (boys, 46.67±7.59; girls, 43.89±7.55). There were no significant associations between sex and directly observed MVPA at baseline (r=-0.035, P=0.37) or 3-months (r=-0.039, P=0.81). Similarly, there were no significant effects of sex on any PA intensity (all P > 0.80) during the intervention.

CONCLUSION: In this sample, sex was not associated with or impacted the number of intervals that preschool-age children spent in MVPA during the structured PA intervention. Future studies are needed to determine if these trends remain the same in a larger sample size.

Funded by: Robert Wood Johnson Foundation, Active Living Research Grant 68509
CONCLUSIONS: Boys' MET level was consistent across time in both locations. Girls' MET level declined in the playground but increased in the garden. For girls, semi-structured activity in a garden may result in sustained higher MET activity during play.

There is limited evidence examining reported weekly volume of recess and odds of overweight and obesity using large nationally representative samples of U.S. children. PURPOSE: Examine the associations between reported weekly volume of recess, and overweight and obesity in a nationally representative sample of U.S. children. METHODS: The study sample included male (n=1,434) and female (n=1,409) children ages 5 to 11 (n=2,843). Daily measures of training load, measured by self-reported (0-10 scale), were collected from pre-season (August 2017) until the end of the season (May 2018). Data was collected from 33 BYL players in Virginia (n=15) and Maryland (n=18) teams. All games were filmed using a digital camera affixed to a camera link system. Game-play characteristics were measured by reviewing the game video and coding for characteristics of unsuccessful passes, successful passes, shots on goal, saves, changes of possession, loose balls, and intercepted passes. Descriptive statistics were reported (Frequency, Mean) for all observed game-play characteristics. RESULTS: The study sample included 12 games total with 159 total athlete-exposures. Total gameplay characteristics were: unsuccessful passes (SG=587, FG=399), successful passes (SG=165, FG=547), shots on goal (SG=81, FG=143), goals saved (SG=28, FG=79), changes of possession (SG=419, FG=335), loose balls (SG=799, FG=670), and intercepted passes (SG=31, FG=24). The average characteristic per game were: unsuccessful passes (SG=97.8, FG=66.5), successful passes (SG=27.5, FG=57.8), shots on goal (SG=13.5, FG=23.8), goals saved (SG=4.7, FG=13.2), changes of possession (SG=69.8, FG=55.8), loose balls (SG=133.2, FG=111.7), and intercepted passes (SG=5.2, FG=4.0). Further characteristics included: percent successful passes (SG=22%, FG=47%) and a requirement of successful shots on goal (SG=60%, FG=41%). CONCLUSION: Generally, SG had a greater percentage of successful passes than SG with comparable attempts per game between the two groups. In addition, SG had a greater successful shot percentage on less shots but had fewer goalie saves per game. Lastly, the SG team had more unsuccessful passes, loose balls, and turnovers. Further research is required to understand the effects of all aspects of the LADM on player development in BYL.

Prior research demonstrates that elevated acute (1-week) relative to chronic (3-4 weeks) training load (TL) ratios are associated with increased injury risk. However, there is no existing research examining this relationship in youth female soccer athletes, who are at high risk for certain injuries during sport, such as anterior cruciate ligament injury. PURPOSE: To investigate the association between acute-to-chronic TL (A:C) ratio measures with time-loss injury in elite-youth female soccer athletes. METHODS: Forty-three elite-youth female soccer athletes participated in the study. Daily measures of training load, measured by self-reported (0-10 scale) rating of perceived exertion (RPE) multiplied by training duration (minutes), were recorded within 30-minutes of practices and games from the pre-season (August 2017) until the end of the fall competitive season (December 2017) using a customized mobile app. Following completion of the competitive season, the athletes completed a survey to determine their history of experiencing a time-loss injury during the season. A:C ratios were calculated at week-9 relative to weeks 5 through 8, as this was the most intensive TL period of the season. Binary logistic regression examined the association between A:C ratio and time-loss injury status. Receiver operator curve (ROC) analyses were performed to select a A:C TL cutpoint, followed by computation of sensitivity, specificity and area under the curve (AUC). Odds ratios (OR) were calculated and compared between those with and without time-loss injury. RESULTS: Nineteen athletes reported to miss ≥1 day of practice or game due to injury. Logistic regression demonstrated greater A:C ratio was associated with increased risk of time-loss injury (OR = 12.65 [95% CI=1.51, 105.27], Wald=5.49, P=0.019). ROC curve analysis identified an A:C ratio cutpoint of 1.62 to have optimal screening properties: sensitivity=73.3%, specificity=87.5%, AUC=0.76. The OR for an A:C ratio of 1.62 or higher compared to less than 1.62 was 19.25 (95% CI=3.64, 101.77). CONCLUSIONS: Elevated A:C ratios (>1.62) are associated with increased risk of suffering time-loss injury in elite-adolescent female soccer athletes. Monitoring and managing A:C TL may be an important injury prevention strategy in this population.
PURPOSE: To determine physical education (PE) enrollment trends of youth with obesity in primary and secondary schools in a large Midwestern metropolitan area.

METHODS: Data from 71 months of clinical visits to a pediatric weight management program were extracted from electronic medical records. Entries were refined to include only school-aged children, ages 6-18 years old. Multiple encounters per subject were included if the encounters occurred during separate school years. Information regarding frequency (days per week) and duration (length of school year) of PE class was used to determine what percent of total school days a subject was enrolled in PE. Data were analyzed to determine trends in PE enrollment by age, gender, race, ethnicity and socioeconomic status.

RESULTS: Data were obtained for 6221 patient encounters (3514 females, 2706 males). Of these, 31.4% of patients were not enrolled in PE during the school year of the encounter. The most common frequencies of PE enrollment overall were 20% (29.4%) and 40% (16.3%) of total school days. There was no significant difference in PE enrollment between the age groups of 6-11 years and 12-13 years (26.6% vs. 26.5%). Students ages 14-18 years old were enrolled in PE a lower percentage of school days (18.5%, p<0.0001). Of students ages 14-18 years, males were enrolled in PE significantly more than females (21.2% vs. 16.7%, p<0.002). Subjects with government-funded health insurance were enrolled in PE more than students with private health insurance (25.2% vs. 22.0%, p<0.0001). Differences between race and ethnicity were not significant. CONCLUSION: PE enrollment in this population falls below previously reported national averages for elementary and middle school students and slightly above average for high school students. The majority of school-aged youth with obesity in this metropolitan area do not acquire enough physical activity through PE to meet recommended daily physical activity guidelines.

PURPOSE: To evaluate which factors may decrease the ability to ride a bike in youth with obesity. Physical activity among youth lacrosse players: full vs. modified field play

METHODS: Data from 71 months of clinical visits to a pediatric weight management program were extracted from electronic medical records. Demographics and anthropometric measures, along with patient response to the question, “Are you able to ride a bike?” were analyzed to determine which factors limit a patient’s ability to ride a bike. Levels of continuous variables for riders vs. non-riders were compared using Wilcoxon rank sums tests. Fisher’s Exact tests were used to compare proportions.

RESULTS: Data were obtained from 4276 patients (2409 females, 1867 males). Mean age was 12.2 ± 3.2 years. Mean BMI was 33.5 ± 9.8 kg/m². Overall, 78.9% of the subjects were able to ride a bike. Males were able more than females (79.4% vs. 78.6%, p=0.54). Caucasians were more able to ride than African Americans (80.0% vs. 76.9%, p=0.0091). Older aged subjects were more able to ride than younger aged subjects (12.6 ± 3 vs. 11.9 ± 3.8 years, p<0.0001). Subjects with a higher BMI were less able to ride (34.8 ± 9.3 vs. 33 ± 8.8 kg/m², p=0.0001). Subjects with a higher percent body fat (PBF) were less able to ride (46.4 ± 6.1% vs. 43.4 ± 6.7%, p<0.0001). Body fat mass was also significantly higher in the group that was unable to ride (41.1 ± 25.5 kg vs. 37.3 ± 15.1 kg, p=0.0001).

CONCLUSIONS: Many different factors contribute to the ability to ride a bike in youth with obesity. Gender, race, age, BMI and body composition were all associated with the ability to ride a bike. Youth with greater amounts of obesity and body fat may struggle more to ride a bike. Being unable to ride a bike limits options for active transportation and moderate-to-vigorous play in youth with obesity.
Purpose: to investigate whether a physical activity (PA) promotion program in overweight/obese (OW/OB) youngsters is favorable to changes in PA levels, vitamin-D (VIT-D) and metabolic profile and the correlations between those changes. Methods: This was an intervention study performed twice a week, over a period of six months with 57 OW/OB youngsters (31 girls). PA promotion program aimed to increase children and adolescent’s moderate-vigorous PA levels. It was performed evaluating body composition, physical activity, maturational stage and biochemical variables (HDL, LDL and VLDL cholesterol, glucose, insulin and VIT-D). For statistical analysis, Paired sample t-tests and partial correlations were used. Results: Significant differences between baseline and post intervention were observed for body composition, lipid profile and PA levels. Furthermore, ΔVIT-D was positively correlated with the AHR (r=0.30), while negative correlations were found with metabolic risk factors. ΔVPA showed significant correlations with ΔVIT-D (r=0.37) and ΔAHR (r=-0.34). Conclusions: After a PA program, OW/OB youth presented positive changes in body composition, vitamin D, metabolic profile and PA levels, indicating that interventions involving physical exercise should be promoted as an important component of a healthy lifestyle. This study was supported by FCT :UID/DTP/00617/2013
MVPA and CRF. The results suggest that accumulating 10 minutes more in MVPA or sedentary per day, is associated with improved achievement in reading and numeracy by approximately 0.5 and 0.3 points, respectively. However, due to the cross-sectional design and the small magnitude of the associations, the practical implications of these results should be interpreted with caution.

1945 Board #101 May 30 3:30 PM - 5:00 PM Intervention With Exergames For Adolescents Promote Moderate To Vigorous Physical Activity
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(No relevant relationships reported)

Both the decline in moderate to vigorous physical activity intensities (MVPA) and the increase in sedentary behavior (SB) have different deleterious effects on the health of adolescents. PURPOSE: Verify a 10-week intervention using exergames with adolescents was able to promote levels of physical activity from moderate to vigorous intensities (MVPA) and compare the time in MVPA between the group with more or less participation in sessions. METHODS: Twenty adolescents (11 boys and nine girls) with an average age of 11.7 ± 0.9 years participated in an intervention with 10 sessions of exergames on the school, twice a week for about 40 to 60 minutes. XBOX 360 equipment was used with Kinect and the pair of adolescents practiced the games using an ActiGraph accelerometer. The analyzes included the total time and time of involvement in MVPA at each session. Descriptive statistics analyzes and the independent student T test were used. The level of significance was 5%. RESULTS: Of the 20 adolescents, three participated in all the sessions (10), six participated in nine sessions and seven participated in eight sessions, representing 80% of effective participation in the intervention. Only 20% of the students participated in only four to six sessions per week. Approximately half the time of each session was spent with MVPA (20.7min vs. 24.4min), in favor of the group with the largest participation in sessions with active video games. This same group presented up to the ninth session with longer mean time in MVMA compared to the group that participated in fewer sessions. CONCLUSION: It was possible to observe that a 10-week intervention using exergames with adolescents was able to promote levels of physical activity of moderate to vigorous intensities (MVPA), mainly in the group that have more participation in sessions.

1946 Board #102 May 30 3:30 PM - 5:00 PM Twelve Years Follow Up - Prevalence Trends Of Physical Inactivity And Overweight In Brazilian Adolescents
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PURPOSE: Determine the physical inactivity and overweight prevalence in adolescents living at São Paulo State (Brazil) from 2005 to 2017. METHODS: We evaluated 3,845 adolescents as part of a cohort study that started in 2005 in São Paulo city. In this study we analyzed 2,012 both sex adolescents that were followed in 2005, 2009, 2013, 2015 and 2017. In 2005, adolescents were from 15 to 18 years of age. We assessed the habitual physical activity practice by International Physical Activity Questionnaire (IPAQ-short-8 version) considering active (AT) the adolescents that accumulated at least 300 minutes per week of moderate-vigorous PA and inactive (INA) if less than 300 min/week were reported. Body weight (kg) and height (m) were self-reported by questionnaire. BMI was calculated and the respective criteria for overweight classification were considered for Brazilian adolescents (CONDE and MONTEIRO, 2006). The anthropometry tendency changed overtime, and a linear regression model was designed to express the annual physical inactivity prevalence average and the excess of body weight. The significance was p<0.05. RESULTS: In general, the prevalence of physical inactivity in 2005 was 50.4%, with significant increase to 53.2% (2009); 56.7% (2013); 59.2% (2015) and 60.2% (2017), with 0.91% annual increase. Higher variation was observed in girls than boys (1.32 x 0.89% per year). The overweight prevalence followed similar trend: 2005 (16.7%); 21.2% (2009); 25.8%; 28.2% (2013); 28.7% (2015) and 29.3% (2017) with 1.29% increase per year (p<0.05). Girls presented significantly and higher percentage change than boys (1.56 vs. 1.15% per year).

CONCLUSIONS: Data showed progressive trend of high physical inactivity and body fat increase, leading to an incidence of obesity in the next 10 years around 71.0% of all adolescents living in São Paulo State 37.2% of physically inactive behavior. These data suggests an early development of cardiovascular disease, with higher impact in girls than boys. Also data strongly suggest to effectiveness of public health policies towards the physical inactivity prevention and the excess of body mass among adolescents are related to unhealthy behaviors of eating, drinking and PA.

1947 Board #103 May 30 3:30 PM - 5:00 PM Compliance With The 24-h Movement Guidelines In Hong Kong Adolescents: Associations With Body Mass Index
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(No relevant relationships reported)

The evidence-based 24-h Movement Guidelines (MG) for children and youth was launched in 2016, shifting the thinking from one single movement behavior to an integration of three behaviors under the 24-h circle: physical activity (PA), screen time (ST), and sleep. A low compliance rate of meeting these combined recommendations has been reported for children. However, few studies have focused on adolescents, and its association with health outcomes such as body weight status is largely unknown. PURPOSE: To examine compliance with the 24-h MG among Hong Kong adolescents and their associations with body mass index (BMI). METHODS: 1,039 adolescents (11-18 yrs) wore the waterproof activPAL™ for 24-h over 7 consecutive days to assess PA and sleep duration. ST was measured using items from the validated Chinese version of the Children’s Leisure Activities Study Survey. Participants were classified into 8 categories depending on the adherence to the 3 recommendations: none, single recommendation (PA, ST or sleep), two recommendations (PA & ST, PA & sleep, or ST & sleep) and all three recommendations. BMI was calculated as weight (kg) / height (m)2. Linear mixed models were used to examine the associations of BMI with the 8 categories and the number of guidelines met (0~3), adjusted for age, sex and school clustering effects. RESULTS: The analytic sample consisted of 656 adolescents (48% of the total sample) provided valid activPAL™ data for at least 4 days and completed questionnaire. Only 1.1% of the adolescents met all the overall 24-h MG, while 38.7% met none of them. The proportion of meeting one single recommendation of PA, ST and sleep was 9.9%, 30.3% and 39.2%, respectively. Adolescents who did not meet the PA recommendation (20.5%) had higher BMI than those who met the respective recommendations. No significant association was found between number of recommendations met and BMI. CONCLUSIONS: Compliance with the 24-h MG was alarmingly low among Hong Kong adolescents. Meeting PA recommendation and the combination of PA and sleep recommendations were more likely to have a healthier body weight. Support by the General Research Fund of the Research Grants Council, Hong Kong, China (#14501415).
LIT, and the training time is at least four weeks; the final results of the study should include weight (body weight), BMI, body fat ratio (% body fat), and body fat (fat weight). The risk assessment was assessed using the Jadad scale (total score of 7).

RESULTS: Compared with LIT, HIIT can significantly reduce % body fat [-1.27(95%CI: -1.87, -0.67), Z = 4.14(p = 0.001)], BMI [-0.42(95%CI: -0.83, -0.01), Z = 2.50(p = 0.05)] and body weight [-0.40(95%CI: -0.73, -0.06), Z = 2.33(p = 0.02)]. Comparing the EG and the CG of HIIT and LIT respectively which is found that for the body weight index, the combined statistical effect values of the two training methods were significantly different. However, LIT is better than HIIT [HIIT = -0.27(95%CI: -0.49, -0.04)] [LIT = -0.94(95%CI: -1.12, -0.75)]; % body fat, HIIT is better than LIT [HIIT = -0.56(95%CI: -0.84, -0.29)] [LIT = -0.45(95%CI: -0.70, -0.21)].

CONCLUSIONS: HIIT is more effective for obese children/adolescents than LIT. LIT is better for whole body weight loss, but HIIT is better for body fat reduction. For aerobic training, the training period and the number of times are not proportional to the weight loss effect.

Body image is an important marker of health and well-being among young people. Instruments to assess body image use contour images that participants use to describe their body image self-perception. These images must be culturally sensitive and adequate for different age groups. Although the Contour Drawing Rating Scale (CDRS) has been validated among adolescents in Spain, no previous studies have compared the body image CDRS with anthropometric measures among Chilean adolescents.

PURPOSE: To assess body image using the CDRS among Chilean adolescents, and compare with anthropometric measures including body mass index (BMI) and waist circumference (WC).

METHODS: A group of 156 Chilean adolescents (87 males, 69 females) aged 13-14 years old participated in the study. They completed the body image CDRS consisting of 9 images from which they selected the one representing their body image self-perception. Values for selected images ranged from 1 (underweight) to 9 (obese). Subsequently, body weight was measured with a Tanita-HD313© scale, height with a SECA-206© stadiometer, and waist circumference with a Lufkin W606© tape, while participants were barefoot, and wore short-sleeve t-shirts and shorts. BMI was then calculated (kg/m²). To determine sex differences, Chi-Square and t-test were used, and correlation analyses were performed to detect association between variables.

RESULTS: Body image CDRS values ranged from 2 to 8 in males, and 1 to 9 in females (Z = 4.237, p = 0.001). Mean (standard deviation) BMI in males and females was 21.3 ± 3.5, and 22.3 ± 3.3 kg/m², respectively (Z = 2.168, p = 0.03). Mean (standard deviation) waist circumference in males and females was 75.9 ± 9.1, and 74.1 ± 8.3 cm, respectively (Z = 1.012, p = 0.05). Spearman correlation coefficients showed a moderate but significant association between the CDRS score and BMI (males, r = 0.46; females, r = 0.49, p < 0.01 for both) and waist circumference (males, r = 0.36; females, r = 0.52, p < 0.01 for both).

CONCLUSIONS: The significant correlation between anthropometric measures and the CDRS in our group of Chilean adolescent males and females suggest that body image self-perception closely represents objective measures of body image assessment; thus, providing an adequate body image assessment tool in this population.
viewed ($p=0.012$) or computer used ($p=0.010$). However, Heavy TV viewers had a higher risk of being overweight/obese regardless of PA level. The associations of TV viewing and computer use were similar with BMI categories and WHtR tertiles. CONCLUSIONS: Heavy TV viewing and computer use are associated with higher BMI and central adiposity in preadolescents. Heavy TV viewing seems to increase the risk for overweightness and central adiposity, regardless of PA level. Strategies to reduce high sedentary screen times could potentially help in preventing overweightness and adiposity among children and adolescents.

### 2015

#### Board #107
**May 30 3:30 PM - 5:00 PM**

**Body Composition Changes Associated With A Structured Exercise Program Among Children And Adolescents**

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(No relevant relationships reported)

Children and adolescents in the U.S. fail to meet physical activity guidelines and health consequences associated with inactivity, such as high body fat composition, continue to impact children. Targeting children for physical activity and fitness interventions have the potential to improve body composition; however, little is known on body composition changes during a fitness-based intervention.

**PURPOSE:** To determine changes in body composition for children participating in a fitness-based intervention.

**METHODS:** 21 children (age = 9.38 ± 3.82, BMI = 21.0, body fat percentage = 30.90) participated in an 8-week, structured fitness intervention consisting of 1-hour weekly sessions. Weekly sessions provided fitness opportunities in a fun, non-competitive environment with the purpose to elicit moderate-to-vigorous physical activity. Pre- and Post-testing using the iDXA was conducted to detail changes in body composition.

**RESULTS:** Results from a paired samples t-test showed significant increases in the following body composition measures: Left Leg Lean Mass ($t = -2.366, p = 0.028$), Right Leg Lean Mass ($t = -3.914, p = 0.001$), Lean Mass Total ($t = 4.575, p = 0.001$), Right Leg Bone Mass ($t = -2.500, p = 0.021$) and Bone Mass Total ($t = 0.826, p = 0.004$). CONCLUSIONS: Participation in an 8-week fitness intervention showed positive body composition changes for children. These changes occurred with minimal intervention (1 hour per week). Future studies should determine the duration of the effect.

#### Board #108
**May 30 3:30 PM - 5:00 PM**

**Multi-Component School-Based Weight-Management Program Improve Physical Fitness and Vascular Reactivity in Obese Adolescent**

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The prevalence of childhood obesity has increased markedly in both eastern and western countries. Development of obesity in early life could lead to serious health problems including a premature cardiovascular disease. Therefore, a primary prevention such as an effective weight management program would be needed in order to minimize the adverse effects of childhood obesity. PURPOSE: This study aimed to determine the effects of multi-component school-based weight-management program on body composition, physical fitness and vascular function and structure in obese adolescents. METHODS: Twenty-eight obese adolescents (21 males, 75%) between the ages of 13 and 15 (14±1.08) at or above the sex-specific 90th percentile on BMI-for-age growth charts were recruited. Participants were randomly assigned into control (CON; n=12) and intervention (INT, n=16) groups. The INT group participated in a multi-component school-based intervention for 10 weeks which included supervised after-school physical activities, dietary and daily physical activities related advices. Moreover, school-health promotion environment and health education lectures for school staffs, students and parents were included in the program. Non-curricular physical activities (i.e., running, playing games and resistance training) were performed moderate to vigorous aerobic activities for 50 minutes/day, three days a week on alternate days. Body composition, physical fitness, vascular function (brachial-FMD) and structure (IMT and baPWV) were measured before and after intervention. RESULTS: After 10-week of multi-component school-based weight-management program, body mass (89.7±6.8 vs. 88.0±0.5, p<0.05) and body fat percentage (44.13±5.27 vs. 41.22±6.74, p=0.05) significantly decreased only in an INT group. Peak oxygen consumption (29.25±12.61 ± 31.56±3.05, p<0.05) and heart related physical fitness improved only in an INT group (p<0.05). Moreover, vascular reactivity of an INT group was improved after 10-week program compared with a CON group (6.81±2.25 vs. 3.62±1.48, p<0.05). There was no change in artery wall thickness and stiffness in any group. CONCLUSIONS: Multi-component school-based weight-management program may be an effective primary prevention for reducing cardiovascular disease risk factors.

#### Board #109
**May 30 3:30 PM - 5:00 PM**

**Weekly Frequency Of Meeting The Physical Activity Guidelines And Cardiometabolic Risk In Youth: Nhanes 2003-2006**

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The current physical activity (PA) guidelines for children and adolescents recommend accumulating 60 minutes of moderate-to-vigorous intensity physical activity (MVPA), 7 days per week. Although the time and intensity components of the PA guidelines have been rigorously studied, the days per week (frequency) component is less researched. PURPOSE: To examine the influence of frequency of meeting the MVPA guidelines on cardiometabolic risk in children and adolescents. METHODS: Accelerometer data from children and adolescents (age 6-18 years; n=673) with at least 4 valid days, 10 hours of wear time, and an average of ≥60 minutes per day of MVPA participating in the National Health and Nutrition Examination Survey 2003-2006 were used. The Evenson cut points for MVPA were applied. The proportion of valid days meeting the ≥60 minutes of MVPA guidelines (DMG) were calculated and used to assign subjects to quartiles. General linear modeling was used to compare associations of quartiles to individual cardiometabolic risk factors. Covariates included age, sedentary time, MVPA, sex, race/ethnicity, asthma, physical disability, academic period, quartiles of the Healthy Eating Index, and poverty-income ratio.

RESULTS: DMG by quartile are as follows: Quartile 1 (n=158, DMG=43.6%; 95% CI 41.8-45.5); Quartile 2 (n=171; DMG 62.3%; 95% CI 61.4-63.2); Quartile 3 (n=154; DMG=75.3%; 95% CI 74.6-76.0); Quartile 4 (n=194; DMG=91.6%; 95% CI 89.2-94.1). Diastolic blood pressure was higher in Quartile 1 and Quartile 2 compared to Quartile 3 (51.2±5.6 vs. 50.8±5.6 mmHg, p<0.05) and Quartile 4 (51.2±5.6 vs. 50.8±5.6 mmHg, 95% CI 50.4-63.4; Q1=50.2±5.6 mmHg; 95% CI 43.2-57.1; p<0.01 and p<0.05 respectfully). There were no other differences between quartiles for BMI percentile, waist circumference, waist-to-height ratio, systolic blood pressure, triglycerides, glucose, or insulin. CONCLUSION: This cross-sectional analysis found no association between proportion of DMG and cardiometabolic risk factors in children and adolescents. Achieving an overall weekly average of 60 minutes per day of MVPA appears to be sufficient for cardiometabolic health regardless of meeting the frequency component of the PA guidelines. Future studies are needed to understand optimal weekly patterns and volume of PA as well as their associations with health outcomes in youth.

#### Board #110
**May 30 3:30 PM - 5:00 PM**

**Fitness In Pediatrics: Is It Adequately Carried Out?**


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(No relevant relationships reported)

INTRODUCTION: The physical fitness in the pediatric area is mandatory, prior to the realization of physical activity, whether recreational, school or competition. Regarding the increasing demand we find that each pediatrician performs them by requesting complementary studies according to their own criteria and in a routine manner. OBJECTIVE: Show the lack of consensus when requesting studies to perform the physical aptitude in the area of pediatrics. MATERIAL AND METHODS: A personalized type survey was conducted; to specialists of the pediatric area in the city of Buenos Aires during the month of May of the year 2018, in which they questioned about physical fitness in pediatric age in healthy children and for all kind of physical activity. The data obtained was analyzed to know what evaluations and complementary studies according to their own criteria and in a routine manner. The request for studies was not greater than 6% had another subspecialty (cardiology, infectology, other ones). 68% had more than 10 years in the profession, only 12% had less than 5 years of activity in the specialty: this data did not make a significant difference when deciding on the request for studies. RESULTS: A total of 105 pediatricians were interviewed, of which 99 of them made physical aptitudes in their daily practice, this being the total number of surveys selected, 94% were clinical pediatricians and 6% had another subspecialty (cardiology, infectology, others). 68% had more than 10 years in the profession, only 12% had less than 5 years of activity in the specialty: this data did not make a significant difference when deciding on the request for studies. The 60% of professionals performed daily physical fitness, being 96% for school physical activity and of these only 45% were competitive schools and sport, none of them was for high performance. In relation to studies requested, 73% asked for an electrocardiogram, 25% Rx. of chest, 21% blood count, 10% echocardiogram and 3% ergometry annually, considering for this the type of physical activity to be carried out, as well as the weekly work load of the activity. The request for studies was not greater in the cases of competitive sports nor was it influenced by the number of weekly hours of sport practice. In relation to the age to request different studies, the majority

Abstracts were prepared by the authors and printed as submitted.
of doctors performed it after 5 years old and it was striking that in 72% of them do it annually, despite being the whole population healthy children. CONCLUSIONS: Facing this result, we believe it is necessary to unify the medical criteria to request studies in relation to the needs of patients

1955 Board #111 May 30 3:30 PM - 5:00 PM Contribution Of In-school And Out-of-school Physical Activity Towards Meeting The Daily Recommendations. Neal C. Phifer, Dale D. Brown, FACSM, Susann Marcum, Emily Jones, Skip M. Williams, Dan Phelps. Illinois State University, Normal, IL. (Sponsor: David Q. Thomas, FACSM)

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PURPOSE: The purpose of the study was to examine in-school and out-of-school activity in children as related to achieving daily activity recommendations for moderate-to-vigorous physical activity (MVPA) and steps. METHODS: Activity patterns of 346, 10-12 year old fifth-grade students in three Midwestern elementary schools were assessed during a two week period, one week during school hours only and the other week for continuous 24 hour periods. Data were collected using wrist worn activity trackers (Polar Acteve). Teachers distributed the devices at the start of each school day and collected at the end of each school day for the first week and provided to the students for the next week for continuous monitoring. Monitors measured MVPA, steps, and calories expended per day. Demographic and anthropometric data were also recorded (age, height, weight). All data were uploaded to the monitor’s main server website and then collected by the researchers. A prior study was used to determine that four days of monitoring could accurately estimate physical activity. A final sample of 186 (N=186) students who attained a 500 step minimum for the same four consecutive school days between both weeks (M-R or T-F), were identified. These data were used to determine averages for steps, minutes of daily activity, and calories expended. RESULTS: Results indicate students attained an average of 15319.38 steps/day. In-school activity and out-of-school activity accounted for an average of 6362.79 steps/day (41.53% of total), 8956.59 (58.47% of total) respectively. Activity minutes averaged 77.43 minutes/day. In-school and out-of-school activity accounted for an average of 33.58 minutes (43.37% of total), and 43.85 minutes (56.63% of total) respectively. Calories expended averaged 2044.66 Kcal/day. In-school and out-of-school activity accounted for an average of 1560.56 Kcal (76.32% of total), and 484.10 Kcal (23.68% of total) respectively. CONCLUSIONS: These results indicate that out of school activities account for most of daily steps taken and activity minutes in the fifth grades students studied during an average school day. A similar distribution of caloric expenditure was not observed between in school and out of school monitoring.

1956 Board #112 May 30 3:30 PM - 5:00 PM The Effect of Increased Extracurricular Physical Activity on the Mathematics Achievements of Children aged 7-9 Years Old

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PURPOSE: The purpose of this study was to assess the impact of an increased extracurricular physical activity on mathematics academic performance for children aged 7-9 years. METHODS: A sample of 120 children aged 7-9 participated in the MQ101 Program. The experimental samples were randomly divided into the experimental group (58 children) and the control group (62 children). The experimental group involved in the extracurricular exercise with games as the main activity content, intervention. The activity lasted for 12 weeks, twice a week for 60 minutes each time, exercise intensity: MVPA = (220-age) × (60-69%); the control group did not participate in any intervention project. The body shape, physical fitness, and mathematics testing scores of the subjects were tested before and after the experiment. The main finding is the change in numerical scores, measured by a standardized mathematical test of 10 minutes. The secondary outcome is a change in body shape and physical fitness. RESULTS: The results showed that the experimental group was better than the control group in the problem solving (t=2.37, p<0.01), calculation speed (t=3.39, p<0.01) and accuracy rate (t=2.21, p<0.05). The math scores of the experimental group were significantly higher than the control group (t=4.14, p<0.01). In addition, the changes in physical fitness of the experimental group were significantly better than the control group (t=2.34, p<0.01), however, the difference in body shape index was not statistically significant (t=1.91, p=0.05).

1957 Board #113 May 30 3:30 PM - 5:00 PM Influence Of Menarche On Perception, Dimension And Body Image Of Active And Insufficiently Active Girls

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PURPOSE: Menarche causes body changes such as increased body fat and classic changes occur in secondary sexual characteristics. In this way due to body changes, the body perception also needs to be adjusted. The regular practice of physical activity has been considered a key element to improve the perception of size and body image in different populations, however, to our knowledge, the association between menarche and the level of physical activity in perception of the dimension and of the body image still unexplored. CONCLUSIONS: Verify the influence of menarche in the perception of the dimension and the body image of active and inactive girls. METHODS: After the approval of the São Judas Tadeu University Research Ethics Committee, thirty-eight girls were distributed into two groups active and insufficiently active subjects and analyzed semiannually by 2.5 years by identification before and after menarche. Anthropometric parameters (height, body weight and body mass index), perceptions of body size (using the Image Marking Procedure) and body image (silhouettes scale) were used as evaluation parameters. RESULTS: After menarche, all the girls in both groups presented alteration (p<0.05) only in the anthropometric parameters and in the body perception index of the hip after the menarche. No significant changes were identified (p>0.05) between groups. CONCLUSION: menarche induced anthropometric alterations and perception of the hip dimension, but without promoting changes in the general perception of the body, as well as in the indication of the silhouettes and in the corporal satisfaction regardless of the level of activity physical.

1958 Board #114 May 30 3:30 PM - 5:00 PM Habitual Physical Activity And Academic Achievements Among Undergraduate Adult Students

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(No relevant relationships reported)

PURPOSE: Physical activity is associated with many physical and mental health benefits. The activity improves mood, reduces stress and anxiety and as shown previously increases academic performance with higher grades among youth and young undergraduate students. PURPOSE: To examine the relationship between physical activity habits and academic achievement among undergraduate adult male and female students. METHODS: Two hundred and thirty two male students (34.5±10.2 yrs) and seventy two female students (36.5±7.6 yrs) from the Faculty of Health Sciences at Ariel University volunteered to participate in this study. The cross-sectional study was conducted using a quantitative method and data was collected by a closed questionnaire, which included questions about physical activity in view of intensity, type of activity, time duration and frequency per week and was analyzed vis-à-vis academic achievements. RESULTS: A significant positive correlation (p<0.03) was found between physical activity habits and higher grades only among the male students. For the younger male students and the adult male students - the higher the physical activity time duration and frequency the higher the grades were. No correlation between adult female students’ physical activity and academic grades were found (p>0.05). CONCLUSIONS: Older male students’ academic grades were correlated to their physical activity habits. The awareness of the importance of physical activity habits among undergraduate male students is not limited to the younger age students but is also true for all age groups.

1959 Board #115 May 30 3:30 PM - 5:00 PM Assessing Hispanic College Students Knowledge Related to Metabolic Syndrome Conditions

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(No relevant relationships reported)

PURPOSE: To investigate Hispanic college students’ awareness and knowledge related to metabolic syndrome (MeS) conditions. METHODS: Hundred and thirty-nine Hispanic college students (age= 22.3 ± 4.07) volunteered to participate in the study. Each participant read and signed the consent form prior to any data collection to take place. Demographic data including age,
race, gender, and major were collected. Participants then answered 89 questions and completed MetS knowledge questionnaire (Yahia et al., 2014; Becker et al., 2008). The questionnaire was designed to assess MetS knowledge and awareness and has seven categories: diabetes, adiposity, hypertension, high serum cholesterol, arteriosclerosis, stroke, and myocardial infarction. Students’ responses were scored and interpreted as poor knowledge (≤50% correct), fair knowledge (51-80% correct), and good knowledge (81-100%).

RESULTS: The results showed that majority of the students had fair level of knowledge (71.80% correct) related to MetS conditions. The participants were more knowledgeable on stroke and adiposity, and least knowledgeable on cholesterol, myocardial infarction, and diabetes components. There was no significant difference between genders for the level of knowledge for adiposity, cholesterol, myocardial infarction, and diabetes component of the questionnaire. However, there was a significant difference of knowledge level for stroke between genders (p<0.01). Males had more knowledge on stroke component than females.

CONCLUSIONS: Majority of Hispanic college students have fair level of knowledge about MetS and MetS related conditions. Findings suggest that students MetS related knowledge and awareness can be improved. MetS is highly prevalent among Hispanic population. Therefore, increasing Hispanic students’ awareness and knowledge related to MetS is essential to improve students’ overall health. Previous studies identified colleges and universities as potential settings for health prevention and early intervention. Future studies should investigate the effects of various intervention methods on Hispanic students’ MetS related knowledge and long-term health conditions.

PURPOSE: To compare differences in school meal patterns and total (both interscholastic organized sports and leisure-time) physical activity among high school athletes and non-athletes. METHODS: A total of 308 high school students (16.04 ± 1.35 years old, 56.5% female, 59.4% Caucasian) completed a series of questionnaires regarding their consumption of meals provided at school (both breakfast and lunch), participation in their school’s free/reduced price meal program, and reasons for not consuming school meals. Additionally, questions regarding weekly frequency and duration of organized interscholastic sports practices and leisure-time physical activity were included. Due to skewed distribution, both non-parametric and parametric analyses were conducted to compare differences among male and female athletes and non-athletes. All analyses were conducted in SAS software version 9.4 with a significance level set at α < 0.05 software.

RESULTS: Out of the 308 participants, 56% of the sample (n=168, 51% female) participated in interscholastic sports, and 44% (n=136; 65% female) were classified as non-athletes. Student athletes participated in more overall weekly physical activity (p<0.00) compared to non-athletes. No differences existed between athletes and non-athletes regarding their consumption of either school breakfast (24.4% athletes vs. 18.4% non-athletes, χ²=0.22, p=0.63) or lunch (52.3% athletes vs 45.6% non-athletes, χ²=0.27, p=0.60). Additionally, there were no differences between athletes (29%) and non-athletes (34.5%) regarding participation in the school free/reduced meal program (p=0.21).

CONCLUSIONS: Student athletes participated in more overall weekly physical activity were included. Due to skewed distributions, both non-parametric and parametric methods were used to assess pre-post program changes in these measures. RESULTS: Participants attended 8.3 ± 1.26 moderate-vigorous exercise sessions under the supervision of their peer-trainer and exercised independently 2.93 ± 1.95 d·wk⁻¹ for an average of 34.85 ± 19.62 min session⁻¹. Despite a significant progressive increase in intensity from the first 3 to the last 3 sessions (mean HR = 135.98 ± 16.98 and 150.15 ± 15.16, respectively; p < 0.001), no effect of aerobic training on cardiovascular fitness or other anthropometric measures were detected (all p > 0.10). Nevertheless, there were significant pre-post-program improvements on multiple measures of psychological functioning including perceived stress, positive affect, sadness, and emotional support (all p < 0.05). There were marginally significant trends towards improvement in measures of perceived rejection (p = 0.055), general life satisfaction (p = 0.062), and perceived hostility (p = 0.069).

CONCLUSIONS: These preliminary findings are consistent with the literature indicating that moderate-intensity aerobic exercise improves psychological functioning. They support the further assessment of peer-mediated aerobic exercise to alleviate stress and improve quality of life in undergraduate students representing a diverse inner-city demographic.

Lack of sleep among college students is currently a massive epidemic affecting millions. Sleep duration and quality is an important determinant of overall health, and is related to health behaviors (physical activity (PA) & diet) and outcomes (mental health). But little is known about these relationships among college students.

PURPOSE: Examine how PA, depression, body mass index (BMI), fruit and vegetable consumption (FVC), and academic performance differed based on sleep quality and duration. Methods: Students completed an online survey, self-reporting their sex, height, weight, grade-point average (GPA), PA levels, FVC, and also responded to questions regarding mental health and sleep. Participants were grouped into those who reported ≤4 or ≥4 nights of restful sleep per week. Paired samples t-tests examined differences in the aforementioned PA, FVC, BMI, and GPA between groups. Chi-square tests for independence examined differences in mental health (depression and stress) based between groups.

RESULTS: 4380 participants responded to the sleep question, the majority of whom were women (59.2%) and non-Hispanic white (76.1%). For all participants, those who reported better sleep reported significantly higher moderate PA (p = 0.045), vigorous PA (p = 0.001), weekly MET-min (p < 0.001), and GPA (p = 0.001), whereas BMI (p = 0.627) and FVC (p = 0.107) did not differ between groups. When split by sex, the same results were revealed for women, but among men the only significant differences were in GPA (p = 0.042) and vigorous PA (p = 0.019). Those who reported better sleep also reported significantly less symptoms of depression regardless of sex (p < 0.001). Conclusion: A positive relationship between sleep and PA was found for women. In men, only vigorous PA was found to have a positive relationship with sleep. Though, a positive relationship between sleep and academic performance was evident for both sexes. In addition, better sleep was associated with better mental health regardless of sex. In summary, findings highlight the importance of more education on the importance in the relationship of sleep and better academic performance and mental health. Further research is required to examine the relationship, in particular directionality, between the amount PA and the duration of sleep in college students.

