C-07   Thematic Poster - Carbohydrate and Fat Metabolism

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100C

1068   Chair: Sara Campbell, FACSM. *Rutgers University, New Brunswick, NJ.*

(No relevant relationships reported)

1069   Board #1   May 31 8:00 AM - 10:00 AM

Postprandial Lipemic Responses After A High-fat Meal And Low- Or High-intensity Interval Exercise

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(No relevant relationships reported)

Evidence suggests that high-intensity interval training can be as beneficial, or superior to traditional low to moderate intensity, long duration exercise in clearing postprandial triglycerides (TG).**PURPOSE**: To compare the effect of exercise intensity on postprandial lipemic responses after a high fat meal. **METHODS**: Maximal oxygen consumption (VO2) was measured in 13 participants (9 male, 4 female). There were no differences between males and females among age (males: 24 ± 2 years; females 23 ± 2 years), height (1.74 ± 0.04 meters vs. 1.69 ± 0.09 meters, respectively), or VO2max (41.42 ± 3.87 mL/kg/min vs. 36.97 ± 1.39 mL/kg/min, respectively.) Males weighed heavier than females (78.9 ± 11.2 kg vs. 65.3 ± 2.1 kg, $p = 0.04$). In a randomized crossover design, participants returned on two separate occasions where they arrived fasting and consumed a high-fat milkshake made from premium chocolate ice cream and heavy whipping cream, delivering 1.3 g/kg bodyweight of fat. Participants performed either low intensity exercise (LE) on a treadmill at a self-selected pace to elicit a heart rate (HR) of 40-60% of heart rate reserve (HRR) for 30 minutes or perform high-intensity interval exercise (HE) of 8 repetitions of 30 second sprints on a treadmill with 90 second active rest. Participants returned on a non-consecutive test day to perform the opposite test. Blood was sampled via fingerstick for TG at baseline (T0), 1 hour (1H), 3 hours (3H), and 5 hours (5H) postprandially. Area under the curve (AUC) determined the postprandial TG response via the trapezoid method. Comparisons among TG at each time point and AUC were determined via paired samples t-tests. Significance was set at $p<0.05$. **RESULTS**: No differences were found among baseline, 1H, or 3H TG values between the exercise conditions (p >0.05). 5H TG and AUC were lower in LE compared to HE (5H: 149.54 ± 113.18 mg/dL vs. 195.85 ± 117.14 mg/dL, respectively, t(13)= -3.384, p=0.005, d=0.402; AUC: 430.39 ± 269.64 mg/dL vs. 508.12 ± 256.97 mg/dL, respectively, t(13)=-2.212, p=0.04,d=0.295). Normalized peak TG values were not significantly different across groups. **CONCLUSIONS**: LE resulted in lower postprandial lipemic responses and lower peak compared to HE. The relatively short HE session may have not been sufficient in duration to clear postprandial TG.

1070   Board #2   May 31 8:00 AM - 10:00 AM

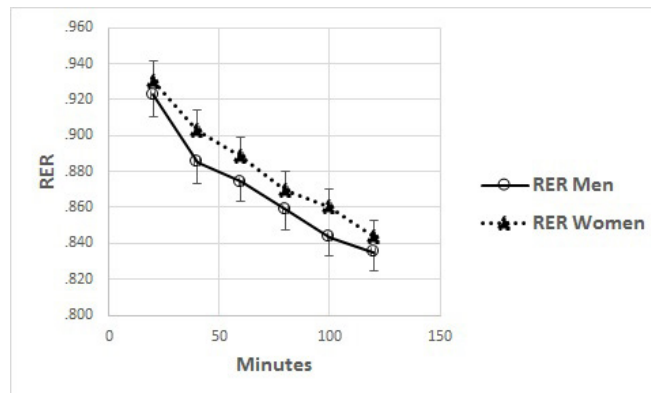**Similar Substrate Use During Prolonged Cycling in Men and Women**

Beth W. Glace, Ian J. Kremenic, Malachy P. McHugh, FACSM. *Lenox Hill Hospital, New York, NY.* (Sponsor: Malachy McHugh, FACSM)

(No relevant relationships reported)

PURPOSE: It is generally accepted that, compared to men, women rely more upon lipids as a substrate during moderate intensity exercise. However, most studies were conducted in a fasting condition, which is not how prolonged exercise is typically performed. The purpose of this study was to compare substrate use between sexes in well-trained cyclists during prolonged exercise after a standardized breakfast. **METHODS**: Well-trained cyclists [18 women, 16 men] were recruited. Subjects reported to our lab twice. On the first day they performed a VO_{2max} test. At 7:30 a.m. on a subsequent day, they drank a standardized breakfast of a liquid meal replacement which provided 6 kcals/kg. At 9 a.m. they pedaled on their own bikes for 2 hours at their ventilatory threshold [~65% VO_{2max}] with 5,1-min sprints interspersed throughout. Water was provided at a rate of 1% body mass/h. Ventilatory gas exchange was measured every 20 min to calculate RER. Descriptive data were compared using independent t-tests, ventilatory data were compared using repeated measures ANOVA. **RESULTS**: Men and women were of similar age [38 yrs, p=0.92] and VO_{2max} was typical of well-trained, recreational cyclists: 56 ml/kg/min for men, and 47 ml/kg/min for women. Body mass declined by 1% and did not differ between sexes [p=0.98]. RER declined during exercise [p<0.001] but there was no difference between sexes [p=0.38] and no time x sex interaction [p=0.78], indicating that substrate usage was

similar between men and women. Perception of effort and heart rate increased over time, but did not differ between men and women [time x sex p≥0.26, effect of sex, p≥0.62].
CONCLUSIONS: The notion that women rely more upon lipids during exercise was not supported by our data in fed subjects. Men and women who perform prolonged exercise after a light meal, as is typical, are likely to use similar amounts of fats and carbohydrates. This underscores the importance of nutritional status in studies comparing men and women.

1071   Board #3   May 31 8:00 AM - 10:00 AM

No Lipolytic Suppression With Pre Exercise Carbohydrate Regardless of its Glycemic Index

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(No relevant relationships reported)

INTRODUCTION: It is well-documented that ingesting carbohydrate prior to exercise reduces fat oxidation, and that this effect is attenuated with low glycemic index carbohydrates. However, it is yet to be established whether these metabolic effects are primarily the result of alterations in the mobilization of free fatty acids (FFA) from adipose tissue (i.e. lipolysis) or whether these effects impact exercise performance. PURPOSE: To determine the impact of pre-exercise carbohydrate of different glycemic indices on subcutaneous abdominal adipose tissue (SCAAT) metabolism and running performance. METHODS: Ten trained male runners completed three experimental trials consisting of 30 min at 60% VO_{2max}, 30 min at 75% VO_{2max}, and a 5-km time trial (TT). Thirty min prior to exercise, participants consumed one of three beverages: 1) 75 g low glycemic index modified starch supplement (UCAN), 2) 75 g high glycemic index glucose-based supplement (G), or 3) a non-caloric placebo (PL). SCAAT lipolysis was assessed via microdialysis. RESULTS: Prior to exercise, blood glucose and insulin were elevated with G vs. PL (+53.0 ± 21.3 mg·dL^{-1} [SD]; p = 0.000; +33.9 ± 11.0 μU·mL^{-1}; p = 0.000) and G vs. UCAN (+36.6 ± 24.9 mg·dL^{-1}; p = 0.00007; +25.2 ± 11.0 μU·mL^{-1}; p = 0.000), respectively. Fat oxidation was attenuated, and carbohydrate oxidation increased prior to exercise with G vs. PL (-0.06 ± 0.06 g·min^{-1}; p = 0.005; +0.18 ± 0.07 g·min^{-1}; p < 0.0001) and G vs. UCAN (-0.06 ± 0.05 g·min^{-1}; p = 0.004; +0.18 ± 0.14 g·min^{-1}; p < 0.0001). There were no differences in SCAAT lipolysis or running performance. CONCLUSIONS: Pre-exercise carbohydrate results in metabolic effects favoring carbohydrate utilization, and these effects are attenuated with low glycemic index carbohydrate. However, these effects are not the result of alterations in SCAAT lipolysis, nor do they affect exercise performance.

1072   Board #4   May 31 8:00 AM - 10:00 AM

Overload Alters Skeletal Muscle Glucose Utilization but not Glucose Uptake or Hypertrophy in Insulin-Resistant Mice

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(No relevant relationships reported)

Resistance exercise training/chronic muscle loading induces skeletal muscle hypertrophy and improves systemic glucose homeostasis in individuals with type 2 diabetes. Surprisingly, it is presently unknown if the improvement in glycemic control is due to an increase in muscle glucose uptake. **PURPOSE:** To determine if chronic muscle loading (overload)-induced muscle glucose uptake is impaired by insulin resistance. **METHODS & RESULTS:** Male C57BL/6J mice (6 wks old) were fed

a low fat diet (LFD) or a 60%kcal high fat diet (HFD) for 12 wks to induce insulin resistance. Plantaris muscle overload was elicited by unilateral ablation of the distal 2/3 of the gastrocnemius and soleus. The contralateral leg was sham-operated. Muscles were weighed 5 days later. Overload increased muscle mass ~40% in both LFD and HFD mice. To assess glucose uptake, muscles were incubated in [^{3}H]-2-deoxyglucose. Overload increased muscle glucose uptake ~80% in both LFD [Sham: 0.52±0.02; Overload: 0.91±0.04 (μmol/g muscle/h)] and HFD mice [Sham: 0.49±0.04; Overload: 0.86±0.09 (μmol/g muscle/h)], showing that overload stimulates glucose uptake independent of insulin resistance. To determine if this effect is due to increased glucose transporter (GLUT) or hexokinase levels, immunoblots were performed. Overload did not alter GLUT4 or hexokinase. In contrast, overload increased GLUT1 ~70%, but only in insulin resistant muscles. Decreased glycogen enhances glucose uptake. To determine if overload lowered glycogen levels, glycogen content was measured using a hexokinase-based reagent. Overload increased muscle glycogen ~26% in LFD (Sham: 29.0±1.6; Overload: 36.1±1.5 nmol/mg muscle), and ~40% in HFD mice (Sham: 31.2 ±2.1; Overload: 42.3±1.7 nmol/mg muscle). To determine if overload-induced glucose uptake is dependent on glucose utilization, muscles were incubated in [5-^{3}H]-glucose to assess glycolytic flux, and immunoblots performed to assess the rate limiting enzyme of the pentose phosphate pathway, glucose-6-phosphate dehydrogenase (G6PD). Overload did not alter muscle glycolytic flux. In contrast overload increased muscle G6PD ~140% in LFD, and ~82% in HFD mice. **CONCLUSION:** Insulin resistance does not impair overload-induced muscle hypertrophy or glucose uptake, but does alter glucose utilization. **SUPPORT:** NIH R01 DK103562

1073   Board #5   May 31 8:00 AM - 10:00 AM

Post-Exercise Fructose-Maltodextrin Ingestion Enhances Subsequent Endurance Capacity

Gareth A. Wallis, Tim Podlogar, Ed Maunder. *University of Birmingham, Birmingham, United Kingdom.* (Sponsor: Professor Janice Thompson, FACSM)

(No relevant relationships reported)

PURPOSE: Restoring muscle and liver glycogen content during short-term (<6 h) recovery from prolonged exercise is pertinent for athletes seeking to maximize performance in repeated exercise bouts. Previous research suggests co-ingestion of fructose-glucose carbohydrate sources augments liver and has equivalent effects on muscle glycogen storage during short-term recovery from prolonged exercise compared to isoenergetic glucose ingestion. The aim of the present investigation was to determine if this has a discernible effect on subsequent exercise capacity. **METHODS:** Eight trained endurance runners and triathletes performed two experimental trials in a single-blind, randomised, and counterbalanced cross-over design. Trials involved treadmill running to exhaustion at 70 %VO$_{2max}$, a four-hour recovery with 90 g.h^{-1} of glucose-maltodextrin (GLU) or fructose-maltodextrin (FRU) ingestion (1:1.5 ratio), and a second bout of treadmill running to exhaustion at 70 %VO$_{2max}$. Indirect calorimetry and stable isotope methods were employed to estimate substrate oxidation and ingested carbohydrate oxidation. **RESULTS:** Endurance capacity in the second exercise bout was significantly greater with FRU (81.4 ± 22.3 vs. 61.4 ± 9.6 min, *P* = 0.02), a *large* magnitude effect (ES = 1.84 ± 1.12, 32.4 ± 19.9 %). Total carbohydrate oxidation rates were not significantly different between-trials at given time-points, although the total amount of carbohydrate oxidised in the second exercise bout was significantly greater with FRU (223 ± 66 vs. 157 ± 26 g, *P* = 0.02). Ingested carbohydrate oxidation rates, representing carbohydrate stored during recovery and/or that derived from ongoing absorption, were greater during bout two with FRU (*P* = 0.001). Plasma glucose and non-esterified fatty acid concentrations were not significantly different between-trials. Plasma lactate concentrations were significantly greater during recovery with FRU (*P* = 0.001). Self-reported nausea and stomach fullness during bout two were marginally in favour of FRU. **CONCLUSION:** Short-term recovery of endurance capacity was significantly enhanced with fructose-maltodextrin vs. glucose-maltodextrin ingestion during recovery.

1074   Board #6   May 31 8:00 AM - 10:00 AM

Prolonged Low-moderate Intensity Exercise On Physiological Markers Of Metabolic And Oxidative Stress

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(No relevant relationships reported)

Oxidative stress results in lipid, protein and DNA oxidation as well as metabolic dysfunctions. This may result in chromosomal damage, telomere erosion, and

accelerated cellular ageing. Long-term physical activity promotes healthy metabolic and oxidative profiles. The effects of prolonged physical activity however, are unknown.
Purpose
This study investigated the effects of prolonged physical activity on oxidative and metabolic stress in healthy adults participating in a 260-km wilderness canoeing expedition.
Methods
Twenty-seven participants took part in the study. Sixteen went on a 14-day wilderness canoeing expedition (EXP) (24 ± 7 yrs, 72 ± 6 kg, 178 ± 8.0 cm, 18.4 ± 8.4 %BF, 47.5 ± 9.3 mlO$_2$·kg^{-1}·min^{-1}), covering a distance of 260 km, requiring 6-9 hrs of low to moderate exercise daily, and eleven were used as controls (CON) (31 ± 11 yrs, 72 ± 15 kg, 174 ± 10 cm, 22.8 ± 10.0 %BF, 47.1 ± 9.0 mlO$_2$·kg^{-1}·min^{-1}). Blood sample collection was completed before and after the expedition. ANCOVA analyses were performed on metabolic and oxidative variables as well as telomere length from isolated blood mononuclear cells.
Results
For metabolic results, no statistical differences were observed in total cholesterol, high- and low-density lipoprotein, testosterone and insulin concentration. Triglycerides were lower following the expedition (EXP 69 ± 18 *vs.* CON 106 ± 45 mg·dL^{-1}; p = 0.002). Malondialdehyde was unaffected (EXP 4.2 ± 1.3 *vs.* CON 4.1 ± 0.7 μM; p > 0.05) but superoxidase dismutase activity, representative of antioxidant activity, was greater in the expedition group (EXP 3.1 ± 0.4 *vs.* CON 0.8 ± 0.5 U·ml^{-1}; p < 0.001). Finally, telomere length was unchanged (EXP 1.00± 0.48 *vs.* CON 0.89 ± 0.28 TS ratio; p > 0.05).
Conclusion
The present results suggest that there is a stronger cellular protective response from antioxidants to counteract the exercise-associated production of pro-oxidant free radical and reactive oxygen species during prolonged low-moderate physical loading. This shift in cellular oxidative balance, however, did not seem to be sufficient to induce a notable change in telomere length.

1075   Board #7   May 31 8:00 AM - 10:00 AM

In Vivo Knockdown of Hepatocellular eNOS Reduces Cellular Anti-Oxidant Defense and Mitochondria Biogenesis/Function

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the effects of long-term knockdown of endothelial nitric oxide synthase (eNOS) in hepatocytes in vivo to establish a potential regulatory role in liver mitochondrial health. METHODS: C57Bl6 mice (6 months of age) were tail vein injected with either an adeno-associated virus with a hepatocyte specific promoter for the shRNA induced silencing of eNOS (AAV8-Ttr-shRNA-eNOS; 1x10^11 GC; N=8) or a scramble control (AAV8-Ttr-shRNA-Scr, N=8). The mice were maintained on a low fat control diet and terminal studies performed 12 weeks post AAV-shRNA injection. RESULTS: Body mass and percent body fat did not differ between treatment groups. Hepatocellular knockdown of eNOS significantly (p<0.05) lowered hepatic gene expression of anti-oxidant defense, including glutathione peroxidase (GPX-1, ~30%), superoxide dismutase 2 (SOD2, ~30%), and NAD(P)H quinone dehydrogenase 1 (Nqo1, ~40%) compared to Scr control. These are all known targets of the anti-oxidant response element transcription factor, nuclear factor-E2-related factor-2 (Nrf2). In addition to apparent downregulation in anti-oxidant defense mechanisms, AAV-shRNA-eNOS also significantly reduced mitochondrial biogenesis marker peroxisome proliferator-activated receptor gamma coactivator 1α (PGC-1α mRNA) by ~30% (p<0.05) and LC3II protein content in isolated mitochondria (a marker of mitophagy) by ~40% (p=0.16) compared to Scr control. This was coupled with significant reductions in both basal and state 3 hepatic mitochondrial respiration with AAV-shRNA-eNOS compared with Scr control. CONCLUSION: These findings represent the first observations that long-term in vivo knockdown of eNOS specifically in hepatocytes with AAV-shRNA results in suppression of hepatic anti-oxidant defense, impaired hepatic mitochondrial biogenesis and mitophagy, and reduced hepatic mitochondrial function. Funding: This work was supported by VA-Merit Grant I01BX003271-01 (R.S.R.).