Research suggests that many undergraduates do not achieve the minimum recommended amounts of physical activity (PA). Furthermore, the relationship between college students’ attitudes toward PA and participation are unclear. PURPOSE: The purpose of this investigation was to qualitatively examine student experiences and attitudes about PA while enrolled in a conceptually-based, mandatory, health and fitness course. METHODS: Semi-structured interviews were performed individually.
with a subset of 10 (6 female, age 18-21 years, 70% Caucasian) students who were enrolled in a larger study (n=135) investigating learning and behavioral outcomes from participation in a health and fitness course. Interviews were audio-recorded and transcribed verbatim. Thematic analysis was used to identify predominant themes.

RESULTS: Interviewees described their experiences and learning outcomes from the course. In regards to PA attitudes and practices, three themes emerged: (1) Self-Consciousness. Participants reported feeling embarrassed and avoided in the fitness class due to what they perceived to be their own fitness level. (2) Friends and Family Influence. The majority of interviewees reported exercising with friends as a strategy to improve motivation. Additionally, many identified family members as either having a positive or negative influence on PA behaviors. (3) Motivational Factors. The primary factors participants cited as influencing PA motivation were health, and maintenance of body weight.

CONCLUSIONS: Results show that several factors influence college students’ PA motivation, attitudes, and adherence to PA participation. It is recommended that health educators consider implementing strategies to promote that physical activity courses meet the specific needs of college students. This study was funded by a Fitchburg State University Special Projects Grant.

1964

Board #120
May 30 3:30 PM - 5:00 PM
Effects Of A 13-week Yoga Class On College Aged Student’s Flexibility, Body Image, And Mood

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PURPOSE: Yoga has been practiced as a low to moderate intensity physical activity in recent years and evidence suggests that yoga practices can bring beneficial effects on physical and mental health. The present study examined whether a 13-week yoga practice of postures, breathing, and relaxation techniques can improve the flexibility, body image and mood of college aged students. METHODS: A sample of 60 students was recruited from university to participate in a 13-week yoga class. A pre-post test design was used for this study. Measurement on the physical aspects included the flexibility test and whereas the mental aspects included body image questionnaire (Body Appreciation Scale), and mood questionnaire (The Positive and Negative Affect Scale). Data were analyzed at the significance level of p<.05 for one group pre- and post-test of two data sets. RESULTS: The Mann-Whitney showed significance at the p<.01 for the sit and reach flexibility test and significance at the p<.05 for the body image and mood questionnaire. Sixty students (19± 2.1 years; 1.6± 0.05 m, 52 ± 8.46 kg) reported improved flexibility (range from 3% to 9%), 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 majority students desired to participate in more yoga classes in the future. CONCLUSIONS: This study suggests that a 13-week yoga class showed improvements of flexibility, increasing positive body image and enhancing mood who are novice yoga practitioners. Since the participants in this study were all girls and future study can examine the gender difference on the topic.

1965

Board #121
May 30 3:30 PM - 5:00 PM
Associations between Parents’ Physical Activity and Young Children’s Health Outcomes

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Email:ゆる(No relevant relationships reported)

PURPOSE: While parents play an important role in child development, little is known about the influence of parents’ physical activity (PA) on their children. This study examined the associations between parents’ PA and their preschoolers’ body mass index (BMI), PA, and fundamental movement skills (FMS). METHODS: Of 257 parent-child dyads recruited across 3 cohorts from 4 Colorado Head Start/preschool centers from 2010-2012, 109 children (57 girls, 36 Hispanic, X̅ = 4.91±0.14) and their parents who had complete data were included in the study. Parents and their children’s PA on 4 weekdays and 2 weekends were assessed by pedometers and FMS—setting the stage for the development of experimental trials seeking to promote improvements in preschool children’s FMS and overall health. Future research with larger and more diverse samples investigating the influence of parents’ PA intensity (i.e., light, moderate, and vigorous) on preschool children’s other health outcomes is warranted.

1966

Board #122
May 30 3:30 PM - 5:00 PM
Effects Of A Peer-led Aerobic Training Program On Physical Activity Behavior Of Urban College Students

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PURPOSE: Peer-based education is commonly used on college campuses to provide health information. Using it to introduce physical activity to ethnically-diverse sedentary students attending an urban commuter college has not been explored. We examined the impact of a 10-week peer-based aerobic-exercise (AE) training program on urban college students’ leisure physical activity behavior. METHODS: Inactive students (N = 23, mean age: 21 ± 2.24 yrs) participated in a 10-week training program consisting of approximately 3 weekly AE sessions. Once-per-week sessions led by a peer-student trainer included a short lecture on exercise’s health benefits followed by 30 mins of AE (55%-65% HRR); participants were instructed to complete 2 other AE sessions independently per week and completed weekly online journals to assess adherence. Pre- and post-training evaluations of AE behavior patterns (International Physical Activity Questionnaire (IPAQ)) were conducted in the weeks prior to and following the exercise program and one month (30-IPAQ) and 90 days (90-IPAQ) after the conclusion of training. Descriptive statistics describing program participation and adherence are presented. Paired-samples t-tests were conducted comparing pre- and post-training cardiovascular fitness. RESULTS: Each week 19.1 ± 1.66 participants attended a peer-led session, training at THR of 142.61 ± 22.88. Participants completed a mean ± SE of 1.126 sessions (p=0.001), which was significantly higher than expected 10. The IPAQ expect 2.39 ± 1.95 wk⁻¹; 34.85 ± 19.62 min session⁻¹ independently. Twenty (86.96%) participants completed the 90-IPAQ thus, students’ leisure physical activity analysis included only these 20 participants. Pre-IPAQ data demonstrated that 25% of participants engaged in leisure physical activity at a mean of 164 ± 120 MET-min·wk⁻¹. One month following the training period 60% of participants exercised at a mean of 434.38 ±395.76 MET-min·wk⁻¹; 90-IPAQ data demonstrated 55% of participants continued to engage in leisure physical activity at 488.73 ± 381.33 MET-min·wk⁻¹ on average. There was no significant effect of aerobic training on participants’ cardiovascular fitness level.

CONCLUSION: Participation in a peer-led aerobic training program may serve as a gateway to adopting a low level of leisure physical activity by urban college students.

1967

Board #123
May 30 3:30 PM - 5:00 PM
Association of Sleep Quality and Physical Activity among Chinese College Students

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Sleep plays a critical role in the growth of youth. However, increasing studies suggest that the sleep quality (SQ) in Chinese youth is in a worrying situation. Meanwhile, SQ is associated with lifestyle factors, such as physical activity (PA). Therefore, this study will particularly focus on the association between PA level and SQ in Chinese college students, a special youth group who are under academic pressure.

PURPOSE: The present study is aimed to determine the correlation between SQ and PA level in Chinese college students.

METHODS: In 2017, 4330 college students (male: 60.1%; female:39.9%) aged 17-24 years were randomly sampled from Shanghai Jiao Tong University, China. SQ, PA level, academic pressure and lifestyles of students were collected via a questionnaire. SQ and PA level were evaluated by Pittsburgh Sleep Quality Index (PSQI) and International Physical Activity Questionnaire, respectively. SQ dichotomizes two levels: good SQ (PSQI score ≤5) and poor SQ (PSQI score ≥6). PA was also divided into two levels: sufficient PA and insufficient PA according to World Health Organization moderate-to-vigorous physical activity (MVPA) recommendations.

RESULTS: Average MVPA time was 43.5±37.3 min/day (males: 47.0±39.6 min/day; females: 38.1±33.2 min/day). About 25.5% of participants met MVPA recommendations (males: 29.0%; females: 20.1%). Average SQ score was 7.81±1.89 (males: 7.67±1.86; females: 8.06±1.91). About 89.5% of participants had poor SQ (males: 87.9%; females: 91.8%). Males with sufficient PA had better SQ (7.41±1.85) than those with insufficient PA (7.74±1.85; P<0.05). But no significant correlation was found in females. The linear regression results showed that insufficient PA was
associated with higher SQ score (B=0.24, P<0.01) among males. Other health-related factors such as dietary habits and academic pressure also showed significant correlation with SQ. However, regarding the females, no significant correlation between PA and SQ was observed. Furthermore, after adjustment for the demographic variables and health-related factors, the results of binary logistic regression showed that males with insufficient PA had higher odds of poor SQ (OR=1.44, 95% CI=1.12-1.86, P<0.001) compared with the others.

CONCLUSION: Better SQ was related to higher PA level in male college students.

1968 Board #124 May 30 3:30 PM - 5:00 PM

Associations Between Physical Activity, Diet, And Substance Use With Academic Performance

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Physical inactivity, poor diet, and alcohol/substance abuse are common health behaviors among college students. However, little is known about the relationship between these health behaviors and academic performance. Purpose: To examine differences in grade point average (GPA) based on physical activity (PA) levels, fruit and vegetable consumption (FVC), and use of alcohol and substances. Methods: Students completed an online survey self-reporting demographics (age, sex, race/ethnicity), PA (min/week of moderate and vigorous PA), FVC (servings/day), use of alcohol and substances (yes/no), as well as GPA. Independent samples t-tests were used to examine differences in GPA between those who did/might not meet PA and FVC recommendations, and those who did/not use alcohol and substances. Results: Data was collected from 5738 participants (women, 57.8%, non-Hispanic white, 77.2%). For all participants, GPA differed significantly between those who did (3.40±0.40) and did not (3.36±0.46) accumulate 500 weekly MET-min (p<.034), and those who did (3.42±.40) and did not (3.34±0.41) meet FVC recommendations (p<.001). GPA also differed significantly between tobacco users (3.26±.41) and non-users (3.40±.42, p<.001), as well as cigarette users (3.30±.40) and non-users (3.41±.42, p<.001), but not based on alcohol use, for all participants. Conclusion: Findings indicate that those who utilize substances, are less physically active and display unhealthy eating habits, tend to have poor academic performance. This provides insight to students and campus health professionals regarding how their health behaviors may be affecting their GPA.

1969 Board #125 May 30 3:30 PM - 5:00 PM

Pilates Connect: A Program To Support The Transition Of Student-athletes To Lifetime Activity

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(No relevant relationships reported)

Student-athletes face challenges maintaining physical activity when they transition beyond college athletics, including loss of team support, few specific goals and strong athletic identities with weaker exercise identities (Fuller, 2014; Reifsteck, Gill, & Labbahn, 2016). Resources that prepare final-year student-athletes for meaningful lifetime physical activity support physical and psychological wellness. Purpose: To implement the Pilates Connect program for final-year student-athletes and evaluate their experiences and program support in the transition to lifetime physical activity. Methods: Twelve final-year student-athletes participated in Pilates Connect, once each week for six weeks. The sessions included 35 minutes of Pilates training, 15 minutes of reflection and discussion, and 10 minutes of evaluation. Measures included attendance, session and program evaluations, and focus groups. Results: Final-year student-athletes strongly adhered to the program, with an overall attendance rate of 94.4%. In session evaluations (1=not at all true, 7=very true), participants agreed that they were pretty good at Pilates (M=4.8), did the activity because they wanted to (M=6.6), and felt like they could trust the other participants (M=6.4). Participants agreed that Pilates Connect supported their confidence in the transition to lifetime activity (M=5.5), greater control over activity choices (M=5.9), and connection to other participants (M=6). They would recommend Pilates Connect to other student-athletes (M=6.8) and consider participating in Pilates or other group exercise in the future (M=6.8). Focus group responses highlighted increased confidence through progression in a new form of activity and recognition of different options for activity after graduation. Student-athletes enjoyed discussing the transition with peers and felt less alone. They recommended more sessions and promoting the program through word of mouth and feedback from past participants. Conclusion: The six-week Pilates Connect program was feasible, as evidenced by strong adherence rates and positive feedback from participants. Final-year student-athletes agreed that the program supported their competence, autonomy, and relatedness in physical activity as they approached the transition to alumni.

1970 Board #126 May 30 3:30 PM - 5:00 PM

Gunter Submission

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PURPOSE: To learn if different physical activity (PA) promotion approaches for boys compared to girls are needed in rural elementary school settings, we evaluated sex differences in total physical activity (TPA) and moderate-to-vigorous physical activity (MVPA) among 1st - 5th graders attending six rural schools in Oregon. METHODS: We assessed the PA levels of 1739 students (835 girls and 901 boys) over four consecutive school days using Walk4Life MVP pedometers in fall 2015. Devices were worn above the right hip for the duration of the school day (6.5 hours/day) and programmed to measure PA time at any intensity (i.e. no minimum requirement for step rates/min). Time spent in MVPA was evaluated using a pre-specified step rate (≥ 120 steps/min). Teachers distributed and collected devices daily, recorded wear time, and reported daily classroom schedules (e.g. time for recess, lunch, etc.). At the end of the school year student-athletes strongly adhered to the program, with an overall attendance rate (M=6.8). Focus group responses highlighted increased confidence through progression in a new form of activity and recognition of different options for activity (M=5.5), greater control over activity choices (M=5.9), and connection to other participants (M=6). They would recommend Pilates Connect to other student-athletes (M=6.8) and consider participating in Pilates or other group exercise in the future (M=6.8). Focus group responses highlighted increased confidence through progression in a new form of activity and recognition of different options for activity after graduation. Student-athletes enjoyed discussing the transition with peers and felt less alone. They recommended more sessions and promoting the program through word of mouth and feedback from past participants. Conclusion: The six-week Pilates Connect program was feasible, as evidenced by strong adherence rates and positive feedback from participants. Final-year student-athletes agreed that the program supported their competence, autonomy, and relatedness in physical activity as they approached the transition to alumni.

PURPOSE: To investigate the effect of 10-week flag football exercise and regular physical education class on daily physical activity (PA) levels in elementary school students.

METHODS: A total of 48 9-10yr students (mean age in yr: 9.73±0.55; 24 males, 24 female) was divided into either a flag football intervention group or a conventional physical education group. The intervention group received a 35-minute flag football exercise session, twice a week, for 10 weeks. The physical education group received a 35-minute/day routine session, including gymnastics and sports games. Daily PA was measured before and after 10 weeks for both groups using Actigraph GT3X + (wore on right hip) for seven consecutive days. The cut-points established by Evenson et al. were used to convert Actigraph counts data into PA in minutes in different intensity levels (sedentary: 0-25 counts/15 seconds, light: 26-573 counts/15 seconds, moderate-to-vigorous: ≥574 counts/15 seconds). Differences in PA between intervention and control groups before and after the 10-week intervention period were compared by a series of mixed model repeated measures ANOVAs. Data were expressed as mean ± standard deviation; Significant level was set at 0.05. RESULTS: The intervention group spent less sedentary time than the control group after the 10-week intervention (Table 1). CONCLUSIONS: Flag football exercise could help reduce overweight and obesity elementary school students’ daily sedentary time. Meanwhile, it was noticed that daily MVPA levels of most of these students were significantly below 60 min/d. This study was supported by National Social Science Fund of China (No. 18BTY095).

Abstracts were prepared by the authors and printed as submitted.
Extracurricular physical activities in the development of coordination of children aged 7 to 9 years

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(No relevant relationships reported)

Purpose: The purpose of this study was to assess the effects of extracurricular physical activities on the physical coordination in children aged 7–9 years.

Methods: A sample of 120 children aged 7–9 years (52% boys) was enrolled for a 12-week experimental intervention study. The sample was divided into an experimental group (58 children) and control group (62 children) by random number method. The experimental group participated in extracurricular intervention courses twice a week for 1 hour. The content of the course was mainly game, medium exercise intensity. The control group did not participate in the extracurricular exercise. The “Chinese Children Coordination Test” (CCCT) developed by the project team was used to conduct the coordination test before and after the experiment. The raw data was standardized and compared according to age and gender.

Results: After 12 weeks of extracurricular intervention, the results showed that the scores of the experimental group in the transfer test (t=8.29, p<0.05) of fine motor coordination, fine to fine (t=0.27, p=0.05), climbing obstacles (t=4.79, p < 0.05), and rolling skills (t=4.81, p<0.05) were significantly higher than the control group. The experimental group showed significant improvement in the standardized comprehensive score. Conclusion: Extracurricular physical activity intervention could significantly improve the coordination ability of children, and the density of extracurricular physical activities should be strengthened in this age group.

Acknowledgement: Supported by NCPB Grant 15CY090020, Humanities and Social Sciences by Ministry of Education Grant 17YJC930002.

Effects of eight-week fundamental motor skills intervention on children's physical and cognitive health outcomes

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(No relevant relationships reported)

Globally, 80.3% of school-aged children do not engage in the recommended 60 minutes of daily moderate-to-vigorous physical activity (MVPA; Hallal et al., 2012). Motor skill competence is fundamental to a child’s physical activity and cognitive development (Stodden et al., 2008), and thus may explain the lack of MVPA engagement among children.

Purpose: This study aimed to examine the effects of a fundamental motor skills (FMS) intervention program on physical and cognitive health outcomes among elementary children.

Methods: Participants were 31 K-2 students (19 girls, 12 boys; M=6.65) from three public elementary schools in the southwestern U.S. They were randomly assigned to either the intervention (1 school, n = 20) or the control group (2 schools, n = 11). During two separate 8-week periods in 2017 and 2018, children in the intervention group (13 girls, 7 boys) joined the FMS intervention for three times per week (60 minutes each time), while children in the control group (6 girls, 5 boys) followed a traditional afterschool program (e.g., free play). Children’s pre- and post-intervention data were collected using the Test of Gross Motor Development - 2nd edition (TGMD-2; Ulrich et al., 2000), accelerometers (Actical), and a cognitive function questionnaire (PedoQOL; Varni et al., 2011). To examine the intervention effect, a 2 × 2 repeated measures ANOVA was used, with group as the between-subjects variable and time as the within-subjects variable.

Results: The MANOVA showed significant differences between the intervention and the control group over time, F(4,26) = 16.83, p < 0.01, partial η2 = .72. Follow-up univariate tests for the group × time effect indicated significant differences (p < .05) in locomotor skills (intervention: M = 25.4 vs. M = 37.98, F = 8.31; control: M = 29.73 vs. M = 30.32, F = 0.25), object-control skills (intervention: M = 24.68 vs. M = 39.78, F = 7.07; control: M = 27.05 vs. M = 27.59, F = 0.19), and MVPA (intervention: M = 143.62 vs. M = 170.06, F = 2.54; control: M = 166.24 vs. M = 155.17, F = 0.79), but not in cognitive function (p > .05).

Conclusion: The FMS intervention showed significant improvements in FMS and MVPA, compared to a traditional afterschool program. Findings highlight the importance of FMS for motor skill competence and MVPA promotion among school-aged children.

Assess the feasibility, acceptability & costs of delivering a physically active lessons (PAL) training program to secondary school teachers & explore preliminary effectiveness for reducing pupils’ sedentary time. METHODS Two mixed-sex, non fee-paying schools were randomised as intervention (n = 1; received PAL training) & control (n = 1; no training) schools. Training was delivered to all subject teachers in two after school sessions & focused on integrating movement into lessons. Feasibility & acceptability of PAL training were assessed with quantitative & qualitative measures. Student outcomes (including accelerometer assessed activity) were assessed at baseline & 8 weeks post training for 107 & 98, 11-14 year olds at intervention & control schools, respectively. The study received ethical approval.

RESULTS 29 of 33 teachers attended both training sessions. Teachers’ feedback indicated low acceptability of PAL training & a need to revise certain training components, e.g., outdoor PAL training & increasing the learning challenge of the PAL strategies. The assistant head teacher echoed teacher’s concerns about the training but suggested the concept was acceptable for secondary schools. At follow-up, teachers had increased PAL delivery & students received an average of 6.9 PAL/week.
week. Of the pupils who recalled being in a PAL (58%), >90% wanted teachers to continue teaching PAL. Delivering the training cost $901 ($45 staff time, $450 equipment). Change in study participants’ sedentary time (95% CI) was -1.3(-6.2,8.7) minutes at control & intervention schools, respectively. CONCLUSION: As most PAL evaluations focus on primary schools, this study makes a valuable contribution to the literature. Delivering PAL training to teachers was feasible, and delivering & participating in PAL was acceptable for teachers & students. However, low acceptability of PAL training & no evidence of effectiveness on student outcomes indicate the need to review the training. Receiving 6-7, 60 minute PAL/day has the potential to reduce adolescent’s sedentary time, although the amount of activity introduced by PAL requires review. Results do not support PAL implementation or progression to a full trial with the current program. Further research could explore if different PAL training elicits more promising results.

1976 Board #132  May 30 3:30 PM - 5:00 PM
SOFIT Studies of Physical Education in U. S. and International Schools
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There is growing interest in assessing physical education programs worldwide in order to improve program quality. To this end, SOFIT (System for Observing Fitness Instruction Time) is a valid and reliable tool for assessing physical education, and it has been used to evaluate physical education programs worldwide since 1991. PURPOSE: To compare and contrast the characteristics of SOFIT studies of PE conducted in U.S. schools and in other countries. METHODS: Following guidelines outlined by PRISMA, we searched 10 library databases for SOFIT studies conducted worldwide. We retrieved a total of 800 distinct records (233 U.S., 567 non-U.S.) for eligibility. Studies were selected if they (a) were published in English in peer review journals; (b) used the standard SOFIT protocol; and (c) assessed physical education in preK-12 schools. RESULTS: Fifty-eight studies met the inclusion criterion, including 29 in the U.S. and 29 in other countries. Approximately 30% of studies assessed MVPA% within lesson contexts.

1978 Board #134  May 30 3:30 PM - 5:00 PM
Effects of Three Regular Activity Breaks on Postprandial Triglyceride Response in Healthy Young Adults
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PURPOSE: To determine whether interrupting prolonged sitting with three kinds of regular walking activity breaks has an immediate or delayed effect on postprandial triglyceride response. METHODS: In a randomized crossover trial, 16 inactive healthy adults (7 men, aged 21-30 years) completed four 26-h (from 8:00 AM on day 1 to 10:00 AM on day 2) laboratory conditions. Except for the 9-h intervention phase, the same procedure was used in the following four trials: (1) 9-h prolonged sitting (SIT); (2), (3), and (4) sitting with 3, 5, and 8 minutes of brisk walking (60% VO2max) every 35, 50, and 70 minutes, respectively (WALK3, WALK5, and WALK8). Postprandial serum triglyceride (TG) and nonesterified fatty acid (NEFA) were measured for 2-h dinner immediately on day 1 and for 2-h breakfast on day 2. Meals and meal times were standardized across the conditions for all the participants. RESULTS: Compared with SIT, only WALK8 significantly attenuated 2-h breakfast postprandial triglyceride total area under the curve (IAUC; SIT: median [Q1, Q2], 2.12 mmol·L−1 [1.4, 3.67] vs. WALK8: 2.00 [1.25, 3.30] P < 0.04). The IAUC 2-h dinner postprandial triglyceride and for both 2-h dinner and breakfast postprandial NEFA were not significantly changed in the three-activity break conditions. However, compared with SIT, the three-activity break conditions significantly increased the pre-dinner NEFA concentrations on day 1 (WALK3 52%, WALK5 36%, and WALK8 75%, all p < 0.05), but only WALK8 increased the fasting NEFA concentration on day 2 (25% p < 0.05). No significant differences in all the above-mentioned indicators were found among the three-activity break conditions. CONCLUSIONS: The 8-min brief bouts every 70 min attenuated the postprandial triglyceride response measured about 24 h after, not immediately after, the intervention phase. Supported by the Shanghai Science and Technology Committee (No. 16080505100).

D-61 Free Communication/Poster - Physical Activity and Health II
Thursday, May 30, 2019, 1:00 PM - 6:00 PM
Room: CC-Hall WA2

1977 Board #133  May 30 3:30 PM - 5:00 PM
Accumulating 10,000 Steps/Day Using a Wristband Activity Monitor May Not Meet Step Guidelines.
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Physical activity (PA) guidelines aimed at accumulating 10,000 steps/day through exercise (EX) and activities of daily living (ADL) have become increasingly common with the advent of wristband PA monitors. Yet, accumulated “steps” with wristband PA monitors may not equal validated pedometers. Consequently, there is a need for evaluating and developing guidelines for step counts using wristband PA monitors for the general population. PURPOSE: To compare pedometer and wristband PA monitor steps accumulated through EX and ADL designed to mimic real-world behavior using a diverse participant population. METHODS: 24 males and 35 females, age: 18-65 yrs., BMI: 19.45 kg/m2, including exercisers and non-exercisers, were recruited for this two-day study. On Day 1 participants completed 30 minutes of EX on a treadmill at 64-74% of their age-predicted HRmax wearing a pedometer and wristband PA monitor. Pedometer and wristband PA monitor steps were recorded after EX and pedometer steps were subtracted from 10,000 to determine the remainder of steps participants needed to accumulate 10,000 steps through ADL on Day 2 (ADL pedometer steps = 10,000 steps – exercise pedometer steps). Next, participants were sent home with a pedometer and wristband PA monitor. On Day 2, participants were instructed to accumulate the remainder of 10,000 steps through ADL. Once participants accumulated their ADL pedometer steps, step counts on both devices (i.e., wristband PA monitor and pedometer) were recorded. Total step counts were calculated as: EX steps on Day 1 plus ADL steps on Day 2 for devices. RESULTS: Significantly fewer wristband PA monitor steps were accumulated than pedometer steps during treadmill EX (3864±68 vs. 3573±81 steps; P<0.01) on Day 1 by 7.5%. Conversely, on Day 2, accumulated wristband PA monitor steps were significantly greater than pedometer steps during ADL (7973±275 vs. 6255±72 steps; P<0.01) by 27.5%. Consequently, total steps were significantly higher for wristband PA monitor steps than pedometer steps (1154±281 vs. 1011±957 steps; P<0.01). CONCLUSION: In order to achieve the equivalent of 10,000 pedometer steps using a wristband activity monitor through treadmill exercise and activities of daily living, wristband activity monitor users should strive for closer to ~11,500 “steps” per day.

1979 Board #135  May 30 3:30 PM - 5:00 PM
Physical Activity Level And Prescription Pattern Of Physical Activity Among Physicians In Santiago De Chile.
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PURPOSE: The aim of this research was to determine the level of physical activity (PA) and prescription pattern of PP of physical activity among physicians in their private practices. METHODS: An analytical cross-sectional study analyzed 341 physicians (182 males, 159 females; mean age 39.7 years) of 13 different private health care centers in Santiago de Chile, South America. Data of PA was collected using the short form of the International Physical Activity Questionnaire (IPAQ-SV) and the data of the PP was collected using the Exercise Is Medicine (EIM) questionnaire developed in Latin America. RESULTS: 30% of the participants reported low level of physical activity (<600-MET min/week). Higher physical activity levels were found among male physicians compared to female physicians (9% versus 6%). 80% of the physicians reported prescribing PA to their patients (always 37%; almost always

Abstracts were prepared by the authors and printed as submitted.
Many growth studies have assessed age at menarche to quantify capacity ($V'\text{O}_2\text{peak}$) and performance. Several studies pointed out the skeletal muscle dysfunctions and atrophy seem to be the main responsible for the low peak work rate ($WR_{\text{peak}}$) and reduced $V'\text{O}_2\text{peak}$ in kidney (KTR) and liver (LTR) transplanted recipients. To determine $V'\text{O}_2\text{peak}$ and $WR_{\text{peak}}$, on an electronically braked ergometer. Pulmonary gas exchange was measured using breath-by-breath analyses. All subjects were asked to attend 24 ET sessions; the DLC group trained both leg at the same time and the SLC group performed the first half of the ET regimen with one leg and the second half with the other limb. Changes in intramuscular adipose tissue (IntraMAT), intermuscular adipose tissue (InterMAT) and subcutaneous adipose tissue (SAT) were calculated. Physical inactivity decreases the skeletal muscle mass and increases content of the adipose tissue in humans. However, it is not well known that the relationships between daily physical activity and various types of adipose tissues such as intramuscular adipose tissue (IntraMAT), intermuscular adipose tissue (InterMAT) or subcutaneous adipose tissue (SAT). PURPOSE: To investigate relationship between daily physical activity and contents of IntraMAT, InterMAT and SAT in the thigh for young men. METHODS: Twenty healthy young men (24.5±4.8 years) participated in this study. Axial images of the mid-thigh were taken using magnetic resonance imaging. Cross-sectional area (CSA) of IntraMAT, InterMAT, SAT and skeletal muscle were measured. Daytime physical activity time was measured using an accelerometer on 14 consecutive days and summarized the activity time of two intensities; light-intensity (1.6-3.9 mJ/s/cm²) and moderate- to vigorous-intensity physical activity (3.0-7.6 mJ/s/cm²). RESULTS: In the accelerometer data, time spent in light-intensity physical activity was 672.4±74.6 min/day, and time spent in moderate- to vigorous-intensity physical activity time was independent variables ($R^2$ = 0.655). As a result, skeletal muscle CSA/body weight and moderate- to vigorous-intensity physical activity time was not significantly correlated with contents of InterMAT and SAT. Stepwise regression analysis was performed, with IntraMAT content as a dependent variable and age, body mass index, SAT CSA/body weight, skeletal muscle CSA/body weight, light-intensity physical activity time, moderate- to vigorous-intensity physical activity time as independent variables. As a result, skeletal muscle CSA/body weight and moderate- to vigorous-intensity physical activity time were independent variables ($R^2$ = 0.655). CONCLUSIONS: These results suggest that moderate- to vigorous-intensity physical activity time was related to IntraMAT content only, skeletal muscle size and moderate- to vigorous-intensity physical activity time could be a major determinant of IntraMAT content in young men.

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43.5%, but only 8% fully knew the international PA recommendations for health. When asked why they do not prescribe PA, among those who do not do it regularly, the main cause was because they do not know the PA current guidelines (12%), and among those who knew the guidelines, the “lack of time within the consultation” was the most common cause (39%), followed by the doctor’s preconceived notion that “the patient will not comply with the prescription given” (19%). Although both national and international guidelines establish PA as the first line of treatment of chronic non-communicable diseases, the second half of physicians do not follow these recommendations. Among these, 46% of them refer not to know these recommendations and something that in our opinion is even more worrisome is that 21% of the doctors surveyed, had knowledge of the guidelines, but do not apply them.

CONCLUSION: data suggested a relationship between the level of knowledge of PA recommendations, the prescription pattern in clinical practice, and the practice of PA itself among doctors.

1980 Board #136 May 30 3:30 PM - 5:00 PM

Large vs Small Skeletal Muscle Mass Training: a Pilot Study on Solid Organ Transplanted Recipients

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(No relevant relationships reported)

Kidney (KTR) and liver (LTR) transplanted recipients suffer from a reduced exercise capacity ($V'\text{O}_2\text{peak}$) and performance. Several studies pointed out the skeletal muscle dysfunctions and atrophy seem to be a common scenario in the post-transplant period (Kempenneers et al., 1990; Kallwitz, 2015).

PURPOSE: The aim of the present study is to determine if endurance training (ET) involving a small muscle mass, e.g. single leg cycling (SLC), might induce skeletal muscle development of higher $V'\text{O}_2\text{peak}$ and $WR_{\text{peak}}$ than ET with large muscle masses, e.g. double leg cycling (DLC), in KTR and LTR.

METHODS: 9 sedentary patients were enrolled (KTR=6; LTR=3) and divided into SLC (n=5; age 50.0±10.3 years; time post transplant 11.14±8.3 years; BMI 25.8±3.0) and DLC (n=4; age 58.8±17.0 years; time post transplant 21.3±1.5 years; BMI 26.3±2.9) groups. Subjects completed DLC incremental test to determine $V'\text{O}_2\text{peak}$ and $WR_{\text{peak}}$ on an electronically braked ergometer. Pulmonary gas exchange was measured using breath-by-breath analyses. All subjects were asked to attend 24 ET sessions: the DLC group trained both leg at the same time and the SLC group performed the first half of the ET regimen with one leg and the second half with the other limb.

RESULTS: 2 subject in the DLC group did not complete the ET regimen due to health-related issues, thus were excluded from the analysis. SLC and DLC groups improved ($p$: 0.053) the $WR_{\text{peak}}$ of 18.0±14.4 and 6.0±7.1 W, respectively. SLC and DLC groups improved ($p$: 0.053) the $WR_{\text{peak}}$ of 18.0±14.4 and 6.0±7.1 W, respectively. SLC and DLC groups improved ($p$: 0.053) the $WR_{\text{peak}}$ of 18.0±14.4 and 6.0±7.1 W, respectively.

CONCLUSION: These preliminary results suggest that SLC training elicited a slightly changed in $V'\text{O}_2\text{peak}$, but slightly higher improvement in $WR_{\text{peak}}$ with respect to the DLC training. This might suggest the key role of skeletal muscles in limiting peak exercise performance. The results are promising, but the low sample sizes prevent us from drawing firm conclusions.

1981 Board #137 May 30 3:30 PM - 5:00 PM

Recalled Age at Menarche from The Michigan State University Motor Performance Study

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(No relevant relationships reported)

Background: Many growth studies have assessed age at menarche to quantify biological maturation, as it is related to several physiological and performance variables. Begun in 1967, the Michigan State University Motor Performance Study (MPS) tested youth on a battery of physical performance, maturation, and motor performance tasks twice yearly for 32 years. One maturation marker, age at menarche, was collected for female participants and their mothers. In a follow-up study to investigate participants’ adult health outcomes, females again reported age at menarche.

PURPOSE: To determine whether recalled age at menarche (up to 20 years after the fact) was related to a more timely assessment of age at menarche, and 2-Determine whether daughters’ and mothers’ ages at menarche were related to each other.

Methods: During the MPS, a letter was sent to participants’ mothers asking for age at menarche for themselves (n = 118) and their daughters (n = 99). At the follow-up, 127 females provided their recalled age at menarche; 25 of these respondents were matched with their earlier recall data. Descriptive statistics and correlations were calculated. Results: Age at menarche (collected by Self-report at MPS) and the MPS for the daughters was (mean ± sd) 13.13 ± 1.1 years (minimum-maximum = 11.2-16.7 years). At the follow-up, the recalled age at menarche was 13.11 ± 1.4 years (minimum-maximum = 10.2-18.0 years). For the 25 participants who had both MPS and follow-up data for age at menarche, the correlation was positive and strong: $r$ = 0.75, p < 0.001. A moderate positive relationship between mothers’ and daughters’ ages at menarche was also found, $r$ = 0.39, p < 0.001. Mothers of the MPS participant reported a slightly younger mean age at menarche than their daughters (12.83 ± 1.4 years).

Discussion: Many studies have examined the accuracy of recalled age at menarche, with the relationship between actual and recalled age at menarche ranging from $r$ = 0.70-0.81. Results from this small sample showed that MPS participants remembered their ages at menarche with similar reliability. Given that the original results were based on the recall from their mothers, the agreement between the two recalls is particularly noteworthy. The current sample is consistent with previous work which found a significant correlation of $r$ = 0.23 between mothers’ and daughters’ ages at menarche.
education programs. METHODS: Participants included 341 preservice teachers enrolled in elementary education programs in the state of Florida. Individuals ranged in age from 18 to over 50, with 93% of the participants in the age range of 18 to 29. Females accounted for 91% of the participants. All participants provided self-report height and weight information and responded to statements regarding perceptions of physical activity, healthy weight, and healthy eating. Participants also provided the number of days per week they engaged in at least 30 minutes of moderate to vigorous physical activity. RESULTS: Bivariate correlations showed that lower BMI was associated with the perceptions of a more physically active lifestyle (r = -0.25, p<0.01), healthier weight (r = -0.66, p<0.01), and healthier eating choices (r = -0.26, p<0.01). In terms of exercise, higher BMI was associated with fewer days per week of at least 30 minutes of moderate to vigorous physical activity (r = -0.16, p=0.04). CONCLUSION: The current findings indicate that BMI is associated with perceptions of health in preservice teachers in elementary education programs. Should they be replicated, such findings encourage researchers to examine the ways in which health promotion programs should be delivered to preservice teachers to improve their health and enhance their ability to promote healthy eating and physical activity to their future students.

Rates of overweight and obesity have risen significantly since the 1980’s, while levels of physical activity have declined. Reductions in physical activity may explain much of the increased body fatness realized over the past several decades, and increases in physical activity may contribute to improved body composition and weight management.

PURPOSE: To examine the relationships among markers of energy expenditure and body composition in adults. METHODS: Participants arrived at the laboratory between 6:00 and 9:00 a.m., having fasted for at least 10 hours. Height and body mass (BM) were measured, and 4-compartment body composition (percent body fat [%BF]) was determined via DEXA. Fat mass (FM) and fat-free mass (FFM) was determined using data derived from bioelectric impedance analysis and dual energy x-ray absorptiometry. Resting metabolic rate (RMR) was determined via indirect calorimetry. Participants were then provided with accelerometers to allow for measurement of various markers of physical activity (PA), including physical activity energy expenditure (PAAE), sedentary time (SEED), time spent in moderate- to vigorous-physical activity (MVPA), and step counts (STEPS). Accelerometers were worn for 21-28 days, and associations between markers of PA and body composition were analyzed. RESULTS: Absolute expressions of PA (e.g., PAAE, STEPS) were not associated with body composition. However, expressions of PA relative to various fractions of BM were significantly correlated with %BF in both men and women. The strongest predictor of %BF was STEPS·kgBM−1·day−1. Power regression analysis yielded the model, 2907.1(STEPS)·kgBM−1·day−1−0.73 in men (R2 = 0.91), and 820.25(STEPS)·kgBM−1·day−1−0.87 in women (R2 = 0.82). CONCLUSIONS: Physical activity expressed per unit of FM strongly predicted %BF. These findings suggest relative expressions of PA (e.g., STEPS·kgBM−1·day−1 or STEPS·kgBM−1·min−1) may be more efficacious than absolute expressions of PA in developing PA prescriptions for weight management.

INTRODUCTION: The High Intensity Interval Training (HIIT) has been identified as an important strategy in fitness by improving the cardiometabolic function in adults. However, different models of HIIT performed with body weight (HWB) in blocks with maximum intensity, still lack information namely the energy demand imposed in training. PURPOSE: Assessment the energy expenditure in a single session of HWB in healthy male adults. METHODS: 12 male adults (33.3 ± 12 years old) performed an all-out protocol with 30 seconds effort x 30 seconds recovery, amounting 20 minutes in the total session. The session exercises were Jumping Jack (JJ), Burpee (BP), Mountain climber (MC) and Squat Jump (SJ), performing 5 sets for each. The energy expenditure was determined by indirect calorimetry with K5, gas analyser throughout the entire session. Heart rate was also measured as well as the rating of perceived exertion (0-10 Borg scale). Repeated measures ANOVA, followed by Tukey (0.05) post hoc test, were performed to compare the differences between exercises. All analysis were performed using SPSS.

software. RESULTS: the session mean VO2 was 35.31 ± 5.21 ml.kg−1·min−1, total energy expenditure was 250.78±27.41 kcal; mean heart rate was 164±8 bpm and mean RPE was 8.92±2.68. The mean and standard deviation for the blocks of the different exercises are described in the table below, values followed by the same letter do not differ significantly from each other. Table – Mean VO2 and energy expenditure per exercise and minute of exercise.

High intensity interval training (HIIT) is known to improve cardiorespiratory fitness (VO2peak) and exercise capacity in healthy and living with chronic disease adults. Mechanical efficiency (energy demand at a given workload) also helps improve exercise capacity; however, few studies have evaluated mechanical efficiency resulting from HIIT, and none with HIV+ adults. PURPOSE: To compare mechanical efficiency in HIV+ and HIV- women after a low volume HIIT intervention. METHODS: A group of 20 HIV+ and 11 HIV- Hispanic women completed a graded exercise test (GXT) on a bicycle ergometer with increments of 25W until volitional fatigue, during which measures of VO2 and HR were obtained. GXT were conducted before and after a low volume-HIIT intervention (11 intervals) 3 days/wk. for 6 weeks (2 wks. (16 min total) at 80%, and 4 wks. (20 min total) at 90% of HR reserve). Percent VO2peak and %HRpeak were determined at 25, 50, 75, and 100W. T-tests and Wilcoxon Rank Sum tests were used to detect pre to post-tests differences within each group.

RESULTS: Compared with HIV-, HIV+ had lower VO2 at 100W workload during pre-test (15.6±1.9 vs. 17.5±1.9 ml·kg−1·min−1; P<0.01), and also at 75W and 100W during post-test (16.9±1.7 vs. 14.8±2.4, P<0.02; 21.0±2.8 vs. 17.3±3.3 ml·kg−1·min−1; P<0.01; respectively). Reduced metabolic demand (%VO2peak) was observed at 25W in HIV+ compared with HIV-, both groups increased their mechanical efficiency at various submaximal workloads; thus, improving exercise capacity with HIIT. Supported by NIMHD S21MD001830, R21MH095524, U54MD007587-04, and R25MD007607.