1076   Board #8   May 31 8:00 AM - 10:00 AM

Acute Exercise by Insulin Resistant Rats Induces Muscle Fiber Type-selective Improvement in Insulin-stimulated Glucose Uptake

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(No relevant relationships reported)

PURPOSE: To determine if acute exercise induces muscle fiber type-selective changes in glucose uptake (GU), glycogen content or GLUT4 protein abundance in insulin resistant rats.
METHODS: Rats were fed a high-fat diet (HFD; 60% fat) or a low-fat diet (LFD; 13% fat) ad libitum for two weeks. On the experimental day, HFD rats were sedentary (SED) or exercised (2h swim exercise). All LFD rats remained SED, serving as controls. Exercised rats were studied immediately-post exercise (IPEX) or 3.5h post-exercise (3.5hPEX). Isolated epitrochlearis muscles were incubated with [³H]-2-deoxyglucose (2DG). Muscles from IPEX and SED controls were incubated without insulin. Muscles from 3.5hPEX and SED controls were incubated ±100µU/ml insulin. Muscles were incubated with collagenase to isolate single fibers. Fiber type (myosin heavy chain expression: type I, IIA, IIB, IIX, IIAX, or IIBX) was determined by SDS-PAGE. In the same single fibers, GU was measured by [³H]-2DG accumulation. Fiber type-specific glycogen was measured by histochemical periodic-acid Schiff staining. GLUT4 abundance was determined by immunoblotting. Data were analyzed by one-way ANOVA.
RESULTS: In HFD vs LFD rats, GU of insulin-stimulated single fibers was decreased in all fiber types (P<0.05) except type I. Insulin-independent GU in single fibers of each fiber type was increased IPEX (P<0.05). Glycogen content decreased in all fiber types IPEX (P<0.01). In HFD rats insulin-stimulated GU 3.5hPEX was increased in all fiber types (P<0.05) except type I. GLUT4 content was unchanged by diet or exercise in each fiber type.
CONCLUSIONS: Greater insulin-independent GU and decreased glycogen IPEX provides compelling evidence that each fiber type, including type I fibers, was recruited. Neither diet nor exercise effects on GU were attributable to altered GLUT4 abundance regardless of fiber type. Earlier research using whole muscles from normal rats demonstrated that exercise causes greater GLUT4 translocation concomitant with greater phosphorylation of AS160 protein, a key regulator of GLUT4 translocation. Our working hypothesis is that fiber type-selective improvement in insulin-stimulated GU at 3hPEX in insulin resistant rats is attributable to fiber type-selective increases in AS160 phosphorylation that facilitates greater GLUT4 translocation.

C-08   Thematic Poster - **Mental Health and Exercise**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100E

1077   **Chair:** Matthew P. Herring. *University of Limerick, Limerick, Ireland.*

(No relevant relationships reported)

1078   Board #1   May 31 8:00 AM - 10:00 AM

Acute Exercise Effects Among Young Adults with Subclinical Generalized Anxiety Disorder: Replication and Expansion

Matthew P. Herring[1], Derek C. Monroe[2], Brett R. Gordon[1], Mark J. Campbell[1]. [1]*University of Limerick, Limerick, Ireland.* [2]*University of California Irvine, Irvine, CA.*

(No relevant relationships reported)

Little is known about the effects of acute exercise among individuals with subclinical Generalized Anxiety Disorder (GAD), a disorder marked by persistent worry, elevated anxiety, and low energy and fatigue. Recent findings supported the positive effects of acute exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. However, exercise effects among young men with subclinical GAD are unstudied. **PURPOSE**: To replicate initial findings, to compare acute responses to aerobic exercise and quiet rest among young men with subclinical GAD, and to explore potential sex-related differences. **METHODS:** Thirty-five young adults (21.4±2.3y; 19M; 16F) with Penn State Worry Questionnaire scores ≥45 (60±8) completed 30-min treadmill running at ~71.2±0.04 percent heart rate reserve and 30-min seated quiet rest in counterbalanced order. Outcomes included worry, worry engagement, absence of worry, state anxiety, and feelings of energy and fatigue. RM-ANOVA examined differences across condition and time. Sex-related differences were explored with RM-ANOVA and paired samples *t*-tests stratified by sex. Hedges' *d* effect sizes were calculated to quantify and compare magnitude of change in the full sample, men, and women. **RESULTS:** There were no significant baseline differences between sexes. Compared to quiet rest, exercise significantly improved state anxiety (*p*<0.04; *d*=0.27) and feelings of energy (*p*<0.001; *d*=1.09). Small improvements were found for worry (*d*=0.22), worry engagement (*d*=0.18), and feelings of fatigue (*d*=0.21). Although RM-ANOVA did not support significant differences between sexes, exercise effects on worry, worry engagement, absence of worry, and feelings of energy were stronger among females. Moderate-to-large improvements in worry (*d*=0.53), absence of worry (*d*=0.38), and feelings of energy (*d*=1.35) were found among women. Among men, moderate-to-large improvements in state anxiety (*d*=0.37) and feelings of energy (*d*=0.92) and fatigue (*d*=0.40) were found. **CONCLUSION:** Findings support initial reports of positive effects of acute aerobic exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. Findings also provide initial support for these positive effects among young men with subclinical GAD.

1079   Board #2   May 31 8:00 AM - 10:00 AM

Working It Out: Acute Exercise to Combat Anxiety and Depression in Individuals Living with PTSD

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(No relevant relationships reported)

Mental health problems are increasingly prevalent in today's society. Exercise interventions have been shown to significantly reduce symptoms of many mental health problems, but often overlooked is the potential for exercise to reduce symptoms of Post-Traumatic Stress Disorder (PTSD) and comorbid psychological conditions (e.g., anxiety & depression). **Purpose:** Examine the acute effects of a bout of moderate intensity continuous aerobic exercise (MICE) and a bout of high-intensity interval exercise (HIIE), relative to a no-exercise inactive control (SED), in participants with subsyndromal PTSD. **Methods:** Participants [*N*= 24, 9 males; age (*M ± SD*); 25.9 ± 9.2 yrs; Estimated VO$_{2peak}$ (*M ± SD*); 34.6 ± 10.2 ml·kg⁻¹·min⁻¹] completed three randomly ordered 35-min conditions (HIIE, MICE, SED) following a within subjects design. All participants met the criteria for subsyndromal PTSD (i.e., having at least one symptom in each of the major DSM-5 clusters), with an average PCL-5 score of 47.64 which exceeded the cut point for probable PTSD of 33. State Anxiety, and Depression were assessed before (Pre), immediate after (Post0), 20-minutes after (Post20), and 40-minutes after (Post40) each condition. **Results:** Anxiety and Depression were significantly reduced following all conditions. Anxiety Post40 was significantly less than Pre for HIIE [Cohen's *d* = 1.05], MICE [Cohen's *d* = 0.78], and SED [Cohen's *d* = 0.53]. Depression Post40 was significantly less than Pre for HIIE [Cohen's *d* = 0.76], MICE [Cohen's *d* = 0.84], and SED [Cohen's *d* = 0.32]. **Conclusion:** Exercise significantly reduced Anxiety and Depression to a greater extent than SED. This study provides evidence for exercise-induced short-term improvements in comorbid psychological conditions associated with PTSD. Future studies need to apply these benefits to a longitudinal program.

1080   Board #3   May 31 8:00 AM - 10:00 AM

The Interrelationship Between Depression and Hemoglobin: Men Are Affected More Than Women

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(No relevant relationships reported)

There are 16.1 million Americans with major depressive disorder (MDD) and 3.4 million Americans with anemia. Low hemoglobin (Hb) is known to predict depressive symptoms, but seldom is the inverse examined: how does MDD affect Hb? There may be a cyclic relationship in which depression reduces engagement in physical activity and reduced activity lowers Hb. This presents possible implications for young athletes owing to higher depression scores on average than age-matched controls. **PURPOSE:** To investigate MDD as a predictor of serum Hb levels. **METHODS:** We analyzed 2,206 patients who were treated at a major hospital. All patients had Glascow Coma Scale scores ≥14, received a complete blood count with differential, and were screened for MDD. Differences in Hb between depressed and non-depressed groups were assessed with independent samples t-tests; multiple linear regression measured the effect of MDD on Hb, controlling for confounding variables. **RESULTS:** Among depressed patients, Hb was 12.16 ± 1.86 g/dL; among non-depressed patients, Hb was 13.52 ± 1.93 g/dL (p<0.001). This difference was more pronounced among men (14.24 vs. 12.36; p=0.001) than women (12.62 vs. 12.02; p=0.165). Across the total sample, holding constant age, sex, oximetry, blood pressure, use of dialysis, and diagnoses of diabetes, bleeding disorder, cirrhosis, cancer, and respiratory disease, depression associated with a 5.7% reduction in Hb (p=0.035; 95% CI: -1.38 to -0.50 g/dL). The overall model was significant (r²=0.299; p<0.001). Among men,

the model retained significance (r^2=0.226; p<0.001) and a diagnosis of depression associated with a reduction in Hb of 1.56 g/dL (p=0.002; 95% CI: -2.56 to -0.56 g/dL). **CONCLUSIONS:** The relationship between Hb and depression may be cyclic. In our population, depression had a greater effect on Hb than diabetes and respiratory diseases, and it had the same effect as bleeding disorders. Depression, via endocrine changes and reductions in physical activity, may lower oxygen-carrying capacity of the blood, and in turn affect endurance performance. Exercise-induced oxidative stress promotes Hb synthesis. For the anemic patient, exercise may enhance mood; for the moody, exercise may enhance oxygen-carrying capacity. For the athlete and the sport psychologist, there may be further implications.

1081   Board #4   May 31 8:00 AM - 10:00 AM

Prevalence of Depression and Low Self-Esteem among Collegiate Female Track and Field Athletes

Samantha Weber, Toni M. Torres-McGehee, Eva Monsma, Allison Smith. *University of South Carolina, Columbia, SC.*
(No relevant relationships reported)

Track and field athletes are under extreme amounts of pressure to be successful as student-athletes. Their academics and demands for their events may predispose them to having low self-esteem (LSE) and mental health disorders like depression (DEP). **PURPOSE:** To examine the prevalence of LSE and DEP in collegiate, NCAA Division I track and field athletes; and to investigate differences between academic status (i.e., freshman, senior, etc.) and event type (e.g., sprinter, distance, lean events etc.). **METHODS:** Collegiate female track and field athletes (n=387) were recruited from 25 NCAA Division I Institutions to participate in an online study. Demographic information, Center for Epidemiologic Studies Depression Scale (CESD) to estimate the risk for DEP and the Rosenburg Self-Esteem Scale for LSE were completed. **RESULTS:** The prevalence of DEP risk was estimated to be 65.1% (n=252). No significant differences were found between academic status; however the highest DEP risk was freshman (19.4%) then sophomores (17.3%). Significant differences were found between event type and DEP within sprinters, middle distance runners, and distance runners (11.4% - 19.6%, $p = \leq 0.01$). Overall, LSE was 10.9% (n=42), with LSE found highest among sophomores (4.1%) then freshman (3.9%). No significant differences were found for event type and LSE; however, distance runners were at the highest risk for LSE with 4.4%. **CONCLUSIONS:** Female track and field athletes demonstrated a high risk of DEP and a lower risk for LSE. Freshman and sophomores demonstrated the highest risk for DEP and LSE, potentially due to the new academic and collegiate sport demands placed upon them. Overall, it is perceived the more acclimated (upper classman) a student-athlete is, the lower risk they have for DEP and LSE. Additionally, distance runners were found to have a higher risk of DEP and LSE; therefore, further examination is needed to draw conclusions to what additional pressures they may have. With a risk of DEP and LSE being most prevalent among younger collegiate athletes, universities need to focus on establishing a support system or mentoring program for incoming student-athletes.

1082   Board #5   May 31 8:00 AM - 10:00 AM

Associations Between Physical Activity and Depression: Results from The Irish Longitudinal Study on Ageing

Cillian P. McDowell[1], Rodney K. Dishman, FACSM[2], Mats Hallgren[3], Ciaran MacDonncha[1], Matthew Herring[1]. *[1]University of Limerick, Limerick, Ireland. [2]University of Georgia, Athens, GA. [3]Karolinska Institutet, Stockholm, Sweden.*
(No relevant relationships reported)

Physical activity (PA) can protect against depression. However, few studies have assessed the influence of dose, including whether meeting PA guidelines is sufficient or if greater benefits can be derived from greater volumes of PA. **PURPOSE**: To examine associations between different volumes of MVPA and walking and prevalence and incidence of depressive symptoms and depression status using data from The Irish Longitudinal Study on Ageing. **METHODS**: Participants (N=4,556; 56.7% female) aged ≥50 years completed the International PA Questionnaire (IPAQ) at baseline, and the Center for Epidemiological Studies Depression Scale at baseline and two years later. Participants were classified as meeting World Health Organisation PA guidelines or not, divided into IPAQ categories, and divided into tertiles based on weekly minutes of walking. Prospective analyses included 4,146 non-depressed respondents. **RESULTS**: After adjustment for age, sex, waist circumference, social class, and smoking, odds of prevalent depression were 45.2% (OR=0.55, 95%CI: 0.44-0.69; p<0.001) lower among those meeting PA guidelines, 40.3% (OR=0.60, 0.47-0.76; p<0.001) and 53.2% (OR=0.47, 0.66-0.61; p<0.001) lower among those in minimally-active and very-active IPAQ categories, respectively, and 24.9% (OR=0.75, 0.59-0.96; p≤0.02) and 44.1% (OR=0.56, 0.43-0.73; p<0.001) lower among those in moderate and high walking tertiles, respectively. Odds of incident depression were 24.4% (OR=0.76, 0.56-1.01; p≤0.06) lower among those meeting PA guidelines, 34.7% (OR=0.65, 0.46-0.93; p≤0.02) and 24.5% (OR=0.75, 0.77-1.07; p>0.10) lower among those in minimally-active and very-active IPAQ categories, respectively, and 22.7%

(OR=0.77, 0.54-1.09; p>0.13) and 25.6% (OR=0.74, 0.52-1.06; p>0.10) lower among those in moderate and high walking tertiles, respectively. **CONCLUSION**: Among a large, nationally representative sample of older adults, moderate and high volumes of MVPA were significantly associated with lower odds of concurrent depression and significantly and non-significantly associated with lower odds of incident depression, respectively. Meeting PA recommendations and walking were associated with significantly lower odds of concurrent depression and non-significantly lower odds of incident depression.

1083   Board #6   May 31 8:00 AM - 10:00 AM

Influence Of Omega-3 Status On Depression And Anxiety In Young Women With Obesity

Helen T. O'Connor[1], Rebecca L. Cook[1], Helen M. Parker[1], Cheyne Donges[2], Janet Franklin[3], Kate S. Steinbeck[4], Hoi Lun Cheng[4], Manohar Garg[5], Nicholas J. O'Dwyer[1]. *[1]The University of Sydney, Sydney, Australia. [2]Charles Sturt University, Bathurst, Australia. [3]Royal Prince Alfred Hospital, Sydney, Australia. [4]The Children's Hospital Westmead, Sydney, Australia. [5]The University of Newcastle, Newcastle, Australia.* (Sponsor: Melinda Manore, FACSM)
(No relevant relationships reported)

PURPOSE: Obesity is associated with an increased risk of depression and anxiety. Higher omega-3 polyunsaturated fatty acid (n-3PUFA) status may help to reduce negative consequences of obesity on mental health outcomes. This cross-sectional study aimed to investigate the relationship of obesity and n-3PUFA with depression and anxiety in young women with a normal (N) or obese (O) body mass index (BMI). **METHODS:** Healthy, young (18-35y) women (N: 18.5-24.9kg/m^2 O: >30.0kg/m^2) with no history of treatment (counselling or medication) for depression or anxiety completed the Depression, Anxiety and Stress Scale (DASS). Status of n-3PUFA was assessed using the red cell Omega-3 Index (low<4%; safe 4-8%; optimal >8%). Data were analysed via repeated measures ANOVA, ANCOVA (controlling for n-3PUFA). DASS components are reported as mean ± SD z-scores (normal <0.5, mild 0.5-1, moderate >1-2, severe >2-3, extremely severe >3). Cohen's d effect size (ES) between BMI, depression and anxiety was also determined. **RESULTS:** 299 women (N: n=157, 24.9±4.6y; O: n=142, 26.9±5.4y) completed the study. Although mean DASS scores were in the normal range, the O group had higher depression (N: -0.33±0.71, O: 0.11±0.98, p<0.001) and anxiety (N: -0.08±0.97, O: 0.29±1.23, p=0.004) scores and lower n-3PUFA status (low; safe, optimal: N: 1%, 83%, 16%, O: 8%, 85%, 8%; p<0.001) than the N group. Medium or small strengths of association were observed between obesity and depression (ES=0.52), anxiety (ES=0.34) and stress (ES=0.21). Adjusting for n-3PUFA attenuated the significance of the depression (p=0.001) and anxiety (p=0.033) scores but they still remained significantly higher for the O group. **CONCLUSIONS:** Young women with obesity had significantly higher scores for depression and anxiety. The status of n-3PUFA had a minimal impact on these scores. This study reinforces the pervasive, negative impact of obesity on mental health in young women.

1084   Board #7   May 31 8:00 AM - 10:00 AM

An Examination of Affective Change in the Absence of Physical Sensation

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(No relevant relationships reported)

Examination of affective responses to acute exercise has been plagued by the inability to find an appropriate control condition, as a true placebo has been elusive. This has resulted in various "control" conditions (e.g., quiet rest, reading, sitting in a chair on a treadmill, stretching). A potential option involves passive cycling. This would also provide a unique methodology for studying affective responses to activity in spinal cord injured (SCI) individuals. **PURPOSE**: To examine the psychological and physiological effects of Passive (PaC) versus Placebo cycling (PLC), both compared to Rest, in SCI individuals. **METHODS**: Heart rate (HR), Rating of Perceived Exertion (RPE), and affect (Calmness, Tension, Energy, Tiredness, State Anxiety) were recorded in 21 (11 male; 27 ± 6.52 yrs; $M \pm SD$) participants before, during and after each Rest, PaC, and PLC 25-min bout. Each cycling session consisted of identically paced warm-ups (5-min @ 35 r·min^{-1}), movement bout (15-min @ 60 r·min^{-1}), and cool-down (5-min @ 35 r·min^{-1}). **RESULTS**: PaC elicited psychological changes that varied significantly with respect to perceptions of Energy and Calmness, but not valenced (i.e., positive, negative) affect. Energy increased from Pre to Post-0 exercise (P= 0.024), then decreased Post-0 to Post-10 (P= 0.002). Enjoyment was greater following PaC relative to PLC (M_{diff}= 8.29, P= 0.06) and Rest (M_{diff}= 9.33, P=0.001). RPE was significantly higher during the PaC (M= 7.05±0.70) compared to both Rest (M= 6.11±0.08; P<0.001) and PLC (M= 6.32±0.05; P< 0.001). There were no significant effects on physiological factors such as HR or Temperature across conditions. **CONCLUSION**: These results provide support for this methodological technique as a

way of examining potential placebo effects of activity on affective outcomes. This also provides insights into how activity may influence affective responses in individuals with a SCI.

1085   Board #8   May 31 8:00 AM - 10:00 AM
Acute Effects of Resistance Exercise in Depressed Black/African American People Living with HIV

Sanaz Nosrat, James W. Whitworth, Nicholas J. SantaBarbara, Mark E. Louie, Joseph T. Ciccolo. *Teachers College, Columbia University, New York, NY.*
(No relevant relationships reported)

In the US, Blacks/African Americans (AA) comprise the largest proportion of People Living with HIV (PLWH). Depressive symptoms and fatigue are highly prevalent among PLWH. Depressive symptoms are linked to progression of HIV disease, and fatigue is linked to severity of depressive symptoms. Resistance exercise (RE) is shown to have psychological benefits in non-HIV depressed populations, and these benefits are hypothesized to be intensity-dependent. To date, no study has examined the use of a single bout of RE for management of affect and fatigue with depressed PLWH. **PURPOSE**: To test the acute effects of RE intensity on affect, arousal, and distress among sedentary AA PLWH who screen positive for depression. **METHODS**: Twenty-five men and 17 women ages 24-66 (47.5±11.2) with a Center for Epidemiologic Studies Depression Scale score of ≥10 completed a battery of questionnaires and 10 repetition maximum (10RM) muscular strength tests. Participants were randomized into: moderate intensity RE (MRE) (i.e., 70% of 10RM), n=21, or vigorous intensity RE (VRE) (i.e., 100% of 10RM), n=21. They had to complete 3 sets of 10 repetitions for 5 exercises. Affect, arousal, and distress were measured with the Feeling Scale, Felt Arousal Scale, and Subjective Units of Distress Scale, respectively. Measures were administered at PRE, MID, POST, at 15-minute DELAY, and at 30-minute DELAY. Changes were analyzed using ANOVAs, with Bonferroni adjustments. **RESULTS**: There were significant group x time interactions for affect (p<.05), and distress (p<.01), and main effect of time for arousal (p<.01). With MRE, affect improved PRE to POST (p<.01), PRE to DELAY15 (p<.01), and PRE to DELAY30 (p<.01), and arousal increased PRE to MID, and PRE to POST (p's<.01). In addition, distress reduced PRE to all time points (p's<.01). With VRE, affect decreased PRE to MID (p<.01), while arousal increased PRE to MID, and PRE to POST (p's<.01). In addition, distress reduced PRE to Delay15 (p<.01), and PRE to DELAY30 (p<.01). **CONCLUSIONS**: Results suggest that an acute bout of MRE is more effective than VRE in improving affect, increasing energy, and reducing distress in depressed AA PLWH. However, VRE also appears to have distress-reducing benefits. These findings should be considered when prescribing exercise for symptom management in this population.

C-09   Thematic Poster - **Performance after ACL Reconstruction**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100F

1086   **Chair:** Brian Noehren, FACSM. *University of Kentucky, Lexington, KY.*
(No relevant relationships reported)

1087   Board #1   May 31 8:00 AM - 10:00 AM
Peak and Rapid Force Deficits during Countermovement Jump Persist Longer than Reduced Jump Height post-ACL Reconstruction

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(No relevant relationships reported)

Following anterior cruciate ligament reconstruction (ACLR) athletes often demonstrate persistent lower extremity biomechanical abnormalities which may inhibit return to sports and/or contribute to increased risk of re-injury. Countermovement jump (CMJ) height is an indicator of lower extremity explosiveness and athletic ability. Phase-specific CMJ ground reaction force-time curve variables provide detailed information on jump performance, and have not yet been examined in collegiate athletes post-ACLR. **PURPOSE**: To assess eccentric (ECC) and concentric (CONC) phase CMJ maximal and rapid ground reaction force (GRF) variables in collegiate athletes post-ACLR and compare with healthy controls. **METHODS**: 18 Division I athletes (12 males) post-ACLR and 18 controls matched by sport, gender, year, and position performed maximal CMJs on force plates (800

Hz) 5.7 ± 1.8 (EARLY) and 9.8 ± 1.8 months post-surgery (LATE). ECC and CONC phase peak force, rate of force development (RFD), and rate of force unloading (RFU) were computed. Variables were analyzed by 3-way mixed ANOVAs (group x limb x interval).
RESULTS: Jump height was significantly lower in the ACLR group EARLY (ACLR: 29.7 ± 7.5 cm, CONTROL: 35.7 ± 11.3 cm), but not LATE (33.8 ± 7.6 cm). ACLR group involved (INV) limb peak and rapid force variables were significantly reduced compared to the uninvolved limb at both intervals (Limb symmetry indices: peak ECC force - EARLY: 84.1%, LATE: 96.9%; peak CONC force - EARLY: 83.8%, LATE: 90.1%; ECC RFD - EARLY: 83.3%, LATE: 82.4%, CONC RFU - EARLY: 80.3%, LATE: 90.0%). LATE post-surgery, ACLR group INV limb peak ECC force (deficit: 10.8%), peak CONC force (7.6%), ECC RFD (41.8%), and CONC RFU (22.5%) were significantly lower compared to CONTROL athletes.
CONCLUSIONS: Although CMJ height was not significantly reduced compared to healthy controls 10 months post-surgery, collegiate athletes post-ACLR present with CMJ maximal and rapid force deficits between limbs and when compared to healthy controls. These findings indicate that kinetic abnormalities persist despite minimal limitation in jump height, the most common CMJ performance metric. Deficits in rapid GRF capacity are greater than deficits in maximal GRF capacity and have practical relevance, as sports activities have limited time available for force development.

1088   Board #2   May 31 8:00 AM - 10:00 AM
Neuromuscular Training improves Sagittal Plane Hip and Knee landing Kinematics and Kinetics In Acl-reconstructed athletes

Christopher Nagelli[1], Samuel Wordeman[2], Stephanie Di Stasi[2], Joshua Hoffman[2], Tiffany Marulli[2], Timothy E. Hewett, FACSM[1]. *[1]Mayo Clinic, Rochoester, MN. [2]The Ohio State University, Columbus, OH.*
(No relevant relationships reported)

Deficits in hip and knee biomechanical and neuromuscular control are commonly observed in anterior cruciate ligament (ACL) reconstructed (ACLR) athletes and are associated with an elevated risk of future ACL injury. The efficacy of neuromuscular training (NMT) programs to improve hip and knee biomechanical deficits in ACLR athletes is currently unknown.**PURPOSE:** To quantify the effect of a NMT program in ACL-reconstructed athletes to improve sagittal plane landing biomechanics. The primary hypothesis tested was that sagittal plane hip and knee biomechanics associated with greater risk of ACL injury would be significantly reduced in ACLR athletes after participation in an NMT program. It was further hypothesized that following training hip and knee sagittal plane biomechanics in the ACLR cohort would not differ from a control cohort who also completed the training program.
METHODS: Eighteen ACLR and ten control athletes were recruited and completed a 12 session NMT program. Both groups of athletes participated in three-dimensional motion analysis prior to and after completion of the NMT program to evaluate hip and knee kinematics and kinetics during a drop vertical jump. Repeated measures ANOVA was conducted to determine the effect of training on kinematic and kinetic measures in ACLR athletes. In addition, a two-way ANOVA was conducted to compare post-training differences between the ACLR and control group. **RESULTS**: The ACLR athletes demonstrated significantly greater hip and knee flexion angle at initial contact and lower hip and knee flexion moment at initial contact after participation in the NMT program (p<0.05). Post-training comparison between the ACLR and control group showed no significant differences (p>0.05) in hip and knee flexion moment at initial contact and knee flexion angle at initial contact. The ACLR group landed with significantly greater (p>0.05) hip flexion angle at initial contact than the control group after training.
CONCLUSIONS: Hip and knee sagittal plane biomechanical and neuromuscular measures of ACL injury risk demonstrate significant improvements after completion of a NMT program in ACLR athletes. In addition, comparison of post-training hip and knee biomechanics between ACLR athletes and controls demonstrate recovery of biomechanical control.

1089   Board #3   May 31 8:00 AM - 10:00 AM
Biomechanical Adaptations After Exercise in Healthy and ACL Reconstructed Individuals

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(No relevant relationships reported)

Athletes with history of anterior cruciate ligament (ACL) reconstruction (ACLR) who return to high level of sport are at increased risk of another ACL injury during a game. Neuromuscular fatigue during sport may result in adaptive movement patterns that increase risk of injury. **Purpose:** Compare changes in an ACLR limb and a healthy limb based on fitness level after exercise. **Methods:** Thirty-three individuals with history of ACLR (22F/11M, 22.7±23.3 months post-surgery) and 29 healthy

individuals (18F/11M) were divided into two groups based on VO_2max (higher fit and lower fit). Sagittal, frontal, and transverse knee, hip, and trunk kinematics and triplanar knee and hip internal moments were measured on the involved limb before and after exercise. Data were reduced to 101 points for 0-100% of the gait cycle for kinematics and reduced to 41 points for 0-40% of the gait cycle (stance phase) for kinetics. Change scores were calculated for each 1% with 90% confidence intervals. Significant differences between groups were determined when confidence intervals did not overlap for three or more consecutive points. Mean differences were calculated for all significant differences. **Results:** Higher fit ACLR demonstrated decreased knee (-3.13°) and hip flexion (-2.14°) and increased trunk flexion (1.59°) and knee abduction (2.79°) compared to healthy individuals after exercise. Higher fit ACLR also demonstrated increased knee flexion moment (0.18Nm/kg) and hip extension moment (0.21Nm/kg) after exercise. Lower fit ACLR demonstrated increased hip adduction (1.48°), knee external rotation (3.57°), hip external rotation (2.87°), and trunk rotation (3.61°) compared to healthy individuals after exercise. **Conclusions:** Higher fit ACLR demonstrated more sagittal plane changes while lower fit ACLR demonstrated increased transverse plane motion after exercise, suggesting that fitness level should be a consideration when making return to activity decisions after ACLR.

1090   Board #4   May 31 8:00 AM - 10:00 AM

Influence of Lower Extremity Muscle Activation on Altered Landing Biomechanics in ACL Reconstructed Individuals

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(No relevant relationships reported)

While altered landing biomechanics contribute to secondary ACL injury following reconstruction (ACLR), neuromuscular contributions to altered landings are unknown. Understanding this relationship may lead to more effective rehabilitation programs and mitigate re-injury risk. **PURPOSE:** To determine differences in landing biomechanics between ACLR and healthy controls and how muscle activation predicts altered landing biomechanics. **METHODS:** Thirty-six females with ACLR and 14 controls (19.4±1.7yrs, 168.5±6.7cm, 66.9±9.4kg) participated. 3D biomechanics of the reconstructed (ACLR) or dominant (Control) limb were collected during 5 jump landings (JL). The average peak root mean square amplitude (RMS) of 6 muscles [gluteus medius (GMED), gluteus maximus (GMAX), biceps femoris (BF), semitendinosis (ST), vastus lateralis, rectus femoris (RF)] was calculated 50ms prior to initial contact (PRE) and during landing (LAND), normalized to peak RMS. ANOVAs determined differences ($P<0.05$) in landing biomechanics between groups, and separate step-wise regressions examined whether muscle activation predicted altered landing biomechanics in ACLR individuals. **RESULTS:** ACLR individuals landed (ACLR, control) with greater peak knee external rotation (ER) (-10.4±7.4°, -5.0±5.1°, P=0.016), peak hip flexion (FLX) (-89.4±15.8°, -75.6±21.8°, P=0.017), hip FLX excursion (-51.2±12.5°, -40.2±16.1°, P=0.013), peak knee abduction (ABD) moment (-0.8±1.1, 0.1±0.2, P=0.035), less peak hip adduction (ADD) (-1.3±5.5°, 2.5±6.8°, P=0.046) and less peak knee internal rotation (4.8±7.8°, 9.5±6.1°, P=0.049) compared to controls. In the ACLR: less BF and GMAX LAND predicted greater peak hip FLX (R^2=0.320, P=0.002); less BF LAND, RF PRE, GMAX LAND, and greater ST PRE EMG predicted greater hip FLX excursion (R^2=0.475, P=0.001); greater RF PRE EMG predicted greater peak hip ADD (R^2=0.142, P=0.026); greater BF PRE EMG predicted greater peak knee ER (R^2=0.161, P=0.017); and less GMED PRE predicted greater knee ABD moment (R^2=0.122, P=0.040). **CONCLUSIONS:** ACLR individuals adopt altered landing strategies that increase the risk of re-injury. Muscle activation patterns that mediate altered landings provide valuable information toward developing targeted neuromuscular interventions and decreasing ACL re-injury risk.

1091   Board #5   May 31 8:00 AM - 10:00 AM

Fear of Reinjury is Associated with Knee Biomechanics During Single Limb Landing after ACL Reconstruction

Julie P. Burland, Lindsey K. Lepley, Lindsay J. DiStefano, Steven. M. Davi, Adam S. Lepley. *University of Connecticut, Storrs, CT.*

(No relevant relationships reported)

Biomechanical alterations after anterior cruciate ligament reconstruction (ACLR) are thought to predict reinjury and are common at return to play. These aberrant movement patterns are highlighted by lower sagittal plane knee angles and moments, and greater asymmetry between limbs. Emerging data suggest that fear of reinjury can hinder rehabilitative success. Identifying whether a patient's fear of reinjury is associated with biomechanical alterations is critical to understanding the role of psychological factors after ACLR on movement control. **PURPOSE:** To evaluate the relationship between knee biomechanics during a single limb hop and a patient's fear of reinjury. **METHODS:** Ten participants with a history of unilateral ACLR

(age 22±2y; height 166.4±7.1cm; mass 65.6±12.1kg; years from surgery, 6±2) volunteered. Lower extremity biomechanics were recorded using 3D motion analysis during a single limb forward hop task. For the injured limb, area under the curve (AUC) during the first 50% of stance for knee flexion angle and internal extension moment was used for analysis. Limb symmetry indices (LSIs) were derived by normalizing to the contralateral limb. Fear of reinjury was measured using the Tampa Scale of Kinesiophobia (TSK), which uses a high score to indicate greater fear of reinjury. Initial Spearman correlations and linear regressions were used to determine the association between biomechanical measures and TSK. **RESULTS:** Knee flexion angle (rho=-0.75, p=0.01) and extension moment (rho=0.67, p=0.03) AUC values for the ACLR limb were negatively associated with TSK scores, predicting 56.4% (p=0.01) and 44.5% (p=0.03) of variance in TSK scores, respectively. Knee flexion angle (rho=0.03, p=0.92) and extension moment (rho=0.01, p=0.96) AUC LSIs were not associated with TSK. **CONCLUSIONS:** Greater knee flexion angle and extension moment AUC of the ACLR limb were associated with less fear of reinjury, indicating those who have lower fear completed the hopping task with more optimal biomechanics. LSIs were not associated with fear of reinjury indicating that biomechanical symmetry may not be the best predictor of fear of reinjury after ACLR. Fear of reinjury and optimization of movement control in the ACLR limb during rehabilitation, rather than limb symmetry, may help to improve ACLR outcomes at return to play.

1092   Board #6   May 31 8:00 AM - 10:00 AM

Functional Knee Bracing Improves Loading Symmetry Following ACL Reconstruction

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Reported Relationships: R. Queen: Contracted Research - Including Principle Investigator; Don Joy Orthopaedics.

Previous work has revealed significant between limb asymmetry following anterior cruciate ligament reconstruction (ACLR). Current clinical return to sport testing utilizes single-limb hop distance symmetry (limb symmetry index (LSI) > 90%) and time since surgery to determine readiness to return to sport (RTS). Loading metrics could provide new insights on readiness to RTS. Functional knee braces are recommended by clinicians following ACLR. The impact of bracing on hop symmetry is not well understood. **Purpose:** To evaluate the effect of knee bracing and time since surgery on loading symmetry during hop testing (single hop (SH), triple hop (TH) and crossover hop (CH)). **Methods:** 25 ACLR (6 male/19 female, age: 18.7, height: 1.73 m, weight: 709.7 N) completed hop testing after being RTS (29.8 weeks post-op) by the orthopedic surgeon and again 3 months later (RTS +3), while wearing the loadsol (100Hz) (Novel Electronics, St. Paul, MN). Hopping tasks (SH, TH and CH) were collected twice per task. Testing (testing order was randomized) was completed with and without a custom extension constraint knee brace (DonJoy Orthopaedics). Peak vertical ground reaction force (vGRF), loading rate (LR), and impulse (Imp) were calculated using a custom Matlab program. The LSI was calculated as the ratio of the Sx/NSx*100%. The effect of time (RTS, RTS +3) and condition (Braced, Non-Braced) was assessed using a repeated measures ANOVA for all tasks. **Results:** No significant interactions or main effects for time were found. Bracing resulted in improved LSI's for vGRF during TH (p<0.039) and CH (p<0.013) and for Imp during the TH (p<0.039) (Table 1). **Conclusion:** These results reveal that loading symmetry is improved while wearing a functional knee brace and loading symmetry (LSI>90%) was achieved during most hopping tasks. Future work needs to examine additional functional measures (eg. bilateral landings, running) to determine the impact of functional knee bracing and time on loading LSI.