INTRODUCTION: The energy rate was also measured as well as the rating of perceived exertion (0-10 Borg scale). Repeated measures ANOVA, followed by Tukey (0.05) post hoc test, were performed to compare the differences between exercises. All analysis were performed using SPSS.

PURPOSE: We have previously shown that weight loss improved dyspnea on exertion in obese, otherwise healthy, women. Dyspnea is a multidimensional symptom comprised of at least two distinct domains: sensory-perceptual (i.e., dyspnea intensity) and affective distress (i.e., unpleasantness and emotional response). Both domains may lead individuals to avoid physical activity. In this prospective study, we investigated the effects of weight loss in obese women and men on these dyspnea domains.

METHODS: Twenty-one participants (12 M 9 F, 33 ± 7 years, 169 ± 12 cm, 102 ± 18 kg, 35 ± 4 kg/m2, 41 ± 7% body fat) underwent a 12-week weight loss program. Pre-
and post-intervention measurements included a submaximal cycling test at 60W for women and 105W for men. Participants rated their perceived breathlessness (RBP, 0-10 Borg scale) as well as unpleasantness, depression, anxiety, fractions, anger, and fear associated with their breathlessness (visual analog scales, 0-10 cm) at the end of the test. Paired t-tests were used to analyze difference between pre- and post-intervention.

RESULTS: Significant decreases were achieved in body weight by 9 ± 4 kg (9 ± 4%), BMI by 3 ± 1 kg/m², and body fat by 5 ± 10% (p < 0.05). RBP dropped by 1.5 ± 1.8 (p < 0.05). Significant decreases in ratings of unpleasantness (-2.3 ± 2.2), anxiety (-1.2 ± 1.8), frustration (-0.8 ± 1.9), and fear (-0.4 ± 1.0) were observed, while ratings of depression and anger were unchanged. CONCLUSIONS: Moderate weight loss alleviated not only dyspnea on exertion, but also the unpleasantness and negative emotional response related to the dyspnea. Supported by NIH Grant R01 HL096782 and King Charitable Foundation Trust.

1988 Board #144 May 30 3:30 PM - 5:00 PM
Prior Baby Jumper Use Is Correlated With Children's Parent-Reported Physical Activity Level
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PURPOSE: Baby jumpers are ubiquitous in the infant equipment selection. Anecdotally, while some parents link them to enhanced motor development, others link them with delayed walking onset. Baby jumper use involves bouncing up and down, push-offs (rebounds) against the floor with the feet. The resulting raising and lowering of the body’s center of mass is consistent with movements that require leg stiffness regulation. Leg stiffness has been shown to be positively related to maximum sprint velocity in adults and adolescents. Yet, no studies to our knowledge have investigated relationships between prior baby jumper use and current locomotor and physical activity (PA) behaviours in young typically developing children. This pilot study investigated these relationships.

METHODS: Parents of 45 children (age: 4 ± 2.3 years; height: 97.5 ± 25.6 cm; mass: 17.2 ± 9.4 kg) completed a 24-item survey administered through Qualtrics software. Questions included prior use of a baby jumper, age at walking onset, current fundamental locomotor behavior and PA level. Questions on the degree of a behavior level were on a 5-point Likert scale. Surveys were excluded, if a parent indicated that the child was born preterm or diagnosed with an intellectual or developmental disability. Bivariate correlations were used to evaluate the directionality of relationships between previous baby jumper use and locomotor and PA behaviors. A Mann-Whitney U test was used to compare age at walking onset between children who used and did not use a baby jumper.

RESULTS: Of the sample, 64% previously used a baby jumper. The proportions of the sample that were underweight, healthy weight, overweight, and obese, were 14%, 51%, 17%, and 17% respectively. Prior use of a baby jumper was moderately positively correlated with children’s parent-reported PA level (p = 0.545, p = .981). Running pace (compared to peers their age and sex) (p = .348, p = .019). There was no significant difference in age at walking onset between the groups (U = 231.0, p = .981).

CONCLUSIONS: Prior baby jumper use may be linked with running performance and PA level and may promote physical activity in young children. These relationships should be further investigated and modeled using objective measures of locomotor and PA behaviors. Prior baby jumper use did not delay walking onset in the sample.

1989 Board #145 May 30 3:30 PM - 5:00 PM
Overall Mortality, Survival, And Causes Of Death In Former US Olympians
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United States (US) send a greatest number of athletes to Olympic Games but their longevity and specific causes of deaths have not been examined.

PURPOSE: To quantify US Olympic athletes’ longevity and to determine the impact of specific causes of deaths (CoD) on Olympians life duration in relation to the general population.

METHODS: Female (n = 2,301) and male (n = 5,823) US athletes who have participated at least once in the summer or winter Olympic Games between 1912 and 2012 were followed up to 2016. Their life status and CoD were certified by the National Death Index. The years-saved method was applied to quantify longevity gains/losses in former US Olympians in comparison to the general population.

RESULTS: Former US Olympians lived on average ~5 years longer (95% CI 4.3 to 6) than their referents in the general population, based on the 2,309 deaths observed out of 8,124 former athletes. The burden of each CoD was distributed according to its impact on the total number of years of life saved: cardiovascular diseases (CVD), 2.2 years (1.9 to 2.5); cancer, 1.5 years (1.3 to 1.8); respiratory diseases, 0.8 years (0.7 to 0.9); and external causes, 0.5 (0.4 to 0.6). Nervous system diseases and mental disorders mortality rates were not significantly different from their peers in the general population.

CONCLUSION: US Olympians live ~5 years longer than their referents in the general population, advantage mainly driven by lower risks of CVD and cancer. Nervous system diseases and mental disorders do not appear to contribute to the extended longevity that Olympians display.

1990 Board #146 May 30 3:30 PM - 5:00 PM
Elevated Serum Uric Acid And Heart Failure In U.S. Adults: 2007-2016 NHANES
Michelle L. Stone, Michael R. Richardson, Larry Guevara, Bethany G. Rand, James R. Churilla, FACSM. University of North Florida, Jacksonville, FL. (Sponsor: Dr. James Churilla, FACSM)

There is limited evidence examining the relationship between elevated serum uric acid (UA) concentration and heart failure (HF) in U.S. adults. PURPOSE: Examine the associations between elevated UA and HF using a nationally representative sample of U.S. adults. Methods: The final sample with complete data for this analysis (N=17,412) included men and women aged ≥40 years who participated in the 2007-2016 National Health and Nutrition Examination Survey. Self-reported diagnosis of HF was assessed via interview. Elevated UA was defined as values >6.0 mg/dL for women and >7.2 mg/dL for men. Multivariable gender-stratified logistic regression was utilized to examine the odds of HF. Results: The estimated prevalence of HF was 3.85% and 3.39% among men and women, respectively. Age adjusted analysis revealed significantly increased odds of HF in men (odds ratio [OR], 2.78; 95% confidence interval [CI] 2.09-3.71, P<0.01) and women (OR, 3.25; 95% CI 2.37-4.45, P<0.01) with elevated UA. Significance remained following adjustment for education, income, race, body mass index, alcohol consumption, hypertension, diabetes, physical activity, and creatinine in men (OR, 1.59; 95% CI 1.04-2.43 P<0.03) and women (OR, 2.03; 95% CI 1.33-3.08, P<0.01). Conclusions: In a representative sample of U.S. adults, having an elevated UA concentration was associated with significantly increased odds of HF when compared to adults with normal UA.

1991 Board #147 May 30 3:30 PM - 5:00 PM
Modernization of a Developing Country: Effect on Body Mass Index
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Modernization provides technology and resources that commonly displace physical activity (PA) from the daily routine; in time, body mass index (BMI) trends upward.
Given the host of deleterious consequences precipitated by poor body composition, it may be helpful to isolate specific factors that predict the largest elevations in BMI. Uganda is an appropriate location to evaluate this. Over the past 5 years, the percentage of women classified as overweight or obese increased from 19% to 24%; men increased from 4% to 9%. During this time, PA underwent considerable change while nutrition was relatively stable. PURPOSE: To evaluate the impact of modernization on BMI in Uganda. METHODS: We analyzed the 2016 Demographic and Health Surveys of Uganda. Household Members database, 11,577 subjects met inclusionary criteria. We conducted descriptive statistics to characterize this population, linear regression to examine the effect of modernization on BMI, and logistic regression to test these factors on the odds of overweight (BMI ≥ 25) or obesity (BMI ≥ 30). RESULTS: Mean age was 28.7 ± 10.2 yr; BMI was 22.0 ± 3.7; 16.0% of subjects were either overweight (n=1,405) or obese (n=440). More subjects owned a bicycle (40.6%) than a motorcycle (12.6%) or car (4.3%); more subjects owned mobile phones (78.7%) than computers (4.3%); 28.8% of households had electricity and 16.2% had television. Linear regression (R²=0.160; p<0.001) found BMI to be increased when a household had a refrigerator (β=0.483; p<0.004), electricity (β=0.409; p<0.001) and television (β=0.961; p<0.001). Additionally, ownership of a car (β=0.421; p<0.016) and a mobile phone (β=0.625; p<0.001) predicted increases in BMI, while ownership of a bicycle (β=0.330; p<0.001) and a land-line phone (β=0.657; p=0.034) predicted decreases in BMI. Logistic regression (pseudo R²=0.21; p<0.001) found the odds of being overweight or obese increased when a household had electricity (79%; p<0.001) and television (107%; p<0.001). Additionally, ownership of an automobile (41%; p=0.002) and a mobile phone (41%; p=0.001) increased the odds of being overweight or obese.CONCLUSION: Specific features of modernization associate with increases in BMI. As developing countries continue their development, public health interventions are warranted to promote the maintenance of PA.

Inflammatory cytokine and immune cell production is modulated by iron status including storage measured by ferritin levels. Cross-country athletes have an elevated risk of iron depletion; the effects of long term cross country training on inflammatory cytokine profile and its relationship with iron storage markers have yet to be elucidated. PURPOSE: To determine the influence of cross-country training on markers of inflammation and iron storage and to interpret potential mechanisms underlying these relationships. METHODS: Twelve NCAA division 1 cross-country athletes, ages 18 to 25 years old, were followed for two years. Blood was collected at the beginning of the season and analyzed by complete blood count (CBC) and ferritin levels were assessed by enzymatic spectrophotometry. Cytokines IL-1β, IL-2, IL-4 IL-5, IL-6, IL10, TNF-α and IFN-γ were measured with the Luminex® MAGPIX® system. Dependent samples t-test was used to compare ferritin cytokines and CBC mean difference between fall and second year measurements. Pearson correlations were conducted to assess associations between ferritin and immune cells/inflammatory cytokines. IBM® SPSS Statistics 22 software was used to analyze the data. RESULTS: TNF-α levels increased from the 1st to the 2nd year (98.60 ± 11.17 vs. 121.41 ± 11.93 pg/dL, p=0.006). Platelets (253.63 ± 12.28 vs 267 ± 13.43 K/μL, p=0.041), Neutrophils (44.46 ± 1.26 vs 50.46 ± 2.70 K/μL, p=0.045) and Monocytes (8.58 ± 1.90 vs 10.61 ± 2.70 K/μL, p=0.003) also significantly increased from the 1st to the 2nd year. Ferritin levels were positively correlated with TNF-α both years (r=0.716 p=0.009, r=0.595 p=0.04). CONCLUSION: One year of cross-country training seems to influence increases in pro-inflammatory cytokines and immune cell concentrations in NCAA Division 1 Athletes. Although there were no significant differences in ferritin levels over the years of study, ferritin increases were linked to increases in pro-inflammatory cytokine TNF-α. Examination Survey. Weight history examined fluctuations of weight, mainly gain in weight, from self-reported current weight and self-reported weight 10 years ago. Depression status was assessed using the PHQ-9 questionnaire, using cut points to assign a depression score. Logistic regression analysis was utilized to examine odds of depression across ranges of weight gain. RESULTS: Overall prevalence of depression among U.S. adults aged 36 years and older was found to be at 7.5% (95% Confidence Interval [CI] 6.9-8.2). Following adjustment for gender, race, education, smoking, and physical activity, those who gained 20 or more lbs. had significantly greater odds of having depression (OR 1.45; 95% CI, 1.26-1.67) compared to those gaining <5 lbs. (referent). A similar relationship was not revealed for other weight gain ranges: 5-9 lbs. (OR 0.84; 95% CI, 0.62-1.14), 10-14 lbs. (OR 0.90; 95% CI, 0.70-1.15), 15-19 lbs. (OR 0.93; 95% CI, 0.66-1.31). CONCLUSION: Findings revealed that weight gain of 20 lbs. or more resulted in significantly greater odds of a PHQ-9 score indicative of depression.
by itself is likely to help sedentary men to increase the step per day number. Future research should involve more sedentary men and women of all ages to help conclude the impact of either FitBit alone and FitBit and counseling.

1996 Board #152 May 30 3:30 PM - 5:00 PM
Heart Rate Characteristics for Male Chinese College Students of Different PA-Level during 3000 Meters Running
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PURPOSE: To explore the Heart Rate Load variation for male Chinese college students of different physical activity level during 3000 meters running, providing a reference for training load monitoring and security.

METHODS: Real-time heart rate of 475 Chinese undergraduate students in Tsinghua University were test with Team 2 Polar tester during 3000-meter-run test. The physical activity was investigated by an international questionnaire. All subjects were grouped three by PA levels. Data calculated by SPSS 20.0.

RESULTS: 1. There were significant difference in heart rate among students with different levels of physical activity during 3000-meter-run. The mean of maximum heart rate in group with lower PA level was the highest 202.4±8.9, while that of the group with good PA level was the lowest 198.7±6.4 (P<0.05). 2. The heart rate has relation to the time during 3000-meter-run. The average speed of first three laps has a significant linear relationship to the average heart rate(R=0.875). The heart rate reached a plateau in the last four laps. The heart rate of all reached the maximum in the end of test. 3. The maximum heart rate of 20% individual students reached or exceeded the exceeded the sum value of maximum heart rate (220-age), and continued for a several minutes within a relatively dangerous range.

CONCLUSIONS: Mean of maximum and average heart rate of Chinese male college students with good PA level group was lower than that of poor PA level group in 3000-meter-run test. There is a high risk factor for poor PA level Chinese male students when running continuously in the maximum heart rate level. Study was supported by The Chinese General Administration of sports (2015B075).

1998 Board #154 May 30 3:30 PM - 5:00 PM
The Downfall of Sitting: The Relationship between Sedentary Time and Blood Pressure
Megan L. Conner, Grace Shin, Jamie C. Clark. University of Central Oklahoma, Edmond, OK.

PURPOSE: The purpose of this study was to evaluate the correlation between self-reported sitting time and blood pressure. It was hypothesized that sedentary time was significantly related to blood pressure.

METHODS: The study included faculty or staff that were ambulatory and full-time equivalent. The participants were given a self-reported physical activity questionnaire (The International Physical Activity Questionnaire [IPAQ]) to determine sedentary time. Resting blood pressure (systolic and diastolic) was assessed using a stethoscope and sphygmomanometer, after sitting quietly in a chair for 5 minutes. Data was analyzed with a bivariate correlation test.

RESULTS: There was a significant, positive, moderate relationship between sedentary time and systolic blood pressure (n = 10, r = .705, p = .01) and a significant, positive, strong relationship between sedentary time and diastolic blood pressure (n = 12, r = .810, p = .001). CONCLUSION: Self-reported sedentary time was positively related to blood pressure. In other words, the greater the individual’s sitting time, the higher the systolic and diastolic blood pressure was found to be. Engaging in physical activity and reducing sedentary time may decrease the likelihood of developing hypertension. Future research should focus on the effects of programming to decrease sedentary time on measures of health.

Regional body fat deposition, particularly visceral fat, may be an important mechanistic link between sedentary behavior and cardiometabolic disease risk with advancing age. PURPOSE: To examine the associations of sedentary behavior and screen time with total, visceral, and segmental body fat in middle to older aged adults. METHODS: 47 adults (mean±SD: age 53.5±11.2 y, body fat 30.5±10.6%; men 38.3%) self-reported sedentary behavior and moderate-to-vigorous physical activity (MVPA) using the Sedentary Behavior Questionnaire and International Physical Activity Questionnaire, respectively. Leisure screen time was defined as television viewing, video games and computer games. Total, visceral, and segmental body fat were estimated with the InBody770 bioelectrical impedance analyzer. Waist circumference was measured at the top of the iliac crest. Multiple regression assessed the associations of sedentary behavior and screen time with total and regional fat distribution, controlling for age, sex and MVPA. RESULTS: Average sedentary time was 7.5±2.3 h d−1 with 1.3±0.9 h d−1 reported as screen time. Sedentary time was associated with total fat mass (R2=0.19, β=0.36, p=0.02), visceral fat (R2=0.20, β=0.31, p=0.03), trunk fat (R2=0.17, β=0.36, p=0.01), waist circumference (R2=0.23, β=0.39, p=0.01) and leg fat (R2=0.24, β=0.30, p=0.03) independent of age and sex. When MVPA was added to the model total fat mass (R2=0.20, β=0.30, p=0.04), trunk fat (R2=0.17, β=0.34, p=0.03) and waist circumference (R2=0.25, β=0.36, p=0.01) remained significant. Screen time was associated with trunk fat (R2=0.13, β=0.30, p=0.04) and waist circumference (R2=0.23, β=0.38, p=0.01) independent.
Cardiovascular disease (CVD) is the leading cause of mortality and is associated with modifiable lifestyle factors, such as physical activity (PA). Research has examined CVD knowledge (CVDK) and PA level in undergraduate students; however, no research has examined the relationship between CVDK and PA in this group.

### METHODS:
Students (N=241) completed an online survey including the 30-item Heart Disease Knowledge Questionnaire and 7-item International Physical Activity Questionnaire (IPAQ). Twenty-four outliers were removed prior to any statistical analyses (n=217; 21.1±2.7 yrs; 145 females, 141 HB majors). Independent samples t-tests were conducted to test for differences in total (TK), dietary (DK), epidemiological (EK), and tolerance, obesity, and poor health-habit decision-making with regard to tobacco and alcohol use.

### RESULTS:
Table 1 shows the least and most favorable three SOC groups in each occupational category with mean (standard error) reported. P-values represent overall group comparisons. Pearson’s r was used to test for linear associations between TK and PA indices. RESULTS: Sixty-seven percent of students met recommended PA guidelines with a median of 500 MET-min/week of MVPA. Females had greater RFK than males (4.6±1.6 vs. 4.0±1.6, p<0.006). HB majors had significantly higher RFK than males (4.6±1.6 vs. 4.0±1.6, p=0.006). HB majors had greater knowledge than NHIB majors in all areas except SK; however, there were no differences in PA levels between majors. This suggests that CVDK may not translate to increased PA levels in undergraduates. Future research should investigate relationships between CVDK and risk reduction behaviors in this population.

### CONCLUSIONS
Of the recognized emergency medical service professionals, the least is known about EMTs and EMTB students. One known study suggests that EMT-B students have some level of predisposition to conditions such as high blood pressure, low exercise tolerance, obesity, and poor health-habit decision-making with regard to tobacco and alcohol use.

### Purpose:
To determine the prevalence of health risk, physical activity, and sedentary behaviors among students enrolled in an Emergency Medical Technician Certification Program.

### Methods:
Sixty EMT students (mean age 24.9 ± 8.3 years, 46.7% female, 98.4% Caucasian) completed risk behavior surveys including physical activity, health status, smoking, and alcohol use modeled after the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS) and a Modified Activity Questionnaire (MAQ) to assess leisure-time physical activity and sedentary behavior.

### Results:
The median (25th, 75th percentile) MET/min/week of self-reported physical activity from the MAQ for all participants was 558 (228, 1074) and by gender 660 (246, 1074) males and 480 (375, 1098) females. When categorized as meeting or not meeting the current US Physical Activity Guidelines, 56.7% met or exceeded the ≥ 500 MET/min/week guideline. Median BMI for all participants was 25.6 (22.9, 30.1) kg/m2 with approximately 28.3% of the population considered overweight and 25% obese. Among reported health conditions, 41.7% rated their general health as very good or excellent; 20.0% percent reported being diagnosed with asthma and 16.7% reported being diagnosed with a depressive disorder. With regard to smoking and alcohol, 11.7% reported currently smoking, 15.0% reported current use of chewing tobacco or snuff and 43.3% reported ever using or using an e-cigarette. Additionally, participants reported a mean (standard deviation) of 4.4 (4.6) days per month of drinking at least one drink of alcohol and drinking 2.4 (2.5) drinks when they drank. CONCLUSION: Among EMT students, over half are meeting the current US Physical Activity Guidelines. Prevalence of overweight/obesity, smokeless tobacco use, and reported depression may put this population at risk for comorbid conditions as they transition from student to professional EMT.

### Purpose:
High accumulated sedentary time with inadequate physical activity is a common behavioral profile in the United States. Examining differences in activity patterns across occupational categories can distinguish target populations for intervention.

### Methods:
This cross-sectional analysis of Year 20 CARDIA data (2003-6) included participants who had valid accelerometry data (24 days with ≥10 hours), reported job and job duties, and were not currently a student (n=2,050). Uniaxial accelerometry data (Actigraph GT3X, including leisure and occupational time, were expressed in 60 second epochs and summarized as: average counts per minute (CPM) and time spent (hours/day) in total sedentary behavior (SED), light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) using Freedson cutpoints. Self-reported job and job duties were categorized into the 23 major groups of 2010 Standard Occupational Classification (SOC) using OccuCode v2.7 followed by adjudication by a trained researcher. Military and forestry categories were excluded because <5 participants reported jobs in those categories. Omnibus group differences were analyzed using ANCOVA adjusted for sex, race, age, education, wear time, center, and BMI.

### Results:
Table 1 shows the least and most favorable three SOC groups in each activity category with mean (standard error) reported. P-values represent overall group comparisons.
difference across occupational categories. Building/grounds maintenance had the highest CPM while office and admin support had the lowest. Architecture/engineering had the highest CPM while food preparation had the lowest. Food preparation had the most LPA and legal had the least. Construction had the highest MVPA while healthcare support had the lowest.

CONCLUSION Activity patterns have large variation across occupational categories, justifying occupation as an important determinant of activity and the workplace as a potential intervention setting.

Table 1 – Occupational Categories with the Most and Least Favorite CPM, SPD, LPA, and MVPA

<table>
<thead>
<tr>
<th>Least favorite 3 categories</th>
<th>mean (SE)</th>
<th>Most favorite 3 categories</th>
<th>mean (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPM</td>
<td>Office and Administrative Support</td>
<td>121.8 (2.2)</td>
<td>Healthcare Support</td>
</tr>
<tr>
<td>SPD</td>
<td>Architecture/Engineering</td>
<td>305.6 (0.9)</td>
<td>Architecture/Engineering</td>
</tr>
<tr>
<td>LPA</td>
<td>Legal</td>
<td>3.89 (0.04)</td>
<td>Legal</td>
</tr>
<tr>
<td>MVPA</td>
<td>Healthcare Support</td>
<td>0.50 (0.02)</td>
<td>Community and Social Service</td>
</tr>
</tbody>
</table>

**2004 Board #160 May 30 3:30 PM - 5:00 PM**

**Association Between Cardiorespiratory Fitness and Continuous Cardiometabolic Syndrome Risk Score in Korean Men**

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(No relevant relationships reported)

**PURPOSE:** We examined the hypothesis that cardiorespiratory fitness (CRF), defined as maximal oxygen uptake, predicts the risk of incident cardiometabolic syndrome (CMS) defined as having ≥3 relevant risk factors and is prospectively associated with continuous CMS risk score in healthy men. METHODS: Participants were 2,742 Korean men who underwent general health examinations and had no evidence of CMS, cardiovascular diseases, diabetes, and hypertension at baseline. Baseline CRF was directly measured by peak oxygen uptake (VO2peak) and divided into quartiles. Incident CMS was defined as participants having ≥3 CMS components, and continuous CMS risk score was computed as the sum of z-score of five risk factors at follow-up. RESULTS: During a median follow-up of 5 years, 946 (34.5%) men developed CMS. The relative risks (RR) and 95% confidence interval (CI) of incident CMS in the highest quartile (>31.8 ml.kg.min) vs. the lowest quartiles of peak oxygen uptake (<31.8 ml.kg.min) was 0.62 (95% CI: 0.52-0.75) after adjusting for age, body mass index, smoking and alcohol intake. Baseline peak oxygen intake was independently associated with continuous CMS risk score at follow up after adjusting for covariates (β=-0.092, p<0.001). CONCLUSION: The association between CRF and incident CMS and continuous CMS risk score, suggesting that improving CRF should be considered as an additional risk factor to predict the future likelihood of CMS in Korean men.

**2005 Board #161 May 30 3:30 PM - 5:00 PM**

**Differential Impacts Of Exercise Systolic Blood Pressure Response On The Risk Of Sudden Cardiac Death In Men With And Without A History Of Cardiovascular Disease**

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(No relevant relationships reported)

**PURPOSE:** Although exercise systolic blood pressure (ESBP) response has been associated with cardiovascular prognosis in men with and without known or suspected coronary artery disease, it remains unclear whether ESBP is associated with an increase or a decrease in the risk of sudden cardiac death (SCD) in both groups. We tested the hypothesis that ESBP would be associated with differential outcomes of SCD in men with and without a history of cardiovascular disease. METHODS: This prospective study was based on a population sample of 2,410 men, aged 42-61 years, who were followed up in the Kuopio Ischemic Heart Disease cohort study. Excessive ESBP was defined by a maximal SBP ≥210mmHg during progressive bike exercise testing to volitional fatigue. Participants were stratified by men with (n=884) and without (n=1,526) a history of cardiovascular disease at baseline. RESULTS: During a median follow-up of 25 years, 226 SCDs occurred. After adjusting for age, each 10 mmHg increase in ESBP was associated with an increased or decreased risk for SCD in men without (HR=1.14, 95% CI 1.06-1.24) and with (HR=0.94, 95% CI 0.89-0.99) a history of cardiovascular disease, respectively. After adjusting for age, BMI, resting SBP, smoking, alcohol intake, LDL-C, HDL-C, family history of heart disease, diabetes, and maximal oxygen uptake, an increased risk of SCD was observed with excessive ESBP response in men without a history of cardiovascular disease (HR 1.73, 95% CI 1.07-2.82). A trend for a reduction in the SCD risk was observed with excessive ESBP response in men with history of cardiovascular disease (HR 0.92, 95% CI 0.60-1.41).

**CONCLUSION:** Our findings indicate that ESBP response was associated with the risk of SCD in both groups. However, the heightened risk of SCD associated with excessive ESBP response appeared in men without a history of cardiovascular disease, whereas excessive ESBP response may have opposite results in men with a history of cardiovascular disease.
Leisure time PA was estimated using the Baecke questionnaire. Participants were included in the analysis if they were at least 18 years of age, scored at least 5 on the IPAQ, and had no history of cardiovascular disease. Spearman’s correlation coefficient was used to assess the relationship between IPAQ and the Baecke questionnaire, and Cohen’s d was used to assess the magnitude of the effect. Pearson’s chi-square test was used to test for differences in the proportions of physically active, moderately active, and insufficiently active across the different European countries. Significance was set at p<0.05.

RESULTS: A significant positive association was found between the IPAQ and the Baecke questionnaire for both sexes (p<0.05). The magnitude of the effect was larger for men than for women. There were no significant differences in the proportions of physically active, moderately active, and insufficiently active across the different European countries (p>0.05).

CONCLUSION: The IPAQ is a valid and reliable method for assessing physical activity in men and women. The results of this study provide evidence for the use of the IPAQ in epidemiological studies in men and women. Future research should be conducted to assess the validity and reliability of the IPAQ in other populations, such as children and older adults.
Conclusions: Different environments promote different life quality in aged population. BL evidences poorer quality of life and fitness status than other European countries. HU seems to well promote healthy lifestyle. Further investigation is need to better understand the present findings.

The biological mechanisms underlying the beneficial effects of regular physical activity (PA) on prevention of chronic diseases are not fully understood. It is currently suggested that N-linked enzymatic glycosylation, a post-translational modification modulating the biological function of several proteins, may contribute to disease development. Nevertheless, the influence of PA on N-glycans in humans has never been explored. PURPOSE: To explore serum N-glycan profile in a sample of community-dwelling older women with different objectively assessed PA levels and metabolic risk status. METHODS: Components of the metabolic syndrome (MetS) and serum N-glycans analyzed using DSA-FACE technology were assessed in 109 older community-dwelling women (65-70 yrs). Ten peaks, each representing a unique N-glycan structure were detected. Adherence to PA guidelines was determined using accelerometer. Participants daily engaged in 30 minutes of MVPA were classified as meeting PA guidelines. RESULTS: Significant differences in N-glycan peaks were indicated when comparing women adhering to the PA guideline to those less active: when adjusted by MetS, a 12% (p = 0.006) and a 13% (p = 0.004) lower level of NA3 (peak 8) and NA4 (peak 10), respectively, were evident among the physically active women compared to those less active. In contrast to findings based on the MVPA threshold, no differences in N-glycan peaks were observed between PA groups when based on the lower intensity threshold, which may indicate that the influence on N-glycan levels by PA is intensity-sensitive. CONCLUSIONS: Adherence to PA guidelines is related to a favorable N-glycan profile, regardless of metabolic risk status. This proposed effect on N-glycans only occurs above the moderate PA-intensity threshold. Our findings support the promotion of a physically active lifestyle as a supporting non-pharmacological public health approach.

PURPOSE: The effects of consuming a normal or high-protein diet containing isolated whey protein (IWP) in conjunction with resistance training (RT) is little known. This study aimed to determine the effects of IWP on performance, biochemical, hormonal and tissue parameters in rats completing a vertical ladder training protocol. METHODS: Thirty two 45-day-old male Wistar rats were divided into four groups (n=8/group): normal protein diet (14% IWP) sedentary (NS); high protein diet (35% IWP) sedentary (HT); high protein diet (35% IWP) trained (HT); RT consisted of 8 vertical ladder climbs/3x a week, over 6 weeks. In weeks 1-2, rats carried a load equivalent to 70% of the maximal load, determined by a maximal load test (MLT), performed on the first and last days of training. The load was adjusted to 80% and 85% of the MLT, respectively, every 2 weeks. At the conclusion of the study, the animals were anesthetized and euthanized after 12h of fasting. Quadriiceps (Q), anterior tibial, gastrocnemius (G), soleus and long finger extensor, kidneys, liver and heart tissues were excised and weighed (g). RESULTS: Performance values (g) on the last MLT improved in HT (964.8±117.6) compared to HS (730.6±89.7), NT (472.6±72.7) and NS (323.0±63.7). There was no difference in plasma levels of testosterone, IGF-1, hepatic enzymes, creatinine, and β-hydroxybutyrate, as well as hematological parameters. Levels of HDL-c (p=0.001) were higher in HT (104.4±26.0) and HS (100.7±21.2) compared to NS (73.9±15.7) and NT (60.8±12.0). There was an observed difference in the relative weights of the kidneys (HS=0.72±0.05, HT=0.70±0.04, > NS=0.58±0.04, NT=0.59±0.02, p=0.0001), liver (HT=2.93±0.21 > NS=2.62±0.19, NT=0.59±0.02, p=0.004) and heart (HS=0.32±0.02 > NS=0.28±0.02, NT=0.27±0.01, p=0.003). In relation to the relative muscle weight of G (p=0.05) and Q (p=0.02), HT (1.16±0.09; 1.67±0.09) showed higher values in comparison to NT (1.04±0.08; 1.53±0.09). CONCLUSIONS: A high-protein diet of 35% IWP in combination with RT improved performance as well as increased muscle and organ weight without damaging tissues related to protein metabolism (confirmed by unchanged hematological parameters). This finding may help to minimize the risk of developing cardiometabolic disorders in certain populations.

PURPOSE: Cold-water immersion during recovery from resistance-type exercise impairs myofibrillar protein synthesis rates.

PURPOSE: Different environments promote different life quality in aged population. BL evidences poorer quality of life and fitness status than other European countries. HU seems to well promote healthy lifestyle. Further investigation is need to better understand the present findings.
PO: The ideal amount of protein intake for endurance athletes has been poorly investigated. The aim of our study was to evaluate the physiological impact of different dietary protein intakes on body composition and performance outcomes in a group of elite cyclists. METHODS: Thirty-four elite cyclists (1600-1800 km/month) participated in the study. Subjects were divided in 4 groups with different levels of protein intake: normal (NP, 1.2 g/kg), moderate (MP, 1.6 g/kg), high (HP, 2.0 g/kg) or very high (VHP, 2.4 g/kg) protein intake. Differences in body composition such as fat mass, fat-free mass, lean mass, and muscle mass were evaluated. RESULTS: After two months both HP and VHP showed a significant improvement in the fat mass compared to NP and MP groups. In all conditions, VO2max, peak power output and 1 RM half squat test were also improved. CONCLUSIONS: Our data suggest that an higher protein intake (2.0 and 2.4 g/kg) may help elite cyclists to improve performance and to increase muscle mass without differences between the two levels of protein intake. Instead 1.2 and 1.6 g/kg of protein seemed to be not sufficient and could impair performance and muscle mass.

PURPOSE: Nutrient timing is a strategic approach to maximize training effects, reduce risk of injury, and help with recovery. The present study examined the effect of BCAA plus Glucose on markers of muscle damage and Inflammation after eccentric exercise in male college students.

METHODS: 18 healthy college students were divided into control group (PLA) group and supplement (BCAA+G) group randomly. Each group was randomly assigned 4 people for pre-exercise supplementation and 4 people after exercise for the first time, and changed for the second time. Before or after supplementation, volunteers performed an eccentric exercise protocol. Muscle soreness (VAS), creatine kinase (CK), C-reactive protein (CRP) and interleukin-6 (IL-6) and 3-Methylhistamine (3MH) levels were measured, and 3-MH and creatinine (Cre) concentrations were measured, and 3-MH and Creatinine were validated by the result that the time-course change in the total amount of UN and UN normalized by Cre were consistent at any given time point. The area under the curve (AUC) of 3-MH was significantly higher in Pre than that in No (P < 0.01). There was no significant difference between Post and No in the AUC of 3-MH. The AUC of 3-MH was significantly higher in Pre than that in No (P < 0.05) and No (P < 0.01).

CONCLUSION: These results suggest that nutrient intake before RE may have no substantial MHE. Supported by Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, culture, Sports, Science, and Technology (Grants 26702029 and 15KK0358).

PURPOSE: To compare the satiating effect of two protein diets on resistance-trained individuals in short-term energy deficit.

METHODS: Following University ethical approval, 16 resistance-trained participants (age 28±2.6 years; height: 1.72±0.03m; body mass: 88.83±11.54kg; body-fat: 21.85±1.82%) were randomly assigned to a moderate (PROmed) 1.8 g·kg⁻¹·day⁻¹ or high protein (PROhigh) 2.9 g·kg⁻¹·day⁻¹ matched calorie-deficit diet for 7 days in a cross-over manner, including 4-week wash-out. Venous samples were collected (time-points T0, 60, 120mins) for assessment of plasma ghrelin and protein YY concentrations to a fixed-protein (0.7g·kg⁻¹) meal, along with perceived satiety ratings, following each diet.

RESULTS: Following PROmed, mean ghrelin concentration (pg·ml⁻¹) significantly reduced post-meal (T0: 972.8±130.4, T60: 659.7±86.4, T120: 613.6±114.3; p<0.003 compared to T0). Similar observations were reported for PROhigh (T0:1088.2±158.8, T60: 972.8±130.4, T120: 659.7±86.4; p<0.001). However, T120 responses differed between conditions, and further confirmed when data were normalised for relative change (PROmed : -0.40±0.06, PROhigh : -0.26±0.06; p<0.015). YY concentrations (pg·ml⁻¹) increased post-meal across time-points (PROmed: 84.9±8.9 to 147.1±11.9 and PROhigh: 100.6±9.5 to 143.3±12.0; p<0.001), with no differences reported between diets. Perceived ‘hunger’, ‘fullness’ and ‘satiety’ were comparable between diets (p>0.05). However, ‘desire to eat’ remained significantly blunted at T120 post-meal for PROhigh only (p<0.048). CONCLUSIONS: PROmed does not confer additional satiating benefits in resistance-trained individuals during short-term energy deficit. Ghrelin response to a test-meal support the contention that satiety was sustained with PROmed with implication that high protein meals may be adequate to increase acute satiety when following a PROmed energy-restricted diet.

PURPOSE: To investigate the order of nutrient intake and RE on acute changes in urinary MB marker and thus MHE.

METHODS: Twelve healthy men were divided into three conditions: 1) nutrient intake before RE condition (Pre), 2) nutrient intake after RE condition (Post), and 3) RE without nutrient intake condition (No). They performed 5 types of multiple RE at 70%RM intensity. In all conditions, RE was performed from 8:30 to 9:30. The time of nutrient intake in the Pre was at 7:00, while in the Post was at 9:30. The standard Japanese lunch menu with 21 g of whey protein and 200 ml of milk (total energy, 1019 kcal; Protein, 53.4 g; fat, 25.1 g; carbohydrate, 139.5 g) was provided. Urinary samples were collected at 7:00, 10:00, 12:00, 15:00, and 18:00, and urea nitrogen (UN), creatinine (Cre), and 3-MH concentrations were measured, and 3-MH and UN, were normalized by Cre. The acute responses of MB markers were validated by the result that the time-course change in the total amount of UN and UN normalized by Cre were consistent at any given time point. The area under the curve (AUC) of 3-MH was significantly higher in Pre than that in No (P < 0.01). There was no significant difference between Post and No in the AUC of 3-MH. The AUC of UN was significantly higher in Pre than that in Post (P < 0.05) and No (P < 0.01).

CONCLUSION: These results suggest that nutrient intake before RE may have no substantial MHE. Supported by Grant-in-Aid for Scientific Research from the Japanese Ministry of Education, culture, Sports, Science, and Technology (Grants 26702029 and 15KK0358).

ABSTRACTS

Board #173 May 30 2:00 PM - 3:30 PM
Different Amounts Of Protein Intake Influence Body Composition And Performance In Elite Cyclists

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PURPOSE

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Ontology relationships reported

None

May 30 2:00 PM - 3:30 PM
Acute Effect Of The Order Of Resistance Exercise And Nutrient Intake On Muscle Breakdown

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Abstracts were prepared by the authors and printed as submitted.

no relevant relationships reported

Combined resistance exercise (RE) and nutrient intake synergistically interacts with muscle hypertrophic effect (MHE) (Phillips et al.,2006). Indeed, muscle breakdown (MB) is suppressed with acute RE and proper nutrient (amino acid + carbohydrate), reflected by decreases in 3-methylhistidine (3-MH), a MB marker in 24h urine collection. The study also suggested that the response of MB marker upon acute RE may reflect MHE in chronic RE training (Bird et al., 2006). However, the effect of the order of nutrient intake and RE on acute MB response remains unclear. Given that MB acutely responds to RE (Louis et al., 2007), it is important to assess acute changes in MB markers upon nutrient intake and RE. PURPOSE: The aim of this study was to investigate the order of nutrient intake and RE on acute changes in urinary MB marker and thus MHE.

CONCLUSIONS: Our data suggest that an higher protein intake (2.0 and 2.4 g/kg) may help elite cyclists to improve performance and to increase muscle mass without differences between the two levels of protein intake. Instead 1.2 and 1.6 g/kg of protein seemed to be not sufficient and could impair performance and muscle mass.
PurPOSE: To analyze the association between the number of meals with adequate protein intake and maximal deadlift strength in college athletes.

METHODS: We evaluated 250 (107 women) college athletes across a national contest. Maximal strength was assessed with one repetition maximum (1RM) on deadlift and was adjusted for body mass (kg) and adjusted for sex. Adequate protein intake per meal was defined as ≥0.3 g/kg of body mass. Adequate protein intake was calculated for the total relative protein intake. Therefore, the association between protein intake and deadlift strength for this population fell significantly below region/gender-specific reference ranges.