Table 1

	Single Hop			Triple Hop			Cross-over Hop		
	vGRF	LR	Imp	vGRF	LR	Imp	vGRF	LR	Imp
RTS	93.24 (4.177)	89.05 (6.772)	92.897 (2.673)	87.362 (2.792)	89.478 (4.564)	90.992 (2.134)	91.807 (3.770)	92.611 (5.133)	94.835 (2.576)
RTS +3	97.791 (1.984)	107.937 (6.711)	95.264 (1.397)	92.124 (2.615)	93.340 (5.151)	92.908 (1.974)	93.179 (1.508)	95.375 (3.780)	92.820 (1.369)
Braced	97.107 (2.938)	99.122 (6.942)	93.505 (2.493)	**91.921 (2.133)** *	92.063 (4.374)	**93.256 (1.887)** *	**96.042 (2.406)** *	96.319 (3.186)	93.593 (1.647)
Non-braced	93.928 (2.676)	97.865 (6.635)	94.656 (1.762)	**87.565 (2.463)** *	90.754 (4.493)	**90.643 (1.762)** *	**88.944 (2.124)** *	91.666 (3.497)	94.062 (1.815)

Note: values are presented as mean (SE)

1093   Board #7   May 31 8:00 AM - 10:00 AM

Effects of Localized Vibration on Knee Joint Position Sense in Individuals with ACL-Reconstruction

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(No relevant relationships reported)

Anterior cruciate ligament (ACL) injury can disrupt one's proprioception such as joint position sense (JPS) and ultimately motor function. The application of localized vibration has been used to investigate the integrity of the sensorimotor system and the mechanisms of quadriceps weakness after ACL injury and ACLR-reconstruction (ACLR). However, effects of localized vibration on knee JPS in ACLR subjects are largely unknown. **PURPOSE:** To evaluate JPS with and without vibration and compare among ACLR, contralateral, and control limbs. **METHODS:** Fourteen subjects with ACLR (8 males and 6 females) and fourteen control subjects (7 males and 7 females) participated. Subjects sat on an isokinetic dynamometer chair with vibration strapped on the quadriceps tendon while visual and auditory cues were removed. Subjects were asked to remember target position and replicate that position. The absolute difference between the target and replicated trial was used as JPS. There were three trials at three target positions (15, 45, and 75 degrees of knee flexion) with and without vibration. The JPS differences between vibration and no-vibration conditions were calculated by subtraction. The average JPS was used for analyses. The order of testing conditions was randomized. One-way analysis of variance (ANOVA) or nonparametric (Kruskal-Wallis) was used to compare among limbs. Significance was at $p<0.05$ a priori. **RESULTS:** There were no significant JPS differences among ACLR, contralateral, and control limbs ($p=0.207$-0.914) in vibration and no-vibration conditions. Similarly, when the JPS differences between vibration and no-vibration conditions were used to compare the limbs, there were no significant JPS differences among ACLR, contralateral, and control limbs ($p=0.288$-0.755). **CONCLUSION:** The current investigation found minimal effects of localized vibration on JPS in the ACLR, contralateral, and control limbs. There are several potential reasons such as vibration-induced post effect, locations of vibration, types of vibration, and rehabilitation status. Despite the current results and limitations, continued effort to develop and refine a means to examine one's sensorimotor system is warranted.

Supported by NIH R01AR056259, R01AR055563, L30AR070273, K12HD065987, the Mayo Clinic Kelly Orthopedic Fellowship.

1094   Board #8   May 31 8:00 AM - 10:00 AM

Quantifying Whole Body Compensations in Ground Reaction Forces During Gait in Individuals Post-ACLr

Paige E. Lin, Neama H. Neamat Allah, Stephanie M. Yano, Andrea L. Alsalahat, Susan M. Sigward. *University of Southern California, Los Angeles, CA.*

(No relevant relationships reported)

Individuals 3 months post-ACL reconstruction (ACLr) decrease vertical (vGRF) and posterior (pGRF) ground reaction forces during loading response (LR) of gait. At this time of double limb support (DLS), decreased loading may result from modifications by the trailing limb. **PURPOSE:** To compare GRFs between limbs during DLS in individuals post-ACLr and controls. **METHODS:** 17 individuals (11F, 24±11yrs) 114±17days post-ACLr and 17 healthy controls (CTRL; 11F, 23±8yrs) walked 1.4 m/s. DLS of stance was divided into initial (iDLS) and terminal (tDLS). Maximum vGRF and pGRF during iDLS and maximum vGRF and anterior GRF (aGRF) during tDLS were identified for ACLr, non-surgical (NS) and CTRL limbs. vGRF and anteroposterior (AP) GRF ratios were calculated: (Reference limb GRF in iDLS)/ (Contralateral limb GRF in tDLS). One-way ANOVAs were used to compare variables among limbs; α=0.05, post hoc: paired and independent t-tests. **RESULTS:** Vertical (p=0.007, ACLr:0.92±.02, NS:1.00±0.02; p=.02, CTRL:0.99±0.02) and AP GRF ratios (p<0.001, ACLr:0.83±0.03, NS:0.97±0.03; p=0.001, CTRL:1.00±0.04) were reduced in ACLr compared to NS and CTRL limbs. vGRF (p=0.02, ACLr:1.01±0.01, NS:1.06±0.01; p=0.04, CTRL:1.05±0.01BW) and pGRF (p=0.001, ACLr:0.19±0.01, NS:0.22±0.01; p=.03, CTRL:0.22±0.01BW) during iDLS were reduced in ACLr compared to NS and CTRL limbs. vGRF of the contralateral limb in tDLS was greater when the ACLr limb was in iDLS compared to NS and CTRL (p=0.006, ACLr:1.10±0.01, NS:1.05±0.01; p=0.10, ES:0.56, CTRL:1.07±0.02BW). No differences were observed in aGRF between limbs (p=0.81, ACLr:0.23±0.01, NS:0.23±0.01, CTRL:0.22±0.01BW). **CONCLUSIONS:** Altered GRF ratios suggest differences among limbs in the distribution of forces between the leading and trailing limbs during LR. Reduced vGRF in the surgical limb during iDLS along with greater vGRF in the contralateral limb in tDLS limb may reflect an interlimb compensation that shifts the load to the non-surgical limb. However, no alterations in aGRF were observed suggesting reduced pGRF in the surgical limb during LR is not compensated for by the trailing limb.

C-10   Thematic Poster - Physical Activity in Cancer Prevention and Control

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Mezzanine M100C

1095   Chair: Alpa V. Patel, FACSM. *American Cancer Society, Atlanta, GA.*

(No relevant relationships reported)

1096   Board #1   May 31 8:00 AM - 10:00 AM

Does PhysicalActivity Reduce Cancer Risk? Latest Resultsfrom the WCRF/AICR Third Expert Report.

Nigel T. Brockton[1], Kate Allen[2], Rachel L. Thompson[2], Martin J. Wiseman[2], Giota Mitrou[2], Teresa Norat[3], Michael Leitzmann[4], Anne McTiernan[5]. *[1]American Institute for Cancer Research, Arlington, VA. [2]World Cancer Research Fund, London, United Kingdom. [3]Imperial College London, London, United Kingdom. [4]Regensburg University, Regensburg, Germany. [5]Fred Hutchinson Cancer Research Centre, Seattle, WA.*

(No relevant relationships reported)

Purpose World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) routinely review, synthesize and interpret the scientific literature on the links between physical activity, nutrition, and cancer through the Continuous Update Project (CUP). The WCRF/AICR Third Expert Report, to be published in 2018, will present the latest synthesis of the strength of the evidence linking physical activity to 17 cancer sites and to outcomes in breast cancer survivors. These assessments inform the update of the WCRF/AICR Recommendations for Cancer Prevention and Survival. **Methods** The research team at Imperial College London searched PubMed for relevant prospective studies and extracted literature according to the CUP Systematic Literature Review Protocol for each cancer site. Meta-analyses were conducted comparing the highest versus the lowest categories of physical activity. Where possible, dose-response meta-analyses were conducted and summary relative risks (RR) were calculated using a random effects model. The CUP Expert Panel graded the evidence as: Convincing/probable (strong evidence); Limited-suggestive (limited evidence); 3) Limited-no conclusion (limited evidence); 4) Substantial effect on risk unlikely (strong evidence). **Results** The Panel determined that strong evidence supports that physical activity decreases the risk of postmenopausal breast cancer by 13% (RR: 0.87; 0.79-0.96), premenopausal breast cancer by 17% (RR:0.83; 0.73-0.98, vigorous activity), colon cancer by 20% (RR:0.80; 0.72-0.88) and endometrial cancers by 21-27% (RR:0.79; 0.71-0.88, occupational; RR:0.73: 0.58-0.93, recreational). Studies with compatible measurements were too few to allow dose-response analysis in endometrial and colon cancer; dose-response analyses were statistically non-significant for breast cancer. Limited-suggestive evidence was found for decreased risk of liver and esophageal cancer and all-cause mortality in breast cancer survivors with highest vs. lowest physical activity levels. **Conclusions** There is strong evidence that physical activity reduces the risk of cancer at specific sites. Research is needed to determine the duration, intensity, frequency and timing of physical activity for optimal cancer risk reduction and to improve prognosis in cancer survivors.

1097   Board #2   May 31 8:00 AM - 10:00 AM

Breast Cancer and Physical Activity Level (BC-PAL) Trial: Findings on Cardiorespiratory Fitness and Body Composition

Jessica McNeil[1], Darren R. Brenner[1], Chelsea R. Stone[1], Rachel O'Reilly[1], Jeffrey K. Vallance[2], Kerry S. Courneya[3], Kevin E. Thorpe[4], Douglas J. Klein[3], Christine M. Friedenreich[1]. *[1]Alberta Health Services, Calgary, AB, Canada. [2]Athabasca University, Athabasca, AB, Canada. [3]University of Alberta, Edmonton, AB, Canada. [4]University of Toronto, Toronto, ON, Canada.*

(No relevant relationships reported)

Regular physical activity (PA) participation can improve recovery and survival following a breast cancer diagnosis. Current guidelines focus on moderate-vigorous intensity PA participation (50-85% heart rate reserve; HRR). However, approximately 85% of breast cancer survivors do not meet PA guidelines and may prefer lighter-intensity PA (≈40-60% HRR). **PURPOSE:** We assessed the effects of prescribing different PA intensities, compared to no additional PA, on cardiorespiratory fitness (VO_{2peak}), anthropometry and body composition in breast cancer survivors. **METHODS:** The Breast Cancer and Physical Activity Level (BC-PAL) Trial is a three-arm, 12-week randomized controlled trial. Forty-five inactive (≤60 minutes of moderate-vigorous PA/wk and ≤10,000 steps/day) breast cancer survivors recruited

for pilot data collection were randomized to one of three groups: no additional PA prescribed (CON), 300 min/wk of lighter-intensity PA (LIPA; 40-60% HRR) and 150 min/wk of higher-intensity PA (HIPA; 60-80% HRR). VO_{2peak} (maximal Balke protocol), anthropometric measures (height, weight, waist and hip circumferences) and body composition (DXA) were assessed at baseline and end of study. Participants in both PA groups received written resources on PA, an activity tracker (Polar A360®) to record heart rate and PA time, and a diary to record PA goals, facilitators and barriers throughout the intervention. In-person/telephone meetings occurred every three weeks to review activity tracker data, reinforce adherence and discuss barriers to achieving the prescribed PA goals.

RESULTS: Statistical differences in VO_{2peak} between groups were noted. Specifically, increases in VO_{2peak} were noted in HIPA vs. CON (5.9±6.4 vs. 0.5±3.0 ml/kg/min; $P = 0.01$) and LIPA vs. CON (4.2±4.9 vs. 0.5±3.0 ml/kg/min; $P = 0.03$). No significant changes in BMI (0.3±0.9, -0.1±0.8, -0.0±1.4 kg/m²; $P = 0.6$), waist (1.2±4.2, -1.1±3.3, -1.1±3.8 cm; $P = 0.2$) and hip (0.8±1.7, -0.2±2.7, -0.2±2.1 cm; $P = 0.4$) circumferences, body fat (0.1±1.4, -0.4±1.9, -1.1±2.3 kg; $P = 0.3$) and lean (0.4±0.8, -0.1±1.4, 0.7±1.5 kg; $P = 0.3$) mass were observed between CON, LIPA and HIPA, respectively.

CONCLUSIONS: Pilot results indicate that improvements in cardiorespiratory fitness can be achieved with both higher- and lower-intensity PA in breast cancer survivors.

1098   Board #3   May 31 8:00 AM - 10:00 AM

Self-reported Physical Activity Is Associated With Angiogenesis- And Inflammation-related Biomarkers In Colorectal Cancer Patients: Results From The Colocare Cohort

Caroline Himbert[1], Biljana Gigic[2], Christy A. Warby[1], Tengda Lin[1], Petra Schrotz-King[3], Clare Abbenhardt-Martin[3], Stephanie Skender[3], Nina Habermann[4], Lin Zielske[2], Alexis Ulrich[2], Juergen Boehm[1], Jennifer Ose[1], Cornelia Ulrich, FACSM[1]. [1]*Huntsman Cancer Institue, Salt Lake City, UT.* [2]*University Clinic of Heidelberg, Heidelberg, Germany.* [3]*National Center for Tumor Diseases, Heidelberg, Germany.* [4]*European Molecular Biology Laboratory, Heidelberg, Germany.* (Sponsor: Jim Martin, FACSM)

(No relevant relationships reported)

Background: Increased physical activity among cancer patients is associated with decreased cancer-related deaths and improved quality of life. The underlying mechanisms of this association are under investigation. We examined the association between biomarkers of angiogenesis and inflammatory pathways and physical activity in colorectal cancer patients.

Materials/Methods: Pre-surgery (baseline) serum samples were collected from 222 colorectal cancer patients in the ColoCare cohort. Levels of CRP, SAA, IL-6, IL-8, MCP-1, sICAM-1, sVCAM-1, TNFα, VEGFA, and VEGFD were measured with the Meso Scale Discovery platform. Self-reported physical activity levels were assessed at baseline by using the VITAL questionnaire from the VITamins And Lifestyle cohort study and calculated into metabolic equivalent (MET) hours/week (h/wk). Patients were classified into ≤10 METs versus >10 METs hours/week based on the American Cancer Society (ACS) cancer prevention recommendations. Partial correlations, t-test, and multinomial linear regression adjusted for age, gender, and body mass index were used to quantify the associations between biomarker and physical activity levels.

Results: A total of 132 patients (59%) reported weekly physical activity levels below cancer prevention recommendations. Lower METs h/wk were significantly correlated with increased IL-8, sICAM-1, and VEGFD serum levels (r=-0.14, p=0.046, r=-0.15, p=0.047; r=-0.20, p=0.006, respectively). sVCAM-1 and VEGFD also significantly differed by METs h/wk groups, where increased physical activity was associated with decreased biomarker levels (≤10 METs h/wk vs. >10 METs h/wk, sVCAM-1: 0.6 ± 0.2 vs. 0.6 ± 0.2, p=0.03; VEGFD: 926 ± 308 vs. 791 ± 240, p=0.002).

Discussion: For the first time, we report an association between not only inflammation-related, but also angiogenesis-related biomarkers among patients diagnosed with colorectal cancer. This research contributes to our understanding regarding potential mechanisms of physical activity in relation to cancer development, and prognosis.

1099   Board #4   May 31 8:00 AM - 10:00 AM

Pennsylvania Cancer Survivors And Their Adherence To The ACSM Physical Activity Guideline

Joachim Wiskemann, Wayne Foo, Renate M. WInkels, Shirley M. Bluthmann, Scherezade K. Mama, William Calo, Eugene Lengerich, Joel Segel, Kathryn H. Schmitz, FACSM. *The Pennsylvania State University, Hershey, PA.* (Sponsor: Kathryn Schmitz, FACSM)

(No relevant relationships reported)

PURPOSE: To investigate whether Pennsylvania cancer survivors adhere to the ACSM exercise and cancer roundtable guidelines recommending to perform either 75 min of vigorous aerobic exercise per week or, 150 min of moderate aerobic exercise per week, or an equivalent combination, and to performed muscle-strengthening exercises at least two times weekly. **METHODS**: We analyzed data from cancer survivors (n=585), identified using the Pennsylvania Cancer Registry, who were mailed a BRFSS-based questionnaire. We created four guideline-related groups (meeting aerobic guideline, meeting strength guideline, meeting both guideline and not meeting any guideline aspects). We evaluated whether demographic factors (e.g. age, gender, education), health aspects (e.g. smoking, comorbidities, general health status) or disease-related factors (e.g. cancer type, time since diagnosis) were associated with meeting the PA guideline. **RESULTS**: Out of 585 respondents 449 (77%) provided sufficient PA data to be included in the analysis. Overall 84 (18.7%) of participants met both, 144 (32.1%) met the aerobic and 28 (6.2%) met the strength guideline. However, 192 (43%) did not meet any aspects of the guideline. Participants with higher education (p=.01) and unemployed/retired participants (p=.04) were more adherent to PA guidelines (main differences for the subcategory meeting both guideline aspects). Having more than two comorbidities (p<.01), being a smoker (p=.04) or being overweight/obese (p<.01) and having a lower general health perception (p<.01) was associated with lower adherence rates for PA guidelines. With regard to disease-related factors no significant differences were found. However, cancer type was borderline non-significant (p=.055) showing lower adherence rates for lung and gynecologic (other than breast) cancer patients. **CONCLUSIONS**: More than 50% of Pennsylvania cancer survivors were meeting at least one component of the ACSM PA guideline for cancer patients. Various factors were found to be associated with adherence to the guideline. Identifying predictors for low guideline adherence can help to identify patient groups that may benefit from increased support to achieve a physically active lifestyle.

1100   Board #5   May 31 8:00 AM - 10:00 AM

Differences In Physical Activity Patterns Between Adults With And Without Cancer History

Amal A. Wanigatunga[1], Gillian K. Gresham[2], Pei-Lun Kuo[1], Pablo Martinez-Amezcua[1], Vadim Zipunnikov[1], Sydney M. Dy[1], Eleanor M. Simonsick[3], Jennifer A. Schrack[1]. [1]*Johns Hopkins University, Baltimore, MD.* [2]*Cedars-Sinai Medical Center, Los Angeles, CA.* [3]*National Institute on Aging, Baltimore, MD.* (Sponsor: Todd M. Manini, FACSM)

(No relevant relationships reported)

ABSTRACT

Purpose: Patterns of activity and rest in a typical day may provide insight into functional capacity and reserve in older cancer survivors that may not be apparent in examining total physical activity alone. Using objectively collected PA data from the Baltimore Longitudinal Study of Aging, we assessed differences in the accumulation of daily PA among older adults by cancer history.

Methods: 663 participants (mean age 71 +/- 10 years, 51% women) wore a chest-fitted accelerometer for 7 consecutive days. Participants self-reported cancer history via questionnaire. Accelerometer data were summarized into two continuous metrics: 1) log-transformed total daily PA volume defined as mean counts/day and 2) a fragmentation index defined as the total number of PA bouts (consecutive minutes registering at 10+ counts/min)/total PA minutes. Volume and fragmentation were also each dichotomized into low and high categories using their medians. Participants were categorized into four groups: high PA/low fragmentation, low PA/low fragmentation, high PA/high fragmentation, and low PA/high fragmentation to assess patterns of daily PA accumulation. Multivariable regression models were used to estimate PA pattern differences by cancer history, adjusting for demographics, behavioral factors and number of morbid conditions.

Results: Participants reporting cancer history averaged 0.12 (SE=0.05, p=0.02) fewer log-transformed activity counts per day compared to those reporting no cancer history. Although no significant fragmentation differences were detected between cancer groups (p=0.15) in the continuous model, cancer history was associated with a 78% (odds ratio (OR): 1.78, 95% confidence interval (CI): 1.11-2.82) higher odds of being in a high (versus low) fragmentation group and a 93% (OR: 1.98, 95% CI: 1.13-3.32) higher odds of being in a low PA/high fragmentation group (versus high PA/low fragmentation group) when compared to no cancer history.

Discussion: These results suggest that cancer survivors engage in lower total daily PA and that this activity is performed in a more fragmented manner, compared to those with no cancer history. Collectively, these results may be attributable to lower reserve capacity and greater fatigue burden among older cancer survivors that warrant further investigation.

1101   Board #6   May 31 8:00 AM - 10:00 AM

Exercise Is More Effective Than Health Education In Reducing Fatigue In Fatigued Cancer Survivors

Patricia Sheehan, Suzanne Denieffe, Michael Harrison, FACSM. *Waterford Institute of Technology, Waterford, Ireland.*
(No relevant relationships reported)

Cancer-related fatigue is the most debilitating side effect reported by cancer survivors, often lasting years following treatment. **PURPOSE**: To determine the effects of a 10 wk exercise intervention compared to a health education intervention on fatigue, psychological health outcomes and physical fitness in cancer survivors with documented fatigue. **METHODS**: This quasi experimental study allocated 37 post-treatment cancer survivors (33 female, 30 breast cancer, aged 55±2 yr, body mass index 28.5±1.3, time since treatment 2.3±0.3 yr; mean±SEM) to an exercise group (ExG, n=19) or health education comparison group (HEG, n=18). The intervention, with 2 min increments weekly, was tailored to fatigued individuals and emphasized brisk walking, stretching, exercise education and self-efficacy enhancement. Participants were evaluated at 0, 4, 8 and 10 weeks with the ExG evaluated again at 26 weeks. **RESULTS**: The intervention effect on fatigue (FACT-F) in ExG was greater (p<0.05) than in HEG, the difference between groups at 10 weeks being 4 times the recognised clinical important difference. The intervention also increased (p<0.05) cognitive function, global quality of life, 6 min walk test and 30 sec sit to stand scores. It reduced (p<0.05) insomnia and fear of physical activity. There was no intervention effect on C-reactive protein, total leukoytes, lymphocytes, monocytes or granulocytes, or on pulse wave velocity. The intervention effect on fatigue in ExG was largely achieved by wk 4 and maintained to 26 weeks. There was 100% retention rate at 10 weeks in both experimental groups and no adverse events reported. **CONCLUSIONS**: In survivors with documented fatigue, progressive exercise training has beneficial and sustained effects of considerable magnitude on fatigue, physical fitness and other quality of life outcomes beyond those attributable to peer support and investigator attention. These effects do not appear to be mediated by inflammatory factors.

Fatigue and fitness changes following an exercise intervention in fatigued cancer survivors				
.	Exercise		Health Education	
Outcome	Pre-	Post	Pre-	Post
‡ Fatigue (FACT-F)	19.3±2.2	40.3±2.4 *	21.9±2.2	29.6±2.5 *
‡ Quality of Life (EORTC QLQ-C30)	50.0±4.6	69.3±4.7 *	48.1±4.7	50.5±4.9
‡ Cognitive Functioning (EORTC QLQ-C30)	41.2±7.7	71.9±6.5 *	50.9±7.9	51.9±6.7
‡ Insomnia Severity (ISI)	15.2±1.8	8.2±1.6 *	15.5±2.0	13.3±1.8
‡ Fear of physical activity (FAPX-B)	28.9±6.3	13.1±3.7 *	28.3±6.3	27.1±3.7
‡ 6 min walk test (m)	438±16	602±18 *	462±19	496±21
‡ 30 sec Sit to Stand (reps)	13.4±0.8	23.8±1.2 *	11.6±0.8	12.6±1.2
Pulse Wave Velocity (m/s)	5.8±0.8	6.2±0.6	7.9±8.3	7.7±0.6
C reactive protein (mg/L)	1.9±0.6	2.9±0.8	3.1±0.7	2.9±0.9
*Values are mean ± SEM. * p<0.05 compared to pre- value in same group. ‡ significant group x timepoint interaction*				

1102   Board #7   May 31 8:00 AM - 10:00 AM

Effects of a Lifestyle Intervention on Change in Body Composition in Prostate Cancer Patients Undergoing Androgen Deprivation Therapy

Zachary L. Chaplow[1], Brian C. Focht, FACSM[1], Alexander R. Lucas[2], Elizabeth Grainger[1], Christina Simpson[1], Ciaran M. Fairman[1], Jennifer M. Thomas-Ahner[1], Victoria R. DeScenza[1], Jessica Bowman[1], Jackie Buell[1], Steven K. Clinton[1]. *[1]The Ohio State University, Columbus, OH. [2]Wake Forest University, Winston Salem, NC.* (Sponsor: Brian C. Focht, FACSM)
(No relevant relationships reported)

Androgen deprivation therapy (ADT) is a foundation of treatment for a many prostate cancer (PCa) patients. However, the adverse effect of ADT on body composition place PCa patients at increased risk for sarcopenic obesity, cardiovascular disease, and metabolic syndrome. The synergistic benefits of promoting concomitant change in both exercise and dietary behavior (EX+D) could represent an optimal lifestyle intervention approach for offsetting the adverse effects of ADT on body composition. Nonetheless, knowledge of the effects of lifestyle EX+D interventions on change in body composition remains relatively limited. **PURPOSE**: The purpose of the single-blind, randomized controlled Individualized Diet and Exercise Adherence-

Pilot (IDEA-P) trial is to evaluate the preliminary efficacy of an EX+D intervention, implementing a group-mediated cognitive behavioral (GMCB) approach, relative to standard of care (SC) treatment among PCa patients undergoing ADT. In the current study, we evaluated the effects of the EX+D intervention on select body composition outcomes. **METHODS**: A total of 32 PC patients (*M* age = 65 years) on ADT were randomly assigned to the EX+D (n = 16) or SC (n = 16) interventions. Measures of body composition were obtained via Dual x-ray absorptiometry (DEXA) at baseline and 3-month follow-up assessments. **RESULTS**: Results of intention to treat 2 (Intervention) x 2 (Time) ANOVA analysis yielded significant Intervention x Time interactions for android, gynoid, and total body fat (p<0.05). Post hoc analysis revealed that the EX+D intervention resulted in significant reduction in android, gynoid, and total body fat while no change in any body composition outcomes were observed with the SC intervention across 3 months. **CONCLUSIONS**: Findings from the IDEA-P trial suggest that an EX+D intervention, implementing a GMCB approach designed to promote adoption and adherence to lifestyle behavior change, resulted in superior improvements in key body composition outcomes relative to SC approach. Given the meaningful impact favorable body composition changes may have on chronic disease risk, these results underscore the utility of including EX+D intervention in the adjuvant treatment of PCa patients undergoing ADT.

1103   Board #8   May 31 8:00 AM - 10:00 AM

Breast Cancer Survivors Maintain Exercise after Breast Cancer Survivors Maintain Exercise after Team Triathlon Training

Linda B. Piacentine[1], Judy A. Tjoe[2], Leslie J. Waltke[2], Aidan M. Flanagan[1], Elizabeth M. DePauw[1], Julia A. Hilbert[1], Lauren Opielinski[1], Alexander V. Ng, FACSM[1]. *[1]Marquette University, Milwaukee, WI. [2]Aurora Health Care, Milwaukee, WI.*
(No relevant relationships reported)

Breast Cancer Survivors (BCS) often do not exercise at recommended levels. Estimates are that only 21% exercise at recommended levels 10 years after treatment. Interventional exercise programs examining exercise maintenance have found 49% to 58% maintain exercise at 6 months, and less then 50% of BCS can be expected to maintain exercise levels at 1 year or longer. Our previous studies have shown improvement in physical and psychosocial function with a 14-week training program. The 14-week triathlon training was comprised of two supervised group sessions and three home-based sessions per week. The training program culminated with participation in a sprint distance triathlon (0.25-0.5 mi swim, 12-15 mi bike, 3.1 mi run). **PURPOSE**: To determine if BCS who participate in a triathlon training program maintain high exercise levels after training. **METHODS**: Female BCS (n=156) were asked to complete a mailed survey about their leisure time activity 1-6 years after completing a triathlon training program. A Leisure Score Index (LSI) was derived from the Godin Leisure-Time Activity Questionnaire in the survey. Those completing the survey who reported the highest and lowest LSI scores were invited to participate in testing which included weight, BMI, body fat and circumference measurements as well as a 6-minute walk test and the FACIT-fatigue scale. **RESULTS**: Eighty (75%) reported LSI of 24 or greater. A subset of BCS with high (H) scores (n=6) and low (L) scores (n=5) were tested. No significant group differences (p>.05) were noted in age (H=62.3(5.1), L=56.6(5.7)yrs), time since training (H=3.2(1.7), L=3.2(1.3) yrs), and 6MWT (H=593.2(60.6), L=553.4(29.6) min p>0.1). Group differences were found in hip circumferences (H=96.2(6.9) L=116(11.5) cm, p<.01), waist circumferences (H=79.8(11.2) L=97.5(9.1) cm, p<.05), weight (H= 61.0(9.9) L=86.2(12.9)kg, p<.01), BMI (H=23.2(3.2), L=39.2(13.7) p<.05), body fat % (H=36.7(2.4) L=46.8(5.1), p<.01) and fatigue (H=49.3(2.1), L=34.8 (14.8) p≤.05). Data are mean (sd). **CONCLUSIONS**: Structured training for BCS can lead to higher levels of activity maintenance at 1-6 years after training. Thus, triathlon training could lead to continued exercise, less fatigue, and better health in breast cancer survivors.

C-11   Thematic Poster - **Sleep**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100H

1104   **Chair:** Edward F. Coyle, FACSM. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

1105   Board #1   May 31 8:00 AM - 10:00 AM

The Influences of Acute and Chronic Sleep Duration on Endurance Performance in Female Youth Athletes

Andrew Watson, Kristin Haraldsdottir, Stacey Brickson. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

Prior research has evaluated the influence of sleep deprivation on endurance performance, but the influence of real-world variation in acute and chronic sleep in youth athletes is unknown.
Purpose: To determine the relationship between acute, chronic, and acute:chronic sleep on aerobic performance in female youth soccer athletes.
Methods: 59 female soccer players (13-18 years) underwent cycle ergometer testing to determine maximal aerobic capacity (VO_{2max}), time to exhaustion (T_{max}) and ventilatory threshold (VT). Subjects were asked to report prior night sleep duration and average sleep duration during the previous calendar month. Acute:chronic sleep was calculated as the ratio of prior night and prior month sleep. Variables were grouped by prior night and prior month sleep duration (<8 hours, ≥8 hours) as well as acute:chronic sleep (<1, ≥1). VO_{2max}, T_{max}, and VT were compared between groups using least square means from age-adjusted linear models. Effect size was calculated as Cohen's d.
Results: No statistically significant differences were identified between those subjects who slept ≥8 the prior night and those who slept <8 hours, with respect to VO_{2max} (50.3 ± 2.4 v 47.6 ± 2.0 ml/kg/min, p=0.10, d=0.45), T_{max} (15.7 ± 0.7 v 14.9 ± 0.9 min, p=0.17, d=0.37), or VT (43.2 ± 1.9 v 40.7 ± 2.2 ml/kg/min, p=0.09, d=0.46). Subjects who averaged ≥8 hours of sleep in the prior month demonstrated significantly greater VO_{2max} (50.4 ± 3.2 v 45.2 ± 1.7 ml/kg/min, p=0.011, d=0.83) and VT (43.0 ± 1.5 v 39.0 ± 2.9 ml/kg/min, p=0.016, d=0.78), but not T_{max} (15.6 ± 0.6 v 14.8 ± 1.2 min, p=0.24, d=0.37). On the other hand, subjects who slept more the previous night than over the previous month (acute: chronic ≥1) demonstrated greater T_{max} (16.4 ± 1.0 v 14.9 ± 0.7 min, p=0.012, d=0.73), but not VO_{2max} (50.1 ± 2.8 v 48.7 ± 1.3 ml/kg/min, p=0.38, d=0.25) or VT (42.7 ± 2.5 v 41.9 ± 1.7 ml/kg/min, p=0.60, d=0.15).
Conclusion: Among female adolescent athletes, greater sleep duration over the prior month is associated with increased VO_{2max} and VT, while increased prior night sleep relative to the preceding month was associated with increased T_{max}. This suggests that chronic sleep may facilitate physiologic adaptation to increase aerobic capacity, while acute:chronic sleep may exert a greater influence on perceived exertion that impacts overall performance.
1

1106   Board #2   May 31 8:00 AM - 10:00 AM

Effects of 36 h of Sleep Deprivation on Physical Performance

Edward F. Coyle, FACSM, Michael R. Casner, Steve Kornguth. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

Acute sleep deprivation is often experienced in military operations. **PURPOSE:** To determine if 36h of sleep deprivation influences physical and cognitive performance. **METHODS:** Twenty-seven physically fit college age men and women, mostly from the U.S. Military Academy at West Point, were evaluated on Day 1 (baseline) and then again on Day 2 after missing a night's sleep and being awake for 36h. Peak oxygen consumption while cycling (VO_2peak) was measured breath by breath using a mass spectrometer, and time to fatigue was determined. Deoxygenated hemoglobin of the vastus lateralis was measured with near infrared spectroscopy. Maximal neuromuscular power was measured using the inertial load ergometer. Cognitive performance was assessed from the two-back test and reaction time. **RESULTS:** The differences between Day 1 and Day 2 were small or non-existent. Peak HR was reduced slightly from 193.6 ± 8.4 bpm to 191.7 ± 8.6 bpm (p < 0.05). Furthermore, during the first stage of submaximal exercise the oxygen cost of cycling increased from 44.7 ± 8.7% to 48.0 ± 7.4% VO_2peak ; p < 0.01). VO_2peak was 3,619 ± 1,026 mL/min vs. 3,671 ± 1,038 mL/kg, respectively; (p = 0.274). Time to fatigue was not different between the two trials (347 ± 168 seconds vs. 347 ± 186 seconds (p = 0.954) and deoxygenated hemoglobin of the vastus lateralis increased similarly. Maximal neuromuscular power was not different on the two days (1,188±268 watts vs. 1,173±215 watts). Cognitive performance was similar on Days 1 and 2, although it did decline during exercise due to divided attention. **CONCLUSION**: Missing a night's sleep and being awake for 36h

has little influence on aerobic performance or maximal neuromuscular power although it does appear to slightly reduce peak heart rate and increase the oxygen cost of low intensity exercise.

1107   Board #3   May 31 8:00 AM - 10:00 AM

The Effect Of Sleep Duration On Sleep Quality In Elite Soccer Athletes

Ryan M. Curtis[1], William M. Adams[2], Courteney L. Benjamin[1], Yasuki Sekiguchi[1], Douglas J. Casa, FACSM[1]. [1]*University of Connecticut, Storrs, CT.* [2]*University of North Carolina at Greensboro, Greensboro, NC.* (Sponsor: Douglas Casa, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the effect of sleep duration on sleep quality in elite soccer athletes. **METHODS**: Twenty-two male collegiate soccer players (mean±SD; age, 20±1y; height, 181.2±6.5cm; body mass, 79.4±6.9kg; VO_{2max}, 50.9±4.4 ml•kg⁻¹•min⁻¹) participated in this study. Participant sleep observations were recorded via wrist-worn actigraphy throughout the complete 2016 competitive season from August to November (1450 files). Sleep was categorized according to sleep duration: <6 hours (580 files), 6-8 hours (643 files), and >8 hours of sleep (227 files). Percentage of time in bed spent in wake time (WT%), light sleep time (LS%), slow wave sleep time (SWS%), and rapid eye movement time (REM%) were used to assess sleep quality. Significant differences between sleep groupings and effect of sleep duration ($Sleep_{Hours}$) on sleep quality was assessed via linear mixed effects models and subsequent tukey post hoc testing (p<0.05). Results are presented as Mean±SE, mean difference (MD) and 95% confidence intervals (95%CI). **RESULTS**: Athletes who slept <6 hours had significantly more WT% (Mean±SE, 15.2%±0.6%) than athletes who slept between 6-8 hours (MD [95%CI], -1.9% [-0.9%, -2.8%], p<0.01) and >8 hours (-1.7% [-0.4%, -3.1%], p<0.001). Athletes who slept >8 hours had significantly more REM% (15.4%±1.1%) than athletes who slept between 6-8 hours (-1.4% [-0.1%, -2.8%], p<0.05) and <6 hours (-1.7% [-0.3%, -3.1%], p<0.05). There were no significant relationships found between sleep duration, LS% and SWS% (p>0.05). For every one hour increase in $Sleep_{Hours}$ athletes decreased WT% by 0.5% [0.3%-0.8%] and increased REM% by 0.4% [0.1%-0.6%]. **CONCLUSIONS**: Increased sleep duration positively impacted aspects of sleep quality by decreasing WT% and increasing REM%, which may allow increases in neuronal and memory formation and decreases in non-functional sleep. Further investigation is warranted to elucidate facilitators of other aspects of sleep quality, such as restorative sleep (SWS), and to examine the extent to which training stress may influence sleep and recovery and vice versa.