CONCLUSIONS: The number of meals with adequate protein intake is associated with higher deadlift 1RM. However, its importance decreased when adjusted for covariates (age [years], lean body mass [kg], bioelectrical impedance), height [cm], sex, relative protein intake [g/kg/d] for each criterion.

RESULTS: For ≥0.3 g/kg criterion, the ≥4 meals group showed significantly higher 1RM than ≤1 group for the unadjusted model. When it was corrected for age, lean body mass, height, and sex, it remained significant. However, the differences were no longer significant when the model was also adjusted for sex, and relative protein intake. As the model was adjusted, the number of meals decreased their contribution to the model. The same pattern was observed with the >0.3 g/kg criterion (Table).

CONCLUSIONS: The number of meals with adequate protein intake is associated with higher 1RM. However, its importance decreased when adjusted for relative protein intake. Therefore, the association between protein intake and deadlift strength could be mediated by total relative protein intake, and the number of meals with adequate protein intake could serve as a strategy to eat more protein rather than playing a “timing” role.

Table. Comparison of maximal deadlift strength by number of meals with adequate protein intake.

<table>
<thead>
<tr>
<th>Number of meals with adequate protein intake</th>
<th>≤1</th>
<th>2</th>
<th>3</th>
<th>≥4</th>
<th>p</th>
<th>R²</th>
<th>R#</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>52</td>
<td>73</td>
<td>91</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1RM (kg/kg) †</td>
<td>1.35 ±0.055</td>
<td>1.52 ±0.047</td>
<td>1.57 ±0.042</td>
<td>1.60 ±0.069</td>
<td>0.008</td>
<td>0.047</td>
<td>0.047</td>
</tr>
<tr>
<td>1RM (kg/kg) †</td>
<td>1.36 ±0.055</td>
<td>1.49 ±0.044</td>
<td>1.54 ±0.041</td>
<td>1.62 ±0.099</td>
<td>0.020</td>
<td>0.04</td>
<td>0.204</td>
</tr>
<tr>
<td>1RM (kg/kg) †</td>
<td>1.43 ±0.063</td>
<td>1.51 ±0.046</td>
<td>1.54 ±0.043</td>
<td>1.52 ±0.108</td>
<td>0.586</td>
<td>0.008</td>
<td>0.218</td>
</tr>
<tr>
<td>n</td>
<td>56</td>
<td>78</td>
<td>86</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3 g meal</td>
<td>1.34 ±0.053</td>
<td>1.53 ±0.045 b</td>
<td>1.55 ±0.043 b</td>
<td>1.69 ±0.072 b</td>
<td>0.001</td>
<td>0.067</td>
<td>0.067</td>
</tr>
<tr>
<td>0.3 g meal</td>
<td>1.40 ±0.051 a</td>
<td>1.49 ±0.043 a</td>
<td>1.49 ±0.043 a</td>
<td>1.71 ±0.092 b</td>
<td>0.032</td>
<td>0.036</td>
<td>0.188</td>
</tr>
<tr>
<td>0.3 g meal</td>
<td>1.49 ±0.061</td>
<td>1.52 ±0.046</td>
<td>1.46 ±0.044</td>
<td>1.57 ±0.106</td>
<td>0.621</td>
<td>0.007</td>
<td>0.211</td>
</tr>
</tbody>
</table>

Data expressed as mean ±standard error. Different letters denote significant differences between groups (p<0.05). IET: One repetition maximum (kg of weight lifted/kg body mass). * Unadjusted model. † Adjusted for age, lean body mass, height, and sex. ‡ Adjusted for age, lean body mass, height, sex, and relative protein intake. R² for number of meals within the model. R# for the model.

Anterior cruciate ligament (ACL) rupture results in significant quadriceps weakness, which will then cause abnormal gait and knee instability. Eccentric training (ET) can produce larger effects on muscle strength than concentric training, which may be further augmented by protein supplement. Purpose To examine the effects of combining whey protein supplement with preoperative isokinetic ET on quadriceps strength and function after ACL rupture. Methods Thirty-seven male subjects aged 18-40 years with ACL rupture were randomly assigned to isokinetic ET (IET, N=19) group or isokinetic ET with whey protein isolate (IET+WP, N=18) group. Both groups received preoperative isokinetic ET for six weeks, containing 3-4 sets per day with 8-10 repetitions for each set, twice a week. Subjects in IET+WP consumed whey protein isolate 22 g per day. Cross-Sectional Area (CSA) of quadriceps was scanned by MRI, and strength and knee function were measured before and after the trials. Results After intervention, CSA of the involved quadriceps increased by 3.7% (NS) in IET and 7.6% (P=0.012) in IET+WP. The ratio of side-to-side increased by 3.9% (NS) in IET and 4.8% (P=0.002) in IET+WP. The peak torque of quadriceps during eccentric contraction at 60 degree/s, concentric contraction at 60, 180 and 300 degree/s increased by 27.9% (P=0.001), 35.9% (P=0.001), 34.3% (P=0.002) and 27.3% (P=0.003) in IET, and increased by 44.2% (P=0.001), 42.3% (P=0.001), 37.4% (P=0.002) and 36.7% (P=0.001) in IET+WP, respectively, with no differences between the two groups. Lysholm and IKDC2000 knee function score in IET+WP increased by 30.0 degree/s increased by 27.9% (P<0.001), 35.9% (P=0.001), 34.3% (P=0.002) and 27.3% (P=0.003) in IET, and increased by 44.2% (P=0.001), 42.3% (P=0.001), 37.4% (P=0.002) and 36.7% (P=0.001) in IET+WP, respectively, with no differences between the two groups. Lysholm and IKDC2000 knee function score in IET+WP increased by 24.7% (P=0.001) and 12.9% (P=0.001). Conclusions Combining whey protein supplement with ET tends to be more effective on improving CSA of quadriceps, knee function and quadriceps strength when compared to ET alone after ACL rupture, even though the results did not reach statistical differences. References [1]. Douglas, J., et al., 2017. [2]. Cermak, N.M., et al., 2012. Supported by The National Key Research and Development Program (No.2016YFD0400603)
The Effect of Protein Supplementation on Recovery From Exercise-Induced Muscle Damage
Brooke E. Starkoff, Elizabeth Lenz, Craig O. Mattern, Danny Too, FACSM, Heidi K. Byrne. Valparaiso University, Valparaiso, IN. The College at Brockport, State University of New York, Brockport, NY. (No relevant relationships reported)

PURPOSE: To determine whether or not a carbohydrate plus protein (CHO-P) supplement (containing branched chain amino acids) invoked improved recovery from exercise-induced muscle damage (EIMD) when compared to an isocaloric carbohydrate (CHO) only control supplement, while simultaneously controlling for diet. METHODS: Twenty resistance-trained college males (22.1±3.9 yrs, 176.0±6.9 cm, 84.2±17.6 kg) participated in a ten-day, double-blind, randomized trial. Subjects consumed a provided diet (60%5% carbohydrate, 25%4% fat, 15%3% protein) and a daily supplement of 60 g carbohydrates or 40 g carbohydrates plus 20 g protein for eight days. On the fifth day, subjects completed a 100-lb jump EIMD protocol. Measures of creatine kinase and myoglobin were obtained prior to EIMD and at 12, 24, 48, and 72 hours post-EIMD. RESULTS: Creatine kinase levels (U/L) were elevated at 12 (227.1±18.5), 24 (216.1±17.0), 48 (189.6±18.3), and 72 (168.1±18.0) hours post-EIMD when compared to baseline (121.4±15.2). Myoglobin levels (ng/mL) were elevated at 12 (60.4±56.6) hours post-EIMD when compared to baseline (8.74±6.5). Although the elevations in creatine kinase and myoglobin indicate that EIMD was produced, there were no significant differences in creatine kinase or myoglobin between CHO and CHO-P groups at any time points measured. Muscle soreness and lower body muscle force production were measured pre-EIMD and at 24, 48, and 72 hours post-EIMD. RESULTS: Muscle soreness was increased at all time points post-EIMD, there were no significant differences between the CHO and CHO-P conditions. In addition, there were no significant differences in lower body muscle force production between the CHO and CHO-P conditions. CONCLUSION: These data suggest that a CHO-P supplement does not elicit greater recovery from EIMD when compared to a CHO supplement alone.

Association of Protein Intake at Three Meals With Muscle Mass in Healthy Young Adults
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PURPOSE: It is well established that moderate-vigorous intensity physical activity (MVPA) and resistance training (RT) positively influence muscle capacity and quality and health across the lifespan. Dietary protein intake is also known to influence muscle mass. Data suggest that MVPA, RT, and dietary protein intake differ in young men and women, which may impact muscle capacity and quality; however, research in recreationally active young adult cohorts is lacking. PURPOSE: The aim of this study was to determine the associations between dietary protein intake quantity and source and muscle mass (MC) and quality (MQ), controlling for MVPA and RT, in young men and women. METHODS: Young adults (n=122; 18-22 yr; 54% female) were assessed for a) total, animal and plant protein intakes via 3-day diet recall with an estimated energy intake of 1250-1500 kcal; b) body composition via DXA scans; and c) knee extensor muscle strength (MC-S) and power (MC-P) via isokinetic dynamometry. RESULTS and CONCLUSIONS: Among dietary protein intake patterns, males differ in their dietary protein intake patterns. Moreover, dietary protein intake is moderately related to muscle capacity and quality with effects being stronger in males compared to their female counterparts.

Effects Of Soy Milk Ingestion On Running Anaerobic Sprint Test (RAST) Performance
Govindasamy Balasekaran, FACSM, Pan Shi Yu. Nanyang Technological University, Singapore, Singapore. (No relevant relationships reported)

PURPOSE: To determine whether or not a carbohydrate plus protein (CHO-P) supplement (containing branched chain amino acids) invoked improved recovery from exercise-induced muscle damage (EIMD) when compared to a CHO supplement alone.

The Effect of Protein Supplementation on Recovery From Exercise-Induced Muscle Damage
Brooke E. Starkoff, Elizabeth Lenz, Craig O. Mattern, Danny Too, FACSM, Heidi K. Byrne. Valparaiso University, Valparaiso, IN. The College at Brockport, State University of New York, Brockport, NY. (No relevant relationships reported)

PURPOSE: In addition to importance of total daily protein intake for regulation of muscle mass, protein intake over 0.24 g/kg body weight (BW) from each meal may be necessary to maximize postprandial muscle protein synthesis in young population. Therefore, we hypothesized that if individuals do not achieve protein intake over 0.24 g/kg BW at least one of three meals (breakfast, lunch, and dinner), muscle mass can be decreased. This cross-sectional study examined the association of protein intake at three meals with muscle mass among healthy young subjects. METHODS: We collected 3-day dietary records to evaluate dietary intake. We calculated total fat free mass (FFM) and appendicular (AppFFM) with dual-energy x-ray absorptiometry, and TotalFFM% and AppFFM% were also calculated as FFM relative to BW. The 266 subjects were categorized into two groups: AP group, achieving over 0.24 g/BW of protein intake at all three meals; or NP group, not achieving 0.24 g/BW of protein intake at least one meal. RESULTS: There was no linear association between total protein intake above the recommended dietary allowances (RDA) and TotalFFM%. Males had a significant association of protein intake at three main meals with muscle mass in subjects consuming total daily protein intake above the RDA. Regardless of potential confounders (e.g. sex, physical activity, and energy intake), we demonstrated that TotalFFM% (77.0 ± 0.5 vs 75.2 ± 0.4%, P = 0.008) and AppFFM% (34.7 ± 0.3 vs 34.1 ± 0.2%, P = 0.008) in AP group was greater than in NP group consuming total protein intake above the RDA. CONCLUSION: This finding suggests that even if individuals achieve total protein intake above the RDA, not achieving protein intake over 0.24 g/kg BW at least one meal may lead to decreased muscle mass in young population. This work was supported by the Japanese Council for Science and Technology (SIP: Project ID 14531567), and the grant “Technologies for creating next-generation agriculture, forestry and fisheries” (funding agency: Bio-oriented Technology Research Advancement Institution, NARO).
Cyclic fluctuations in ovarian hormone (estrogen and progesterone) levels that play an important role in reproductive function are a unique characteristic of adult women. However, these changes in ovarian hormone levels affect physical and mental condition. Previous studies have reported that levels of branched-chain amino acids (BCAA) and aromatic amino acids (AAA) in the blood are related to fatigue. PURPOSE: This study investigated the effects of the menstrual cycle on the concentration of BCAA and AAA during endurance exercise and the recovery period in female athletes. METHODS: Seven eumenorrheic female athletes (lacrosse players; age, 21.7 ± 0.5 years; height, 1.574 ± 0.1 cm; weight, 52.7 ± 4.8 kg), who usually exercised 4 h/day, 5 days/week, were recruited. Subjects performed endurance exercise on a cycle ergometer for 60 min at 65% of VO2peak, measured in a preliminary trial, during the follicular phase (FP) and luteal phase (LP) of their menstrual cycles. After exercising, subjects rested in a chair for 60 min and their post-exercise recovery was observed. Blood samples were taken: pre-exercise (0 min); 30 min after the start of exercise (30 min); 45 min after the start of exercise (45 min); immediately post-exercise (60 min); 30 min post-exercise (90 min); and 60 min post-exercise (120 min). Levels of estradiol, progesterone, BCAA (valine, leucine, and isoleucine), and AAA (tyrosine, phenylalanine) in the blood were assessed. The Fischer ratio (BCAA/AAA) was calculated using the following formula: BCAA/AAA = (valine + leucine + isoleucine) / (tyrosine + phenylalanine). RESULTS: Estradiol and progesterone levels were significantly lower in the FP than in the LP (estradiol: 40.2 ± 15.4 µg/mL vs. 170.8 ± 75.2 µg/mL, p < 0.01; progesterone: 0.5 ± 0.1 ng/mL vs. 11.3 ± 6.5 ng/mL, p < 0.05). The Fischer ratio significantly decreased from exercise initiation to exercise conclusion during both phases (FP: 3.6 ± 0.4 (0 min), 3.2 ± 0.3 (60 min), p < 0.05; LP: 3.6 ± 0.4 (0 min), 3.3 ± 0.6 (60 min), p = 0.05); however, no significant differences were observed between the FP and LP. CONCLUSION: No differences in the levels of BCAA and AAA in the blood were observed between the FP and LP of the menstrual cycle pre-, during, or post-exercise.
CONCLUSIONS: A 30-min acute moderate aerobic exercise could elicit inhibitory control for young adults. The studies manifested the potential physiological mechanism for central nervous system and autonomous nervous system which were reflected by HRV index.

Project funded by the National Health and Medical Research Council (APP1120518).

In aiding cognition underlying older adolescents' academic performance.

Purposes related to faster processing speed and greater RA during a task modulating inhibitory control for young adults. The studies manifested the potential physiological mechanism for central nervous system and autonomous nervous system which were reflected by HRV index.

PURPOSE: To investigate the cortical activation during a dual task of walking while smartphone texting in young healthy adults using near-infrared spectroscopy (NIRS).

P3 amplitude did not differ between groups at pre-test

Methods: Students (15-17 years, N = 289, 122 females) from ten secondary schools completed tests of inhibition, working memory (WM), CRF (PACER), and MF (standing long jump, push-ups).

RESULTS: Stepwise regression analyses accounted for demographic factors in step 1, and either CRF or MF in step 2. CRF predicted smaller RTs (β = 0.15, p < 0.05). In the 1-back WM task, CRF predicted greater RA, greater d', and shorter non-target RT (β = 0.15, p < 0.05). In the 2-back WM task, CRF predicted greater non-target RA and d' (β ≥ 0.14, p < 0.05). Comparatively, MF only predicted 2-back target accuracy (β = 0.14, p = 0.02). Follow-up 3-step regressions assessed significant outcomes from the 2-step models to account for the confounded fitness variable in step 2, and the fitness variable of interest in step 3. CRF remained a significant predictor for most cognitive outcomes (β ≥ 0.17, p < 0.05). However, with CRF entered in step 2, CRF marginally predicted incongruent flanker RA and 1-back non-target accuracy (β = 0.16, p < 0.05), and no longer predicted greater 2-back d' (p = 0.11, p = 0.20). Comparatively, MF marginally predicted 2-back target accuracy with CRF accounted for (β ≥ 0.12, p = 0.09). Conclusion: MF was unrelated to cognitive performance, especially with CRF included in the model. CRF’s predictability of WM decreased with MF accounted for, particularly during conditions requiring greater WM demands. CRF was generally related to faster processing speed and greater RA during a task modulating inhibitory demands, suggesting that increased CRF may improve cognition via modulation of older adolescents’ inhibitory control. Such findings highlight physical activity’s value in aiding cognition underlying older adolescents’ academic performance.

BACKGROUND: Previous studies demonstrated that gait performance was decreased when walking while performing a cognitive task such as texting on a smartphone, which reflects a cognitive-motor dual-task interference. The neural bases of the interference are not well studied.

PURPOSE: To investigate the cortical activation during a dual task of walking while smartphone texting in young healthy adults using the functional near-infrared spectroscopy (fNIRS). METHODS: In a crossover study design, 39 right-handed college students (21.3 ± 2.5 years, 46.1% females) randomly performed with a typing APP on a smartphone.

CONCLUSIONS: The findings indicated that walking on a low speed requires less cognitive resources from the prefrontal cortex, while the temporal lobe is involved. When walking while texting on a smartphone, the brain areas (temporal lobe and superior temporal gyrus) involved in gait were activated, and areas in prefrontal cortex were also activated. Thus, more cognitive resources were allocated to smartphone texting during the dual task.

PURPOSE: To identify the effects of adiposity and a physical activity (PA) intervention on cognitive and neuroelectric indices of inhibitory control in preadolescent children. METHODS: Children were randomly assigned to either a 9-month afterschool physical activity (PA) or a wait-list control (CON) group. Children completed a task that manipulated inhibition control in post- and post-test while measures of task performance and the P3-event related potential (ERP) were assessed. Children were further grouped according to weight category. 76 children with obesity (39 PA; 37 CON) completed testing. A sample of normal weight children (NW) (n=76) were matched to the sample of children with obesity based on treatment allocation and demographic variables of age, sex, IQ, SES, and fat-free mass.

Changes in adiposity measures included whole body percent fat (%Fat), subcutaneous abdominal adipose tissue (SAAT), and visceral adipose tissue (VAT). The influence of physical activity and adiposity on task performance and brain function was examined. RESULTS: Children in the PA group decreased %Fat from pre- to post-test (p<0.01); an effect not observed in the CON group. Children in the CON group gained SAAT and VAT from pre- to post-test (p<0.001), whereas children in the PA group did not. The PA group showed larger P3 amplitude from pre- to post-test (p=0.026); an effect not seen in the CON group. P3 amplitude did not differ between groups at pre-test for children with obesity; however, the PA group demonstrated larger P3 amplitude compared to the CON group at post-test (p<0.006). Children with obesity in the CON group had smaller P3 amplitude at post-test compared to pre-test (p=0.003), an effect not seen in NW children. Results suggest that physically inactive children with obesity...
have increased adiposity and smaller P3 amplitude over 9 months. Furthermore, results suggest that a PA intervention may be particularly beneficial for children with obesity, as they showed increased P3 amplitude from pre- to post-test. CONCLUSION: PA is beneficial for brain function in pre-adolescent children, especially in those with obesity. Given that childhood obesity is a public health concern with an array of health complications, these results have important implications for the physical and cognitive health of children.

2033 Board #189
May 30 2:00 PM - 3:30 PM
Association of School Day Segmented Physical Activity with Children’s Physical and Cognitive Health
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Purpose: Around 32% of children are overweight or obese and do not meet the 60-minute moderate-to-vigorous physical activity recommendation (MVPA; SHAPE America, 2016). Given that physical activity is highly variable between children across the school day and during specific segments (CDC, 2013), it is unclear which segmented MVPA during school contributes the most physical and cognitive health benefits. This study aimed (1) to investigate associations between time spent in MVPA during recess, lunch, physical education (PE), and physical fitness components (BMI, cardiorespiratory and muscular fitness), as well as cognitive health, respectively; and (2) to test the indirect effect of segmented MVPA on cognitive health through physical fitness among 8-9 years old children.

Methods: Participants were 340 8-9 years old children (Mage = 8.40, SD = 0.49) recruited in the southwest region of the U.S. Time spent in MVPA during recess (RE, MVPA), lunch (L_MVPA) and PE (PE_MVPA) segments were measured by accelerometers across five school days. The FITNESSGRAM® test battery was used to assess physical fitness components including PACER, curl-up, push up, and BMI. Children’s cognitive health was measured by the 6-item PedsQL™ Cognitive Functioning Scale (Varni et al., 2011).

Results: The time spent in MVPA during recess was positively associated with physical fitness (cardiorespiratory and muscular fitness; r = .27, r = .40, p < .01) and had low, but positive correlation with cognitive function (p < .05). Both cardiorespiratory (r = .26, p < .01) and muscular fitness (r = -.12, p < .05) were significantly related to cognitive health. The structural equation modeling analyses suggested a significant indirect effect of time spent in MVPA during recess and PE on children’s cognitive function through physical fitness with sound goodness-of-fit indices: χ²/df = 109.46/58; CFI = .93; RMSEA=.051; (90% CI [0.04, 0.07]).

Conclusion: The results suggest that school segmented MVPA in PE and recess provide children with opportunities to maintain appropriate levels of physical fitness and cognitive health. This study fills the research gap by identifying unstructured physical activity periods such as recess that can provide greater room to implement physical activity and health promotion strategies in school-age children.

2034 Board #190
May 30 2:00 PM - 3:30 PM
Relationship Between Fitness and Active-Sedentary Behavior with Cognitive and Emotional Recognition in Elderly: Core Study
Email: andreasvivas69@gmail.com

The decline in cognitive function and emotional regulation in aging have broad negative implications for independence, social competence and behavior that affect health. These impaired conditions can be exacerbated by increased sedentary behavior (SB) and lower levels of physical activity (PA) and fitness. However, it is not clear which of these have a higher relationship with cognitive function and emotional regulation in elderly.

PURPOSE: To investigate the relationship between cognitive function and emotional regulation with physical fitness, PA and SB in the elderly.

METHODS: This preliminary analysis of the Cardiovascular, Cognitive and Exercise Study in the Elderly (CORE) included 60 volunteers (64±14.77 years; female n= 39%); who performed a cognitive task (Wisconsin cards sorting test) and an emotional facial recognition task, physical fitness test (senior fitness test and handgrip strength), PA level (Minnesota Leisure-time Physical Activity Questionnaire) and sedentary behavior questionnaire (Longitudinal Aging Study Amsterdam). Bivariate correlations using Spearman’s rho were performed with statistical significance set at 5%.

RESULTS: Significant relationships between cognitive performance with leg strength (total correct response, p=0.28; total errors, p=0.28; and non-perseverative errors, p=0.28), 6-min walking test (total correct response, p=0.31; total errors, p=0.31; and non-perseverative errors, p=0.30) and SB (perseverative errors ρ=displaystyle \left(rho \right) = -0.27). Also, the reaction time (RT) during the emotional facial recognition had a significant relationship with upper body strength (F(10,26) = 0.26; RT negative p=0.033) and PA level (MET, hr/w) (RT negative p=0.31). Also, a significant relationship between worse cognitive performance with handgrip strength (non-perseverative errors, p=0.26) and SB (perseverative errors, p=0.27).

CONCLUSIONS: These preliminary results suggest that physical fitness and SB are associated with cognitive performance. Also, PA level and upper body strength are associated with emotional performance. These findings suggest the importance between the balance of maintaining an active behavior and the inclusion of aerobic and resistance exercises to improve cognition and emotional regulation in the elderly.

2035 Board #191
May 30 2:00 PM - 3:30 PM
Cardiovascular Risk Moderates Aerobic Training Efficacy on Executive Function in Older Adults
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PURPOSE: To examine whether the Framingham Cardiovascular Risk Profile Score (FCRP) moderates the effect of a 6-month progressive aerobic training program (AT) on executive function in older adults with mild subcortical ischemic vascular cognitive impairment.

METHODS: This is a secondary analysis of a proof-of-concept randomized controlled trial in 71 older adults, who were randomized to either a 6-month, thrice-weekly, progressive AT program (AT), or usual care plus an education program (CON). At baseline and trial completion, three executive processes were measured: 1) response inhibition by Stroop Colour Word Test; 2) working memory by digits backward test, and 3) set shifting by the Trail Making Test (B-A). Baseline cardiovascular risk was calculated using the FCRP, and participants were classified as either low risk (<20% FCRP score; LCRV) or high risk (≥20% FCRP score; HCRV). A complete case analysis (n=57) was conducted using an analysis of covariance (ANOVA) to evaluate between-group differences in the three executive processes. Age, baseline Montreal Cognitive Assessment score, education, and baseline score for the outcome variable were entered as covariates in all models.

RESULTS: A significant interaction was found between FCRP and group (AT or CON) for the digit span backward (F(1,49)=4.67, p=0.03) and the Trail Making Test (B-A), Baseline cardiovascular risk was calculated using the FCRP, and participants were classified as either low risk (<20% FCRP score; LCRV) or high risk (≥20% FCRP score; HCRV). A complete case analysis (n=57) was conducted using an analysis of covariance (ANOVA) to evaluate between-group differences in the three executive processes. Age, baseline Montreal Cognitive Assessment score, education, and baseline score for the outcome variable were entered as covariates in all models.

CONCLUSION: We found that cardiovascular risk significantly moderates the efficacy of aerobic exercise on working memory and set shifting in older adults with vascular cognitive impairment. Our findings highlight the importance of intervening early in the disease course of vascular cognitive impairment, when cardiovascular risk may be lower, to reap maximum benefits of aerobic exercise.
were counted as accuracy errors. RESULTS: Exercise improved the capacity of participants to successfully destroy targets, but differences between exercise (119.43 
(4.23)) and rest (111.50 (3.98)) did not reach statistical significance (p = 0.094). Exercise enhanced accuracy, with fewer errors after exercise than after rest (paired t-test; t=1.81; p=0.094). Exercise enhanced accuracy, with fewer errors after exercise than after rest (paired t-test; t=2.38; p=0.033). Self-reported sitting time was negatively associated with total score after the rest condition (r = -0.55; p = 0.040). Neither other variable (cardio-respiratory fitness, BMI, cognitive level) was associated with game performance. CONCLUSION: Exercise performed before playing LoL improves video game performance increasing accuracy. The fact that players with less sitting time showed better performance reinforces the importance of reducing sedentary behaviors in this group. The implementation of exercise routines in video gamers may improve their general health and their gaming performance.

Supported by FRQS Junior 1 Salary Award (MR) and by the McGill Faculty of Medicine (OL).

2037 Board #195 May 30 2:00 PM - 3:30 PM 
Exploring The Relationships Between Personality And High-Intensity Exercise-affect In Men And Women
Shelby E. Dietz, Allyson G. Box, Annmarie Chiwzewski, Steven J. Petruzello, FACSM, University of Illinois Urbana-Champaign, Urbana, IL. (Sponsor: Steven J. Petruzello, FACSM)

In general, men are more likely to meet physical activity guidelines in comparison to women, and tend to report exercising at higher-intensities. However, less is understood in regards to how men and women differ in feeling states (e.g., core affect) during a high-intensity exercise bout. PURPOSE: Determine whether sex differences exist in personality traits and high-intensity exercise-affect. METHODS: Male (M; n=63) and female (F; n=101) undergraduates (n=164, 20±2yrs, 24±4 body mass index (BMI), 62% female, 82% regular exercisers) completed several personality surveys along with a 15-minute high-intensity cycling trial (HIC). Core affect (via Feeling Scale & Felt Arousal Scale) was assessed prior to, every 3-minutes during, and 20-minutes post (P20) condition. RESULTS: Multivariate ANOVAs revealed significant differences (P<0.05) in the personality traits extraversion (F=4.62, M=42.2, d=0.394), neuroticism (F=4.74, M=45.1, d=0.644), openness (F=14.5, M=15.6, d=0.496), sensitivity (F=26.4, M=28.4, d=0.535) and impulsivity (F=25.2, M=28.4, d=0.651). No sex differences (P>0.05) were observed for exercise-affect prior to, during, and following the HIC. CONCLUSIONS: Although sex differences exist in various personality traits, these differences did not influence how one felt prior to, during, and following a HIC. These findings support the notion that men and women respond similarly to exercise stimuli. More research is needed to understand why women exercise less and at lower-intensities in comparison to men.

2038 Board #194 May 30 2:00 PM - 3:30 PM 
Exercise Intensity Influences Prefrontal Cortex Oxygenation During Cognitive Testing
Terence Moriarty, Kelsey Bourbeau, Bryanne Bellovary, Micah Zuhl. University of New Mexico, Albuquerque, NM.

Various types of exercise training, including high and low intensity aerobic exercise, along with mind-body exercise (e.g., yoga) have been implemented into treatment for those suffering from psychological disorders and traumatic brain injury. The prefrontal cortex (PFC), which houses key cognitive constructs is responsive to exercise, and is commonly measured through functional near infrared spectroscopy (fNIRS). fNIRS evidence suggests that exercise mediates neural adaptation through increased blood flow and neurogenesis, which enhances neural activation leading to improved cognitive performance. However, the type and intensity of exercise that has the most robust impact on brain blood flow is currently unknown. PURPOSE: Therefore, the primary aim of the study is to compare fPFC activation during cognitive tasks performed after low intensity, high intensity, and yoga exercise. We aim to determine if markers of cardiovascular and metabolic stress influence brain activity after each exercise bout.

METHODS: Eight subjects (4 male, 4 female), aged 35 ± 5 years completed a control, high intensity, low intensity, and yoga exercise trial followed by administration of a cognitive task (NIH Toolbox Fluid Cognition). Left and right PFC oxygenation were measured during the post-exercise cognitive assessment using fNIRS technology.

RESULTS: Oxygenation during the cognitive task was higher in the left PFC region after low intensity exercise compared to all other trials (control, high intensity, yoga). Regression model analysis showed that a 10% increase in left PFC oxygenation by 2.11 umol. No relationship was detected between PFC oxygenation and cognitive performance or the lactate response among participants in the current study, however a relationship between control levels of brain derived neurotrophic factor (BDNF) and exercising speed was detected.

CONCLUSIONS: Acute exercise below 70% aerobic intensity increased brain blood flow during a post-exercise cognitive task. Therefore, it may be beneficial for those who engage in any cognitive related activity to perform a brief bout of low intensity exercise prior to the task. This may include people who participate in academic-based testing, cognitive behavioral therapy, or motor training.

2040 Board #196 May 30 2:00 PM - 3:30 PM 
Acute After-School Screen Time in Children Decreases Impulse Control: A Randomized Crossover Trial
Bruce W. Bailey, Mary Efrain, Chance McCutcheon, Hunter LaCouture, Harrison Marsh. Brigham Young University, Provo, UT.

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PURPOSE: This study examined the effect of three hours of after school active play vs. sedentary screen time on executive function in children.

METHODS: This study used a crossover design with treatment conditions that were randomized and counter-balanced. There were two experimental conditions: three hours of active play compared to three hours of sedentary screen time. Participants included 32 boys and girls aged 8-9 yrs. Physical activity patterns were measured using an actigraph accelerometer. Executive control was measured using the Stroop color and word test. RESULTS: The mean age and BMI were 8.7 ± 0.4 years and 16.9 ± 2.2. On the active day, children spent 95 ± 28 minutes in MVPA after school compared to 3 ± 3 minutes on the sedentary day (F = 252.1, P = 0.0001). There was no difference between days in the Stroop Task performance for word reading or color naming. However, there was a significant difference between conditions for the incongruent task, with children performing better on the active day (F = 6.79, P = 0.0105). CONCLUSIONS: The results of this study demonstrate that active play after school improves executive function in children by increasing their ability to inhibit cognitive interference.

2041 Board #197 May 30 2:00 PM - 3:30 PM 
Acute Exercise Alters Functional Connectivity During Cognitive Task
Soichi Ando1, Sota Saito1, Nobuaki Mizuguchi2, Mizuki Sudo1, Kazunori Ohkawara1, Atsushi Serido3. 1The University of Electro-Communications, Tokyo, Japan. 2Keio University. Tokyo, Japan. 3Meiji Yasuda Life Foundation of Health and Welfare, Tokyo, Japan. 4Tokyo Metropolitan University, Tokyo, Japan. Email: soichi.ando@uec.ac.jp

PURPOSE: There is a growing body of evidence to show that acute aerobic exercise improves cognitive performance. Nevertheless, it remains largely unknown how acute
exercise improves cognitive performance. The purpose of this study was to test if alteration in functional connectivity is involved in improving cognitive performance induced by acute exercise.

**METHODS:** Participants were 10 healthy right-handed young men (age: 21.6 ± 1.4 yr., peak oxygen uptake = 46.5 ± 8.7 ml/kg/min). Experiments were conducted in a randomized crossover design. In the Exercise condition, subjects cycled at 40% peak oxygen uptake for 30 minutes. In the Control condition, subjects rested for 30 minutes without exercise. Blood samples were collected at baseline and 30 minutes after exercise for measurement of peripheral BDNF levels. The calculation ability post exercise. These results suggest that exercise at a moderate or vigorous intensity and auditory processing speed and flexibility, and calculation ability post exercise. These results suggest that exercise at a moderate or vigorous intensity and auditory processing speed and flexibility, and calculation ability post exercise.

**RESULTS:** RT was reduced in the Exercise condition (Pre: 420 ± 77 ms, Post: 388 ± 65 ms, p = 0.02), while it did not change in the Control condition (Pre: 416 ± 79 ms, Post: 417 ± 78 ms, p = 0.82). We observed significant increases in activation in the opercular and triangular parts of the left inferior frontal gyrus (IFG) and anterior cingulate cortex (p < 0.01, uncorrected). We observed an increase in functional connectivity between the opercular part of the left IFG and the left putamen (Pre: 0.02 ± 0.11, Post: 0.12 ± 0.13, p = 0.08). Alteration in the functional connectivity between these regions was negatively correlated with the alteration in RT (r = -0.44, p = 0.06).

**CONCLUSIONS:** Alteration in functional connectivity may be associated with improvement of cognitive performance after acute exercise.

**INTRODUCTION:** Working memory (WM), generally considered executive function, is gaining attention due to its role in contributing to children and adolescents’ academic achievement, especially verbal and quantitative reasoning, and sports-related tactical memory. Quantitative reviews regarding the effect of exercise interventions (EX) on this higher-level cognitive skill in these important cohorts are lacking.

**PURPOSE:** The aim of the study was to assess the chronic effect of EX on WM in children and adolescents and to evaluate potential moderators of this effect using a meta-analytic approach.

**METHODS:** A computerized literature search was conducted based on seven databases: SPORTDiscus, Google Scholar, PubMed, ScienceDirect, Dialnet Plus, Scielo, and MEDLINE. Studies needed to meet the following inclusion criteria: 1) a RCT design in children or adolescents, 2) EX with mode description, 3) published in English, Spanish, or Korean 4) WM as dependent variable, and 5) reported descriptive statistics that permitted effect size (ES) calculation. The quality score was defined using a scale ranging from 0 to 1. Random-effects model with a within-group design was used to calculate the ES. One-way analysis of variance of independent groups or Pearson’s correlation coefficients were used to examine moderators.

**RESULTS:** 6207 articles published before Nov. 2016 were found, of which 10 studies representing 60 ES’s and totaling 806 participants (males and females, 9.9 ± 4 years) were included in the analysis. The mean quality for the studies was 4.4 ± 7. An overall ES of .85 was found (g = 0.01; CI95% = 0.47 to 1.24; z = 4.35; p = 0.04; ES = 94.28%) suggesting a positive high effect of the EX to enhance WM. Age (r = 0.34, p = 0.048), number of sessions (r = 0.42, p = 0.03), and sex (F = 0.9; p = 0.17), significantly moderated the effect. Neither a) quality of the studies (r = 0.24; p = 0.09), nor d) type of exercise (i.e., aerobic, anaerobic, neuromotor; r = 0.1; p = 0.53) were significant moderators. No bias was found according to Egger’s regression analysis (p = 0.39).

**CONCLUSIONS:** EX has a positive significant effect on children and adolescents’ WM compared with their control peers. Different types of exercise appeared to be equally effective strategies for improving WM in these cohorts.

**REFERENCES:**

**Purposes:** The purpose of this study was to examine how menopausal status affects choice reaction time and peripheral BDNF levels after aerobic exercise. It was hypothesized that exercise would affect peripheral BDNF levels and alters reaction time similarly among pre and postmenopausal women. **METHODS:** The subjects consisted of 14 active females (7 premenopausal and 7 postmenopausal). Subjects were randomly assigned to each of the following exercise conditions: moderate (35% VO2 max), vigorous (70% VO2 max), and sedentary (no exercise). There was a main effect for gender for the number of problems answered correctly (F = 6.09, p = 0.08). Alteration in the functional connectivity between these regions was negatively correlated with the alteration in RT (r = -0.44, p = 0.06).

**CONCLUSIONS:** Alteration in functional connectivity may be associated with improvement of cognitive performance after acute exercise.
RESULTS: The CrossFit participants presented higher levels of enjoyment, stress management, social recognition, affiliation, competition, and weight management. Conversely, RT participants reported higher motives for appearance. Intrinsic regulation to exercise was significantly higher in CrossFit, whereas RT clients scored higher regulated motivation. The CrossFit group reported higher levels of relatedness, while RT group presented more perception of autonomy. There was no significant difference between weekly exercise volume between groups; therefore, correlation and mediation analysis were conducted with pooled data. Autonomy and competence were significantly associated with more autonomous forms of motivation. Exercise frequency and weekly exercise volume were positively related to intrinsic motivation.

When mediating model was evaluated, the social motives to exercise and intrinsic motivation were found to mediate the relationship between competence and weekly exercise volume (95% BCa CI of 2.47 to 11.91).

CONCLUSIONS: These findings suggest that CrossFit members attend the gym/ CrossFit box predominantly for intrinsic reasons and social motives as compared to RT participants. Exercise professionals may consider the development of programs to increase social motives and exercise-related identity (e.g., interest, affiliation, and enjoyment) to promote intrinsic regulation in individuals from fitness centers.

Acute aerobic exercise exerts a small beneficial effect on cognition. A majority of studies have examined cognitive function following acute bouts of exercise, while very few have evaluated changes that may occur during exercise. The limited research that has been conducted in this area is mixed, demonstrating differential effects on cognitive performance depending on methodological decisions including exercise intensity and duration. PURPOSE: The primary purpose of this study was to examine the effects of low-intensity cycling on cognitive function, measured by behavioral performance (response accuracy and reaction time) and neuroelectric indices of attentional processing (P3 amplitude and latency). METHODS: Twenty-seven (Mage = 22.9 ± 3.0 years old) college-aged individuals were counterbalanced into low-intensity exercise (EX) and seated control (SC) conditions. During each condition, participants completed a 10-minute resting baseline period, 20 minutes of either sustained cycling or seated rest, and a 20-minute recovery period. Electroencephalography (EEG) data were recorded during a modified oddball paradigm in order to assess primary cognitive outcome measures at 10-minute intervals (5 blocks total) throughout each condition. RESULTS: Individuals in EX and SC conditions displayed lower accuracy to rare trials across time, ß(2.43) = 4.54, p < .008, ñ² = .44, suggesting reductions in performance to more difficult trials as testing sessions progressed. There were no significant differences in reaction time between EX and SC conditions. Significant reductions in P3 amplitude and latency were observed between EX and CON during the 20-minute cycling period compared to seated rest, ß(2.43) = 3.50, p < .023, ñ² = .38, while no differences in P3 latency were observed between EX or SC conditions. CONCLUSIONS: Taken together, results indicate that exercise at lower doses may have small but significant effects on behavioral and neuroelectric outcomes of cognitive performance. These changes may be due in part to the shifting of attentional resources from the cognitive task to the maintenance of exercise. Information gathered from this study may aid in the development of appropriate exercise prescription for populations looking to specifically target cognitive function deficits through acute aerobic exercise.