1108   Board #4   May 31 8:00 AM - 10:00 AM

In-season Examination Of Sleep Quality, Hormone Function, Strength And Affective State Of Division-i Volleyball Athletes

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(No relevant relationships reported)

PURPOSE: Over the course of the 2017 competitive season, the researchers collected data from 20 Division 1 volleyball players. Beginning with the initial team meeting of the season, measures of sleep quality, hormone regulation and affective state were collected from each member of the team.**METHODS**: Sleep quality measures were gathered using wrist-worn actigraph device. Hormone regulation was measured via passive drool sample collection. Affective and emotional states data was collected digitally using an email link to two reliable and validated psychological surveys: Positive and Negative Affect Survey (PANAS); and the Depression, Anxiety, and Stress Survey (DASS-21).**RESULTS**: Repeated measure Anova did not reveal a main effect for week over the course of the season (F=1.31, p=0.38, range from 93.3% to 95.9%). Similar analysis did reveal a main effect for time for salivary cortisol (F=3.76, p=0.04), with post hoc testing revealing that week 6 significantly elevated over baseline (1.77 μg/dl± 1.08)and week 8 (0.42 μg/dl± 0.33), 9 (0.40 μg/dl± 0.26) and 10 (0.53μg/dl± 0.45) significantly reduced compared to baseline. Analysis of testosterone did not reveal a significant main effect for time (F=2.72, p=0.11). When testosterone to cortisol ratio was examined a significant main effect for time was revealed (F=8.89, p<0.01) with week 1,2,3,10,11 significantly elevated over baseline and week 6 significantly reduced compared to baseline. Analysis of DASS 21 data did not reveal main effects for time for Depression (F=0.70, p=0.72), Anxiety (F=1.00, p=0.60) or Stress (F=2.43, p=0.32). Analysis for PANAS positive scores revealed a significant main effect for time (F=3.78, p=0.032). For the PANAS positive all time points (weeks 1-11: average 32.0±10.8) were significantly lower than baseline (38.7±5.7). Analysis for PANAS negative score did not reveal a significant main effect for time (F=0.69, p=0.76).

Abstracts were prepared by the authors and printed as submitted.

CONCLUSIONS: While being a competitive scholarship athlete is stressful and time consuming, it is not all that defines the participants. Further examination of other factors, such as academic demands, along with social and family commitments should be studied to better understand their effects on the hormone and psychometric scores.

1109   **Board #5**   May 31 8:00 AM - 10:00 AM

Self-Reported, Current and Ideal Sleep Habits of Adolescent Athletes

Melissa L. Anderson, Kortney J. Dalrymple, Timothy J. Roberts. *GSSI, Bradenton, FL.*

Reported Relationships: M.L. Anderson: *Salary; This study was funded by the Gatorade Sports Science Institute. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc..*

BACKGROUND: Leading health organizations recommend adolescents obtain 8 to 10 hours of sleep each day. There is a growing body of literature that suggests many adolescents, including athletes, are not meeting these recommendations; however, barriers to obtaining adequate sleep are still largely unknown. **PURPOSE**: To quantify sleep habits in a group of athletes and to understand how their current habits compare with their self-reported ideal sleep durations. **METHODS**: One hundred seventy three adolescent team- and individual-sport athletes (16 ± 2 y; male: n=139, female: n=34) from 10 different sports completed both Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) surveys during a laboratory visit. The PSQI was analyzed to determine self-reported habitual bedtime, wake time, and sleep duration, as well as sleep quality over the previous month. The ESS was analyzed to determine self-reported ideal bedtime, wake time, and sleep duration. Data are presented as mean ± SD. A paired t-test was used to compare current and desired sleep durations. **RESULTS**: Habitual bedtime (n=171) was $22:37 \pm 0:46$. Habitual wake time (n=167) was $06:47 \pm 0:58$. Self-reported actual sleep duration was 7.6 ± 1.0 h with 54% of athletes obtaining less than the recommendation of 8 h of sleep per night. To feel their best, ideal self-reported bedtime (n=162) was $21:57 \pm 0:41$ and self-reported wake time (n=159) was $07:49 \pm 1:18$. Calculated ideal total sleep duration (n=158) was 9.9 ± 1.4 h, which was significantly longer than actual sleep duration (n=155; p<0.001). Habitual sleep quality, assessed as the mean Global PSQI score, (n=159) was 4.3 ± 2.2; however, 63 athletes (39.6%) had a score ≥ 5, which is the PSQI cutoff indicative of poor sleep quality. **CONCLUSIONS**: Self-reported habitual sleep duration in a group of adolescent athletes suggests the majority do not meet the minimum sleep duration recommendations and many have poor sleep quality. However, when reporting their ideal sleep habits, most athletes would prefer to obtain significantly more sleep, desiring durations at the top end of the recommendations even. This suggests lack of desire is not the main reason for sub-optimal sleep duration in this group. Therefore, researchers and practitioners should focus on identifying and creating solutions to overcome barriers to sleep.

1110   **Board #6**   May 31 8:00 AM - 10:00 AM

Sleep Coaching Augments the Physiological Benefits of Exercise Training

Eric V. Neufeld, Brett A. Dolezal, David M. Boland, Jennifer L. Martin, Christopher B. Cooper, FACSM. *David Geffen School of Medicine at UCLA, Los Angeles, CA.*
(No relevant relationships reported)

Exercise and quality sleep exert positive effects on each other. The practice of healthy sleep habits also enhances sleep quality and duration.
PURPOSE: To examine whether a multicomponent sleep coaching intervention (SC) combined with aerobic and resistance training programs would improve fitness and health measures more than the training program alone. **METHODS:** Thirty-eight healthy fitness club patrons (22 men) were randomized to receive SC (n = 19), consisting of twelve, 10-min education sessions between the trainer and participant to discuss sleep-related topics coupled with weekly, individualized sleep improvement assignments or equal-attention (EA) (n = 19), consisting of identical training and education time, with education sessions discussing general wellness topics. All participants engaged in one hour of coached resistance training and remotely guided aerobic exercise thrice weekly for 12 weeks. Fitness measures (aerobic performance, body composition, muscle strength and endurance, lower-body power), sleep characteristics, heart rate variability (HRV), and biochemical assays were obtained at baseline and after the 12-week program. **RESULTS:** SC demonstrated greater improvements in aerobic performance measures [maximum oxygen uptake (0.44 ± 0.12 vs. $0.23 + 0.08$ L/min, $P < 0.001$), metabolic (lactate) threshold (0.64 ± 0.13 vs. 0.34 ± 0.13 L/min, $P < 0.001$) and ventilatory threshold (0.36 ± 0.13 vs. 0.05 ± 0.71 L/min, $P = 0.003$)], peak and average lower-body power (524 ± 190 vs. 300 ± 208 W, $P = 0.006$ and 212 ± 79 vs. 137 ± 58 W, $P = 0.005$, respectively), and body composition [decreased body fat percentage (-3.6 ± 2.6 vs. $-1.4 \pm 1.9\%$, $P = 0.011$) and fat mass (-2.7 ± 1.7 vs. -1.3 ± 1.6 kg, $P = 0.021$)]. Additionally, SC positively influenced the parasympathetic tone (HF-HRV: 2.6 ± 3.3 vs. 0.3 ± 2.2 ms², $P = 0.036$) and glucose metabolism [fasting insulin (-1.6 ± 1.7 vs. 0.2 ± 1.2 mIU/L, $P = 0.004$) and fasting glucose (-8.4 ± 9.9 vs.

6.1 ± 8.8 mg/dL, $P < 0.001$)]. **CONCLUSION:** SC resulted in greater improvements in fitness measures, body composition, and HRV compared with an equal-attention control group. These findings have intriguing implications regarding the role of SC in maximizing health and physical performance.

1111   **Board #7**   May 31 8:00 AM - 10:00 AM

Effects Of Continuous Versus Interval Exercise On Sleep Profile In Young Healthy Males

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(No relevant relationships reported)

The total sleep time of the population is decreasing every year and, in addition, the number of people complaining of poor sleep or sleep disorders is increasing. On the other hand, regular exercise is known as one of the tools that help to promote sleep hygiene. However, it is not known which type of exercise is best.
Purpose: To evaluate the effects of continuous running and interval running on the sleep profile of healthy young males.
Methods: 12 healthy males were recruited, all physically active, aged 23.6 ± 1.9 years and BMI of 24.9 ± 2.7 kg/m². The volunteers were all submitted to 3 different conditions: Baseline (BL), Continuous Running (CR) and Interval Running (IR). In the BL condition, no physical exercise was performed for 24h. In the CR condition, they were submitted to continuous running (5 minutes of warm-up, 30 minutes run at intensity 12-14 according to the Borg Scale, and 5 minutes of cool down). In the IR condition, they were submitted to interval running (5 minutes of warm-up, 6 bouts of 2.5 minutes at intensity 15-17 on the Borg Scale separated by 2.5 minutes recovery intervals, followed by 5 minutes of cool down). In the morning soon after waking up, volunteers completed 4 records: Sleep Diary, Visual Analog Pain Scale, Scale of Overall Quality of Recovery and STAI-state. The data analysis performed was one-way ANOVA with Duncan test and a significance level at $P < 0.05$. The study was approved by UNIFESP Ethics Committee (#1686/08).
Results: In the sleep diary, a decrease was observed in the scores in CR condition when compared to the BL (BL= 28.00 ± 3.19, CR= 23.36 ± 4.59, p= 0.01). In the waking sensation, a decrease was observed in CR condition when compared to the BL (BL= 8.13 ± 1.13, CR= 6.68 ± 1.82, p= 0.02). In the Visual Pain Scale, the CR condition presented higher scores when compared to the BL condition (BL= 1.12 ± 1.11, CR= 3.18 ± 2.48, p= 0.01). Finally, in the Overall Quality of Recovery Scale, the BL condition presented higher scores when compared to CR and IR conditions (BL= 17.08 ± 2.50, CR= 14.64 ± 2.94, IR= 14.58 ± 2.11, p= 0.02). No significant differences were found regarding STAI-state.
Conclusions: After more intense exercise volunteers had a more restful sleep when compared to continuous running. Thus, we concluded that interval exercise can be used in training to also improve sleep quality.
Financial support: CAPES

1112   **Board #8**   May 31 8:00 AM - 10:00 AM

The Effect of Total Sleep Time on Ultra-Endurance Triathlon Performance

Jacob N. Kisiolek[1], Kyle A. Smith[1], Daniel A. Baur[2], Brandon D. Willingham[1], Margaret C. Morrissey[1], Samantha M. Leyh[1], Patrick G. Saracino[1], Michael J. Ormsbee, FACSM[1]. *[1]Florida State University, Tallahassee, FL. [2]Elon University, Elon, NC.* (Sponsor: Dr. Michael Ormsbee, FACSM)
(No relevant relationships reported)

PURPOSE: The primary purpose was to determine the effect of sleep time on performance during a 3-day multistage ultra-endurance triathlon (stage 1: 10km swim, 144.8km bike; stage 2: 275.8 km bike; stage 3: 84.4km run). Secondarily, we determined if performance time predicts sleep time. **METHODS:** Eighteen triathletes (age: 37 ± 7.9y; height: 175 ± 7cm; weight: 70 ± 9kg) partook in sleep analysis pre, during, and post triathlon using an actigraphy wrist band. Participants wore the band to record sleep time for five days (1-2 days pre-race, 3 race days, 1-day post-race), except during racing. Bands were collected before each stage to download the previous night's data, then re-distributed after each stage. Performance times were recorded after each stage, and following total completion of the race. The data was analyzed via linear regression. **RESULTS:** Total sleep time (mean±SD; pre-race: 393.9 ± 81.1 min, pre-stage 1: 342 ± 90.2min, pre-stage 2: 347.5 ± 54.6min, pre-stage 3: 299.7 ± 107.0min, post-race: 308.8 ± 86.3min) significantly decreased over time (P<0.05). Sleep time predicted performance in multiple stages. Specifically, pre-stage 3 sleep time explained 30% and 43% of the variation in stage 3 performance (R²=0.30, p=0.035), and total finishing time (R²=0.43, p=0.008). Performance time also predicted sleep time. Specifically, stage 1 performance explained 37% and 47% of the variation in pre-stage 2 sleep time (R²=0.37, p=0.010), and pre-stage 3 sleep time (R²=0.47, p=0.005). Stage 2 performance explained 39% the variation in pre-stage 3 sleep time (R²=0.39, p=0.014). Total race sleep time (Pre-stage 1, 2, and 3) was averaged; 33% of the variation in total finishing time can be predicted by average total racing sleep

time (R^2=0.33, p=0.015). No additional relationships were seen. A cutoff value was found at 401.6 min of average total race-night sleep time, indicating the top 25% of race finishers slept for ≥401.6 min. **CONCLUSIONS:** During a multistage ultra-endurance triathlon, performance time can be predicted by sleep time the night before. In addition, faster performance times during each stage predicts more sleep time. Based on our results, average total race-night sleep time of roughly 402 min (6.7h/night) leads to faster finishing time in the Ultraman Florida. This study was supported by FSU and FatigueScience.

C-12   Free Communication/Slide - **New Insights in Measurement of Physical Activity and Sedentary Behavior**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Mezzanine M100D

1113   **Chair:** Gregory J. Welk, FACSM. *Iowa State University, Ames, IA.*

(No relevant relationships reported)

1114   May 31 8:00 AM - 8:15 AM
Measuring Change in Physical Activity Across a Technology-Based Intervention

Whitney A. Welch, Bonnie Spring, Siobhan M. Phillips, Juned Siddique. *Northwestern University Feinberg School of Medicine, Chicago, IL.* (Sponsor: Ann M Swartz, FACSM)

(No relevant relationships reported)

PURPOSE: To characterize and compare the change in moderate to vigorous physical activity (MVPA) between an accelerometer and smart phone-based physical activity log across a three-week physical activity intervention. **METHODS**: Participants (N=204, 77% female, age=33±11y, BMI=28.2±7.1 kg/m²) in the Make Better Choices 1 (MBC1) Study were randomized to one of two activity-related intervention arms: 1) increase MVPA arm or 2) decrease sedentary active control arm. Participants wore an accelerometer while simultaneously completing a smart phone-based physical activity log for five weeks: a two-week baseline assessment phase and a three-week intervention follow-up phase. Linear mixed effects models were used to characterize the difference in MVPA between measurement methods across baseline and intervention. **RESULTS**: Physical activity logs show a 43.5 min/day (95% CI: 31.9, 55.1) difference in means between the two groups at follow-up and accelerometer results indicate a 12.3-min/day (95% CI: 9.5, 15.2) difference in means between the two groups at follow-up, with the increase MVPA group recording more minutes per day of MVPA. Correlations between the two measurement methods for the physical activity group increased from baseline (r=0.58, p<0.001) to intervention follow-up (r=0.68, p<0.001) and no change was seen in the active control group from baseline (r=0.59, p<0.001) to intervention follow-up(r=0.55, p<0.001). Intervention effect size when using the physical activity log was 0.48 and 0.54 when capturing change in MVPA using the accelerometer. **CONCLUSIONS**: Treatment effects measured in minutes per day were very different between measurement method, however, the standard deviations were similar. Similar effect sizes suggest smart phone-based activity logs may provide similar results to accelerometers for estimating intervention effects.

1115   May 31 8:15 AM - 8:30 AM
Validation Of A Research-grade Accelerometer In Estimating Free-living Sedentary Time

Albert Mendoza[1], Kate Lyden[2], John Sirard[3], John Staudenmayer[3], Catrine Tudor-Locke, FACSM[3], Patty Freedson, FACSM[3]. [1]*California State University, East Bay, Hayward, CA.* [2]*KAL Research|Consulting LLC, Denver, CO.* [3]*University of Massachusetts-Amherst, Amherst, MA.* (Sponsor: Patty Freedson, FACSM)

(No relevant relationships reported)

Research-grade accelerometers (RGA) are valuable tools to monitor sedentary behavior. Despite the broad appeal of RGA for researchers and clinicians, there is limited evidence of how well they estimate sedentary time (ST) in free-living settings. **PURPOSE:** To examine the accuracy and precision of ST estimates from an RGA in worn on the hip and wrist in free-living settings. **METHODS:**Thirty-two participants were directly observed while completing three, 2-hour sessions on different days and wearing commonly used hip- and wrist-worn RGA's. A validated video-taped direct observation (DO) system was used to determine ST. For the RGA, ST was estimated using (1) the 100 counts/min cutpoint (hip RGA) and (2) random forest model using

15-sec raw acceleration data (Staudenmayer et al., 2015) (wrist RGA). Linear mixed models were used to compare the accuracy and precision of ST estimates from the hip- and wrist-worn RGA to DO measured ST. Pearson correlation coefficients were used to determine the association between DO measured and RGA estimated ST. **RESULTS:**

	Mean min (SD)	Bias	95% CI	r
DO (Criterion)	42.8 (42.3)			
RGA hip	93.4* (24.0)	50.7	43.3,58.1	0.59
RGA wrist	63.1* (25.2)	20.3	13.3,27.3	0.77

*, significantly different than criterion (p<0.05).