The effects of acute exercise on muscle metabolism are well established, however the impact of mental stress (MS) on muscle metabolism is not well understood. PURPOSE: To assess muscle oxygen consumption (mVO2) after acute MS and evaluate the effect of acute exercise on mVO2. METHODS: Participants (N = 15 males, 22 ± 2 yr, VO2peak 40.8 ± 5.7 ml/kg/min) served as their own control in a randomized counterbalanced design. Participants completed a total of three visits over 3.5 weeks. On the initial visit, a maximal oxygen uptake test on a cycle ergometer was performed. Near-infrared spectroscopy (NIRS) was used during a five-minute cuff occlusion and the initial slope during the occlusion was used to assess mVO2 in the gastrocnemius muscle. mVO2 was assessed at baseline (BL), after rest (CON) and after exercise (EX) from the MS. On two separate days, participants either rested for 25 minutes (CON) or completed 25 minutes of exercise (EX) at 90% ventilatory threshold on cycle ergometer. MS was evoked by a serial subtraction test administered by two research assistants dressed in white lab coats. Data were analyzed using a 2x3 repeated measures ANOVA with Fishers LSD post hoc tests, and are presented as mean percent change ± SD. RESULTS: A significant interaction effect of Condition x Time on mVO2 was observed(F=6.3 p<0.05,η2=0.326). Post hoc comparisons indicated mVO2 was significantly increased after exercise compared to CON by 21.8% / 26.0% p<0.05. Within CON, MS increased mVO2 by 12.6% /+10.2% (p<0.001). In EX, there was an increase in mVO2 from BL to after EX by 12.6% / 16.0% (p<0.05) and from BL to after MS by 18.2% / 64.1% (p<0.05). CONCLUSION: To our knowledge, these data are the first to suggest that acute MS increases the metabolic rate of resting skeletal muscle. Interestingly, the combination of prior EX and MS does not further augment metabolic activity beyond MS alone.

2048 Board #204 May 30 2:00 PM - 3:30 PM Affective and Perceptual Responses to High-Intensity Interval Training: Comparing Graded Walking to Ungraded Jogging

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(No relevant relationships reported)

Benefits associated with high-intensity interval training (HIIT) are well-established. Research has also demonstrated that HIIT can be well-tolerated in a variety of populations, protocolls, and modalities. Treadmill-based HIIT has almost exclusively included running interspersed with walking. Research to date has not investigated the delivery of HIIT by way of graded walking interspersed with ungraded walking.

PURPOSE: Compare the effects of ungraded jogging to graded walking as a modality of HIIT on perceived exertion, affect, and enjoyment. METHODS: Nine healthy participants (5 males, 4 females; mean BMI = 25; mean age = 26) completed two 20-minute counterbalanced HIIT trials after completion of maximal testing. Both trials alternated between workouts associated with 85% of VO2max and a brisk and comfortable walking speed (mean = 3.2 mph). The interval portions of the trials were performed at elevated grade (mean = 17%) for the WALK-HIIT trial and elevated speed (mean = 6.7 mph) for the RUN-HIIT trial. Affect, enjoyment, and perceived exertion, both overall (RPE-O) and legs only (RPE-L), were measured throughout each trial. Enjoyment was measured upon completion of each trial.

RESULTS: Data was analyzed using dependent t-tests. RPE-O, RPE-L, affect, enjoyment, and HR (all p-values > 0.05; all ES values < 0.50) were not significantly different for the WALK-HIIT and RUN-HIIT trials. CONCLUSIONS: Findings indicate that WALK-HIIT and RUN-HIIT trials produce similar perceptual and affective responses, providing a significant exercise stimulus sufficient to improve cardiometabolic health. The production of relatively similar responses suggests that graded walking is a viable alternative to running for the delivery of the many benefits associated with interval-based exercise without negative impacts on the exercise experience.

2049 Board #205 May 30 2:00 PM - 3:30 PM The Impact of Qigong Baduajin on Cognitive Function & Mental State in Patients with type 2 Diabetes

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(No relevant relationships reported)

PURPOSE: This study aims to assess the clinic efficency of Qigong Baduajin (QBDJ) on cognition and mental status in patients with type 2 diabetes. METHODS: sixty-seven type 2 diabetic patients with mild cognitive impairment (MCI) (31 males and 36 females; aged 47-68 years; the educational background of all participants were above middle school) were screened and randomly divided into two groups: the QBDJ group (n=34), and the control group (n=33). Both groups were based on the routine treatment of diabetes. The QBDJ group received Baduajin exercise forty minutes a time and five times per week for three months, whereas the control group without special exercise intervention. Mental Cognitive Assessment (MoCA) and Hamilton Anxiety Scale (HAMA) were also used to assess the changes in cognition and mental status in all patients. All data were analyzed using SPSS Statistics for Windows v 17.0. Group differences in baseline characteristics were tested using the χ2 test and the T test. For the outcome measures, independent-sample T test was performed to compare the changes between the QBDJ and control groups. The paired T test was used to compare the effects before and after treatment. The level of significance was established at p<0.05. RESULTS: There was no significant difference in the scores of MoCA and HAMA between two groups before the intervention. After 3 months of Baduajin practice, the total score of MoCA, the score of visuospatial/executive, and the score of delayed recall were significantly higher in the QBDJ group than in the
control group (P<0.05). QBJD training also contributed to improving the ability of emotion regulation. Compared with the control group, participants in the QBJD group had significantly lower total HAMA score (P<0.05). CONCLUSIONS: These results indicate that regular QBJD exercise can effectively improve cognitive function and produce positive effects on mental state in type 2 diabetic patients with MCI.

### TABLE 1. COMPARISON OF SCORES ALL MsCAs SUBTESTS IN TWO GROUPS

<table>
<thead>
<tr>
<th>Control group (n=20)</th>
<th>QBJD group (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before intervention</td>
<td>After intervention</td>
</tr>
<tr>
<td>Visuospatial/executive</td>
<td>3.01 ± 0.74</td>
</tr>
<tr>
<td>Naming</td>
<td>2.51 ± 0.63</td>
</tr>
<tr>
<td>Attention</td>
<td>4.42 ± 0.75</td>
</tr>
<tr>
<td>Language</td>
<td>2.02 ± 0.64</td>
</tr>
<tr>
<td>Abstraction</td>
<td>0.98 ± 0.27</td>
</tr>
<tr>
<td>Delayed recall</td>
<td>1.92 ± 0.66</td>
</tr>
<tr>
<td>Orientation</td>
<td>5.78 ± 0.50</td>
</tr>
<tr>
<td>Total score</td>
<td>20.43 ± 3.24</td>
</tr>
</tbody>
</table>

When the difference is significant (p<0.05), the P-value is noted with *QBJD group vs. Control group (n=10) compared with before intervention in QBJD group (n=20).

### TABLE 2. COMPARISON OF HAMA SCORE IN TWO GROUPS

<table>
<thead>
<tr>
<th>Control group (n=20)</th>
<th>QBJD group (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before intervention</td>
<td>After intervention</td>
</tr>
<tr>
<td>HAMA</td>
<td>15.44 ± 3.59</td>
</tr>
</tbody>
</table>

When the difference is significant (p<0.05), the P-value is noted with *QBJD group vs. Control group (n=10) compared with before intervention in QBJD group (n=20).

Prior work has found that high cannabis use (CU) is associated with learning and memory impairments, whereas physical activity (PA) has been linked to enhanced memory and cognition. **Purpose:** To determine whether PA moderates the link between CU and memory among adolescents, such that CU leads to greater memory deficits in those who report less PA. **Methods:** Participants were 387 adolescents (ages 15-19) from a larger study, such that CU leads to greater memory deficits in those who report less PA. **Results:** Our findings replicate the well-established link between higher levels of fitness, physical, and vascular function, and higher scores on executive control, visuomotor speed, and complex attention. These standard measures are sensitive to cognitive decline. Physical function was determined via the timed Up & Go, Short Physical Performance Battery (SPPB), and 6-minute walking test (6MWT). Vascular function was determined via brachial artery flow-mediated vasodilation (FMD) following 5-minutes of forearm occlusion. Correlations were assessed via Pearson’s bivariate correlation. **Conclusions:** Participants scored below the fiftieth percentile of age and sex specific normative values on the TMT; 32% scored below the tenth percentile on the TMT-A and 50% scored below the tenth percentile for TMT-B. Age, year of education, sex, with TMT-A, TMT-B, or race did not correlate with TMT-A, TMT-B, or TMT-C. TMT-A were inversely correlated with 6MWD (r=-.5, p<.007), SPPB score (r=-.65, p<.001), and FMD (r=-.4, p<.04). TMT-B was inversely correlated with 6MWD (r=-.39, p<.04), but not with SPPB, or FMD. DSC was correlated with 6MWD (r=.47, p<.01), but not with SPPB, or FMD. **Conclusion:** In patients with CKD, psychomotor speed is associated with indicators of physical function and fitness levels, and with vascular function. Executive control, visuomotor speed, and complex attention was associated with physical fitness levels. These results indicate a concomitance between higher levels of fitness, physical, and vascular function, and higher scores in psychomotor speed and executive control in patients with CKD. The clinical
Physical education classes provide an opportunity for students to be physically active and also to help in school learning. **PURPOSE:** To compare the effects of physical education program combined with scholarly contents named “Playing actively and Learning (PAL)” on selective attention in boys and girls.

**METHODS:** 39 children with low academic achievement (9.5±0.9 y) from an elementary public school of vulnerability area at Brasilia - Brazil, undertook Stroop test before and after intervention. The anthropometric data (weight and stature) were assessed for school of vulnerability area at Brasilia, Brazil. The stimuli at Stroop test GO/No-go was a colored bar after intervention. The anthropometric data (weight and stature) were assessed for school of vulnerability area at Brasilia, Brazil. The stimuli at Stroop test GO/No-go was a colored bar after intervention. The anthropometric data (weight and stature) were assessed for school of vulnerability area at Brasilia, Brazil.

**RESULTS:** No differences were observed in congruent or incongruent conditions between groups. The reaction time decreased in congruent Go condition in both groups after intervention for boys (958.3±113.3ms to 929.3±112.3ms; p=0.004) and girls (976.6±91.5ms to 939.7±92.8ms; p=0.005) (Figure 1).

**CONCLUSION:** Three months of PAL resulted in improvement in a similar way in boys and girls at the most difficult part of Stroop test. To support these results studies with a neuroelectric analysis (i.e. event related potential component) can be recommended.

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**Purpose:** The purpose of this study was to determine why cancer patients choose to participate and remain in an exercise rehabilitation program. **Methods:** 79 participants in a cancer rehabilitation program were asked to complete a questionnaire consisting of 6 open ended questions asking 1. Who referred them, 2. What did they follow through with the referral, 3. Why they have chosen to remain in the program, 4. What their initial thoughts of the program were, 5. What their current thoughts about the program are, and 6. Are they satisfied with the program. This study was approved by the Saint Francis University IRB. **Results:** 38% of clients were referred by either an oncologist or family doctor, 25% by hospital staff, 24% by friend or support group and 13% by media outlets. 59% of clients followed though for their health, and 15% for financial reasons. Furthermore, cumulative PA exposure in young adulthood and adulthood was associated with better visual processing and sustained attention in men. These associations were independent of PA levels in other measured age frames. Therefore, physically active lifestyle should be adopted already in early childhood, and continued into midlife to ensure the plausible benefits of PA on midlife cognitive performance. Concluding, this study provides novel insight into cost-effective and well-timed promotion of cognitive health.
Endurance athletes commonly strive for optimal hydration status during and after events, and have vast nutrition options available to support performance and well-being. 

**PURPOSE:** We aimed to evaluate relationships among nutrients consumed during exercise and markers of hydration status.

**METHODS:** Fifty-one cyclists (age mean=51y and range=21-72y; 49 males, 2 females) completing a 161km event were analyzed via two-way ANOVA to evaluate nutrient intake influence. TUE were compared using one-way repeated measures ANOVA with Sidak post hoc analyses. Levels of significance were set a priori at P < 0.05. RESULTS: USgs were 1.007 ± 0.003 (PL), 1.008 ± 0.003 (Na), 1.007 ± 0.004 (NaCa0), and 1.009 ± 0.004 (NaCa75) (P > 0.05). TUE for PL (87 ± 30%) was significantly higher than all other protocols (P < 0.05). TUE for NaCa0 (73 ± 16%) was significantly higher than Na (56 ± 18%, P < 0.02) and NaCa75 (52 ± 13%; P < 0.01). NSD in TUE was observed between Na and NaCa75.

**CONCLUSION:** The results reaffirm that, when caffeine is consumed at the beginning of a SAH strategy, hydration can be achieved, but at a lower level compared to SAH without caffeine. The results also suggest that waiting to consume caffeine until 75 min after water is consumed does not result in caffeine induced diuresis during a SAH protocol.

Dehydration impairs motor coordination but the influence on other fundamental cognitive-motor functions is unclear. **PURPOSE:** To determine the impact of dehydration on rhythmic bimanual choice performance (accuracy & reaction time) and brain function (electroencephalography). **METHODS:** Ten aerobically fit men (22.4 ± 2.5 y) completed three experimental sessions: control (seated rest; CON), dehydration (EHS-DEH) induced by 2.5 h intermittent walking in the heat (45°C, 15% RH), and euhydration (EHS; 2.5 h intermittent walking in the heat but matching sweat loss with water ingestion). Performance during a bimanual probabilistic choice reaction time task (PCRT; 32 min) consisting of randomly presented dominant (~67%) and non-dominant (~33%) stimuli was examined concurrently with visual evoked potentials. Perceived PCRT mental workload (NASA-TLX, 21-point scale) was assessed following task completion. **RESULTS:** PCRT reaction time was not different (P = 0.40) averaged across trials (CON: 538.3 ± 37.7, EHS: 542.6 ± 39.2, DEH: 532.6 ± 39.2 ms). EHS-DEH (67.3 ± 14.1%) reduced PCRT accuracy during non-dominant (less frequent) responses vs. CON (83.7 ± 5.8%; P = 0.04) but not compared with EHS (74.6 ± 11.0%; P = 0.18). Accuracy during dominant stimuli were not different across trials (P = 0.51) and among trials for the contingent negative variation (movement anticipation) or N2 (stimulus categorization). EHS-DEH (6.4 ± 5.0) elicited greater levels of perceived effort vs. CON (3.7 ± 2.4; P = 0.03) and frustration vs. EHS (11.8 ± 5.0; 7.5 ± 5.1; P = 0.0004).

**CONCLUSIONS:** Dehydration increased perceived effort, frustration, and perceptual processing demands, resulting in impaired accuracy for this cognitive-motor task requiring vigilance during prolonged fine motor movements. Prevention of dehydration during exercise-heat stress preserved cognitive-motor performance, brain activity, and mental workload similar to control conditions.

Supported by Carl V. Gisolfi Memorial Fund ACSM Foundation Grant

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**Impact of Nutrient Intake During Exercise on Hydration Markers Following Exercise and Rehydration**

**Results**

These data suggest that some nutrients impact fluid-electrolyte balance and hydration markers. Nutrient intake appears to mediate markers more than Pcop, and Pcop more than BM. Further, sodium and water appear to best mitigate water retention signaling following exercise and rehydration.

**Conclusions**

Urinary markers more than Pcop, and Pcop more than BM. Further, sodium and water appear to best mitigate water retention signaling following exercise and rehydration.
**2059**

**Board #215**

**May 30 2:00 PM - 3:30 PM**

**Dehydration Has No Influence on Simulated Motor-race Performance Despite Greater Cardiovascular and Thermoregulatory Demand**

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(No relevant relationships reported)

**Purpose:** Motor-racing drivers compete in hot, humid environments and must maintain adequate hydration levels to prevent heat injury. We examined the influence of dehydration on performance and physiological outcomes during a simulated motor-race.

**Methods:** Fifteen healthy men (age: 25.2±5.4 y, body mass: 84.8±10.7 kg, VO₂peak: 43.6±2.2 [L.min⁻¹]) participated in this crossover study. Participants were randomised (counter-balanced) to a no fluid trial [1.9±0.1% body mass loss (BML)] or a fluid trial [1.9±0.1% body mass loss (BML)] with intra-race fluid and sugar containing drinks (4% dextrose).

**Results:** There was no difference in simulated race performance measured by mean lap time, despite significantly decreased core temperature (38.7±0.3°C vs 37.7±0.3°C), physiological strain (4.1±1.1 vs. 3.5±1.1), and Sosm (310±4 vs. 300±4 mOsm.kg⁻¹), total body mass loss (2.7±0.3 vs. 0.9±0.4%) and change in PV (38±0.2 vs. 37.3±0.7°C) in the no fluid trial compared with the fluid trial. There was no difference between trials in mean plasma volume (PV) changes.

**Conclusions:** Dehydration on the safety, health and well-being of drivers.

**2060**

**Board #216**

**May 30 2:00 PM - 3:30 PM**

**Self-Reported Changes in Thirst and Alertness during Variable Prescribed Fluid Intake**

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(No relevant relationships reported)

**Purpose:** To evaluate the relationship between self-reported thirst and alertness in people drinking variable amounts of prescribed water. **METHODS:** Subjects (n = 115, 59 males, 32 ± 10 y, 24.6 ± 4.4 kg m⁻²) completed 10 days of exercise, starting with a baseline visit, followed by three days of fluid restriction (1 L.d⁻¹), of which 250 mL was consumed in the morning prior to the visit; and V3, the morning following a prescribed increase in water intake. The increase in water intake at V3 varied by group assignment: a control group (CON) that increased fluid intake by 1.9±0.1% body mass; and three levels of prescribed fluid intake: 3.8±0.1%, 5.7±0.1%, and 8.1±0.1%. The no fluid trial resulted in significantly higher thirst (3.6±1.2 mm) and lower alertness (18 ± 25 mm) than both LOW (thirst, -7 ± 8 mm; alertness 1 ± 24 mm) and CON (thirst, -6 ± 23 mm; alertness 0 ± 23 mm; all p < 0.01). There was no difference between LOW and CON (both p > 0.92). Repeated measures correlation analysis showed a negative relationship between change in alertness and thirst (R² = 0.29, p < 0.01). **CONCLUSION:** An inverse relationship was observed between self-reported alertness and thirst. Following fluid restriction, drinking a larger volume of water (750-1000 mL) in the morning decreased thirst and increased alertness.

**Investigation funded by Danone Research**

**2061**

**Board #217**

**May 30 2:00 PM - 3:30 PM**

**Exercise Induced Hypohydration Reduces Subsequent Ad-libitum Food Intake**

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(Reported Relationships: L.J. James: Industry contracted research. Funding from PepsiCo and LucozadeRibenaSuntory, with funds paid to the institution.)

The relationship between hydration status and appetite regulation/energy intake is unclear. Animal models suggest hypohydration/reduced water availability suppresses food intake, but the effects in humans are less clear, with a paucity of research examining exercise-induced hypohydration. **PURPOSE:** To investigate the effects of exercise-induced hypohydration with or without post-exercise rehydration on ad-libitum energy intake, as well as selected appetite regulatory gut peptides.

**METHODS:** Twelve recreationally active, non-obese males (mean (SD) age 22±3 y; height 1.77±0.06 m; body mass 77.7±9.8 kg; VO₂peak 47 (9) mL.kg⁻¹.min⁻¹) completed a 75 min treadmill run at 65% VO₂peak in 24.5 (0.8) °C and 82 (4) % relative humidity without fluid intake, inducing body mass loss of 1.7 (0.4) %. Over the subsequent hour, subjects either rehydrated with water equivalent to 100% of body mass loss (REHY) or consumed no water so they remained hypohydrated (HYP0). A multi-item ad-libitum buffet lunch was then served, with subjects instructed to eat until ‘comfortably full and satisfied’. Venous blood samples were taken before and after and exercise and before lunch. **RESULTS:** Serum osmolality was higher, whilst plasma volume was lower pre-lunch during HYPO vs REHY (p<0.05). Ad-libitum energy intake at lunch was lower in HYPO (1149 (638) kcal vs 1399 (712) kcal; P<0.024), whilst ad-libitum water intake from drinks (733 (338) mL vs 344 (288) mL; P<0.008) and from food and drinks combined (1113 (330) mL vs 737 (366) mL; P=0.011) were higher in HYPO. Additionally, fat (P=0.042) and sodium (P=0.046) intake were lower in HYPO, whilst carbohydrate (P=0.064) and protein (P=0.099) intake tended to be lower in HYPO. Pre-lunch, acylated ghrelin concentration was lower in HYPO (48.7 (35.3) pg/mL vs 62.7 (33.5) pg/mL; P<0.038), but there was no difference between trials for PYY (P=0.157) or GLP-1 (P=0.379) concentrations. **CONCLUSION:** These data suggest that in healthy, non-obese males, exercise induced hypohydration without subsequent rehydration reduces acylated ghrelin concentration, as well ad-libitum energy intake. Exercise-induced changes in hydration should be carefully considered in situations where adequate post-exercise energy and nutrient replenishment are important. This project received no funding.

**2062**

**Board #218**

**May 30 2:00 PM - 3:30 PM**

**Influence Of Different Hydration Levels On Artistic Gymnastics Performance In Preadolescent And Adolescent Gymnasts**

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(No relevant relationships reported)

The effect of different hydration levels in artistic gymnastics performance has not been studied. **PURPOSE:** To examine the possible influence of different hydration levels in artistic gymnastics performance in preadolescent and adolescent gymnasts.

**METHODS:** Eleven male preadolescent and adolescent artistic gymnasts [12.1 ± 0.8 (range 10-15) years old, 2.8 ± 0.2 (range 2-3.5) Tanner Stage; mean ± SE] performed two 3-hour identical training sessions separated by one week, while they ingested artifically sweetened water equivalent to either 50% (Low Volume; LV) or 150% (High Volume; HV) of the fluid lost in training. After training, in both trials participants performed the same programs in 3 apparatuses and were evaluated by an international level judge via the assistance of video. The fluid lost in training was identified during three similar preliminary training sessions, where gymnasts drank water ad libitum, and was observed that they replaced about 50% of their fluid lost. Hydration, dietary and training status were controlled before LV and HV trials which were performed in a random order and under similar environmental conditions (23.4 ± 0.3 °C and relative humidity 53-54 ± 2% in both LV and HV). Pre and post exercise differences between trials were analyzed using two-tailed t-tests, whereas responses over time were examined by 2-way ANOVA. **RESULTS:** The different volumes of

Abstracts were prepared by the authors and printed as submitted.
fluid provided different hydration levels as indicated by the different urine specific gravity (USG) levels post-exercise (LV: 1.017 ± 0.002 vs. HV: 1.002 ± 0.001; p<0.001), while pre-exercise USG were similar between conditions (LV: 1.018 ± 0.002 vs. HV: 1.015 ± 0.001; p=0.09). The percentage of fluid lost was higher in LV (1.2 ± 0.2 %) compared to HV (0.4 ± 0.1 %) (p=0.02), however, mean evaluation performance in the 3 apparatuses was not different between conditions (LV: 8.72 ± 0.21 vs. HV: 8.68 ± 0.20; p=0.57). CONCLUSIONS: By ingesting fluid equivalent to about 50% of the body mass 30 min after hydration and 15 min after 3 hours of moderate dehydration, those moderate dehydration and exercise-heat challenge (EHC) in a hot environment (35.6 ± 0.2 °C, 35.0 ± 1.8 % relative humidity) differing only in rehydration mode. Participants EHC subjects completed a 25 min submaximal run followed immediately by an all-ad libitum exercise. Performance was analyzed with a two-way repeated measures ANOVA. Run time and number of boxes lifted per minute were recorded. Performance was analyzed with a two-way repeated measures ANOVA.

RESULTS: Total number of boxes lifted was significantly lower in the ADL and HV trials (47 ± 9.5, 46 ± 11.8, respectively) compared to I+O (52 ± 11.1), but not IV (49 ± 12). Boxes lifted during minutes 1 and 5 were significantly higher than minutes 2, 3, and 4 for all trials. Performance times for the 0.5 min run were not different among trials.

CONCLUSIONS: Partial rehydration via IV and oral fluids appears to have an ergogenic effect on high-intensity, total-body exercise in the heat possibly due to a

2064 Board #220 May 30 2:00 PM - 3:30 PM Hydration And Gender Differences In Terms Of Non-oxidative Performance
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Nonoxidative performance is vital to the performance of many high level athletes (Armstrong, Johnson, McKenzie, Ellis, & Williamson, 2015; Chamari, Chaouachi, & Racinais, 2015). Many athletes are voluntarily hypohydrated through training as they do not properly rehydrate after a training session (Cengiz, 2015). The decrease in performance that accompanies changes in hydration can negatively impact athletes (Cengiz, 2015). PURPOSE: The present study examined the effect of hydration status on nonoxidative performance and to examine differences between the genders in terms of nonoxidative performance. METHODS: Twelve subjects, 6 males and 6 females, completed three sessions where a Wingate test was performed and lactate was measured. All subjects were NCAA Division III club or varsity athletes. The subjects completed a familiarization trial, a trial in the hypohydrated state and a trial in the hydrated state. The hypohydration trial was conducted after a 12 h water restriction

in order to induce a 2.4% decrease in body weight. No weight was lost prior to the hydrated trial and urine specific gravity was below 1.010. RESULTS: No significant difference was found in terms of hydration and nonoxidative performance (p = 0.02, η² = 0.27). A significant difference was found in terms of gender and nonoxidative performance. Males had a higher nonoxidative capacity (9.01 W/kg ± 0.37 vs. 6.58 W/kg ± 0.37, p = 0.001), nonoxidative power (13.51 W/kg ± 1.12 vs. 9.18 W/kg ± 1.12, p = 0.021) and fatigue index compared to females (24.54 W/kg ± 3.86 vs. 10.28 W/kg ± 3.86, p = 0.024). CONCLUSION: The results from this study indicate that hydration does not influence non-oxidative performance in NCAA Division III club or varsity athletes. Female athletes within this study had a decreased nonoxidative performance compared to the male athletes. These results contradict previous findings that indicated that relative measures of nonoxidative performance did not vary between the genders when represented in relative terms (Maud & Stull, 1986; Van Praag, Fellman, Bedu, Falgairette & Coudert, 1990). Future research can be performed to look at differences in fat mass between the genders and the impacting collegiate athletes in terms of non-oxidative performance.
Participants provided a 24-h urine sample across 7 (n=13) or 3 (n=19) consecutive days (148 ± 10 days for assessment of urine volume (Uvol), urine osmolality (Uosm), urine specific gravity (USG), and urine color (UCOL). Differences in 24-h hydration status between sex and ethnicity were assessed using linear mixed effects models with associated Bonferroni post hoc analyses. Significance was set a-priori at p < 0.05.

RESULTS: Uvol was significantly lower in BL (0.85±0.03 L) compared to WH college students (2.03±0.70 L) (p<0.001). Conversely measures of Uosm, USG, and UCOL, were significantly greater in BL (716±263 mOsm·kg⁻¹, 1.020±0.007, and 4.2±1.4, respectively) compared to WH college students (473±194 mOsm·kg⁻¹, 1.013±0.006, 3.0±1.2, and respectively) (p<0.05). Independent of race, women were significantly less hydrated than men as measured by Uosm, USG, and UCOL with the differences: 62; CI: 45-78). The overall diagnostic ability of urine osmolality assessed at late afternoon (1600-1959) to diagnose elevated urine osmolality (>800 mmol·kg⁻¹) was 80 mmol·kg⁻¹. The analysis was performed by using the first spot urine sample from each window. Other spot urine samples after the first spot urine within each time window were not used to avoid unequally weighting data.

RESULTS: Equivalence test showed that the late afternoon (1600-1959) spot urine sample Uosm value was equivalent to the 24-h Uosm value in children (P<0.05; mean difference: 62; CI: 45-78). The overall diagnostic ability of urine osmolality assessed at late afternoon (1600-1959) to diagnose elevated urine osmolality (>800 mmol·kg⁻¹) was 80 mmol·kg⁻¹.

CONCLUSIONS: These data suggest that in free-living healthy children, 24-h urine concentration can be approximated from a late afternoon spot urine sample.
Skin Tattoos Do Not Affect Exercise-induced Sweat Rate Or Sodium Concentration.

Purpose: Skin tattoos have been shown to reduce sweat rate and increase sweat sodium concentration when sweating is artificially stimulated. This study investigated whether similar responses are observed with exercise-induced sweating.

Methods: Twenty-two healthy individuals (25.1±4.8 y (Mean±SD), 14 males) with a unilateral tattoo ≥11.4 cm in size, >2 months in age, and shaded ≥50% participated in the study. Skin from the right and left ventral forearms with an Absorbent patch (3M Tegaderm+Pad) and Epifluidic patch (Epicore Biosystems, Inc.), respectively. A subset of subjects (n=9) completed two identical trials 2-4 days apart to determine test-retest reliability.

Results: There was no difference in sweat [Cl] between Absorbent and Epifluidic patches (32.9±16.8 vs. 34.5±19.6 mmol/L, p=0.21). Bland-Altman Limits of Agreement between methods was -10.1 to 13.3 mmol/L. There was a significant correlation between correlations (r=0.96, p<0.0001) and the coefficient of determination (r²) for predicting Absorbent from Epifluidic patch (Cl) was 0.92. Based on Deming regression analysis, the slope and intercept of the regression line describing Absorbent vs. Epifluidic patch sweat [Cl] were not different than 1 and 0, respectively. Sweat [Cl] was not different between repeat trials for the Absorbent (1.4±4.4 mmol/L, p=0.36) or Epifluidic patch (0.4±1.6 mmol/L, p=0.51) and test-retest CVs were 12% and 4%, respectively.

Conclusions: The Epifluidic patch provides accurate and reliable data for forearm sweat [Cl] estimation during exercise in controlled laboratory conditions. Future research is needed to evaluate the Epifluidic Colorimetric Patch for on-skin analysis of sweat [Cl] at other regional sites as well as during live practices and games.
vasodilation is thought to originate from increased nitric oxide bioavailability, thus increasing blood flow into the limb. However, the different aspects of the downstream microvascular oxygen delivery (i.e. perfusive and diffusive) to the exercising muscle have yet to be described. PURPOSE: The purpose of this study was to determine the effect of seven days of passive heating on oxygen delivery during handgrip exercise. We tested the hypothesis that, 7 days of passive heating would result in a decrease in the diffusive oxygen delivery (total-[heme]) and an increase in the perfusive oxygen delivery (deoxy-[heme]) in the exercising muscle. METHODS: Three participants (2 women, 23.0 ± 1.0 yrs, 70.9 ± 1.57 kg, 171 ± 1.01 cm) participated in this study. Peak power was determined by an incremental two-hand handgrip exercise test. Subjects performed 10 minutes of dynamic handgrip exercise at 40% peak power pre and post 7 days of passive heating. Absolute concentrations of deoxy-[heme] and total-[heme] of the flexor digitorum superficialis muscle were measured continuously via frequency-domain multi-distance near-infrared spectroscopy (OxiplexTS, ISS). The passive heating protocol consisted of immersion up to the shoulder in a 40°C hot tub until rectal temperature reached 38.5°C or increased by 1°C for 60 minutes. Data reported as mean ± SE. RESULTS: From baseline to the last 30 seconds of exercise there was no significant change in the Δ deoxy-[heme] (perfusive oxygen delivery) for pre (52.3 ± 2.2 µM) and post passive heating (47.7 ± 1.46 µM; p=0.22). However, the Δ total-[heme] (diffusive oxygen delivery) was significantly lower following passive heating (p=0.001). Pre and post passive heating Δ total-[heme] was 75.1 ± 13.8 µM and 30.7 ± 13.3 µM, respectively. CONCLUSION: The significant decrease in Δ total-[heme] after passive heating suggests that the diffusion of oxygen into the exercising muscle was reduced. This finding, along with no change in the perfusive oxygen delivery as represented by the Δ deoxy-[heme], suggests that the oxygen uptake of the exercising muscle was decreased.
A wet bulb globe temperature (WBGT) policy with suggestions for practice modifications can potentially help decrease the number of exertional heat illnesses (EHI) reported in high school football. It is unknown what impact such a policy would have on the number of outdoor football practices that would be cancelled or modified. **Purpose:** To assess WBGT during a full season of football at various high schools in Florida to determine how a regional WBGT policy would have impacted football practices. **Methods:** Environmental data was collected daily throughout the duration of the regular football season by athletic trainers stationed at 10 high schools in west central Florida. WBGT measures were recorded at approximately 4PM (R1) and again at 6PM (R2) to correspond with practice start and end times. These measures were then allocated into 5 previously defined, regional WBGT categories (R1) and again at 6PM (R2) to correspond with practice start and end times. These schools in west central Florida. WBGT measures were recorded at approximately 4PM for this same R1 timepoint were > 33.4°C which would have resulted in cancellation of outdoor practices on only a few days. It is also clear that the risk of dangerously elevated WBGT was not limited to preseason practices in August. Finally, the cancellation of outdoor practices on only a few days. It is also clear that the risk of dangerously elevated WBGT was not limited to preseason practices in August. **Results:** Nearly 39% (n=169) of all WBGT measures at R1 (~4PM) across the 10 schools were > 27.8°C and would not have required any practice modifications. Only 7.5% (n=33) of the measures for this same R1 timepoint were ≥ 33.4°C which would have resulted in cancellation of practice. Fifty-seven percent (n=208) of R2 WBGT measures were ≥ 27.8°C while only 1.1% (n=4) were ≥ 33.4°C. Also, the maximum WBGT measurement in August (33.1 ± 0.7°C) was significantly higher than in October (26.6 ± 0.7°C; P=0.000) but similar to maximum WBGT in September (32.7 ± 0.9°C) and November (31.0 ± 1.9°C; P=0.05). **Conclusions:** Our findings revealed that if existing regional heat guidelines would have been applied in Florida during our study, the policy would have resulted in the cancellation of outdoor practices on only a few days. It is also clear that the risk of dangerously elevated WBGT was not limited to preseason practices in August. Finally, delaying practices to later in the afternoon would likely decrease the risk of EHI and minimize the number of practices affected by a heat policy.

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Board #235

May 30 2:00 PM - 3:30 PM

**An Evaluation of Race Car Cockpit Temperature as an Indicator of Thermal Strain in Race Car Drivers**

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**No relevant relationships reported**

Under current Federation Internationale de l’Automobile (FIA) rules, in endurance sports car racing, if ambient temperatures inside the cockpit of a racing car exceed 32°C, then the maximum time a driver spends in the race car is reduced. However, teams have in the past used a variety of methods to monitor this risk. **Purpose:** To evaluate if cockpit temperature of a racing car effects the thermal strain of racing driver with and without an air conditioning (AC) system. **Methods:** Four male racing drivers had heart rate (HR), core temperature (Tcore), skin temperature (Tsk), and the physiological strain index (PSI) measured continuously during over 38 driving sessions of racing driver with and without an AC system. **Results:** Cockpit temperature elicited a positive relationship, with each measured variable: cockpit temperature (Twb) (r=0.243, p=0.001), core temperature (Tcore) (r=0.557, p<0.001), and PSI (r=0.469, p=0.002). There were no significant correlations with Tre (r=0.179, p=0.179) above 38.5°C was related to TTE performance, however, is influenced by both Tcore and HR, such as the physiological strain index (PSI), may also provide useful information to aid in return-to-duty decisions. **Conclusion:** Use of calculations that encompass both Tcore and HR, such as the physiological strain index (PSI), may also provide useful information to aid in return-to-duty decisions.
The heat tolerance test (HTT) assesses cardiorespiratory and thermoregulatory capacity during heat stress using core temperature (Tc) and heart rate (HR) as pass/fail criteria. Currently, there is minimal information available on the efficacy of various PSI interpretations, with respect to accurately identifying differences in physiological strain between those that have passed and failed an HTT. PURPOSE: To report different methods to evaluate physiological strain during HTT using PSI. METHODS: Eighty-two military personnel (age: 25 ± 5 yrs; height: 178.2 ± 7.2 cm; weight: 84.5 ± 9.9 kg) completed a 30 min continuous treadmill walking at 3.3 mph; 4.0% grade, in 40°C and 40% relative humidity. PSI was calculated from Tc and HR measurements that were recorded every 5 min. PSI was then interpreted as trial mean, end of test (EOT), slope, and time-weighted (0 min - EOT) area under the curve (AUC) for subjects that passed and failed an HTT and compared using independent samples t-tests. RESULTS: The trial mean PSI was significantly less in those that passed compared with those that failed (4.7 ± 0.3 vs. 4.8 ± 0.2, p < .005). Similarly, EOT PSI was significantly less for subjects that passed compared with those that failed (4.6 ± 0.3 vs. 4.7 ± 0.2, p < .001). PSI was also calculated as AUC (pass: 416 ± 141, fail: 453 ± 87, p < .001) and, when adjusted for trial time, resulted in a significantly lower V̇E/PETCO2 for those that passed compared with those that failed (3.4 ± 0.8 vs. 3.5 ± 0.8, p < .001). CONCLUSION: Findings indicate all PSI parameters investigated appropriately differentiated between subjects that passed and failed the HTT, resulting from either cardiorespiratory stress, thermoregulatory stress, or a combination of the two. Further work on the use of this index and its evaluation is warranted, as there are no defined criteria for HTT fail using PSI as an integrative value of total thermal strain.
Purpose: The purpose of this investigation was to examine the recruitment of classical monocytes during prolonged aerobic exercise in high temperature and humidity conditions. Methods: Seven recreationally active men (23.4 ± 3.0 yrs; 180.9 ± 5.8 cm; 85.1 ± 11.3 kg; 3.7 ± 0.27 L∙min⁻¹) completed four cycling trials in 37°C/23% Relative Humidity (RH) (HTLH), 37°C/33%RH (MTMH), and 37°C/51%RH (MTHH) in a counterbalanced design. This was followed by another 10 days of controlled (internal work-rate) cycling under neutral conditions (CON). Twelve healthy sedentary subjects (7M/5F, 28±6y, 78±17kg), completed a 10-day (90min/day exercise bout) clamp controlled (internal work-rate) cycling bout. The purpose of this investigation was to examine the recruitment of classical monocytes (CD14++CD16-) via flow cytometry. Briefly, CCR2 expression was determined as fold change over fluorescence minus one (FMO). Data were analyzed using within-subjects repeated measures ANOVA. Results: A significant main effect for time was observed (F = 8.9; p = 0.018). A main effect for condition (F = 2.788, p = 0.659) for CCR2 expression. No differences in CCR2 expression were observed between HI versus MI exercise. These data indicate that high temperature and/or humidity conditions do not impact recruitment of classical monocytes. Furthermore, prolonged cycling appears to increase circulating MCP-1 and decrease CCR2 expression on classical monocytes. Collectively, this may indicate a limited effect of aerobic exercise on the overall recruitment of classical monocytes, although further research is warranted.

Thermal behavior is greater during HI exercise due to a greater afferent thermal work limit readings were 8 a.m. 161.56 +/-12.06 (5.4); 10 a.m. 155.8 +/-17.76 (7.9); Noon. 139.54 +/-26.98 (12.1); 2 p.m. 152.2 +/-46.21 (20.7); and 4 p.m. 166.56 +/-33.78 (15.1). The mean UV index readings were 8 a.m. 0.1 +/-0 (0.0); 10 a.m. 2.68+/-1.11 (0.5); Noon. 8.14 +/-1.00 (0.7); 2 p.m. 8.56 +/-0.23 (1.0); and 4 p.m. 6.66 +/-2.11 (0.9). CONCLUSIONS: Data suggest that the thermal conditions from June to July in southern Texas are considered “low alert” based on the Event Alert System used by the ACSM and other organizations, such as the Bank of America Chicago Marathon. Based on UV index data, participants and track meet officials should wear sunscreen. Although data suggest “low alert,” track & field officials should consider starting summer track meets at 4 p.m. when UV index begins to diminish.

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Environmental physiology studies rely on the accurate measurement of skin and internal temperatures. Many traditional skin temperature systems utilize thermistor or thermocouple measurements. However, utilizing a transistor-based sensor allows for a more linear data set, which could provide more stability, thus allowing for a more robust and accurate measurement over a range of environmental conditions. Field Programmable Gate Arrays (FPGA) are relatively low cost and low power consuming programmable hardware devices that allows for a signal to be processed and viewed in real time. Combining the processing power of the FPGA and the heightened accuracy of transistor-based analog temperature sensors, a modernized data acquisition (DAQ) system could provide linearized real time data.

PURPOSE: To design a wireless patch-type transistor-based skin temperature DAQ system that will provide a more accurate and linear set of data for measurement in hot/humid/cold/alpine environments, and will be sufficiently robust for outdoor field studies.

METHODS: We designed and built a prototype wireless transistor-based skin temperature DAQ that implements a precision analog temperature sensor to acquire skin temperature and FPGA technology for signal processing. The tested accuracy for the precision analog temperature sensor is ±0.05-0.1°C in a temperature range of 20°C to 42°C. By utilizing FPGA technology, the system will process, pack, and wirelessly send data to a computer for real time monitoring.

RESULTS: In preliminary testing, the FPGA system showed an overall lower power consumption in addition to less variability in Voltage (V), the signal upon which the precision analog temperature sensor is ±0.05-0.1°C in a temperature range of 20°C to 42°C. By utilizing FPGA technology, the system will process, pack, and wirelessly send data to a computer for real time monitoring.

CONCLUSION: Our data suggest that our new FPGA approach is superior to traditional skin temperature measurements in its ability to rapidly attain and maintain accurate temperature readings. Next steps include field testing the device over a wide range of temperature, wind and humidity conditions.

Funded by USAMRMC; author views not official US Army or DOD policy.

Body water loss due to thermoregulation during exercise in a hot environment may cause a significant decrease in body mass, affecting blood plasma volume and consequently parameters such as blood glucose (BG) concentration. It is not known if the increased rate that occurs as a result of exercise in a microclimate such as personal protective equipment impacts BG concentrations differently than a slower rate of thermal acquisition. PURPOSE: The purpose of this study was to determine if rapid heat acquisition impacts body mass, urine specific gravity (USG) and BG concentration differently than slow heat acquisition during exercise.

METHODS: Fourteen healthy male subjects (mean age, 33.6 ± 12.1 years) performed an incremental exercise test to a termination criterion in a control condition (CON) and an experimental session (PPE). Body mass, USG and BG were measured before and after each trial. RESULTS: Rate of thermal acquisition was significantly different (p = 0.001) between CON (0.02±0.04 °C/min) and PPE (0.04±0.19 °C/min). Time to termination (TTT) was significantly different between CON (77.3 ± 22.5 min) and PPE (50.3 ± 12.4 min) and subjects also showed a lower HR throughout CON (pre = 76.8 ± 8.6 bpm; post = 161.1 ± 20.7 bpm) when compared to PPE (pre = 86.5 ± 9.3 bpm; post = 179.6 ± 11.7 bpm). Both conditions resulted in an identical and significant loss of total body mass (1.45 ± 0.62 kg; p<0.05), with a corresponding increase in USG (p<0.01). Despite body water loss, no significant change in blood glucose concentration occurred pre- to post-exercise in either condition (BGCON = 0.04±0.853 mmol/L; BGPE = 0.34±0.93 mmol/L). CONCLUSION: This data suggests that constant levels of blood glucose concentration are maintained regardless of rate of heat acquisition and despite body water loss that would affect plasma concentration.
Participating in marathons in hot and humid weather may lead to fatigue, syncope, injuries or even death. In the diagnosis and monitoring of delayed onset muscle soreness and fatigue status, infrared thermography (IRT) has been used as a non-invasive method for assessing skin temperature as a response of muscle hyperthermia after exercise.

**Purpose:** Analyze the effect of running in a marathon in a hot and humid environment on skin temperature.

**Methods:** Seventeen amateur runners (age 35.82 ± 7.03 years, weight 66.79 ± 11.97 kg, height 168.44 ± 10.59 cm, VO2peak 52.88 ± 7.09 ml/kg/min) had their lower limb skin temperature measured using infrared IRT (FLIR T450) after running a marathon (80-80 m.a.s.l.) in a hot (thermal index 28.3 ± 3.27 °C) and humid environment (~81 %), the measures were taken in a temperature controlled room (23°C). Both dominant (DLL) and non-dominant (NDLL) lower limbs were divided for analysis into fourteen different areas and mean temperature of each area was used for analysis. A one-way ANOVA were used to compare thermal images taken 15 days and before marathon and 24 hours and 6 days after marathon.

**Results:** We found significant differences in skin temperatures: knee (DLL: F(3.48): 4.097, p = 0.004); Vastus lateralis (DLL: F(3.48): 7.191, p < 0.01; NDLL: F(3.48): 4.885, p = 0.003); Rectus femoris (DLL: F(3.48): 5.956, p = 0.002, NDLL: F(3.48): 5.521, p = 0.002); Vastus medialis (DLL: F(3.48): 5.079, p = 0.004, NDLL: F(3.48): 7.214, p < 0.001); Adductor (DLL: F(3.48): 4.097, p = 0.011; NDLL: F(3.48): 5.702, p = 0.002); Biceps femoris (DLL: F(3.48): 18.952, p < 0.01; NDLL: F(3.48): 15.105, p = 0.01); Popliteal fossa (DLL: F(3.48): 11.103, p = 0.001; NDLL: F(3.48): 11.598, p = 0.001); Semitendinosus (DLL: F(3.48): 14.382, p < 0.01; NDLL: F(3.48): 15.060, p = 0.01); Lateral gastrocnemius (DLL: F(3.48): 5.079, p < 0.01; NDLL: F(3.48): 10.316, p < 0.01); and Medial gastrocnemius (DLL: F(3.48): 7.567, p = 0.01). Significant differences in all areas mentioned were found between measures: pre 15d < post 24h, pre marathon < post 24h y post 24h > post 6d.

**Conclusions:** Running a marathon in hot, humid environment leads to significant increases in lower limb skin temperature and the temperature levels returned to baseline values after 6 days of recovery.
used to model and predict GH output over time. The LSTM was trained on the first 1-4hr of each of the exercise and resting profiles using lagged GH and SampEn. Five iterations of each model were run and the root mean square of the error (RMS) from each of these iterations were compared across conditions. RESULTS: The LSTM models trained on the exercise profiles provided significantly better fit compared to the resting condition (RMS$_{\text{fit}}$ = 0.28 ± 0.02; RMS$_{\text{rest}}$ = 0.41 ± 0.06; p = 0.02), resulting in more accurate prediction of the nighttime changes in GH than resting profiles.

CONCLUSIONS: The ability of these models to learn the relationship and accurately predict GH output based on the patterned regulation of cardiac control throughout the day represents a shared hierarchical regulation between the HP and cardiac axes. These methods capture the more rapid time-dependent relationships that are currently missed with common assessment techniques.

Evidence tying ultraviolet (UV) light exposure to endogenous vitamin D synthesis presents a possibility for naturally enhancing serum testosterone via endogenous vitamin D. PURPOSE: 1) Determine the effect of an acute bout of UV light exposure on post-resistance exercise serum testosterone in older men and 2) to investigate whether serum testosterone was influenced by endogenous vitamin D. METHODS: Six older adult men (age 62.1 ± 9 yrs, height 179.9 ± 12.1 cm, body mass 83.7 ± 3.12 kg, BMI 25.9 ± 1.15 kg/m$^2$) participated in two identical resistance exercise sessions no significant difference compared with group C. After 35D, (p < 0.01), and then decreased without significantly difference. But the protein expressed have stage characteristics, and the expression level of KISS-1 and GPR54 almost unchanged from 21D to 35D, and increased significantly from 35D to 43D, then decreased from 43D to 56D. The GPR54 protein of 56th D was significantly lower than that of group C at 56th day (p<0.01).

RESULTS: The Kiss-1mRNA of FS group increased continusly, which was opposited with CS group. The GPR54 mRNA of FS group got to the maximum level on 42nd day, which was similar with CS group. Both in FS and FS groups, GnRH mRNA decreased significantly before 56th day, which had the trend of increase. In both CS and HE groups, the mRNA level of Kiss-1 and GPR54 got the maximum levels on 42nd day, which opposed with the lowest level of GnRH mRNA. CONCLUSIONS: The changed trend of kisspeptin/GPR54 signaling pathway during the growth period were obvious increase in high-fat diet rats. Exercise could change the trend of kisspeptin/GPR54 signaling pathway induced by high-fat diet especially after puberty.

Evidence tying ultraviolet (UV) light exposure to endogenous vitamin D synthesis presents a possibility for naturally enhancing serum testosterone via endogenous vitamin D. PURPOSE: 1) Determine the effect of an acute bout of UV light exposure on post-resistance exercise serum testosterone in older men and 2) to investigate whether serum testosterone was influenced by endogenous vitamin D. METHODS: Six older adult men (age 62.1 ± 9 yrs, height 179.9 ± 12.1 cm, body mass 83.7 ± 3.12 kg, BMI 25.9 ± 1.15 kg/m$^2$) participated in two identical resistance exercise sessions followed by a 30-minute recovery. Sessions were approximately one week apart and the exercise protocol consisted of 4 sets of 10 repetitions of leg press, chest press, and back row with one minute of rest between sets. After the second exercise session, participants were exposed to an UV light source during the first 10 minutes of recovery. Serum testosterone and vitamin D were measured pre- and post-resistance exercise in 5-minute increments during the 30-minute recovery. RESULTS: Exercise alone did not significantly affect serum testosterone or vitamin D. Exercise combined with acute UV light exposure significantly increased serum testosterone area under the curve (p = 0.05) but did not significantly alter serum vitamin D. CONCLUSION: These findings suggest that acute UV light exposure may positively affect serum testosterone response following a single bout of resistance exercise in older adult men.

Salivary cortisol (C$_{s}$) represents the free cortisol concentration of serum cortisol (C$_{s}$). It has been suggested that C$_{s}$ is approximately 5-10% of total C$_{s}$; however, the impact of normal variation in C$_{s}$ and how this pattern affects the proportion of C$_{s}$ and C$_{p}$ (C$_{p}$/C$_{s}$) has yet to be explored. PURPOSE: Therefore, the purpose of this study was to assess the diurnal changes of C$_{p}$/C$_{s}$ and the extent to which a high-intensity exercise bout may impact this relationship. METHODS: Male (n = 7) college-aged students (26.3 ± 2.8 yrs, 176.3 ± 8.1 cm, 73.6 ± 12.6 kg, 9.9 ± 3.2% BF(%), VO$_2$ max: 68 ± 9.5 ml.kg$^{-1}$.min$^{-1}$) completed 24-hour (rest and exercise) cortisol profiles. Subjects had a catheter inserted at 0600h and blood and saliva samples were collected simultaneously every 120 mins. During the exercise condition, subjects performed 5x30s sprinting intervals on the cycle ergometer, at a resistance of 75% of body mass. Subjects were permitted 3-min of passive recovery between bouts. C$_{s}$ and C$_{p}$ were analyzed via competitive-binding assay. C$_{prop}$ was calculated as proportion of C$_{prop}$ relative to C$_{s}$ at each time point. Multilevel growth models with varying fixed/random coefficients were tested and compared (AIC). The final cubic growth model controlled for condition and freely estimated the intercept, velocity, and acceleration terms while coefficients were tested and compared (AIC). The final cubic growth model showed a significant effect for exercise (β = -1.37, p = 0.036; AIC = 1030.781). The greatest C$_{prop}$ at 2300hr appears to be driven primarily by the shift in the cortisol secretion pattern. This shift may be influenced by night time cortisol secretion dynamics, especially during late afternoon and nighttime hours. It is therefore recommended that cortisol profiles be constructed from both total and free C$_{s}$ for the most accurate monitoring of the HPA-axis, especially within an exercise context.

Hypothalamic kisspeptin/GPR54 system is the “control switch” for the onset of puberty. Obesity induced by high-fat diet and/or physical inactivity is a leading cause of precocious puberty.PURPOSE: To observe the effect of high-fat diet on the hypothalamic expression of kisspeptin-1, the G-protein coupled receptor (GPR) 54and GnRH mRNA and explore the modulatory role of moderate-intensity exercise in the high-fat diet feeding male rats, which are in growth period. METHODS: Male weaning rats (21d) were fed high-fat-diet were randomly assigned to chow diet sedentary (CS, n=24), Chow diet exercise (CE, n=24) and high-fat diet sedentary (HS, n=24), high-fat diet exercise (HE, n=24) groups. SE and FE groups did the 60%-$\text{V}^\circ\text{O}2\text{max}$ treadmill training (5 days/week, 1 hour/day). The $\text{V}^\circ\text{O}2\text{max}$ of exercise groups were measured every two weeks. 6 rats of each group were killed on the 35th, 42nd, and 56th day. The hypothalamic expression of kisspeptin-1, GPR54 and GnRH mRNA were tested in each group. RESULTS: During the growth period, the Kiss-1mRNA of FS group increased continuously, which was opposed with CS group. The GPR54 mRNA of FS group got to the maximum level on 42nd day, which was similar with CS group. Both in FS and FS groups, GnRH mRNA decreased significantly before 56th day, which had the trend of increase. In both CS and HE groups, the mRNA level of Kiss-1 and GPR54 got the maximum levels on 42nd day, which opposed with the lowest level of GnRH mRNA. CONCLUSIONS: The changed trend of kisspeptin/GPR54 signaling pathway during the growth period were obvious increase in high-fat diet rats. Exercise could change the trend of kisspeptin/GPR54 signaling pathway induced by high-fat diet especially after puberty.
Low muscle strength and decline in the power are associated with low walking speed and with mobility limitations, disabilities and falls among older populations. Whether menopause per se accelerates decline in physical performance in women and in this way contributes to functional limitations in later years remains controversial.

PURPOSE: The aim of this study was to examine changes in physical performance in women aged 47 to 55 following the menopausal transition. METHODS: This longitudinal study is a part of the Estrogenic Regulation of Muscle Apoptosis study. Women aged 47 to 55 were randomly selected from the Finnish National Registry (n=678) and perimenopausal women (n=228) were followed until postmenopausal. The baseline menopausal status was defined based on menstrual cycle diary and follicle stimulating hormone (FSH) level. The progression of menopausal transition was followed at three-to-six months intervals for early perimenopausal and late perimenopausal women, respectively. When FSH >30 IU/l was recorded, the participant was considered to be postmenopausal. To capture a comprehensive understanding of the physical performance, measures of muscle power (vertical jump), muscle strength (grip and knee extension), aerobic capacity (6min walking distance), and walking speed were carried out. RESULTS: A significant decline in hand grip force for -2.9 % (95%CI 4.5, -1.1; d=0.20) in knee extension force for -3.1% (95%CI -4.8, -1.3; d=0.23) and in vertical jumping height for -3.24 % (95%CI -4.6, -1.7; d=0.28) was observed following the menopausal transition. Walking distance significantly increased for 1.9 % (95%CI 1.2, 2.7, d=0.38) while in walking speed changes were not significant (95%CI -0.4 % -1.1, 1.6; d=0.02) non-significant. CONCLUSIONS: The menopausal transition influences muscle strength and power, whereas the influence on mobility walking was less evident and may follow after. Supported by the funding from the European Union’s Horizon 2020 research and innovation Programme under the European Commission’s Horizon 2020 (829167) grant on MCRT and the Academy of Finland (ERMA study grant agreement 275323).

Vitamin D deficiency, defined as total hydroxyvitamin D (25(OH)D) <50 nmol/L, is associated with poor bone health, impaired muscle function and increased risk of some diseases. The biologically active form of vitamin D is dihydroxyvitamin D (1,25(OH)2D) to the catabolic metabolite (24,25(OH)2D) determines biological activity. In women, higher 25(OH)D concentrations have been reported in oral contraceptive users compared with women on hormone therapy (HT) or no hormone (no-HC) use. However, it is unclear whether the secretions of salivary cortisol and IgA levels in response to different exercise volumes are related to subjective fatigue and exercise performance. PURPOSE: The aim of this study was to investigate relationships among salivary cortisol and IgA levels, subjective fatigue, and exercise performance after acute endurance exercise. METHODS: Nine healthy young males voluntarily participated in this study. All subjects randomly performed the following three sessions: cycling exercise at 70%VO2max for 20-min (20-min session), cycling exercise at 70%VO2max until exhaustion (exhaustive session), and resting control for 20-min (resting session). Salivary cortisol and IgA levels, visual analog scale on subjective fatigue, and maximum voluntary contraction (MVC) in knee extensor muscle groups were measured before and immediately, 30, 60, and 120 min and 24 hours after each session. RESULTS: In the 20-min and exhaustive sessions, subjective fatigue increased at immediately after exercise and decreased 60, 120 min and 24 hours after exercise. However, MVC showed no change throughout the all sessions. In the resting sessions, no significant differences in salivary cortisol levels before and after exercise were observed. In the 20-min and exhaustive sessions, salivary cortisol levels were significantly higher 30 min after exercise as compared with before exercise and after then gradually decreased until 120 min after exercise. (p<0.05). No significant differences in salivary IgA levels before and after exercise were observed in all sessions. Additionally, salivary cortisol and IgA levels were positively correlated with the subjective fatigue (cortisol; r=0.243, p<0.05; IgA; r=0.167, p<0.05), but were not correlated with the MVC. CONCLUSIONS: These findings suggest that the changes in salivary cortisol and IgA levels may be related to increase in acute exercise-induced subjective fatigue. Supported by Grants-in-Aid for Scientific Research (#17H02182 and #16K13059, M. Iemitsu).
and sex-specific standard deviation scores (SDS) using the CDC growth charts. In athletes with >1 examination, generalized estimating equations were used for repeated measures analyses of height SDS changes over time.

**RESULTS**: Data on 2,287 athletes were available, of which 693 had >1 height measurement and formed the study population (70.4% males, mean age 11.5±2.4 years, range 6-18, from 46 sport types). The median duration between the first and last examinations was 1.9 years (IQR 0.99-2.93 years) with a maximum of 9.3 years. Height SDS was not significantly changed throughout the follow-up period in the total cohort (0.13 per year, 95% CI -0.52-0.03, p=0.51), see Figure. In subgroup analyses, no significant change in height SDS was seen among athletes aggregated from classic height-advantageous sports (basketball, volleyball, tennis and swimming, p=0.73), basketball players (p=0.84) or gymnasts (p=0.24). No significant change in height SDS over time was seen when participants were stratified by first measurement age (<9, 9-12, 12+ years) and sex.

**CONCLUSIONS**: In this large cohort of pediatric athletes with repeated physical examinations, competitive sports were not associated with significant changes in body height relative to age. This finding remained true regardless of age at first measurement and sex, as well as when focusing on sports with typically tall or short statures. Competitive sports do not seem to hinder growth in children.

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**Board #263**

**May 30 3:30 PM - 5:00 PM**

**The Effect Of FTO rs9969309 Polymorphism On Body Composition In Chinese adults**

Chunbo Qin¹, Xi Jin², Ji Li³, Daixi Xie¹, Xin Zhao¹, Mark Loftin, FACSM⁴. Shenzhen University, Shenzhen, China. The University of Mississippi, University, MS. The Sixth Hospital of Shenzhen, Shenzhen, China. (Sponsor: Mark Loftin, FACSM)

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(No relevant relationships reported)

The FTO (fat mass and obesity associated) gene, the first common obesity susceptibility gene in a Caucasian population, was reported by GWAS (genome-wide association studies) in 2007. **PURPOSE**: The aim of this study was to explore the effect of genotypes of FTO rs9969309 polymorphism on body composition related traits in Chinese adults. **METHODS**: Forty-three Chinese adults aged from 19 to 55 years old (32 males and 11 females) were recruited from Shenzhen University and a running club of local community. The subjects participated in physical activity at least three times per week with thirty minutes each session. Body composition related traits, including body weight (BW), hip circumference (HC), abdomen circumference (AC), waist-hip ratio (WHR), percentage of body fat (PBF), fat mass (FM), fat free mass (FFM) and body mass index (BMI), were analyzed by bioelectrical impedance analyzer (BI-380 in Beijing Aecenway Co. The genotypes of FTO rs9939609 were analyzed by the Beijing Genomics Institute. One-way ANOVA was used to compare between genotypes and body composition related data. **RESULTS**: There were three genotypes (TT, AT and AA) in rs9939609 polymorphism, in which 24 individuals with TT genotype, 16 individuals with AT genotype and 3 individuals with AA genotype. The body composition related traits, including HC, AC, BMI and FM, were significantly lower in TT genotypes than those in AA genotypes (p=0.017, p=0.004, p=0.002, p=0.006, respectively), and were significantly lower in TT genotypes than those in AT genotypes (p=0.025, p=0.010, p=0.041, respectively). Also, there was a significant difference only between TT and AA genotypes in WHR (p=0.015). No significant differences were found in the three genotypes with BW, PBF and FFM. **CONCLUSION**: The results indicate differences in several body composition parameters regarding the FTO rs9969309 polymorphism in a small sample of Chinese adults.

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**Board #264**

**May 30 3:30 PM - 5:00 PM**

**The Association Between Mct1 T1470a And Ace I/d Polymorphisms And Athletic Status In Climbing Athletes**


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(No relevant relationships reported)

Previous studies have shown a relationship between MCT1 T1470A polymorphism and blood lactate concentration during and after high-intensity intermittent exercise. In addition, the I allele seems associated with endurance-oriented events, while the D allele seems like to be the opposite with power-oriented events in the ACE I/D polymorphism. Sports climbing also required muscle power and endurance performance, therefore we hypothesis that MCT1 T1470A and ACE I/D polymorphisms associated with athletic performance in climbing athletes. **PURPOSE**: To investigate the effects of the MCT1 T1470A and ACE I/D polymorphisms on athletic achievements (national or regional level) in climbing athletes. **METHODS**: Sixty-nine climbers (49 men and 20 women) were genotyped for the MCT1 T1470A genotype (rs1049434) and ACE I/D (rs429413) using the TaqMan®Assay. All climbers were assigned to two groups (35 national level climbers and 34 regional level Climbers) based on their results of competitions. **RESULTS**: The genotype frequency of the AA, TA, and TT genotypes in the MCT1 gene were 43%, 49% and 8% in the national level and 44%, 32%, and 24% in the regional level. TT genotype frequency was lower tendency in national level climbers (8%) compared with regional level athletes (24%) (P=0.089). The genotype frequency of the DD, ID, and II genotypes in the ACE I/Dgene were 16%, 38% and 46% in the national level and 3%, 38%, and 59% in regional level. There was no significant differences of frequency of the DD, ID, and II genotypes in the ACE I/D. **CONCLUSIONS**: Results: conclusions were suggested that MCT1 T1470A and ACE I/D genotypes can provide useful information (e.g., talent selection and genotype-based customization for training) for athletes, especially well-trained men and their strength and conditioning coaches and sports coaches.
MC: Endurance-oriented athletes have a higher proportion of slow-twitch muscle fibers (MF), whereas muscles of sprinters and strength athletes predominantly consist of fast-twitch MF. The heritability of the MF composition was estimated at 45%.

**PURPOSE:** To perform a genome-wide association study for MF composition and to validate the results in additional studies using sport-related phenotypes.

**METHODS:** MF composition of M. vastus lateralis in 168 physically active healthy Russian subjects (55 females, 113 males) was evaluated with immunohistochemistry. The case-control study involved 241 elite Russian athletes (89 sprinters, 49 strength and 103 endurance athletes). Twenty male wrestlers participated in the Wingate anaerobic test. Micro-array analysis (for detection of 700 K - 1.1 M single nucleotide polymorphisms (SNPs)) or whole-genome sequencing (wrestlers only) was used for genotyping.

**RESULTS:** We identified 929 SNPs that were associated (P<0.05) with the proportion of fast-twitch MF both in males and females. Next, we found that of the 929 SNPs, 37 variants were associated with sprinter athlete status (i.e., alleles associated with increased proportion of fast-twitch MF were over-represented in sprinters compared to endurance athletes). Of those, sprint-related alleles of 4 SNPs (rs7669580, rs1247330, rs2084968, rs2369665) were also over-represented in strength athletes (vs endurance athletes). Only rs7669580 SNP located in the LDL2 gene (encodes cytoskeletal protein) was found to be associated with the relative peak power in wrestlers. **CONCLUSION:** We have identified the A allele of the LDL2 rs7669580 SNP that was associated with increased proportion of fast-twitch MF (P=0.00046), ability to become a sprinter (P=0.002) or a strength athlete (P=0.016) and increased peak power of wrestlers (P=0.0187). The study was supported by grant from the Russian Science Foundation (Grant 17-15-01436).

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**2110  Board #266**

**May 30 3:30 PM - 5:00 PM**

**Circulating DNA As A Monitoring Tool In Professional Soccer**


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(No relevant relationships reported)

**PURPOSE:** Player monitoring in elite sports settings is becoming increasingly important. Questionnaires or biomarkers, such as circulating, cell-free DNA (cfDNA) are possible approaches for load monitoring. cfDNA concentrations were shown to increase dependent on total distance covered in soccer and cfDNA was associated with overtraining in weightlifters. Thus, the purpose of this study was to examine whether cfDNA is feasible as a monitoring tool in elite soccer players.

**METHODS:** Capillary blood from 22 elite male soccer players was collected on 40 time points during 4 months of a regular season. Moreover, 2 time points during pre-season were included. Blood samples were drawn on the day before and on days after season games. Players filled in a Visual-Analogue-Scale questionnaire (VAS) including the items “general perceived exertion” and “muscular fatigue”. Performance was recorded by a GPS based (training) or a camera based (games) tracking system.

**RESULTS:** cfDNA concentrations and V AS scores did not significantly correlate with training, the V AS scores were correlated with the tracking of the season games. Moreover, a higher load due an additional midweek game led to significantly higher cfDNA concentrations. Future studies will reveal the full potential of cfDNA as a monitoring tool for player load in soccer Players.

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**2111  Board #267**

**May 30 3:30 PM - 5:00 PM**

**A Genome-wide Association Study For Muscle Fiber Composition**


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(No relevant relationships reported)
Combining effects on DHEA patterns: -2GC + 5HTTLPR (interaction effect, F(7.3, 126.3) = 3.7, p < .001), -2GC + Bcll (group effect, F(3, 53) = 4.2, p = .01), and 5HTTLPR + Bcll (interaction effect, F(7.8, 134.8) = 3.7, p < .001). Salivary cortisol profiles were not modulated by candidate variants. CONCLUSION: Whereas MR’s affinity for cortisol and aldosterone is well researched, the link between -2GC and DHEA helps to resolve equivocal literature regarding MR’s potential compatibility with DHEA. Also, the connection between 5HTTLPR and DHEA implies the signaling between serotonergic and HPA systems extrapolates beyond the primary end-product, cortisol. Finally, this study demonstrates that genetic modulation of salivary DHEA profiles is additive, if not synergistic.

In endurance athletes, chronic mechanical stress to tendon and ligament induces local inflammation, leading to tendon and ligament injuries. Type 1, 5 and 12 collagen is the major structural component of tendon and ligament and other component is type 3 and 6 collagen. Several studies identified the relationship between tendon or ligament injuries and collagen gene polymorphisms such as, rs1800012 in COL1A1, rs12722 and rs3196738 in COL5A1, rs1800255 in COL3A1 and rs35796750 in COL6A1. However, effect of tendon and ligament inflammations on collagen-related gene polymorphisms remains unclear in Japanese endurance athletes. PURPOSE: This study aimed to clarify whether single nucleotide polymorphisms (SNPs) within the collagen genes were associated with the incidence of tendon and ligament inflammations in Japanese male endurance athletes.

METHODS: Twenty-four Japanese elite male long-distance runners participated in a cross-sectional study. All subjects were investigated the onset number of tendon and ligament inflamations in the student period of the university as compared with CT and TT genotype individuals (P<0.05) and was significantly higher in CC genotype of rs12722 in COL5A1 gene than in GG genotype individuals (P<0.05) and immediately after an incremental cycling test to exhaustion from a single healthy male athlete. Using size exclusion chromatography (SEC), 2 ml of plasma were separated into 16 fractions of 1 ml. cDNA concentration in plasma and SEC fractions was measured by direct quantitative real-time PCR of the LIPA2-repeat sequence with or without prior treatment of the fractions with DNase. To take pre-analytical considerations into account, the analysis was performed on freshly prepared plasma in a technical duplicate, and frozen SEC fractions. Vascular fractions 4 to 7 were defined by the presence of the genuine EV markers CD9 and CD63 as well as the platelet-EV marker CD41b in western blot analysis. Results Plasma cDNA concentration increased from 14.05 ng/ml plasma Pre to 157.91 ng/ml Post the cycling test. The amount of DNA, recovered in differently prepared SEC samples (fraction 1-16), was 8.8 ± 0.9 ng in the pre samples and 108.8 ± 22.8 ng post samples. The run of the cDNA curve in the SEC samples was very similar in the pre and post samples (r = 0.90, 95% CI: 0.82-0.94, p<0.001). In the vesicular fractions (SEC 4-7) 23.8 ± 1.9 % of the recovered DNA occurred. DNAseq treatment only slightly decreased the amount of DNA in fractions (4-7) from 2.18 ± 0.15 ng to 1.72 ± 0.52 ng in the Pre samples and from 24.9 ± 7.0 to 20.3 ± 0.4 ng in the Post samples. In the remaining SEC fractions 79.9 ± 6.4 % of the DNA was digested. Conclusion About 24% of the cDNA in human plasma occurs in the vesicular Sec fractions. The larger amount seems to be independent of EVs and is prone to DNaseI digestion. Further experiments are required to clarify if the DNA is inside of EVs or on the outside, protected from DNaseI.

To the best of our knowledge, the pertaining sources of information on the Potassium Voltage-Gated Channel Subfamily A Member 4 (KCNA4) gene do not evidence a KCNA4 Gene Variant is Auxiliary in the Complex Phenotype of Endurance Running Performance Level

ATHLETIC TRAINING EDUCATOR CONCUSSION SYMPTOMATOLOGY PRIORITIZATION FOR CLINICAL DECISION-MAKING COMPARED TO TYPICAL SYMPTOM PRESENTATION

Athletic training education program directors (PDs) are often tasked with setting the tone of their curriculum and prioritizing items of focus for students. Given the current attention on concussion, it is important to understand PDs’ concussion knowledge and strategies for decision making. PDs personal strategies may influence educational content and student practices, implicating clinical practices for new athletic trainees (AT). PURPOSE: To determine whether educator-identified prioritized symptoms for removing an athlete from play align with common concussion-related symptoms experienced by athletes. METHODS: PDs from 32 professional-level athletic training education programs (n = 25 undergraduate; age = 43.8 ± 8.2; yrs experience = 21.1 ± 9.2) completed a validated survey examining concussion knowledge and the three symptoms most likely to cause them to remove an athlete from play. Participants responded to questions regarding symptoms and consequences of concussion on the
Purpose: Concussion symptom evaluations are the most common tool used by clinicians to diagnose an injury. However, the most common post-concussion symptoms reported are also the symptoms that appear first on the Standardized Concussion Assessment Tool (SCAT) symptom list. The purpose of the current study was to evaluate whether SCAT symptom order influenced symptom reporting in healthy young adults with and without a prior concussion. Methods: Previously concussed and non-concussed young adults completed a survey consisting of demographics, medical history, and SCAT symptoms. Participants were randomized to either complete the original SCAT form or the SCAT with randomized symptom order. Since the individuals were healthy, many participants reported zero symptoms. Thus, logistic regression and zero inflated negative binomial models compared the symptom scores of the first 5 SCAT symptoms to determine whether presentation order influenced symptom reporting. The first five symptoms evaluated were headache, pressure in the head, dizziness, neck pain, and nausea. Results: A total of 13 (n = 6 Female) participants completed the surveys who had an average age 25.07 ± 4.73. Participants who completed the randomized SCAT consisted of 2 females (33.3%), 5 males (71.4%), there was no significant effect of sex on likelihood of receiving the randomized SCAT order (p = 0.05). The participants (60.5%) out of five with a concussion completed the randomized SCAT order. There was no significant effect of prior concussion on likelihood of receiving the randomized SCAT order (p = 0.05). Logistic regression and zero inflated negative binomial models yielded no significant effect of SCAT order on the likelihood to report symptoms or the severity of symptoms (all p’s ≥ 0.05). Conclusions: These data suggest that in general, PDs are prioritizing the most common symptoms that appear first on the SCAT presentation does not appear to influence symptom reporting or severity. Follow up analyses should evaluate for this effect in a larger sample and in acutely concussed individuals.
Fourteen participants (n=6 CON 22.87 ± 2.13 years, 3.16 ± 2.14 concussions, 4.49 ± 1.66 years from concussion, n=8 NC 26.42 ± 5.25 years) completed the 2-Minute Walk (2WALK), and Timed Up and Go (TUG) gait tasks while equipped with 10 IMU’s. Exclusion criteria included no orthopedic injuries in the past year or condition that impedes gait, or the ability to jump. Additionally, control participants were excluded if they presented with any concussion history. Independent t-tests were utilized to examine the relationship between concussion history and motor function utilizing turn velocity, angle, and duration, as well as double support gait percentage and TUG duration. For all TUG variables, the results from the participants’ three trials were averaged before computation. Results: There was a significant difference amongst groups for turn duration (p<0.01), turn velocity (p=0.04), during the TUG gait task. Additionally, there was a significant difference for percentage of gait cycle in double support for the 2WALK (p=0.011). Turn velocity was faster for the concussed participants (mean CON = 2.80 ± 0.35 m.sec^-1) while turn duration was shorter (mean CON = 1.66 ± 0.1 sec, ICC = 0.94 ± 0.07) compared to controls. Concussed participants spent approximately 3.5% less of their gait cycle in double support during the 2WALK task. Conclusion: Preliminary findings show altered gait and turning strategies among those with a concussion history. These differences may be explained by concussion history. Alternatively, differences in activity levels and sporting experience may also contribute. Future analyses will reassess these changes in addition to other kinematic metrics as sample size increases.

2121 Board #277 May 30 3:30 PM - 5:00 PM Interrater And Intrarater Reliability Of The Standard Assessment Of Tackling Technique (SATT) On Secondary School Football Athletes Scott Dietrich1, Braden Lawson2, Jane McDevitt1. Kansas State University, Manhattan, KS. Independent, Manhattan, KS. Temple University, Philadelphia, PA. Email: sdietric@ksu.edu (No relevant relationships reported)

BACKGROUND: Eighteen years after Guskiewicz et al. (2000) began studying sport related concussion in collegiate and high school football players, head and spine injuries remain a very serious concern for the sport. An upward trend in serious catastrophic brain and spinal cord injuries still exists (Meekan and Landry, 2015), despite greater awareness of signs and symptoms, improved injury evaluation, more accurate symptom assessment, cautious return to play decisions, better helmet technology, new tackling styles, updated coach education, and rule changes limiting contact in practice (Yang et al., 2017). A consistent, cost effective method to evaluate and screen unsafe tackling styles, updated coach education, and rule changes limiting contact in practice remain a very serious concern for the sport. However, the association between subjective symptoms and objective measures of head impacts for defensemen in games, but not for forwards. Player position may play an important role in future interventions to reduce quantity and severity of head impacts in collegiate ice hockey.

METHODS: Collegiate men’s and women’s ice hockey players (N = 33; men = 17, women = 16) were randomly assigned to a 3D-MOT group (3D-MOT = 17) or control group (C = 16). 3D-MOT training occurred twice per week for 12 weeks throughout one regular season. Quantity, location, linear acceleration, and rotational velocity of head impacts were measured in practices and games. Independent samples t-tests compared peak linear acceleration and peak rotational velocity between groups. Pearson chi square analysis compared the quantity of impacts between groups. Independent groups ANOVAs compared peak linear acceleration and peak rotational velocity of impacts between player positions and peak linear acceleration and peak rotational velocity at five different helmet locations between groups. RESULTS: 3D-MOT forwards sustained fewer head impacts than forwards with greater head acceleration (3D-MOT = 41.33 ± 28.54g; C = 38.03 ± 24.30g) and mean peak rotational velocity (3D-MOT = 13.59 + 8.18 rad.sec^-1; C = 12.47 + 7.69 rad.sec^-1) in games, and greater mean peak rotational velocity in practices versus control forwards (3D-MOT = 11.96 + 6.77 rad.sec^-1; C = 10.22 + 6.95 rad.sec^-1). Conversely, 3D-MOT defensemen sustained fewer in-game head impacts (3D-MOT = 181 head impacts; C = 282 head impacts) and head impacts with a mean peak rotational velocity less than control defensemen (3D-MOT = 11.54 + 6.76 rad.sec^-1; C = 13.65 + 8.43 rad.sec^-1). There was no significant difference for all other parameters analyzed between 3D-MOT and control groups. CONCLUSION: 3D-MOT training reduced the quantity and severity of head impacts for defensemen in games, but not for forwards. Player position may play an important role in future interventions to reduce quantity and severity of head impacts in collegiate ice hockey.
Reliability of the Stability Evaluation Test Over Consecutive Annual Baseline Assessments

Theresa L. Miyashita1, Eleni Diakogeorgiou2. Concordia University - Chicago, River Forest, IL. 2Southern Connecticut State University, New Haven, CT. Email: theresa.miyashita@cuchicago.edu

PURPOSE: It is recommended athletes receive annual concussion baseline testing that includes an assessment of postural control. Research has found concussion history does not correlate to baseline Balance Error Scoring System (BESS) scores. However, the BESS is not as sensitive in detecting when an athlete’s tremor control changes between groups to force plate measurements. The Stability Evaluation Test (SET) on the VSR Sport®由 NeuroCom® is an instrumented BESS and measures sway velocity. The purpose of this study was to determine the reliability of baseline sway velocity measurements taken during consecutive annual baseline screenings in Division I lacrosse players.

METHODS: 44 healthy Division I Lacrosse Players (14 females, 30 males; age = 20.57 ± 0.99; height = 69.59” ± 3.38”; weight = 169.73lbs ± 31.24) from one university participated in the study. All players were medically cleared for full participation and did not have a history of a concussion in the last 12 months. At the start of each season, players performed the standard 3 stances of the BESS test (double leg, single-leg, tandem) on two surfaces, firm and foam, while standing on the VSR Sport® force plate.

RESULTS: A Pearson correlation analysis of the 2017 and 2018 sway velocities during each stance of the Stability Evaluation Test, found that none of the stance trials met the prior threshold of r > 0.70 to indicate good test-retest reliability. CONCLUSIONS: There is not a strong correlation between baseline balance measurements taken at the start of consecutive seasons. To ensure the reliability of measurements, it is recommended annual baseline measurements be taken even in the absence of a concussion. An individualized approach is ideal in the management of a concussion injury, and baseline accuracy should be considered a critical component.
2128 Board #284 May 30 3:30 PM - 5:00 PM
Relationship Between Cardiorespiratory Fitness and Arterial Stiffness in Healthy Adults
Eleanor H. Santer, Daniel R. Estlon, Bradley S. Fleener, Matthew P. Harber, FACSM. Ball State University, Muncie, IN.

Conclusions: These data suggest that PTSD individuals have less RoR in response to graded exercise compared to AH individuals. In addition, PTSD group had increased plasma BNP, and TNI suggesting an increased risk of having a cardiac event. It is suggested that this procedure may be useful as a screening process to help identify individuals with a risk of a coronary event.

2129 Board #285 May 30 3:30 PM - 5:00 PM
Relationships Among Muscle Function, Skeletal Muscle Mass, and Arterial Stiffness
Olivya E. Jones, Daniel E. Estlon, Bradley S. Fleener, Matthew P. Harber, FACSM. Ball State University, Muncie, IN. (Sponsor: Matthew P. Harber, FACSM).

Skeletal muscle function (MF), skeletal muscle mass (SMM) and arterial stiffness are independent risk factors for all-cause mortality and cardiovascular events. Decreases in SMM are negatively associated with arterial stiffness, however, the relationship between MF and arterial stiffness remains unclear. Purpose: To examine the relationship between MF and SMM with arterial stiffness. Methods: Participants (N=203, 97 males/106 females) were apparently healthy adults (Age 48.3 ± 20.2 years, BMI 26.8 ± 4.9 kg/m², VO₂peak 32.8 ± 12.0 ml/kg/min (range 11.4-66.4)). The entire cohort had a cPWV (m/s) of 7.3±1.6 (range 4.8-12.2). cPWV was moderately associated with CRF (r= -0.585, P<0.001).

CONCLUSION: Arterial stiffness is inversely related to CRF. These data suggest that the beneficial effects of CRF on cardiovascular-related outcomes may be mediated, at least partially, through arterial stiffening.