The hip- and wrist-worn RGA estimates of ST were significantly overestimated compared with DO. Precision, assessed as the 95% CI for the bias, was similar between the RGA hip and RGA wrist. The RGA ST min was moderately (RGA hip) to highly (RGA wrist) correlated with DO. **CONCLUSION:** The accuracy of ST estimates from RGA were affected by wear location and data processing technique. These results demonstrate the need for more research to elucidate how these factors influence estimates of ST from RGA in free-living settings. Funded by: NIH: 1F31HL129802-01

1116   May 31 8:30 AM - 8:45 AM
Validation of Activity Monitor Methods in Classifying Sedentary Behavior in Distinct Activity Domains

Julian Martinez, Mami M. Takeda, Sarah K. Keadle. *California Polytechnic State University San Luis Obispo, San Luis Obispo, CA.* (Sponsor: Todd Hagobian, FACSM)

(No relevant relationships reported)

PURPOSE: The present study compared sedentary time estimates from a thigh-worn monitor (AP) to a wrist and hip-worn AG monitor across five different activity domains in a free-living environment.
METHODS: Participants (n=16, mean age=26.9yrs, 69% female) wore two AG monitors (right hip, non-dominant wrist), and one AP accelerometer (thigh) for two, 2-hour sessions. Each participant completed 2 out of 5 activity domains that represent daily life: household (H, N=5), active leisure (AL, N=8), sedentary leisure (SL, N=6), work (W, N=7), and transportation/errands (TE, N=4).Sedentary time was estimated from the AG-hip data using: Sojourn 3x (S3x), 100 vertical count cut-point (V100), 200 vector magnitude cut-point (VM200), and the Crouter two-regression (C2) method. A random forest machine learning method (RF) was used to classify AG wrist data. Relationship between AG and AP methods were examined with Pearson correlations. A paired t-test was used to examine mean differences in overall sedentary time estimates, and a linear mixed effects model was used to test for any significant interaction between accuracy of AG methods by activity domain. P-values < 0.05 are considered statistically significant.
RESULTS: Compared to AP, correlations for AG methods were: S3x (R=0.82), VM200 (R=0.81), C2 (R=0.71), V100 (R=0.61) and wrist RF (R=0.68), (all p<0.05). Compared to AP, estimates were significantly higher for the S3x (mean diff [95%CI]) 9.4 (0.57, 18.3)min (p=0.02) and V100 (18.9[5.3, 32.4]min, p=0.003). The RF (-4.6 [-17.4, 8.2]min, 200VM (-1.2 [-10.8, 8.4] min), and C2 (2.2 [-9.8, 14.2]min), were not statistically different than AP. The accuracy of S3x did not differ by domain (0.05), while the accuracy of the 200VM, C2, 100V and RF estimates significantly differed by domain (p<0.05). VM200, C2 and RF overestimated sedentary time in the TE and H domains and underestimated in AL and SL.
CONCLUSIONS: The S3x method overestimated sedentary time compared to AP, but was the most precise and consistent across domains. These data highlight the importance of ensuring a range of activity domains in free-living validation studies. Future research should expand the sample and include direct observation measures of sedentary time compared to AP and AG.
Supported by Bill and Linda Frost Fund

1117   May 31 8:45 AM - 9:00 AM
Video-Recorded Validation of Wearable Step Counters Under Free-living Conditions

Lindsay Toth. *University of Tennessee, Knoxville, TN.* (Sponsor: David R. Bassett, Jr., PhD, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the accuracy of 14 step counting methods under free-living conditions during all waking hours of one day. **METHODS**: Twelve adults (mean±SD, age: 35±13 yrs) wore a chest harness that held a GoPro video camera angled down towards the feet. The GoPro continuously recorded video of all steps taken throughout the day. Simultaneously, participants wore two StepWatch [SW] devices on each ankle (each programmed with different settings), one activPAL [AP] on each thigh, four devices at the waist (Fitbit Zip [FZ], Yamax Digi-Walker SW-200 [DW], New Lifestyles NL-2000 [NL], and ActiGraph GT9X

[AG]), and two devices on the dominant and non-dominant wrists (Fitbit Charge [FC] and AG). The GoPro videos were downloaded to a computer and two researchers independently counted steps using a hand tally device, which served as the criterion method.

RESULTS: The SW devices captured between 95.3% and 102.8% of actual steps taken throughout the day (P>0.05). Seven step counting methods estimated less than 100% of actual steps; FZ, NL, AG with the Moving Average Vector Magnitude algorithm (MAVM) and without the low frequency extension (LFE), both worn on the hip, the FC worn the non-dominant wrist, and the AP on both the left and right thighs, capturing 69% to 81% of actual steps (P<0.05). Three methods estimated more than 100% of actual steps; AG with LFE worn on the hip and both wrists, capturing 128% to 220% of actual steps (P<0.05). Estimated steps from SW (with all settings), DW, FC on the dominant wrist, and AG (with LFE and MAVM) on both wrists did not significantly differ from actual steps (P>0.05).

CONCLUSIONS: Across all waking hours of one day, step counts differ between methods. Compared to hand counted steps, the SW device, regardless of settings, was highly accurate for counting all free-living steps.

1118   May 31 9:00 AM - 9:15 AM

Use of Consumer Monitors for Estimating Energy Expenditure in Youth

Andrew S. Kaplan, Samuel R. Lamunion, Paul R. Hibbing, Scott E. Crouter, FACSM. *University of Tennessee- Knoxville, Knoxville, TN.*

(No relevant relationships reported)

Consumer-grade physical activity monitors (PAMs) have been extensively examined for estimating energy expenditure (EE) in adults; however, few studies have examined their ability to estimate EE in youth. **PURPOSE:** The purpose of this study was to examine equivalence between predicted EE (consumer-grade PAMs) and measured EE (indirect calorimetry) in youth. **METHODS:** Ninety-five youth (mean(SD); age, 12.2(3.5) yr; 49% male) performed 30 min of supine rest and 16 structured activities ranging from sedentary behaviors to vigorous intensities. Each structured activity was performed twice: once for 60-90 s and once for 4-5 min. During all testing, participants wore an Apple Watch 2 (AW, left wrist) and Mymo Activity Tracker (MT, right hip). Subsamples wore two Misfit Shine 2 devices (MSH, right hip; MSS, right shoe, n = 27), a Samsung Gear Fit 2 (SG, right wrist, n = 44), and/or a Fitbit Charge 2 (FC, right wrist, n = 53). A Cosmed $K4b^2$ was used as the criterion measure of EE. Oxygen consumption was converted to EE in kilocalories (kcal), then summed over the whole trial to obtain gross EE. Net EE was calculated by subtracting the estimated basal EE (Schofield's equation) from the measured gross EE. For all PAMS, EE was recorded at the start and end of the trial, and the difference was used for analysis. 95% equivalence testing with ±10% equivalence zone was used to assess equivalence between the estimated (PAM) and measured ($K4b^2$) EE. All PAMs estimated gross EE, except for AW which estimated net EE, thus separate equivalence test was performed for the AW. Mean absolute percent error (MAPE) was used to assess individual-level error. **RESULTS:** Equivalence testing results and MAPE are summarized in Table 1. **CONCLUSION:** Only the MT was equivalent to the $K4b^2$, however it also had the largest individual error. Caution is warranted when using consumer-grade PAMs in youth for tracking EE as there is a high degree of variability in device output.

Table 1. Mean EE±SD (kcal) and MAPE for six PAMs in youth.

	$K4b^2$ EE	Apple Watch
Net EE		
EE (kcal)	160±59 (143.9-175.9)#	75±42
MAPE	---	56.4

	$K4b^2$ EE	Mymo Tracker	Misfit Shine Hip	Misfit Shine Shoe	Samsung Gearfit 2	Fitbit Charge 2
Gross EE						
EE (kcal)	232±71 (209.1-255.6)#	236±108*	208±77	208±76	177±65	281±113
MAPE	---	42.1	17.6	21.8	33.9	39.1

*significantly equivalent to $K4b^2$ (p<0.05); #values in parentheses are equivalence zone

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1119   May 31 9:15 AM - 9:30 AM

Validity and Reliability of the Exercise Vital Signs Questionnaire in a Diverse Urban Population

Norberto Quiles[1], Lin Piao[1], Aston K. McCullough[2]. *[1]Queens College, Flushing, NY. [2]Teachers College, Columbia University, New York, NY.*

(No relevant relationships reported)

The Exercise Vital Signs (EVS) is a new brief (<30 seconds) physical activity (PA) questionnaire used by the Exercise is Medicine initiative within the American College of Sports Medicine. While the criterion validity of the EVS has been evaluated in a select number of ethnic groups, research on the validity and reliability of the EVS questionnaire in a diverse, urban sample is lacking. **PURPOSE**: To determine the validity and reliability of the EVS in a diverse, urban sample. **METHODS**: An ethnically-diverse sample (White 33%, Latino 31%, Asian 21%, Black 15%) of N=39 participants [age *31*(10.4)] were asked to wear an accelerometer at the hip for 9 days and to complete the EVS at the beginning (T1) and end (T2) of the wear period. The criterion validity of the EVS-estimated minutes of weekly moderate-vigorous PA (MVPA) was determined against accelerometer-derived estimates of the total time spent in ≥10min bouts of MVPA using Spearman's correlations. EVS responses were used to predict subjects who were confirmed to meet current PA guidelines of ≥150 MVPA min/week via accelerometry using logistic regression. The EVS receiver operating characteristic area under the curve (AUC), sensitivity, and specificity were calculated. The concurrent validity of the EVS MVPA estimates was tested against accelerometer-derived steps/day using Spearman's correlations. The intraclass correlation coefficient (ICC) was calculated between the EVS responses at T1 and T2 in order to evaluate questionnaire test-retest reliability. **RESULTS**: Reliability for the EVS questionnaire was strong (ICC= .98). There was a moderate correlation (*rho*= .58 at T2, *p*= <.01) between the EVS-estimated PA minutes/week and the accelerometer-derived MVPA minutes/week. There was also a moderate correlation (*rho*= .43 at T2, *p*= .006) between EVS-determined PA minutes/week and the accelerometer-derived steps/day. The T2 EVS specificity and sensitivity were 56% and 78%, respectively, and the AUC was 0.74. **CONCLUSIONS**: In a diverse, urban sample, the EVS questionnaire has acceptable validity and high test-retest reliability. The EVS may be a useful tool for identifying ethnically-diverse individuals not meeting current PA guidelines. Further research in larger ethnically-diverse samples is needed.

1120   May 31 9:30 AM - 9:45 AM

Validity of a Novel Objective Screening Test for Risk of Physical Inactivity in Toddlers

Aston K. McCullough, Carol Ewing Garber, FACSM. *Columbia University Teachers College, New York, NY.* (Sponsor: Carol Ewing Garber, FACSM)

(No relevant relationships reported)

PURPOSE. To evaluate the accuracy of the Objective Physical Inactivity Risk Assessment for Toddlers (OPIRA-T), a brief (15-60min) screening test for physical inactivity.

METHODS. Families (N=119) with children 24-35 months-old were recruited from an urban Early Head Start (EHS). Children's physical activity (PA) was measured for 7 days via hip-worn triaxial accelerometers. Cliff (2009) wear time criteria were applied to children's 15s epoch PA data, and Trost (2012) cut points were applied. Children not meeting respective moderate-vigorous PA (MVPA) and total PA (TPA) guidelines of 60min/day and 180min/day were determined using 7-day wear time data. Brief raw accelerometer data segments [15, 30, 45, 60min] were randomly extracted from the full 7-day wear data from periods when children were in the EHS. The raw signals were scored using our novel signal analysis algorithm (OPIRA-T). A classification tree (CART) was used to fit OPIRA-T scores as a predictor of children not meeting PA guidelines during the 7-day wear period. CART algorithm ROC area under the curve (AUC) and bootstrapped 95% CI were evaluated. OPIRA-T scores were also used to classify children at risk of physical inactivity using a custom cascaded 2-step algorithm (OPIRA-T screening test). The bootstrapped sensitivity, specificity, positive and negative predictive values for the OPIRA-T screening test were calculated. Descriptive statistics are presented as Mean(SD) and Frequencies (%).

RESULTS. Children [n=60; F: 53%; age: 29(4) months] with valid 7-day wear time data were included. Respectively, 75% and 32% of toddlers did not meet MVPA and TPA guidelines. OPIRA-T score and OPIRA-T screening test validation results appear in Table 1.

CONCLUSION. Within the EHS setting, OPIRA-T accurately identified toddlers at risk of physical inactivity from a brief period (15min) of objectively measured PA. Further research is needed on which classroom periods are the most reliable testing times for using OPIRA-T.

Table 1. Accuracy of OPIRA-T scores and screening test in identifying toddlers at risk of insufficient daily activity according to current physical activity recommendations

Accuracy Indices	Observation Length			
	15min	30min	45min	60min
	n = 53	n = 60	n = 58	n = 55
OPIRA-T Scores (AUC [95% C.I.])				
Not Meeting MVPA[a]	0.96 [0.89, 0.99]	0.97 [0.91, 0.99]	0.92 [0.77, 0.99]	0.95 [0.86, 0.99]
Not Meeting TPA[b]	0.95 [0.87, 0.98]	0.94 [0.84, 0.98]	0.92 [0.81, 0.97]	0.90 [0.78, 0.97]
OPIRA-T Screening Test (%)				
Sensitivity	90%	93%	96%	96%
Specificity	92%	93%	92%	70%
Positive Predictive Value	94%	96%	96%	86%
Negative Predictive Value	86%	88%	92%	90%

[a]American Heart Association. The AHA's Recommendation's for Physical Activity in Children
[b]Institute of Medicine. Early Childhood Obesity Prevention Policies

1121 May 31 9:45 AM - 10:00 AM

Sensitivity of a Consumer Activity Tracker to Detect Changes In Lab-based and Free-living Activity Settings

Greg J. Petrucci, Jr., Patty S. Freedson, FACSM, Brittany R. Masteller, Melanna F. Cox, John W. Staudenmayer, John R. Sirard. *UMass Amherst, Amherst, MA.* (Sponsor: Patty S. Freedson, FACSM)

Reported Relationships: G.J. Petrucci: *Contracted Research - Including Principle Investigator; Misfit Shine™ Wearables (Fossil Group, Richardson, TX, USA).*

PURPOSE: Determine the sensitivity of a consumer activity tracker (CAT) to detect changes in physical activity (PA) measures during laboratory (LAB) and free-living (FL) conditions.
METHODS: Twenty-one participants wore the CAT and ActiGraph GT3X+ accelerometer (AG) at the hip and dominant wrist during three, 1-hour LAB sessions: sedentary (SS), sedentary plus walking (SW), and sedentary plus jogging (SJ). For SW and SJ, participants performed 30-minutes of sitting, then 30-minutes of walking or jogging at 5.15 or 8.0 kph, respectively. Direct observation (DO) of steps served as the criterion measure for SW and SJ sessions. Devices were also worn during two FL conditions: 1) active week where participants met activity guidelines (ACT); 2) sedentary week, absent of purposeful activity (SED). The PA measures were: CAT and AG steps and kCals, CAT "points", and AG vertical axes counts. For LAB and FL, significant differences were examined by comparing non-overlapping 95% confidence intervals (C.I.'s) and linear mixed effects models, respectively. Linear mixed effects models were fit for differences (bias; absolute and percent) between CAT device estimated steps and DO step ($\alpha \leq 0.05$).
RESULTS: For all hip-worn CAT measures there was a significant step-wise increase ($p < 0.05$) from SS to SJ. For the wrist-worn CAT, there was a significant step-wise increase in steps and "points" from SS to SJ ($p < 0.05$). However, the wrist CAT kCal estimates were greater for SJ, compared to SS and SW, which were similar to each other [95% C.I.'s (95.5, 152.8) and (141.1, 378.9), respectively]. Compared with DO, CAT hip significantly underestimated steps by 3.5%, while CAT wrist significantly overestimated steps by 4.2%. AG estimates of kCals and counts showed a significant step-wise increase from SS to SJ ($p < 0.05$), however estimates of steps were greater for SJ, compared to SS and SW, which were similar to each other [95% C.I.'s hip: (2861, 3542) and (3433, 4789), wrist: (2068, 2803) and (1908, 2647)]. During FL conditions, all CAT and AG outcomes were sensitive to changes between ACT and SED ($p < 0.0001$).
CONCLUSIONS: The hip-worn CAT was sensitive to changes during LAB and FL. CAT may be a useful tool for interventions where PA measures are used as exposure and/or outcome measures. **FUNDING:** UMass Institute of Applies Life Sciences and Fossil Group™

C-13 Free Communication/Slide - **VO2max**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Mezzanine M100F

1122 **Chair:** Paul M. Gallo, FACSM. *Norwalk Community College, Norwalk, CT.*
(No relevant relationships reported)

1123 May 31 8:00 AM - 8:15 AM

Fitness And Age-related Associations: Is VO_{2peak} A Valid Measure For Older Adults?

Ryan J. Dougherty, Jacob B. Lindheimer, Aaron J. Stegner, Stephanie Van Riper, Jacob V. Ninneman, Ozioma C. Okonkwo, Dane B. Cook, FACSM. *University of Wisconsin - Madison, Madison, WI.* (Sponsor: Dane B. Cook, FACSM)
(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is routinely investigated in older adults; however, the most appropriate CRF measure to use for this population has received little attention. **Purpose:** To (i) evaluate the reliability and validity of the oxygen uptake efficiency slope (OUES) as a sub-maximal measurement of CRF, (ii) examine demographic, risk-factor, and exercise testing differences in older adults who satisfied standardized criteria for a peak oxygen consumption (VO_{2peak}) test compared to those who did not and (iii) determine the difference between directly measured VO_{2peak} values and OUES-predicted VO_{2peak} values. **Methods:** One hundred ten enrollees from the Wisconsin Registry for Alzheimer's Prevention participated in this study. Participants performed a graded maximal exercise test and wore an accelerometer for 7 days. For each participant, the OUES was calculated at 75, 90 and 100% of exercise duration. VO_{2peak} was recorded at peak effort, and one week of physical activity behavior was measured. **Statistical analyses:** Intraclass correlation coefficients (ICC), bivariate Pearson correlations and a one-way repeated-measures ANOVA examined the reliability and criterion validity. Independent samples *t*-tests and Cohen's effect sizes examined between group differences and linear regression was used to obtain the formula for OUES-predicted VO_{2peak}. **Results:** OUES values calculated at separate relative exercise durations displayed excellent reliability (ICC = .995; $p < .001$), and were strongly correlated with VO_{2peak} (r_{range} = .801 - .909; $p < .001$). As hypothesized, participants who did not satisfy VO_{2peak} criteria were significantly older than those who satisfied criteria ($p = .049$) and attained a directly measured VO_{2peak} that was 2.31 mL·kg·min^{-1} less than their OUES-predicted VO_{2peak} value ($d = .72$; $p = .003$). **Conclusions:** Older adults are less likely to satisfy VO_{2peak} criteria, which results in an underestimation of their CRF. Without adhering to standardized criteria, VO_{2peak} measurement error may lead to misinterpretation of CRF and age-related associations. Here, we conclude that OUES is a reliable, valid measurement of CRF which does not require consideration of standardized criteria.