2130 Board #286 May 30 3:30 PM - 5:00 PM
Effect Of Exercise On Reserve Of Repolarization And Blood Stress Markers
Allan H. Goldfarb, FACSM, Joseph Starobin, Blair Wisco, Kerry Martin, Alexis Slutsky, Kirsten Ward. Univ., of North Carolina Greensboro, Greensboro, NC.

Email: ahgoldfa@uncg.edu

Reserve of repolarization of the heart (RoR) is a non-invasive method to monitor the heart’s response to stress. RoR assess stability of cardiac membranes and when excitation becomes unstable. Previous studies reported RoR as a useful tool to determine cardiac risk in cardiac patients. In this study we compared two cohort groups, posttraumatic stress disorder (PTSD) which has a strong association with CVD and a group of apparently healthy subjects (AH). Purpose: To determine if RoR and blood stress markers in AH and PTSD cohorts are different at rest and in response to a graded exercise test to 85% HRmax. Methods: Ten young women with documented PTSD (23.2 ± 1.4 yrs.) and 8 AH individuals (24.1 ± 1.7 yrs) with normal BP survived after overnight fast (7:39 am) and rested for 20 minutes. ECG’s (12 lead) were monitored before, during and after exercise to obtain RoR. Blood was taken at rest and after exercise. Plasma samples were analyzed for stress proteins. Results: Resting HR was statistically higher in the PTSD group compared to AH group (77.2 ± 3.1; 67.7±2.6 bpm, <0.0001). RoR between both groups was not significantly different (AH=81.7%; PTSD = 78.5%, P = 0.2). RoR at the final exercise stage in AH group had significantly greater reserve (RoR = 40.4% compared to PTSD = 32.6%, P = 0.02) despite greater workload. Brain natriuretic peptide (BNP) increased in PTSD (pre = 134.7 ± 27.8, P = 0.02). AH had a marginally significant increase (pre = 123.9 ± 30.2, post = 136.8 ± 42.2 pg/ml). Plasma TnI was not different between groups at rest (P = 0.3) but increased significantly (P = 0.03) only in PTSD group with no changes in blood creatine kinase between groups and across time. Conclusions: These data suggest that PTSD individuals have less RoR in response to graded exercise compared to AH individuals. In addition, PTSD group had increased plasma BNP, and TNI suggesting an increased risk of having a cardiac event. It is suggested that this procedure may be useful as a screening process to help identify individuals with a risk of a coronary event.

2131 Board #287 May 30 3:30 PM - 5:00 PM
Poor Cardiorespiratory Fitness is Associated with Higher Risk of Infectious Events in Kidney Transplant Recipients
Sara Ortolan, Daniel Neunhaeuserer, Alessandro Patti, Francesca Battista, Mattia Grassi, Andrea Gasperetti, Lucrezia Furian, Andrea Ermolao. University of Padova, Padova, Italy.

Email: sara.ortolan88@gmail.com

Kidney Transplant Recipients (KTRs) have a reduced cardiorespiratory fitness, which is a well-known independent predictor of overall mortality in the general population and in patients with different chronic diseases. Although it is known that infections are one of the main cause of death in these patients, the possible correlation between cardiorespiratory fitness and the incidence of infectious events remains unexplored. Purpose: To investigate parameters of cardiorespiratory fitness as possible prognostic markers for infectious events in KTRs. Methods: KTRs were evaluated at our outpatient clinic with an incremental, maximal Cardiopulmonary Exercise Test (CPET), 3-12 months after transplantation. Cardiorespiratory fitness was analyzed with peak oxygen consumption (VO₂peak) and the oxygen uptake efficiency slope (OUES). Laboratory data, drug therapy and history of infectious events were collected. The results of the study analysis were obtained with multivariate regression models. Results: 157 KTRs (age 51±13 years, 64% men) were included in this study, with a mean BMI of 24.2±3.3 Kg/m², Glomerular Filtration Rate of 57.1±19 mL/min/1.73m², and hemoglobin concentration of 123.5±16.7 g/L. During a mean follow-up period of 33 months after the CPET, at least one infectious event occurred in 72 subjects (46%); the mean VO₂peak of the entire population was 25.6±6.9 mL/kg/min, corresponding to 81.3±21.6% of the VO₂peak predicted for age and gender. 14.7% (n=22) of our patients had a VO₂peak below the 5th percentile of a matched healthy population based on the FRIEND study results. This subgroup demonstrated an increased risk of infectious events with a Hazard Ratio of 2.11 (CI 95%, 1.19-2.73, P<0.01), which was independent of age, hemoglobin and immunosuppressive regimen. Conclusion: To our knowledge, this is the first clinical study associating a poor cardiorespiratory fitness with a higher risk of infectious events in KTRs. It can be speculated that an improved cardiorespiratory fitness, obtained by specific aerobic exercise training, may thus reduce infectious events and improve prognosis in this specific population.
The evaluations were performed in the follicular phase between the 9th and 11th day and in the luteal phase between the 19th and 21st day after the beginning of the menstrual cycle. Statistical analysis employed t-test parametric tests with two-tailed p value set at 5%. RESULTS: At rest, HR was [supine: 64.12±8.2 bpm - 64.7±1.9 bpm, (p<0.05)] and [orthostatic: 82.6±3.4 - 82.1±3.4 bpm (p<0.05)] in the follicular and luteal phases, respectively. Chronotropic reserve was not different (p>0.05) during Follicular (86.4±2.2 bpm) and Luteal (86.9±3.8 bpm) phases. Also, absolute HRR, Δ% HRR and HPP were significantly lower. CONCLUSION: Had no show any difference between both phases of menstrual cycle (p>0.05).

### Table 1: Comparison of Heart Rate (HR) during Menstrual Cycle Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>HR Initial (bpm)</th>
<th>HR Max (bpm)</th>
<th>C.R. (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follicular</td>
<td>99 ± 4.4</td>
<td>182.5 ± 3.2</td>
<td>86.4 ± 2.2</td>
</tr>
<tr>
<td>Luteal</td>
<td>95.18 ± 4.4</td>
<td>182.1 ± 2.9</td>
<td>86.9 ± 3.8</td>
</tr>
</tbody>
</table>

CONCLUSIONS: We concluded that HR responses during rest, maximal treadmill exercise and 5 minutes post-exercise were not affected by the menstrual cycles, even with all physiological changes that occur during Follicular and Luteal phases.

### Table 2: Comparison of Heart Rate (HR) during Menstrual Cycle Phases

<table>
<thead>
<tr>
<th>Variables</th>
<th>Follicular</th>
<th>Luteal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR Initial</td>
<td>96 ± 3.3</td>
<td>95.18 ± 4.4</td>
<td>0.84</td>
</tr>
<tr>
<td>HR Max</td>
<td>182.5 ± 3.2</td>
<td>182.1 ± 2.9</td>
<td>0.93</td>
</tr>
<tr>
<td>C.R.</td>
<td>86.4 ± 2.2</td>
<td>86.9 ± 3.8</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Glycogen storage disease 3 (GSDIII) is a rare inherited metabolic disorder caused by glycogen debranching enzyme (GDE) deficiency which primarily affects the liver, skeletal muscle and heart and results in muscle weakness and profound exercise limitation. Despite exercise intolerance being a major complication associated with the disease, the influence of GSDIII on aerobic capacity is largely unstudied. PURPOSE: To preliminarily describe the impact of GSDIII on aerobic capacity and investigate potential mechanisms responsible for any impairment. METHODS: In this descriptive study 5 patients (3 female) (39 ± 11 years) with GSDIII underwent an incremental cycle exercise test to volitional exhaustion. Patients were randomly assigned to combined exercise group (EX; n = 24) trained for 12-weeks (3 days per week) or to a “non-exercise” control (CON; n = 21) group. The 60 minute combined exercise program (aerobic exercise 1 time, strength exercise 2 times/week) was performed 3 times per week for 12 weeks, and the intensity was progressively increased every four weeks.(1-4 weeks: RPE 12 to 13, 5-8 weeks: RPE 13 to 14, 9-12weeks: RPE 14 to 15). RESULTS: The vascular inflammatory markers were as follows; All variables showed interaction effects and there was a significant difference in delta values between the two groups. WBC and CRP levels significantly decreased in the EX group (p<0.05). But control group CRP (p<0.05) and fibrinogen (p<0.01) levels significantly increased in the CON. SBP showed interaction effect and significant difference in delta-value. CON: Women become more likely to develop chronic diseases as their metabolic function decreases after menopause. Vascular disease is a major problem for elderly women. The problem of these elderly women is due to a decline in health status due to lack of physical activity. PURPOSE: The purpose of this study was to analyze the effects of a combined exercise training regimen on vascular inflammatory markers (WBC, CRP, fibrinogen) and arterial stiffness (blood pressure, pulse wave analysis and velocity) in elderly women. METHODS: Forty-five healthy elderly female volunteers, aged 75.44 ± 5.30 years, were randomly assigned to combined exercise group (EX; n = 24) trained for 12-week or to a “non-exercise” control (CON; n = 21) group. The 60 minute combined exercise program (aerobic exercise 1 time, strength exercise 2 times/week) was performed 3 times per week for 12 weeks, and the intensity was progressively increased every four weeks.(1-4 weeks: RPE 12 to 13, 5-8 weeks: RPE 13 to 14, 9-12weeks: RPE 14 to 15). RESULTS: The vascular inflammatory markers were as follows; All variables showed interaction effects and there was a significant difference in delta values between the two groups. WBC and CRP levels significantly decreased in the EX group (p<0.05). 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this sport modality, favors athletes presenting morning types profile. There are no data about amateur triathletes chronotype, but probably there are also a high percentage of morning type, mainly because the training sessions occur even earlier, once amateurs need to work after the training. As the training sessions occur early in the morning, it is possible for morning-type athletes are able to develop higher intensity trainings and thus having better physiological adaptations. However, there are no data about chronotypes and physiological profile.

CONCLUSIONS: Chronotype profile in a group of triathlon amateur competitors who participate in the Olympic distance triathlon race. Verify if there are association between chronotype profile and physical fitness in amateur triathletes.

METHODS: Thirty-nine men and six women who had subscribed to compete in the sixth stage of the 26th Brazil Triathlon Trophy (26º Troféu Brasil de Triathlon) in the Olympic distance participated in this cross-sectional observational study. Participants were evaluated for anthropometric characteristics (body mass, height, and body composition through [DXA]), aerobic physical fitness (maximum oxygen consumption [VO2max], anaerobic threshold and respiratory compensation point, maximum aerobic velocity [MAV] and running economy [RE]). Chronotype profile was evaluated using Horne-Ostberg morning-eveningness questionnaire.

RESULTS: According to the chronotype questionnaire 66.7% of the volunteers (69.2% men and 50.0% women were classified as morning profiles (22.2% definite morning and 44.4% as moderate morning) and only 6.7% were classified as evening profiles. There were no significant correlations between chronotype profiles and the physical fitness variables.

CONCLUSIONS: Amateur triathletes show to comprise high proportions of morning-types, but the physiological profile is similar between the different existing chronotypes.
sleep restriction, reducing sleeping hours per night and leading to numerous health damages. This phenomenon has been conceptualized as social JetLag (SJL). Purpose: Investigate the association between chronotype and mood profile in presence of SJL of young adults. Methods: Participated in this study 68 male subjects (mean age 25.43±6.64 years, and BMI 24.59±4.25) and physically active. In a transversal study approved by our institutional ethics committee (n° 2.263.382), the subjects answered a sleep questionnaires battery composed by Pittsburgh Sleep Quality Index (PSQI), Morningness-Eveningness Questionnaire (MEQ), Munich Chronotype Questionnaire (MCTQ), Epworth sleepness scale (ESS) and Brunel Mood Scale to determinate a mood profile (subscals: anger, confusion, depression, fatigue, vigor, tension). The SJL was categorized in accord to MCTQ results in 3 groups: a) No SJL (≤ 30 min), b) SJL until 1 h (31-60 min), c) SJL more than 1 h (>61 min). Results: The groups were compared, and no differences were found between all subscales of Brunel. Moreover, we didn’t find any differences regard the sleep quality and diurnal excessive sleepiness. On the other hand, the groups were different on sleep duration and chronotype. Longer SJL is associated to higher Evenness index (F(2,65)=7.48; p=0.001). Conclusions: Our finds suggest that the presence of SJL didn’t impact the volunteer’s humour profile and longer SJL is associated to higher eveningsness index.

2141 Board #297 May 30 3:30 PM - 5:00 PM Effects of Aerobic Physical Exercise Performed Under Hypoxic Conditions on Melatonin

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(No relevant relationships reported)

Melatonin is a hormone which controls sleep, inflammation, and oxidative stress. Aerobic physical exercise can influence melatonin in normoxia. However, there is controversy about the effects of exercise on the melatonin level in hypoxia, which is characterized by impaired sleep. Purpose: This work evaluated the effects of aerobic physical exercise on melatonin under hypoxic conditions. Methods: Forty healthy men were randomized into 4 groups: Normoxia (N) - (22.1 ± 3.1 y, 69.1 ± 1.1 kg); Hypoxia (H) - (23.2 ± 2.1 y, 67.2 ± 4.1 kg); Exercise under Normoxia (EN) - (26.1 ± 3.2 y, 71.1 ± 3.2 kg); and Exercise under Hypoxia (EH) - (24.1 ± 3.1 y, 72.3 ± 2.1 kg). The observation period for all groups was 36 hrs, beginning with a first night devoid of any intervention. The normobaric hypoxia condition was conducted in a room equipped for altitude simulation that can reach up to 4,500 m (normobaric chamber, CAT - Colorado Altitude Training ™ / 12 CAT-Air Unit, USA). Aerobic exercise was performed by the EN and EH groups on a treadmill at 50% of VO2.peak on the 1st and 2nd days at 7:30 AM as well as on the 1st and 2nd nights at 10:30 PM. Venous blood samples for the melatonin measurement were obtained on the 2nd night, melatonin was higher in the H group compared to the N group (39.1 ± 3.1 vs. 28.1 ± 2.1, p< 0.05); and low in the EN group compared to the EH group (48.3 ± 2.2 vs. ± 59.2 ± 2.1, p< 0.05); low in the H group compared to the EH group (26.1 ± 1.1 vs. ± 59.2 ± 2.1, p< 0.05); on the 2nd day, melatonin was higher in the H group compared to the N group (39.1 ± 3.1 vs. 28.1 ± 2.1, p< 0.05); low in the N group compared to the EH group (28.1 ± 2.1 vs. 46.2 ± 2.0, p< 0.05); and high in the EH group compared to the H group (46.2 ± 2.0 vs. ± 39.1 ± 3.1, p< 0.05). Conclusions: Hypoxia acutely increases melatonin. Diurnal remission of the nocturnal increase in melatonin seems to be delayed by hypoxia and to an even greater extent if acting together with exercise.

2142 Board #298 May 30 3:30 PM - 5:00 PM Investigations of Sleep Quality Disturbances and Its Associations with Respiratory Functions and Depression Level among Young Adults with Down’s Syndrome

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(No relevant relationships reported)

Individuals with Down Syndrome (DS) have a broad range of respiratory problems. These problems are important cause of morbidity, mortality and may increase tendency to sleep disturbances. Also depression has been frequently reported in individuals with DS. Purpose: To investigate of sleep quality disturbances and its associations with respiratory parameters and depression levels in young adults with DS. Methods: 50 individuals with DS (28 male, 22 female; 21.5±3.39 year) were included in the study. Sleep quality components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction) evaluated with Pittsburgh Sleep Quality Index (PSQI). According to PSQI guidelines, good sleep quality is indicated by a composite score of <5 (possible total=21), and poor sleep quality by a score of >5. Forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and peak expiratory flow (PEF) values were recorded using with spirometry. Pearson correlation was used to relate variables. RESULTS: Sleep quality parameters, respiratory values and depression scores of participants showed in Table 1. A total of 4% (n=26) of participants have poor sleep quality. % 10 of participants (n=5) in severely depressed status. We found significant correlations of sleep quality parameters (habitual sleep efficiency; sleep disturbances, total PSQI) to depression level (r=0.68, r=0.75;r=0.72, p<0.05). Significant correlations were found between PEF values and total PSQI scores; habitual sleep efficiency (r=-0.86; r=-0.69 p<0.05). Conclusions: Our study suggest that sleep quality has a important effects on depression level. Also suggest that sleep quality and respiratory parameters are correlated, especially with PEF. All of this three parameters may affect each other. Further studies with bigger populations and controls needed for better results.

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<th>Table 1. Values of Sleep Quality, Respiratory Functions and Depression Scale</th>
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60128.75
Elastic Band Resistance Training Effects on Strength and Sleep of Shift Workers

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(NO relevant relationships reported)

PURPOSE: To determine the effect of elastic band resistance training in strength, muscle mass and sleep of shift workers. METHODS: Twelve sedentary workers with weekly work schedule of 12 hours of work for 36 hours of rest (Age: 42.3±8.8 years, Body Mass Index: 27.6±3.7 Kg), performed 16 elastic band training sessions (2 sets until failed; 3 times by week, for 16 weeks). The initial training load was determined by color and/or number of elastic band test to 10RM (shoulder abduction and biceps curl) and 20RM to seated low row exercise. The push up exercise no used elastic band. In following training sessions, the participants were instructed to perform the four exercises in the maximal number of repetition possible each new session. The estimated arm muscle mass, exercises repetition number and sleep (sleep-duration, sleep latency, sleep efficiency and weak after sleep onset) were assessment pre and post-training. The sleep variables were determined by actigraphy technique for during seven days. The pre and post-test comparisons were made using paired t test. RESULTS: The arm muscle area, was improved after training (480.5±38.3 vs. 384.6±43.8 min; Sleep Latency: 8.3±1.8; biceps curl: 10.2±0.6 vs. 23.7±7.7, P<0.001). There is no change in sleep variables after training (Sleep Duration: 386.3±36.7 vs 384.6±43.8 min; Mean Sleep Efficiency: 86.7±7.5%; Weak after sleep onset: 34.2±22.2 vs. 38.3±27.3 min, P<0.05). CONCLUSIONS: Elastic band resistance training improved the strength and muscle mass of shift workers.

Impact Of Sleep Deprivation On Flexibility Performance

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(NO relevant relationships reported)

PURPOSE: The purpose of this study was to verify the impact of sleep deprivation in flexibility of young adults. METHODS: Ten sedentary male young adults (Mean age: 24.3 ± 3.8 years old, body mass index: 24.8 ± 2.5 kg/m²) wore wrist actigraph before and during the 36h of sleep deprivation to measure sleep wake cycle, and Passive Maximal Range of Motion (PROMmax) was evaluated by the modified knee extension test with a fleximeter in 4 different moments: at onset of sleep deprivation (8:00am, day 1 – baseline), and after 12h (8:00am, day 1), 24h (8:00am, day 2) and 36h (8:00am, day 2) of sleep deprivation. Volunteers lay back with the hip flexed at 90°, and the initial knee ROM (0°) was considered as 90° right knee flexion. PROMmax was measured 06 times, and mean values at the 03 lasts was analysed. Analyses of Paired-Samples Variance were used to compare the variables in four moments, and statistical significance set at P<0.05. RESULTS: PROMmax values showed significant difference (F(1) = 51.148, P<0.001) after 12h (71.7±2.7; CLmax = 66.2-77.2), 24h (71.0±2.6; CLmax = 65.8-76.3) and 36h (69.8±2.6; CLmax = 64.5-75.7) of sleep deprivation compared with baseline (73.0±2.7; CLmax = 67.6-78.4). Moreover, there was decrease of PROMmax (F(1) = 17.951, P<0.001) from 12 h to 36 h and from 24 h to 36 h of sleep deprivation. CONCLUSION: Our findings suggest that sleep deprivation may have a negative impact on PROMmax. Furthermore, 12 h and 36 h after baseline moment showed reduction of the PROMmax, even as the time of maximal circadian rhythm values (acrophase) have generally observed between 4:00pm and 8:00pm. The duration of sleep deprivation and the circadian time are important in determining the impairment in passive flexibility performance. Acknowledgment: CAPES, CNPQ, FAPEMIG, CEMSA, CEPE.

Effects of Sleep Deprivation On Histopathological Changes And Oxidative Damage In Different Type Muscle Fibers

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(NO relevant relationships reported)

Previous studies has shown that sleep deprivation (SD) induces muscle atrophy and histopathological changes, however, these effects may be different considering the type muscle fiber. PURPOSE: to analyze histopathological changes and oxidative damage after SD in different types of muscle fibers (oxidative and glycolytic) of rats. METHODS: 20 Wistar male rats (3 months, 300-350 g) were distributed in two groups, control group (CTL, n=10) and SD group (SD6, n=10). The SD6 group was sleep deprived on consecutive 96 h, while the CTL group remained in the housing box. At the end of SD, the soleus and plantar muscles were analyzed for lipid peroxidation by concentrations of malondialdehyde (MDA), oxidative damage to DNA by nuclear labeling of 8-OHdG and histopathological changes. RESULTS: It was observed increased MDA concentrations in the soleus of SD6 compared to CTL (0.01±0.0009 vs. 0.02±0.0009 mmol/mg, P=0.01). Comparison between muscles revealed that the soleus had higher concentrations of MDA than plantar to both groups (P<0.01) for both. Regarding 8-OHdG, there was increased nuclear labeling to the plantar muscle in the SD6 compared to CTL (25.4±3.6 vs 7.2±1.9 positive cells, P<0.001). In the soleus, greater nuclear labeling was observed in SD6 compared to CTL (60.13±6.3 vs 96±3.6 positive cells, P<0.001), already the comparison between the muscles revealed a greater nuclear labeling of 8-OHdG in the soleus muscle compared to plantar in the SD6 group (P<0.001). The histopathological evaluation of the soleus revealed the presence of interstitial edema in SD6 compared to CTL (19±4.2% vs 0%, P<0.001), associated with intense cellular infiltration, alterations in the arrangement of muscle fibers, as well as areas of tissue degeneration and reduction of muscle parenchyma (72.7±2.7 vs 92±4.1%, P<0.001). In the plantar muscle, the changes were more subtle, with slight increase in cellularity in the SD6 and fibers presenting a smaller cross-sectional area in SD6 group. CONCLUSIONS: SD induces degenerative process and oxidative damage in the skeletal muscle, being more intense in type I fibers.
PURPOSE: Inadequate sleep is associated with an increased risk of injury, however it is unknown what physical risk factors for injury are altered by inadequate sleep.

We hypothesized that one night of sleep restriction would affect reaction times and landing mechanics but not leg strength.

METHODS: Inadequate sleep is associated with an increased risk of injury, however it is unknown what physical risk factors for injury are altered by inadequate sleep.

PURPOSE: To describe the common injuries of youth American football (FB) quarterbacks (QBs) within the last 15 years. METHODS: A retrospective chart review of all patients cared for in a sports medicine clinic of an academic pediatric medical center between 01/01/2003 - 10/01/2018. Patients were identified using the search engine HoundDog to search the term “quarterback.” Records were then reviewed to identify all QBs < 18 years of age. Injuries that were not associated with FB participation were excluded. Main outcome variables were injured anatomic locations, injury types, surgical status, and settings in which the injury was sustained. Descriptive statistics were used to analyze the outcome variables. RESULTS: A total of 374 male QBs (mean age: 14.6±2.1) sustained a total of 423 injuries. The top 5 injured anatomic locations (Figure 1) were shoulder (22.2%), knee (15.5%) head/neck (14.5%), elbow (13.6%), and wrist/hand/forearm (11.3%). The injuries consisted of 64.3% in acute mechanism and 35.7% chronic in nature. The acute injuries occurred during actual competition (55.3%), practice (14.3%), and off-season (6.7%); for the remaining 23.5% there was not sufficient documentation in the medical record to determine the setting. Of the chronic injuries, 47.0% occurred during off-season and 34.4% occurred in-season; for 15.2% of the chronic injuries there was not sufficient documentation in the medical record to determine the setting. Among all injuries, 22.9% were surgical cases, and of the top 3 anatomic locations of surgery were knee (35.9%), shoulder (20.7%), and elbow (18.7%). CONCLUSIONS: The shoulder is the most commonly injured body part among young QBs seeking care in a specialty sports medicine clinic.
although the knee is the most commonly injured body part that requires surgery. Quarterback injuries are primarily acute in mechanism, and the majority of these acute injuries occur during game competition.

2151 Board #307
May 30 3:30 PM - 5:00 PM
Spine Injuries and Concussions among Figure Skaters
Kristen M. Lambrinakos-Raymond, Gregory Kobelski, Ellen Geminiani, Dai Sugimoto, William P. Meehan, III, Boston Children’s Hospital, Boston, MA.

CONCLUSIONS: While this was only a pilot feasibility study involving relatively small teams, we show that development and implementation of an ePPE system is technically feasible, is preferred by users, and facilitates sports research.

2153 Board #309
May 30 3:30 PM - 5:00 PM
Psychological Factors Related to Return to Sport After ACL Reconstruction in Adolescents
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RESULTS: Among all participants, (n=48) reported that they expected to return to sport within less than six months of surgery. A significantly lower proportion of competitive athletes (14%) reported that they would be content returning to a lesser activity level or less strenuous sport. There was no significant association between perceived social support and confidence in returning to sport.
respectively. When comparing the diagnosis of musculoskeletal, medical, wound care, and other complaints, there was a statistically significant difference in incidence with p<0.001.

CONCLUSIONS: The most common presenting complaints were musculoskeletal, followed by medical, other, and then wound care. The largest number of runners seeking medical care were at the finish line and halfway point of the race and so the majority of resources should be focused at these locations. While there was a larger proportion of musculoskeletal complaints near the halfway point of the course, the higher percentage of medical complaints was at the finish line.

2155 Board #311 May 30 3:30 PM - 5:00 PM Iron and Vitamin D Deficiency in D1 Female Track & Field Athletes

Kristopher J. Paulitre, William Cade, Hannah Ellis, Thomas M. Best, FACSM. University of Miami, Miami, FL. (Sponsor: Dr. Thomas Best, FACSM)

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(No relationships reported)

PURPOSE: To identify the prevalence of Iron and Vitamin D deficiency in D1 female track and field (T&F) athletes

METHODS: In a retrospective review of medical records at a single institution, laboratory data were reviewed for female T&F athletes [BT1] from 2013 to 2019. Labs were acquired as part of the entrance pre-participation physical (PPE) including ferritin, hemoglobin, and Vitamin D. Iron deficiency was defined as serum ferritin below 30ng/mL-1 with severe deficiency below 13 ng/mL-1. Vitamin D was classified as; below 15 ng/mL- deficient, 16-29 ng/mL- insufficient, and above 30 ng/mL- sufficient. Anemia was defined as hemoglobin (Hgb) < 11.1 g/dL-1.

RESULTS: Seventy-seven student-athletes were screened, 48% were iron deficient, and a further 13% had severe iron deficiency. Of those with iron deficiency (ferritin <30, n=37), four had anemia (n=3). For Vitamin D, 7% were deficient, 24% were insufficient, and 69% were sufficient. CONCLUSIONS: When compared to the prevalence of iron deficiency in the general US female population ages 16-49 (11%), there was an increased prevalence in our sample (48%). Interestingly, we noted a similar prevalence of iron deficiency anemia (3-5% general population vs. 4.3% in our sample). Furthermore, our results showed a 24% prevalence for Vitamin D Insufficiency consistent with the general US female population of similar age at 24-26%. The prevalence of Vitamin D deficiency was higher in the US population at 10-11% when compared to our study at 7%. The effects and benefits of screening, intervention, and performance outcomes are a topic of ongoing investigation.

2156 Board #312 May 30 3:30 PM - 5:00 PM The Impact of Clinical Factors in Physician and ATC Decision Making for Concussion Return to Play: Insight from Policy Capturing Study

Darwin McKnight, Vicki Nelson, Franklin Sease, RG Gilliland. Greenville Health System, Greenville, SC. (Sponsor: Franklin Sease, FACSM)

(No relationships reported)

PURPOSE: To scrutinize the role of several clinical factors in physician and clinical athletic trainer (ATC) return-to-play (RTP) decision making in high school athletes who sustained a concussion.

METHODS: Sports Medicine physicians and ATCs completed a policy capturing survey of 50 clinical scenarios and rated how likely they were to clear the athlete for RTP. Nine factors were randomly varied within the scenarios: age, gender, sport, prior concussion, initial symptom score, symptom duration, and ImPACT performance. Participants then ranked how important each variable was in their decision making process.

RESULTS: 16 physicians (87.5% CAQSM, 12.5% Fellows, mean 9.2 concussions managed per month) and 29 ATCs (mean 4.8 concussions managed per month) participated. ImPACT testing was the most significant contributor in RTP decisions. Physicians and ATCs weighted ImPACT charged from baseline (β 0.42±0.23 and 1.28±1.18 respectively) and ImPACT compared to normative values (0.39±0.24 and 1.38±0.90 respectively) most heavily. Respondents self-ranked prior concussion and age as most influential in their RTP decision making. There was no correlation between participants self-ranking of importance and the observed contribution of a variable to decision making.

CONCLUSIONS: Respondents displayed poor insight to the role of various clinical factors in their management of concussion RTP. ImPACT testing has a greater influence on RTP decisions than physicians and ATCs realize. Despite having low self-ranked importance, variables related to ImPACT results were among the most influential. Self-ranking importance of clinical variables is similar between physicians and ATCs; however, correlation is less important to ATCs compared to physicians. Although age was considered important in self-ranking it was not a significant contributor to RTP decision making.
**Purpose:** Health and weight management benefits may influence athletes’ decisions regarding specific dietary practices. Eating disorders/disordered eating (ED/DE) are highly prevalent in the athletic population. The purpose of this study was to determine if following specific diets correlated with a greater likelihood of responding positively to ED/DE screening tools compared to not adhering to a diet. **Methods:** 1,000 female athletes (15-30 yrs) were asked to complete a comprehensive health and wellness survey. Athletes were asked to specify their diet and completed 3 ED/DE screening tools: the Brief Eating Disorder in Athletes Questionnaire, the Eating Disorder Screen for Primary Care, and self-reported current or past history of ED/DE. We hypothesized that athletes adhering to specific diets were more likely to score positively on ED/DE screening tools than those not following a diet. The most common diets were included in the analyses: vegan, vegetarian, pescatarian, gluten free, low carbohydrate, low dairy, and ≥2 diets. Athletes following diets for health issues (e.g. Celiac disease) were excluded. Descriptive statistics were calculated for all study measures and Chi-square testing was performed to assess relationships between athletes’ dietary practices and their responses to ED/DE screening tools.

**Results:** 234 of 1,000 female athletes reported adherence to specific diets; 766 reported no diet adherence. 69 of the 234 athletes were excluded due to medically-related dietary practices or vague dietary descriptions. 133 athletes reported following 1 of the diets and 32 athletes reported following ≥2 diets. Of the diet-adherent athletes, 67.9% responded positively to ≥1 of the 3 ED/DE screening tools. Athletes practicing vegetarian, vegan, low carbohydrate, low dairy, or ≥2 diets were more likely to respond positively to ≥1 ED/DE screening tool vs. athletes without dietary restrictions (70.0%, 60.0%, 66.0%, and 65.6%, respectively vs. 41.8%, p<0.048). **Conclusion:** Specific diet adherence in female athletes is associated with greater likelihood of positive screening for ED/DE using survey self-report. Health practitioners should assess ≥1 ED/DE screening tool vs. athletes without dietary restrictions (70.0%, 60.0%, 66.0%, and 65.6%, respectively vs. 41.8%, p<0.048).

**Purpose:** To evaluate differences in concussion symptom reporting across age levels. **Methods:** Between 2008-2018 post-concussion symptoms were reported by Middle School (MS), High School (HS) and Collegiate athletes (CA) utilizing the post-concussion symptom scale after a concussion injury. Repeat evaluations and initial evaluations with a symptom score of zero were excluded. ANOVA was performed assessing total symptom scores and number of symptoms reported by age group and gender. **Results:** 1,748 athletes (65.2% male, 22 sports) were included: Middle School (6.3%, n=110), High School (86.4%, n=1,511) and Collegiate (7.3%, n=127). Significant differences were found in total symptom scores (p<0.006) and number of symptoms reported (p=0.00003). Symptom scores were highest in High School athletes (23.37, SD 20.2) compared to MS (mean 17.78, SD 18.5) and CA (20.13, SD 21.3). Total number of symptoms reported was also highest in High School athletes (9.73, SD 6.1) compared to MS (7.55, SD 5.4) and CA (8.02, SD 5.9). High School females report significantly higher symptom scores (27.5±/22.5 vs 21.6+/18.9, p<0.0001) and number of symptoms (10.7+/6.1 vs 9.4+/6.1, p=0.0002) relative to male peers. **Conclusion:** In student athletes who have suffered a concussion, the post-injury symptom scores and total number of symptoms and individual symptoms reported varied significantly across age levels, with significantly less symptoms being reported in the middle school athletes.

**Purpose:** To determine whether resistance training effects pain and quality of life in individuals with knee osteoarthritis (OA), and whether or not a dose-response relationship exists. Secondly, we will investigate if the effects of resistance training are influenced by KL grade or location of OA (tibiofemoral and/or patellofemoral). **Methods:** A systematic literature search of three electronic databases (PubMed, CINAHL, and EMBase) was performed for English studies to identify RTCs comparing resistance interventions with no intervention or education in knee OA and reporting changes in pain and physical function. Articles meeting inclusion criteria were assessed independently by two reviewers for methodological quality using the CONSORT 2010 scale and bias assessed by the Cochrane Collaboration’s tool for assessing risk of bias. **Results:** Four hundred and sixty-nine studies were found in the initial search. Fourteen were included for analysis after screening. Thirteen trials were rated with high methodological quality based on the CONSORT scoring system. One study was excluded due to poor CONSORT score (9). Thirteen eligible trials with 1,521 participants were therefore included in the subsequent analysis. The average CONSORT quality score was 20.3 (range 17 to 24.5). Evidence from eleven studies revealed resistance training significantly improved pain and quality of life. No trends were identified with maximum strength, and frequency of exercise sets or repetitions, and thus trends between strength training outcomes and location or KL grade of knee OA were unable to be evaluated. **Conclusion:** This systematic review suggests that resistance training improves pain and quality of life for patients with knee OA, but specific optimal dosing strategies remain unknown. Further high quality prospective studies with homogenous populations and interventions aimed to investigate precise dosing parameters are needed.
A 23 year old professional football player self-reported abnormal vision during a game. He had two episodes of blurriness in the superior visual field of the right eye lasting 15-20 minutes each and separated by 15 minutes. He had no eye pain or headache. No identified head trauma preceding symptoms. He was not removed from play.

Exam

Post-game: Normal visual acuity and remainder of exam normal.

Differential Diagnosis
1. Retinal detachment
2. Retinal vessel occlusion
3. A cephalic migraine
4. Concussion
5. Optic nerve lesion

Tests and Results
Athlete referred to ophthalmology for full eye exam the day following the game. Ophthalmology Findings:
- normal intraocular pressure
- bilateral AV nicking consistent with hypertensive retinopathy
- right retinal venous engorgement with few dot blot hemorrhages consistent with central retinal vein occlusion
- no retinal detachment

Final/Working Diagnosis
Central retinal vein occlusion and hypertensive retinopathy, likely associated with obstructive sleep apnea, an association described in the literature, with no other identified etiology.

Treatment and Outcomes
- Athlete did not miss any football practices or games
- Vision remained normal and follow up retina exam was unchanged
- Blood pressure monitored frequently without any documented daytime hypertension
- Began to use CPAP at night
- Reported improved sleep quality and reduced daytime fatigue

HISTORY:
1 year male high school soccer player with headache and dizziness following injury 1 month prior.
Event was soccer ball striking right temporal area with fall to the ground without secondary head trauma or loss of consciousness. On rising, patient was knocked down by the opponent. He removed himself from the game due to symptoms of headache, balance problems, dizziness, sensitivity to light and noise, irritability, feeling slowed down, feeling mentally foggy, difficulty concentrating, and having visual problems. He had associated neck pain, numbness and tingling in the left upper extremity and left lower extremity after the injury.

No weakness in the upper or lower extremities.
No retrograde or antegrade amnesia reported.

He continued to play the game.

Reported his symptoms to the coach and licensed athletic trainer (LAT) when the game finished.
HISTORY: An 18 year old, high school, football kicker suffers a leg injury during his last regular season game. He kicked his last PAT of the game when he reported tightness in his anterior leg. During the following kick off, he felt a pop in his right upper thigh as he kicked the ball. He reported immediate pain and difficulty walking. He was able to independently limp off the field. That night he elevated and iced his leg. He reported that he fell asleep with his leg elevated with ice on the area. Upon waking the next morning he felt numbness in the outside of his right thigh. He continued experiencing the soreness in the anterior portion of his thigh, but reported it was no worse than the day before. He denied any back pain, prior back injury, or history of trauma to his back. PHYSICAL EXAMINATION: General: NAD, crutch assisted ambulation. Athletic build CV: 2+ dorsalis pedis pulses bilaterally, warm extremities Palp: no dyspeusia GI: abdomen soft, non-tender Skin: no bruising Neuro: decreased sensation subjectively along the outer right thigh from hip to knee to MSK: Pain to palpation along proximal hip flexors and AHS, no defect in muscle palpated, full AROM, PROM of hips. 4/5 strength of right hip flexion secondary to pain, 5/5 on left. 5/5 strength bilaterally with hip extension, adduction, abduction, as well as knee flexion and extension. No spinoous process or SIJ tenderness to palpation, no step offs appreciated. DIFFERENTIAL DIAGNOSIS: 1. Avascular fracture of AHS with associated nerve injury 2. Hip flexor strain with meralgia paresthetica 3. hip flexor strain with direct nerve injury from ice 4. FAI with acute hip labral tear 5. Lumbar disc herniation TEST AND RESULTS: Pelvis XR: Normal radiographic examination of the hips and the remainder of the pelvis. FINAL/WORKING DIAGNOSIS: Hip flexor strain with associated meralgia paresthetica TREATMENT AND OUTCOMES: 1. Rest from kicking over the following 10 days. 2. Active recovery with ATC at school 3. Numbness resolved at time of follow up in clinic, strength was returning without pain with hip flexion 4. Released to increase kicking distance from PAT to less than 30 yards with plans to increase as tolerated, recommended no kick offs for the remainder of playoffs 5. Athlete had complete resolution of symptoms and was back to full kicking duties approximately 4 weeks after initial injury.

HISTORY: 22-year-old female presented with progressively worsening ankle pain, swelling, catching, and locking over a five year period. She denied recent or prior trauma. Her limitation was inability to stand throughout a full work day. Past medical history was significant for morbid obesity s/p sleeve gastrectomy 4 years ago. She was seen in the past and told it was "just another ankle sprain" or "from her weight". The pain has worsened despite claims it would improve "once she lost weight". PHYSICAL EXAMINATION: Mild circumferential swelling with moderate pes planus noted. Tenderness: talor dome, post.-tib. tendon, posterior talar processes. Full ROM, with 4/5 strength appreciated in all planes. Able to walk on heels and toes, with a limp. Unable to hop. Anterior Drawer: positive w/excessive laxity and crepitus. Talar Tilt: positive. Anterior impingement and impaired proprioception noted. Sensation and pulses intact.

DIFFERENTIAL DIAGNOSIS:
1. Talar Stress Fracture
2. Tarsal Coalition
3. Av. Traction

TEST AND RESULTS:
Radiographs: 3-view Left Ankle
- Degenerative changes of the tibiotalar joint.
- Osteochondral lesions of the medial talar dome and medial shoulder of the tibial plafond.
- Hypertrophic change concerning for enthesitis about the tendinous insertions.

MRI: Left Ankle:
- Chronic OCD lesion to medial talar dome with large subchondral cysts, measuring 16mm x 8mm.
- Talar Dome collapse with Outerbridge Grade 3/4 articular cartilage loss of the overlying tibial plafond and talar dome.
- Enthesophytes of the dorsal and plantar calcaneus.

FINAL/WORKING DIAGNOSIS:
Large medial talar dome OCD lesion with subchondral cysts (Grade 5 Hepple MRI Siegung) and evidence of enthesitis and degenerative talonavicular changes concerning for longstanding inflammatory arthritic condition.

TREATMENT AND OUTCOMES:
1. Tall walking boot and ice therapy, with work modifications to limit weight bearing status.
2. Ortho Foot and Ankle referral to address operative management in process.
3. Referral to Rheumatology after case discussion given concern for inflammatory arthritis.
4. Final Outcome pending; patient has yet to consult with either of the above.

HISTORY: 21 year old female, D-1 gymnast, with 2 weeks of tight and achy right triceps pain. Athlete noted pain after practice, denies specific injury. Her pain is worse with resisted elbow extension. She is treating conservatively, rehabbing with ATC with strengthening both shoulder and arm, and is now tolerating forward tumbling, but soreness remains with backward tumbling. She feels she has plateaued in progress.

PE: Grossly unremarkable, no ecchymosis or swelling. She has tenderness to triceps muscle belly without palpable muscle defect. ROM and strength are intact at her shoulder and elbow. She is neurologically intact distally.

DX: Triceps tear, triceps tendinopathy, shoulder pathology.

TEST & RESULTS: MSK US-proximal, mid belly of long head of triceps muscle fiber disruption with 2 cm fiber gap and hematoma. Extensive hyperemia in zone of injury and 8 cm of fascial thickening. Active contraction demonstrates fiber gap without contraction at zone of injury and abnormal contraction of surrounding fibers. FINAL WORKING DX: Acute tear of right triceps, long head, grade 2b TREATMENT & OUTCOMES: Platelet-rich plasma injection into triceps tear followed by compression and 2 days rest. Progressive, sport-specific, pain-free strengthening with ATC guidance. Athlete avoided weight bearing on hands and stretching of triceps. She tolerated dance and trampoline work without issue. Upon reaching 80% speed/power without pain or functional limitation, 2 weeks after diagnosis, we performed serial US exams to evaluate tissue healing and guide progressive muscle loading. 2 week US demonstrated decreased fascial thickening, 2 cm fiber gap w/hyperemia persisted. Absent contraction at site of injury remained, abnormal contraction of surrounding fibers was improved. Continued rehab, did not progress beyond 80% at this time regardless of pain-free status. 4 week US revealed resolution of hematoma and fascial edema. Mild hyperemia remained at zone of injury. Some abnormal contraction at site of injury present, and normalized contraction of surrounding fibers. Athlete was released to gradually RTP under ATC guidance. Athlete progressed overhead loading, reached 100% power/speed and was advanced to forward and eventually backward tumbling. She tolerated full RTP 8 weeks after initial US. Athlete remains without re-injury.
Through the fall season (unable to chip and putt secondary to pain) and has been unable to participate in spring practice for more than 10 minutes at a time without pain. At this time she is also having resting pain.

**PHYSICAL EXAMINATION:** Right Wrist/Hand: No muscular atrophy, full range of motion active and passively, non-tender to palpation, ligamentously stable Right Elbow: No soft tissue swelling, bruising, or muscle atrophy, tender to palpation over the flexor pronator mass, medial epicondyle, and sublime tubercle with resisted digital and wrist flexion as well as pronation, stable in varus and valgus at 0 and 30 degrees, positive Tinel’s test and elbow flexion test, negative subluxable ulnar nerve, negative moving valgus test, negative Milking maneuver, decreased sensation in the distribution of the ulnar nerve, negative Froment sign, negative Scott Earl test, negative Wartenberg syndrome. **DIFFERENTIAL DIAGNOSIS:** 1. Median Epicondylitis 2. Cubital Tunnel Syndrome 3. Flexor Pronator Syndrome **TEST AND RESULTS:** 1/2/19 MRI Right Elbow - minimal tendinopathy of the common flexor tendon without tear, small spurring at the sublime tubercle with subtle marrow edema, possibly reflecting low-grade stress reaction, intact UCL, anconeous epicondyle identified T2-weighted axial images 11-12 1/10/19 Right Upper Extremity EMG/NCV - no evidence of right cervical radiculopathy or ulnar neuropathy 2/19 Right Upper Extremity Dynamic EMG/NCV - no significant change in activity, recruitment or motor unit seen pre- or post-exertion of right upper extremity; parenthetically despite normal studies, significant tenderness palpated in the area of the anconeous/flexor carpi ulnaris origin on the median elbow region

**FINAL/WORKING DIAGNOSIS:** Dynamic Compression of Ulnar Nerve secondary to Anconeous Epicondylitis with Medial Epicondylitis **TREATMENT AND OUTCOMES:** Surgical cubital tunnel release with anterior subcutaneous nerve transposition with a nerve protection wrap, neurolysis of the posterior medial antebrachial cutaneous nerve and excision of the Flexor Carpi Ulnaris. Post-operatively she will be in a long arm splint for two weeks followed by a removable long arm splint with 30 degrees extension at the wrist and 90 degrees flexion at the elbow. Continue progression at 4 weeks post-operatively full active range of motion, then 6 weeks full passive range of motion if indicated. At 8 weeks patient can begin sport-specific activity with full return to play after 12 weeks of post-operative recovery.
Both STI tests (from training room and ER) positive for gonorrhea after discharge from ER. In follow up with patient, she is feeling better and has returned to normal activities.

2173 Board #329 May 30 3:30 PM - 5:00 PM
A Narrow Wrestling Decision
Tyler K. Drewry1, Richard Okragly1, Jaideep Chunduri2.
1TriHealth, Cincinnati, OH; 2Beacon Orthopaedics, Cincinnati, OH. (Sponsor: Henry Stenic, MD, FACSFM)
Email: krdrewry88@gmail.com
(No relationships reported)

HISTORY: A 25 year-old male college wrestler presented to the training room the day after a wrestling match complaining of neck soreness. He had unintentionally fallen backwards on the mat and sustained a hyperextension injury of his neck. Immediately after the trauma, he felt an “electrical sensation” traveling down both of his arms into his hands, which resolved within 24-48 hours. At the time of evaluation, he denied any weakness, bowel or bladder retention or incontinence, or numbness or tingling. His only complaint was residual neck pain which was previously treated with oral prednisone and NSAIDS.

PHYSICAL EXAMINATION: A young healthy male in no distress. Normal ambulation. Neck range of motion demonstrated full flexion, but 50% in extension, right and left rotation and lateral tilting. Pain reproduced with neck extension. There was left and right cervical paraspinal tenderness to palpation with no step-off or crepitus noted. Bilateral upper and lower extremity strength, sensation, and reflex testing were normal. No clonus and negative Babinski, Spurling’s, and Hoffmann’s signs.

DIFFERENTIAL DIAGNOSIS:
1. Cervical paraspinal muscle strain
2. Cervical Cord Neurapraxia
3. Fracture of cervical vertebrae
4. Congenital Cervical Stenosis

TEST AND RESULTS:
Cervical Spine AP and Lateral Radiographs: Seven cervical vertebrae seen in AP view. Pedicle shadows intact. Lateral view shows loss of cervical lordosis. Intervertebral disc spaces are well maintained.
MRI Cervical Spine WO Contrast: No evidence of acute injury. Multilevel cervical spondylosis with congenital stenosis with the diameter of the spinal canal measuring 6-7 mm. No significant CSF surrounding the spinal cord. Torg ratio measured on all imaging had values of 0.7 or less.

FINAL WORKING DIAGNOSIS:
Congenital Cervical Stenosis with associated Cervical Cord Neurapraxia and Cervical strain

TREATMENT AND OUTCOMES:
Based off of imaging and Torg ratio of 0.7 or less, the athlete was not cleared to return to play. Over several weeks rehabbed to full strength and range of motion in the neck. Given the duration of time away from sport, patient decided to red-shirt the rest of his football season.

2174 Board #330 May 30 3:30 PM - 5:00 PM
A Jaw Crushing Line Drive in a Baseball Pitcher
Joshua I. Wilner, Michael Fong. Kaiser Permanente, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSFM)
(No relationships reported)

Title: A Jaw Crushing Line Drive in a Baseball Pitcher
Authors: Joshua Wilner, MD, Michael Fong, MD (Sponsor: Aaron Rubin, FACSFM)
Institutions: Kaiser Permanente Los Angeles
History: A 23 year old collegiate baseball pitcher sustained a line drive off the right body of his mandible. The patient had a few seconds in which he reported loss of consciousness. After regaining consciousness, he found the baseball at his feet and threw it to first in time for the out. At initial medical evaluation, patient complained of pain and bleeding at the right body of his mandible where the baseball made struck him. However, the site of maximal pain was the left superior mandible, where there was no direct trauma. The patient also had concussion symptoms, including headache, confusion, and photophobia.
Physical Examination: Examination on the field indicated a superficial laceration over the right body of the mandible. There was tenderness and swelling at the right body and left subcondylar aspect of the mandible. He had trismus, but no dysphagia or malocclusion. Patient had a positive concussion evaluation. There was no dental or oral trauma. There was no airway compromise or cervical spine abnormalities. There were no neurological deficits. The patient was sent to the emergency room for further evaluation and imaging.
Differential Diagnosis:
1. Mandible fracture
2. Mandible contusion
3. Mandible dislocation

Test and Results:
CT Scan Head and Mandible:
1. Non-displaced left subcondylar mandible fracture
2. No fracture of right body of mandible
3. No acute intracranial hemorrhage or pathology

Final Diagnoses:
Non-displaced, closed left subcondylar mandible fracture
Concussion
Facial laceration

Treatment and Outcomes:
1. Mandible fracture was treated with observation and soft diet for 4 weeks.
2. All concussion symptoms resolved within 4 days, and the patient graduated return to play protocol.
3. The laceration was treated with simple interrupted suture repair for 7 days. There were no wound complications.
4. The patient returned to full baseball activities 4 weeks after date of initial injury.

2175 Board #331 May 30 3:30 PM - 5:00 PM
A Real Pain in the Neck: A Football Player with Atypical Post-Traumatic Neck Pain
James Suchy, Doug McKee, FACSFM. OHSU, Portland, CA.
Email: jsuchy@gmail.com
(No relationships reported)

HISTORY:
18 yo M football player presented to college training room clinic with painful right-sided neck swelling after blunt neck trauma from another player’s shoulder pad 2 weeks prior. He had presented to ER 2 days after the incident with acute neck pain and limited ROM, headaches, and difficulty concentrating. CT head & cervical spine were unremarkable. Diagnosed with concussion and SCM strain. He started concussion and muscle strain rehab. Concussion symptoms improved over the next two weeks, but his cervical pain and ROM didn’t, and his neck became more swollen. He denied recent illness, cough, rash, fever, chills, dyspnea, dysphagia. POCUS was performed before referral to ER.

PHYSICAL EXAMINATION: VS; Normal; Gen: No acute distress; HENET: tender 5 x 3 cm subcutaneous mass on the antero-lateral neck, no bruits appreciable; MSK (Neck): tenderness to palpation along the entire right SCM, no spinous process tenderness, decreased lateral flexion and rotation towards the contralateral side; Card: Regular rate and rhythm, no murmurs; Resp: Clear bilaterally

DIFFERENTIAL DIAGNOSIS: Occult cervical spine fracture, Intramuscular infection, Ruptured sternocleidomastoid, Internal jugular thrombosis, Arterial pseudoaneurysm

TEST AND RESULTS: POCUS: diffuse heterogeneous regions throughout the SCM musculature, increased vascularity; ED Labs: WBC: 15.40; ED CT Neck: Contrast: diffuse inflammation of the right SCM muscle with multiple intramuscular abscesses collections in the deep aspect, largest measuring 2.1 x 2.4 x 6.0 cm with associated narrowing of the right internal jugular vein.

FINAL WORKING DIAGNOSIS: Traumatic SCM myositis with intra-muscular abscesses

TREATMENT AND OUTCOMES:
Hospitalized and started on IV Unasyn and Decadron. Ultrasound guided needle aspiration collected 2 cc purulent fluid that grew 2+ strep pyogenes. Symptoms didn’t improve, so sent to OR for I&D where purulent fluid was drained from cavities superficial to and within the SCM. Neck swelling, pain, and range of motion improved. Repeat neck CT confirmed resolution of infection. Discharged on oral Augmentin.

Over several weeks rehabbed to full strength and range of motion in the neck. Given the duration of time away from sport, patient decided to red-shirt the rest of his football season.

2176 Board #332 May 30 3:30 PM - 5:00 PM
Atypical Shortness of Breath in Division 1 Athlete
Email: david.baxter@crozer.org
(No relationships reported)

HISTORY: This patient a 20 year-old NCAA Division 1 Field Hockey player who presented with shortness of breath, early fatigue, weakness, and achiness with aerobic training for the past several years. She had symptoms almost immediately with aerobic conditioning that would progress as she continued to exercise. Our athlete reported a trial of pre-exercise albuterol which did not improve her symptoms or exercise tolerance.

PHYSICAL EXAMINATION: Lungs were clear to auscultation bilaterally, with appropriate inspiratory and expiratory effort and normal lung sounds. The patient was able to speak in full sentences without hoarseness. Pulse oximetry 99% and resting.
heart rate was 64. There was no cyanosis or clubbing of the nails, with normal capillary refill. Cardiac exam revealed regular rate and rhythm without murmurs, rubs, gallops. PMI was not displaced.

DIFFERENTIAL DIAGNOSIS:
1. Reactive Airway Disease
2. Exercise Induced Bronchospasm
3. Valvular Heart Disease
4. Vocal Cord Dysfunction

TEST AND RESULTS:
- Chest X-rays — normal findings
- FEV1 90.5% — Normal
- Lungs — normal findings

PHYSICAL EXAMINATION:
- No localized swelling, erythema or fluctuation.
- Normal active range of motion at shoulder, elbow, forearm and wrist.
- Intact sensation to light touch.
- Intact radial pulse.

DIFFERENTIAL DIAGNOSIS:
- Reactive Airway Disease
- Exercise Induced Bronchospasm
- Valvular Heart Disease

Patient with improved exercise tolerance, although continues to have symptoms and was unable to return to NCAA Division 1 competition level.

1. Referred to Otolaryngologist for diagnosis and treatment; diagnosed with Exercise-Induced Laryngeal Obstruction as diagnosis of exclusion.
2. Treated with boxers to the bilateral thyro-arytenoid muscles on 3 separate occasions separated by 4 months with positive clinical response.
3. Regular behavioral voice/speech therapy with Speech Language Pathologist tolerated well.
4. Sport psychology counseling was utilized and subjectively helpful to address the underlying anxiety associated with her dyspnea.
5. Patient with improved exercise tolerance, although continues to have symptoms and was unable to return to NCAA Division 1 competition level.

TITLE: Tunneling Away Lateral Ankle Pain

AUTHORS: Geoffrey M. Dreher, DO; David Webner, MD; Kevin DuPree, DO

ACSM Sponsor (if you accept): Thomas Kaminski, PhD, ATC (kaminski@udel.edu)

HISTORY:
60-year-old boilermaker presented with 2-week insidious onset left lateral ankle pain, localized to the lateral malleolus, described as achy and throbbing, 7/10, worse with walking, stairs and climbing ladders. No relief with Acetaminophen or NSAIDs.

PHYSICAL EXAMINATION:
- Left ankle: no edema or ecchymosis.
- Full range of motion with pain in active dorsiflexion and plantarflexion.
- Strength 5/5, gross sensation intact and 2+ dorsalis pedis and posterior tibial pulses.
- Tenderness to palpation along the lateral malleolus extending distally approximately 5 cm along lateral ankle.

DIFFERENTIAL DIAGNOSIS:
- Chronic lateral ankle instability
- Peroneal tendinosis with subluxation
- Lateral malleolar stress fracture
- Ankle osteoarthritis
- Talar osteochondral lesion

TREATMENT AND OUTCOMES:
- Left ankle 3 view x-ray: Normal.
- Left ankle MRI: Anatomic variant involving conjoined peroneus brevis and longus tendons, located along the anterolateral aspect of distal fibula. Deficient/absent peroneal groove along posterior fibula, which also suggests congenital abnormality.
- Mild conjoined tendinosis, without surrounding edema.
- Left lateral ankle ultrasound: Intact peroneal tendon overlying the lateral malleolus with trace fluid in sheath. The peroneal tendons split just before brevis insertion onto base of 5th metatarsal.

FINAL WORKING DIAGNOSIS:
- Conjoined left peroneal tendon subluxation with tenosynovitis and absence of fibular groove.

TREATMENT AND OUTCOMES:
- Physical therapy for 6 weeks led to improved balance and walking mechanics, but no change in pain.
- Immobilization in CAM boot for 6 weeks caused no improvement in pain or swelling out of boot.
- Corticosteroid injection to peroneal tendons at level of lateral malleolus led to no improvement.
- Podiatry referral and surgery including tubularization of peroneal tendons, creation of 6mm fibular groove and repair of peroneal retinaculum. 3 months post-operatively, the patient was full weight bearing pain free with daily activities in lace-up ankle brace.

TITLE: Shoulder Pain in a Weightlifter

AUTHORS: Kelly Joy Valignota, Terry Nicola, FACSM, Melody Hrubes. UIC Sports Medicine, Chicago, IL.

ACSM Sponsor (if you accept): Dr. Terry Nicola, FACSM

HISTORY:
20-year-old male weightlifter presented as a new patient to a sports medicine clinic with left shoulder pain. Pain began 5 months prior while the patient was performing overhead presses with a 205 lb barbell. While pushing up into his 5th repetition, he felt a “shift” in his left shoulder. He did not have a significant amount of pain at the time. In the following weeks, he began to have more pain in the left shoulder and decreased his weight during overhead presses and chest presses due to pain and weakness. He tried taking two weeks off from lifting, but when he resumed...
he was unable to complete any overhead or chest work due to pain. The pain is focal over the anterior-lateral shoulder with no radiation. No numbness or tingling. He is unsure if his weakness is due to pain or a separate issue.

PHYSICAL EXAMINATION: There was no bony abnormality or muscle atrophy. Patient had full active range of motion of the left shoulder in forward flexion and abduction, with mild pain at end range. Passively, he had 85 degrees of external rotation and 85 degrees of internal rotation with arm abducted to 90 degrees. There was tenderness to palpation along the distal clavicle and acromion, as well as over the supraspinatus, infraspinatus, teres minor/ major, biceps, and anterior deltoid. Jobe’s test positive for pain and weakness. Positive cross-arm test. Negative Hawkin’s, Neer’s, O’brien’s, Speed’s, and Yergason’s. Pain with resisted external rotation and shoulder abduction. Strength was 5/5 at bilateral deltoid, biceps, triceps, wrist extensors, finger flexors, and finger abductors, but 4/5 during resisted left glenohumeral external rotation due to pain.

DIFFERENTIAL DIAGNOSIS: 1) Glenohumeral subluxation 2) Rotator cuff tear 3) Labral tear 4) AJ joint sprain/separation 5) Clavicle fracture TESTS AND RESULTS: 1) XR Chest from ER visit for unrelated incident: Visualized left clavicle normal, shoulder not visualized. 2) MRI left shoulder without contrast: Nondisplaced fracture of the distal clavicle with associated bony edema of the clavicle and acromion at the AC joint with mild surrounding soft tissue edema. Low grade tendinosis of the infraspinatus and supraspinatus with suspicion for a tiny undersurface tear without retraction. 3) XR Clavicle: Clavicle is intact and negative for fracture. FINAL WORKING DIAGNOSIS: Nondisplaced fracture of distal clavicle

TREATMENT AND OUTCOMES: 1. Given no signs of fracture healing after 5 months, ordered laboratory work which revealed Vitamin D deficiency. Patient started on Vitamin D 1200mg and Calcium 800mg daily.
2. Activity modified to abstain from weight bearing exercises through the left upper extremity until next follow up visit.

HISTORY: A 22-year-old male with no significant past medical history presents with reports of two weeks of progressive medial knee pain, after beginning training for a sprint triathlon. Prior to starting his training, he primarily lifted weights and ran only sporadically. He increased his running significantly up to 3 to 4 miles 4 to 5 times per week. Pain was initially only present while running, but became present with any activity including swimming, especially with a frog-leg kick, after cycling, and finally with day-to-day walking. He notes mild swelling in the medial knee. He denies any catching, locking, buckling, or give-way of the knee. He denies any paresthesia in the right lower extremity.

PHYSICAL EXAMINATION: Pain in the right medial knee with single leg squat on the right. No knee effusion, however, there is mild swelling located just below the medial joint line over the proximal medial tibia on the right. Knee range of motion is full bilaterally. Ligamentous exam stable. No tenderness over the medial or lateral joint lines. Tenderness to palpation over the proximal medial tibia a few centimeters distal to the joint line and over the MCL in this region. No tenderness to palpation over the proximal MCL or pes anserine bursa. DIFFERENTIAL DIAGNOSIS: 1. Medial tibial plateau stress reaction 2. Distal MCL sprain 3. Pes anserine bursitis

TEST AND RESULTS: Plain radiographs: — No acute osseous abnormality. MRI of the pelvis: — Symmetric stress edema on either side of pubic symphysis consistent with osteitis pubis.

FINAL WORKING DIAGNOSIS: Osteitis pubis

TREATMENT AND OUTCOMES: 1. Several weeks of rest and NSAIDS with mild improvement in symptoms, followed by athletic trainer supervised therapy focused on core and pelvic strengthening.
2. Corticosteroid injection of pubic symphysis two months after initial presentation with modest improvement in symptoms, though short-lived.
3. Patient continues to have significant pain with any increased levels of activity.
4. Recently prescribed topical NSAID.
5. Consult with local surgeon recommended against surgical intervention at this time.

Is it Friction? A Rare cause of Medial Knee Pain

Wade Johnson, Jeffrey Payne. Mayo Clinic, Minneapolis, MN. (Sponsor: Jonathan Finnoff, FACSM) (No relationships reported)

2180 Board #336 May. 30 3:30 PM - 5:00 PM

Mayo Clinic, Minneapolis, MN. (Sponsor: Jonathan Finnoff, FACSM) (No relationships reported)

2181 Board #337 May. 30 3:30 PM - 5:00 PM

Osteitis Pubis: A Career Ending Diagnosis?

Stephen Sanker, Amanda Goodale. TriHealth, Cincinnati, OH. (Sponsor: Henry Stiene, FACSM) (No relationships reported)

2182 Board #338 May. 30 3:30 PM - 5:00 PM

Left Knee Pain In A 9-year-old Female

Branden Turner. Kaiser Los Angeles Sports Medicine, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSM) Email: branden.turner@kp.org (No relationships reported)
to completely extend knee. Denies acute trauma. Pain is improved with massage and stretching. Occasionally taken NSAIDS for pain management. Denies numbness, tingling, weakness, numbness, swelling, redness, fever, or chills. XR and US performed in clinic. Subsequently, MRI of left knee was ordered.


**DIFFERENTIAL DIAGNOSIS:** Hamstring hypotonia, Mass/tumor, Reactive arthropathy, Entrapnent arthropathy, Meniscus tear

**TEST AND RESULTS:** X-ray left knee, standing: flattening of the lateral tibial plateau and tibial spines, no acute fracture, no joint disease, open physia.

US left knee: normal hamstring tendon and muscle no fluid appreciated along tendon sheath, no pes anserine bursitis, no IT band bursitis, no effusion, meniscus not visualized

MRI Left knee: discoid lateral meniscus with horizontal tear.

**FINAL/WORKING DIAGNOSIS:** Discoid meniscus with tear.

**TREATMENT AND OUTCOMES:** Left discoid meniscus sncerization and Physical therapy for rehabilitation. Patient doing well after surgery, with return to full activity without pain or other symptoms.

**D-75 Clinical Poster/Reception - Clinicians’ Reception with Poster Presentations**

**Thursday, May 30, 2019, 6:00 PM - 7:00 PM**

Room: Hotel-Signature 1 Meeting Room

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**2197 Board #1**

**May 30 6:00 PM - 7:00 PM**

The Relationship between Bone Mineral Accrual and Changes of Body Composition in Competitive Girl Runners

Norimitsu Kinoshita1, Eriko Uchiyama1, Kenta Okuyama1.

1: Hosei University, Tokyo, Japan. 2: Shimane University, Shimane, Japan. (No relevant relationships reported)

Low bone density is a complication of a long-term strict weight control during adolescence in women.

**PURPOSE:** To assess whether decrease in percent body fat (%BF) is associated with left discoid meniscus saucerization and Physical therapy for rehabilitation. Patient doing well after surgery, with return to full activity without pain or other symptoms.

**METHODS:** Consecutive 22 freshman girl runners (15y/o, 158cm, 45kg) during 7 years in competitive high school teams were evaluated over 2 years of training. DXA was performed at the preparatory phase (baseline) and repeated after 23 ± 2 months (follow-up). The runners were divided into 2 groups; negative (DEC, n=11) or positive changes of body composition (Δ%BF) and ΔLSM (ΔLSM). Written informed consent was obtained to palpation No tenderness along IT band. Positive: Stretched 3/5: hip and knee flexion and extension. Sensation intact to light touch.

**DIFFERENTIAL DIAGNOSIS:** Hamstring hypotonia, Mass/tumor, Reactive arthropathy, Entrapnent arthropathy, Meniscus tear

**TEST AND RESULTS:** X-ray left knee, standing: flattening of the lateral tibial plateau and tibial spines, no acute fracture, no joint disease, open physia.

US left knee: normal hamstring tendon and muscle no fluid appreciated along tendon sheath, no pes anserine bursitis, no IT band bursitis, no effusion, meniscus not visualized

MRI Left knee: discoid lateral meniscus with horizontal tear.

**FINAL/WORKING DIAGNOSIS:** Discoid meniscus with tear.

**TREATMENT AND OUTCOMES:** Left discoid meniscus sncerization and Physical therapy for rehabilitation. Patient doing well after surgery, with return to full activity without pain or other symptoms.

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**2198 Board #2**

**May 30 6:00 PM - 7:00 PM**

Pre-Race Risk Screening and Stratification Predicts Adverse Events - SAFER Study In 76654 Distance Runners

Martin Schwellnus1, Sonja Swanewelder2, Esme Jordaann2.

1: SEMLI, University of Pretoria, Pretoria, South Africa. 2: South African Medical Research Council, Cape Town, South Africa. (No relevant relationships reported)

**PURPOSE:** The purpose of this study was to determine if a pre-race medical screening and risk stratification program predicts adverse events (ability of a runner to finish the race, or develop a medical complication) during an endurance running event.

**METHODS:** This prospective study, conducted during the Two Oceans marathon races (21.1km and 56km) in South Africa over 4 years, involved 76654 consenting race entrants. Race entrants completed a pre-race medical screening questionnaire at registration (3-4 months before the race), and were risk stratified into four groups: high risk (VHR; existing cardiovascular disease - CVD), high risk (HR; risk factors for CVD), intermediate risk (IR; existing other chronic disease, medication use or injury), and low risk (LR). All runners in the VHR and HR categories were provided with educational information to decrease the risk of medical complications, and were also advised to undergo a pre-race medical assessment. Runners were tracked from registration to starting and finishing the race, and medical encounters (ME) were documented. Main outcome variables were the did-not-start (DNS; % runners registering but not starting) and the adverse event rate (AE) defined as % starters that did not finish the race (DNF) or had an ME in any risk category.

**RESULTS:** The DNS rate (%: 95% CI) for runners was similar in all risk categories (VHR=19.5; 17.9-21.2, IR=18.8; 18.0-19.7, LR=18.4; 18.0-18.9, and LR=18.6; 18.2-19.1)(p<0.004). The DNS rates in the VHR (2.2; 1.6-3.0)(p<0.003), HR (1.8; 1.5-2.1)(p<0.017), and IR (1.9; 1.8-2.1)(p<0.001) were significantly higher compared to the LR (1.4; 1.2-1.5) The overall AE rates for runners in the VHR (2.3; 1.8-3.0) (p<0.001), IR (1.8; 1.5-2.1) (p<0.032), and LR (2.0; 1.9-2.6)(p<0.001) were significantly higher compared to the LR (1.5; 1.3-1.6).

**CONCLUSIONS:** A pre-race medical screening, risk stratification and educational intervention program did not change the DNS in the risk categories. However, runners in the higher risk categories, that chose to start the race, were more likely to suffer an adverse event (not finish the race or present with a medical encounter) compared with runners in the lowest risk category.

**2199 Board #3**

**May 30 6:00 PM - 7:00 PM**

Impact of Silver Ion Laundry Treatment on Athletic Gear and Environmental Pathogens and Athlete Health

Priya Balachandran1, John J. Openshaw2.

1: Applied Silver, Hayward, CA. 2: Stanford University, Palo Alto, CA. (No relevant relationships reported)

Community-acquired infections caused by *Staphylococcus* and MRSA can spread easily through sharing towels, gear and contaminated surfaces. The resulting skin infections can lead to athlete disqualifications, cancellations of competitions and potential impact on team performance. In this study, we evaluate a residual antimicrobial textile treatment as an environmental hygiene and infection control strategy through improved textile cleanliness and reduced athlete risk for infection.

**PURPOSE:** To determine the impact of silver-based residual antimicrobial textile treatment served as the control data set. Infection rates and number of days missed pre- and post-laundry treatment were also recorded. Samples collected before initiating the silver ion textile treatment served as the control data set. **RESULTS:** Prior to silver-ion treatment implementation, significant levels of *Staphylococcus* were measured on athlete textiles (average 75 CFU/100 sq. cm.) and on environmental surfaces (average 16 CFU/100 sq. cm.). Silver ion treatment of the textiles resulted in dramatic decreases in *Staphylococcus* by 77% on textiles and by 37.5% on environmental surfaces. Similar trends were also observed with MRSA. The overall bioburden levels continue to trend downward during the period of treatment. **CONCLUSIONS:** The current results demonstrate that a normal laundry process augmented with an active antimicrobial treatment provide athletic gear and a locker room environment that are safe and clean. Final data related to cleanliness, infection rates and player days will be tallied at the close of 2018.
Sport specialization has become increasingly common and has been related to sports injury and menstrual dysfunction among female high school distance runners. The association between sport specialization and low bone mineral density (BMD) is poorly described in this population. **PURPOSE:** To determine the association between sports specialization and low BMD in female high school distance runners.

**METHODS:** Participants consisted of 64 female runners (age 15.6 ± 1.4y), not currently on birth control medication, who competed in interscholastic cross-country and distance track events in southern California. Each runner completed a survey on sport participation and menstrual function, and had her height and weight measured. Each runner’s spine and hip BMD were assessed using DXA, standardized to BMD Z-score by age and sex normative values. Sport specialization classifications were: low specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); moderate specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); and high specialization (distance running sport(s) for ≥9 months/year and participation in ≥1 other non-running high school sports); and high sport specialization (participation in ≥1 other non-running high school sports); moderate specialization (participation in ≥1 other non-running high school sports); and low specialization (distance running sport(s) for ≤8 months/year and no other sports). Twenty-three (35.9%) runners had low BMD (Z-score < -1.0). After adjusting for gynecological age and BMI, high sport specialization was associated with low BMD among female high school distance runners. Further investigation of this association is warranted as low BMD has been related to athletes’ cognitive abilities without clinical symptoms or reporting of mTBI. The results of this pilot study suggests further investigation is warranted.

**RESULTS:** The data was analyzed between sports specialization and low BMD in female high school distance runners. Running sport specialization has become increasingly common and has been related to sports injury and menstrual dysfunction among female high school distance runners. The association between sport specialization and low bone mineral density (BMD) is poorly described in this population. **PURPOSE:** To determine the association between sports specialization and low BMD in female high school distance runners. **METHODS:** Participants consisted of 64 female runners (age 15.6 ± 1.4y), not currently on birth control medication, who competed in interscholastic cross-country and distance track events in southern California. Each runner completed a survey on sport participation and menstrual function, and had her height and weight measured. Each runner’s spine and hip BMD were assessed using DXA, standardized to BMD Z-score by age and sex normative values. Sport specialization classifications were: low specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); moderate specialization (distance running sport(s) for ≤8 months/year and participation in ≥1 other non-running high school sports); and high specialization (distance running sport(s) for ≥9 months/year and no other sports). Twenty-three (35.9%) runners had low BMD (Z-score < -1.0). After adjusting for gynecological age and BMI, high sport specialization was associated with low BMD among female high school distance runners. Further investigation of this association is warranted as low BMD has been related to athletes’ cognitive abilities without clinical symptoms or reporting of mTBI. The results of this pilot study suggests further investigation is warranted.

**CONCLUSIONS:** Our findings indicated that high sport specialization was associated with low BMD among female high school distance runners. Further investigation of this association is warranted as low BMD has been related to athletes’ cognitive abilities without clinical symptoms or reporting of mTBI. The results of this pilot study suggests further investigation is warranted.

**Excessive long-term training and extensive exertion during exercise can influence cytokine expression. Various measures have been explored to minimize this, and dietary supplements having anti-inflammatory and antioxidant functions can help athletes recover from repetitive intensive exercises, thereby preventing reduced vitality.**

**PURPOSE:** This study aimed to identify the effect of mistletoe extract consumption on inflammatory markers of university male rowing athletes for 8 weeks during the winter training period. **METHODS:** This study included 20 male rowing athletes divided into the Korean Mistletoe extract supplement group (KME, n = 10) and the control group (CON, n = 10). The KME group took 110 mL of mistletoe extract every morning and evening after meals (total of 220 mL) for eight weeks. Before and after taking mistletoe for eight weeks, 2,000 m rowing performance capabilities were measured, and KME group took 110 mL of mistletoe extract after recovery from the rowing exercise. Blood samples were collected during the rest, immediately after exercise, and after 30 min of recovery. Among inflammatory markers, IL-6 and TNF-α were analyzed. **RESULTS:** Both groups showed a significantly reduced 2,000 m rowing time (KME: p<0.001, CON: p=0.01), and the total number of strokes were significantly fewer in the KME group than in the CON group (p=0.05). After supplementation the levels of IL-6 and TNF-α were lower in the KME group than in the CON group in all periods of the rest (p<0.001), immediately after exercise (IL-6: p<0.01, TNF-α: p<0.001), and after 30 min of recovery (p<0.01). **Conclusion:** Therefore, mistletoe extract intake can reduce the serum inflammatory cytokine levels (which are otherwise increased due to high-strengh exercise) among active individuals, indicating improved anti-inflammatory activity.

**PURPOSE:** Health and weight management benefits may influence athletes’ decisions regarding specific dietary practices. Eating disorders/disordered eating (ED/DE) are highly prevalent in the athletic population. The purpose of this study was to determine if following specific diets correlated with a greater likelihood of responding positively to ED/DE screening tools compared to not adhering to a diet. **METHODS:** 1000 female athletes (15-30 yrs) were asked to complete a comprehensive health and wellness survey. Athletes were asked to specify their diet and completed 3 ED/DE screening tools: the Brief Eating Disorder in Athletes Questionnaire, the Eating Disorder Scale for Primary Care, and self-reported current or past history of ED/DE. We hypothesized that athletes adhering to specific diets would respond positively to ≥1 ED/DE screening tool vs. athletes without dietary restrictions (70.0%, 95% CI: 67.9%, 72.2%) and athletes following a specific diet would respond positively to ED/DE screening tools compared to those not following a diet. The most common diets included in the analyses: vegan, vegetarian, pescatarian, gluten free, low carbohydrate, low dairy, and ≥2 diets. Athletes following diets for health issues (e.g. Celiac disease) were excluded. Descriptive statistics were calculated for all study measures and Chi-square testing was performed to assess relationships between athletes’ dietary practices and their responses to ED/DE screening tools.

**RESULTS:** 234 of 1000 female athletes reported adherence to specific diets; 766 reported no diet adherence. 69 of the 234 athletes were excluded due to medically-related dietary practices or vague dietary descriptions. 133 athletes reported following 1 of the diets and 32 athletes reported following ≥2 diets. Of the diet-adherent athletes, 67.9% responded positively to ≥1 of the 3 ED/DE screening tools. Athletes practicing vegetarian, vegan, low carbohydrate, low dairy, or ≥2 diets were more likely to respond positively to ≥1 ED/DE screening tool vs. athletes without dietary restrictions (70.0%, 77.8%, 79.5%, 60.0%, and 65.6%, respectively vs. 41.8%; p<0.048). **CONCLUSION:** Specific diet adherence in female athletes is associated with greater likelihood of positive screening for ED/DE using survey self-report. Health practitioners should consider further ED/DE questioning of athletes reporting specific diet adherence in order to enhance nutritional knowledge and help treat and prevent ED/DE. **Abstracts were prepared by the authors and printed as submitted.**
**Board #8 May 30 6:00 PM - 7:00 PM**

**The Impact of Clinical Factors in Physician and ATC Decision Making for Concussion Return to Play: Insight from Policy Capturing Study**

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**PURPOSE:** To scrutinize the role of several clinical factors in physician and clinical athletic trainer (ATC) return-to-play (RTP) decision making in high school athletes who sustained a concussion.

**METHODS:** Sports Medicine physicians and ATCs completed a policy capturing survey of 30 clinical scenarios and rated how likely they were to clear the athlete for RTP. Nine factors were randomly varied within the scenarios: age, gender, sport, prior concussion, initial symptom score, symptom duration, and ImPACT performance.

Respondents then ranked how important each variable was in their decision making process.

**RESULTS:** 16 physicians (87.5% CAQSM, 12.5% Fellows, mean 9.2 concussions managed per month) and 29 ATCs (mean 4.8 concussions managed per month) participated. ImPACT testing was the most significant contributor to RTP decisions. Physicians and ATCs weighed ImPACT changed from baseline (β 0.42±0.23 and 1.28±1.18 respectfully) and ImPACT compared to normative values (0.39±0.24 and 1.38±0.90 respectfully) most heavily. Respondents self-ranked prior concussion and age as most influential in their RTP decision making. There was no correlation between participants self-ranking of importance and the observed contribution of a variable to decision making.

**CONCLUSIONS:** Respondents displayed poor insight to the role of various clinical factors in their management of concussion RTP. ImPACT testing has a greater influence on RTP decisions than physicians and ATCs realize. Despite having low self-ranked importance, variables related to ImPACT results were among the most influential. Self-ranking importance of clinical variables is similar between physicians and ATCs; however, symptom duration is less important to ATCs compared to physicians. Although age was considered important in self-ranking it was not a significant contributor to RTP decision making.

**Board #9 May 30 6:00 PM - 7:00 PM**

**Spine Injuries and Concussions among Figure Skaters**

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**PURPOSE:** To determine the prevalence and mechanism of spine injuries and concussions among a sample population of figure skaters. To assess for potential risk factors for these injuries.

**METHODS:** This is a cross-sectional analysis of spine injuries and concussions reported by figure skaters. Data was obtained through an anonymous, confidential online questionnaire distributed to members of participating figure skating clubs. The main outcomes included diagnoses, mechanism and source of medical care. Simple descriptive statistics were used; Fisher’s exact test was used to assess for statistical differences in categorical variables between groups. SPSS was used for all analyses.

**RESULTS:** Thus far, 88 participants have completed questionnaires (recruitment ongoing). The mean age of participants is 25.2 years (SD 17.1). Most (79%) respondents are female. Most (85%) figure practice figure skating year-round; 85% participate in competitions. Some skaters participate in more than one discipline including singles(n=68), pairs(n=3), ice dance(n=21), synchronized skating(n=29), theatre on ice(n=17). More than a quarter (27%; n=24) of participants reported spine injuries/back pain. The most common diagnosis was muscular back pain. Treatment was primarily guided by primary care (n=10), sports medicine (n=13), physical therapists (n=14) and athletic trainers (n=10). Almost half of those who reported back pain did not present to a health care provider (HCP) (45%; n=N/11/24). All injuries occurred in practice. More than a quarter of participants (27%; n=24) sustained at least one concussion; 7 sustained two concussions. Several (42%; n=N/10/24) skaters did not present to a HCP for evaluation of their first concussion. All concussions occurred during practice and most (92%; n=N/22/24) were during on-ice activities. The most common mechanism of injury was a fall (62%; n=N/15/24). The sex of the skater was not associated with either mechanism of spine injury or history of concussion.

**CONCLUSIONS:** Nearly a third of skaters sustained a concussion or spine injury, yet nearly half did not report their injuries to a HCP. Our findings warrant further investigation into the reasons for such a low reporting rate among figure skaters and the potential effect on injury outcomes.