1124 May 31 8:15 AM - 8:30 AM

Evaluating The Influence Of Methodological Variables On The Determination Of Vo_{2max} And The Lactate Threshold.

Nicholas Jamnick[1], Javier Botella[1], David Pyne, FACSM[2], David Pyne, FACSM[3], David Bishop, FACSM[1], David Bishop, FACSM[4]. [1]*Victoria University, Melbourne, Australia.* [2]*Australian Institute of Sport, Canberra, Australia.* [3]*University of Canberra, Canberra, Australia.* [4]*Edith Cowan University, Joondalup, Australia.* (Sponsor: Professor David Bishop, FACSM)
(No relevant relationships reported)

Graded exercise tests (GXTs) can be used to determine peak oxygen uptake (VO_{2peak}) and the lactate threshold (LT), and are commonly employed by sport scientists and coaches to evaluate and prescribe exercise training. Two critical methodological choices that influence these indices are GXT stage length (for VO_{2max} and the LT), and the method used to calculate the LT. However, there has been little investigation of the effects of these choices on the validity of the derived indices. **PURPOSE:** To determine the influence of GXT stage length and method of calculation on the estimation of LT and VO_{2peak}. **METHODS:** Trained male cyclists (n=17) completed five GXTs of varying stage length (1, 3, 4, 7 and 10 min) on different days, each followed by a verification exhaustive bout (VEB) to confirm VO_{2peak}, and a series of 30-min constant power bouts to establish the maximal lactate steady state (MLSS). All tests except GXT_1 (which was performed first) were performed in a randomized order. VO_2 was assessed during each GXT and VEB, and 15 different LTs were calculated from four of the GXTs (3, 4, 7 and 10 min) - yielding a total 60 LTs. Agreement was assessed between the highest VO_2 measured during each GXT (VO_{2peak}), and between each GXT and subsequent VEB. Validity of the LTs derived from the GXTs was assessed using the MLSS as the criterion measure. VO_{2peak} and LT data were analyzed

using mean difference (MD), effect size (ES), intraclass correlation (ICC), and the coefficient of variation (CV). **RESULTS:** The VO_{2peak} value from GXT_1 was 61.0 ± 5.3 mL/kg/min and the peak power 420 ± 55 W (mean $\pm$ SD). The MLSS power was 264 ± 39 W. VO_{2peak} from $GXT_{3, 4, 7, 10}$ underestimated VO_{2peak} from GXT_1 (MD = -1.2, -2.1, -3.7 and -4.8 mL/kg/min; ES = 0.23, 0.36, 0.69 and 0.88; ICC = 0.82, 0.75, 0.63 and 0.77; GXT_1 vs. $GXT_{3, 4, 7, 10}$, respectively). The VO_{2peak} values from the GXT and VEB during GXT_1 and GXT_4 were within the error of the measurement (CV<3%). The Modified Dmax method (log-poly-MD_{max}) derived from GXT_4, with an alternate initial data point calculated using the log-log method, provided the most valid estimate of the MLSS (MD = 1.1 W; ES = 0.03; ICC = 0.96). **CONCLUSION:** The log-poly-MD_{max} derived from GXT_4 yielded the most valid estimate of the MLSS; however, the VO_{2peak} from the four longest GXTs (3, 4, 7 and 10 min) underestimated the VO_{2peak} from GXT_1.

1125 May 31 8:30 AM - 8:45 AM

Evaluation of VO^{2Peak} Calculations for the Boer 2 Through 5 Protocols

Nicholas F. Boer, Josh Johann, Gregory Heath, FACSM. *Univ. of Tennessee, Chatanooga, TN.*
(No relevant relationships reported)

PURPOSE: The purpose of this investigation was to determine whether individuals of varying fitness levels would self-select an appropriate exercise test from the Boer 1 - 5 graded (maximal) exercise testing protocols. The protocols were developed to be discreet for each of five fitness levels (1 - Clinical, 2- Moderately Fit, 3 - Fit, 4 - Highly Fit and 5 - Elite). It is hypothesized that calculated VO_{2peak} in each group will be different, while testing time will be statistically the same.
METHODS: Students from an exercise prescription lab course completed one of the five Boer protocols as a class assignment. Subjects completed a short survey and listened to a lecture regarding protocol selection. Subjects completed the grade exercise test and stopped the test when volitional fatigue was achieved. Treadmill testing time and calculated VO_{2peak} (from the intensity reached during the last two minutes) was recorded. A one-way ANOVA was completed with treadmill time and calculated VO_{2peak} as dependent variables and protocol selection as the independent variable.
RESULTS: N=83 (33 Male, 50 Female) Age 21.8 years (1.3), BMI 24.9 (4.3) There were no statistical difference between male and female results. Therefore, all subjects were pooled into the respective protocol. (No subjects completed Boer 1.)

	Boer 2 (N=9)	Boer 3 (N=50)	Boer 4 (N=20)	Boer 5 (N=4)
VO2Peak (ml/kg/min)	36.5 (2.2)*	43.3 (3.8)*	54.1 (4.5)*	64.0 (5.2)*
Time (min)	14.9 (2.6)	13.9 (2.1)	13.5 (2.2)	12.8 (1.5)

* (p<0.0001 compared to each of the other groups) Total time includes a three minute warm up. **CONCLUSIONS**: Subjects were able to determine an appropriate Boer 1 - 5 protocol and calculated VO_{2peak} was discreet between participants in each protocol. Treadmill time remained similar in each group, which does not occur when existing maximal protocols are used to determine aerobic fitness in subjects of varying fitness levels. Preliminary evidence would suggest that this is a viable method to test aerobic fitness in the population.

1126 May 31 8:45 AM - 9:00 AM

Change In VO_2max And Time Trial Performance To Interval Training Prescribed According To Ventilatory Threshold

Todd A. Astorino, Jamie DeRevere, Theodore Anderson, Patrick Holstrom, Erin Kellogg, Sebastian Ring, Nicholas Ghasb, Anders Rosland Nordstrand. *California State University--San Marcos, San Marcos, CA.*
(No relevant relationships reported)

Research shows that about 20 % of participants demonstrate no change in maximal oxygen uptake (VO_2max) in response to moderate intensity continuous training (MICT) (Bouchard et al 1999) or high intensity interval training (HIIT, Astorino & Schubert 2014). Approximately 50 % of this non-response is hereditary (Bouchard et al 1999) although the other 50 % is unexplored (Mann et al. 2015) and likely related to participants' habitual physical activity and dietary patterns, sleep, and traits of the training regime. In unfit adults, Wolpern et al. (2015) showed that MICT prescribed according to Ventilatory Threshold (VT) led to lower onset of individual non-response than when prescribed using HR. **PURPOSE:** To prescribe HIIT according to VT to monitor aggregate and individual responses in both VO_2max and time trial (TT) performance. **METHODS:** Eleven active (age and VO_2max = 28.9 $\pm$ 7.9 yr and 38.4 $\pm$ 4.5 mL/kg/min) men and women performed baseline testing including a VO_2max test on a cycle ergometer to determine peak power output (PPO) and ventilatory threshold (Caiozzo et al. 1986). Each subject also performed a 8.2 km cycling TT over three separate trials. Over a 3 wk period, they underwent 9 d of HIIT consisting of 8 – 10 60

s bouts at work rate of 130% VT with a 75 s active recovery period. Training elicited an intensity = 89.2 $\pm$ 5.7 %PPO. VO_2max and TT were assessed within 96 h after training. Controls (CON) (n=6, age and VO_2max = 22.7 $\pm$ 2.3 yr and 40.4 $\pm$ 8.7 mL/kg/min) consisted of active individuals who completed two sessions of baseline testing separated by 3 wk. **RESULTS:** Data showed a significant groupXtime interaction for VO_2max (38.4 $\pm$ 4.5 mL/kg/min to 40.7 $\pm$ 4.8 mL/kg/min vs. 40.4 $\pm$ 8.7 mL/kg/min to 40.6 $\pm$ 8.7 mL/kg/min, p=0.017) and TT (923.1 $\pm$ 78.2 s to 899.4 $\pm$ 67.2 s vs. 921.2 $\pm$ 115.0 s to 924.3 114.4 s, p=0.007) between HIIT and CON. With 2Xtypical error = 0.11 L/min for VO_2max and 18.0 s for TT, 63 % of participants showed meaningful increases in VO_2max and TT in response to this low dose of HIIT. Two of 11 participants exhibited non-response in both variables. **CONCLUSION:** These preliminary data show that 9 d of HIIT at 130 %VT significantly increases VO_2max and TT performance, but these responses do not occur in everyone. It is possible that the volume or duration of HIIT used is inadequate to promote greater responses in habitually active individuals.

1127 May 31 9:00 AM - 9:15 AM

The Impact Of An Interval Training Program On Muscle And Cerebral Oxygenation Responses To Incremental Ramp Exercise.

Jan Boone, Kevin Caen, Kobe Vermeire, Jan Bourgois. *Ghent University, Ghent, Belgium.*
(No relevant relationships reported)

PURPOSE: To study the effects of interval training on cerebral and muscle (de) oxygenation and their relationship to improvements in VO_2peak obtained from incremental ramp cycle exercise.
METHODS: Ten male subjects performed incremental ramp exercise tests (50 Watt + 25 Watt.min^{-1}) prior to and following a six week training intervention. During the tests, muscle (M. Vastus Lateralis) and cerebral (de)oxygenation (O_2Hb and HHb) was recorded with Near-Infrared Spectroscopy (NIRO 200, Hamamatsu, Japan). The training sessions were performed 3 times a week and consisted of 6 bouts of 4 min cycling at the critical power, interspersed by 3 min recovery a work rate corresponding to the gas exchange threshold. The changes in the tissue oxygenation responses (muscle HHb and totHb, cerebral O_2Hb and totHb) was calculated by expressing these responses obtained from the posttest relative to those obtained in the pretest in which the amplitude was set to 100%.
RESULTS: Following the training intervention, the VO_2peak had increased from 52.4$\pm$3.5 ml.min^{-1}.kg^{-1} to 56.4$\pm$3.8 ml.min^{-1}.kg^{-1} (P<0.001) and peak power output from 384$\pm$36 Watt to 415$\pm$40 Watt (P<0.001). Muscle HHb amplitude had increased (P<0.01) with 64$\pm$50%, whereas also the muscle HHb/work rate slope had increased (P<0.01) from 0.52$\pm$0.14%.Watt^{-1} to 0.99$\pm$0.57%.Watt^{-1}. The change in muscle HHb amplitude was correlated to the increase in VO_2peak (r=0.75, P=0.03). Muscle totHb amplitude increased with 85$\pm$79%, although this was not correlated to VO_2peak increase (r=0.22, P>0.05). Cerebral O_2Hb amplitude had increased (P=0.019) by 50$\pm$57% with no change in cerebral O_2Hb/work rate slope (0.89$\pm$0.47%.Watt^{-1} vs. 1.00$\pm$0.42%.Watt^{-1}, P=0.58). Cerebral totHb did not show a change in amplitude (28$\pm$46%, P=0.24) nor in slope (0.67$\pm$0.15%.Watt^{-1} vs. 0.73$\pm$0.27%.Watt^{-1}, P=0.58).
CONCLUSIONS: This study showed that the improvement in VO_2peak was predominantly related to an improved fractional O_2 extraction (i.e, amplitude of muscle HHb). However, interval training also induced an enhanced O_2 diffusive capacity (i.e., amplitude of muscle totHb) and cerebral oxygenation which might also affect maximal exercise performance.

1128 May 31 9:15 AM - 9:30 AM

Relationships Between Vo_{2max} And Blood Lactate During Exercise Across Different Populations

Inigo San-Millán[1], Jared Berg[2], Janel Martinez[1], Ryan Kohler[2], Charles Van Atta[2]. *[1]University of Colorado School of Medicine, Aurora, CO. [2]CU Sports Medicine and Performance Center, Boulder, Colorado, CO.*

Reported Relationships: I. San-Millán: *Consulting Fee; Ascent Nutrition, Institute of Motion Analysis (IMA). Contracted Research - Including Principle Investigator; Leomo, LLC. Ownership Interest (Stocks, Bonds); MuscleSound, Inc.*

BACKGROUND: Maximal oxygen consumption ($VO2_{max}$) has been considered for decades the gold standard to measure cardiorespiratory fitness. The field of exercise physiology has experienced an important shift towards cellular and exercise metabolism in the past decade. The measurement of blood lactate ([La$^-$]$_b$) as a biomarker of cellular metabolism reflecting the metabolic response to exercise is widely used nowadays to assess performance. While many laboratories around the world still use VO2 and $VO2_{max}$ to assess human performance, many others use [La$^-$]$_b$. The debate of weather $VO2_{max}$ or [La$^-$]$_b$ is the best approach to assess fitness and performance has escalated over the past decade. However, there is neither consensus nor studies showing which method is more appropriate to assess fitness and performance. **PURPOSE:** To show the relationships between $VO2_{max}$ and [La$^-$]$_b$ during

exercise across different populations. **METHODS:** 232 male subjects divided in 24 international-level professional cyclists (PC), 77 US domestic competitive cyclists (DC), 107 recreational cyclists (REC) and 24 sedentary men (SM) performed an incremental cycling test starting at 1.0 W·kg⁻¹ with increments of 0.5 W·kg⁻¹ every 5 min until volitional exhaustion. VO_2 and $VO2_{max}$ (ml·kg⁻¹) and $[La^-]_b$ (mmol·L⁻¹) were measured at the end of each step. Comparisons were done for each group by means a Student t-test. Pearson correlation coefficient was used to verify the relationships between the different variables studied. Statistical significance was set at p<0.05. **RESULTS:** The average correlations between the VO2 and the $[La^-]_b$ at each step of the cycling test were weak for PC (r = 0.05 ± 0.02, p<0.001), DC (r = -0.11 ± 0.12, p<0.001), REC (r = 0.17 ± 0.14, p<0.001) and SM (r = 0.13 ± 0.21, p<0.001). The average correlations between $VO2_{max}$ and the $[La^-]_b$ at each step of the incremental test was moderate for PC (r = -0.50 ± 0.14, p<0.001) while weak for DC (r = -0.36 ± 0.15, p<0.001), REC (r = -0.27 ± 0.26, p<0.001) and SM (r = -0.32 ± 0.28, p<0.001). **CONCLUSION:** Our study shows weak to moderate correlations between VO2, $VO2_{max}$ and $[La^-]_b$ across different populations. Since lactate is a more descriptive parameter of the metabolic responses to exercise, measuring $[La^-]_b$ over VO2 and $VO2_{max}$ is a more appropriate parameter to assess metabolic fitness and performance.

1129   May 31 9:30 AM - 9:45 AM

The Effect Of Stride Frequency Variations On Running Performance At The Velocity Of Vo₂Max

Boram Lim, Boe Burrus, Justus Ortega, Young Sub Kwon. *Humboldt State University, Arcata, CA.*

(No relevant relationships reported)

Running economy (RE) is considered to be a critical factor to improve running performance. Stride frequency (SF) is an important variable for determining RE. The importance of SF has gained more attention in recent years, especially for recreational runners. However, no previous research has investigated the interaction between running performance at the velocity of VO2max and SF. **PURPOSE**: To investigate the effect of five different SF conditions on running performance at the velocity of VO2max. **METHODS**: Twelve male recreational runners (Age=25 ± 4.2yr, Height=1.70 ± 0.6m, Body Mass=70.9 ± 8kg) measured VO₂max (53.1 ± 5.4 ml/kg/min) and preferred stride frequency (PSF; 89.5 ± 4 / min) through a graded exercise test (GXT) and running session, respectively. Running speed was determined based on each individual's GXT results by using ACSM estimation equations for exercise metabolism. Participants ran on the treadmill at this constant speed (0% grade) with different SF conditions (PSF, ±5%, ±10%) until time to exhaustion. Data were analyzed using a one way ANOVA with repeated measures. **RESULTS**: The total running distance was statistically significant among SF variations (p<0.05). Specifically, A Tukey post hoc revealed that the total distance at four SF conditions (90%, 95%, 100%, 110% of PSF) was statistically significant compared to 105% of PSF (p<0.05). Additionally, the respiratory exchange ratio (RER) was no statistically significant among SF variations (p=0.37). **CONCLUSIONS**: The SF variations have a significant influence on running performance. The relationship between SF variations and RER were possibly related to the central governor theory to delay the onset of fatigue. These results suggest that recreational runners could use a 105% of PSF to improve performance with the better RE.

Table 1. The relationship between SF, Distance, and RER					
SF variations	90%	95%	100% (PSF)	105%	110%
Distance(mile)	1.00 ± 0.5 *Ψ	1.04 ± 0.5 *	1.32 ± 0.6*	1.64 ± 0.7	1.15 ± 0.7 *
RER	1.05 ± 0.05	1.05 ± 0.03	1.03 ± 0.03	1.01 ± 0.02	1.02 ± 0.03

Note. Results reported in mean ± SD. * p < 0.05, vs. 105% SF conditions. Ψ p < 0.05, vs. 100% PSF conditions.

1130   May 31 9:45 AM - 10:00 AM

Predictability Of VO₂ₘₐₓ From Three Commercially Available Devices

Luke D. McCormick. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Dr. Karin Pfeiffer, FACSM)

(No relevant relationships reported)

Sports watches have been developed with a feature that predicts $VO2_{max}$ from a submaximal effort. **PURPOSE**: To examine the predictability of VO2max from two heart rate monitors (Device A and V) and a global positioning system (GPS) watch compared to measured VO2max. **METHODS**: Twenty-seven participants, 15 males and 12 females ages 18 to 55, came to the Running Science Laboratory at Eastern Michigan University on two occasions. During visit 1, participants arrived in a semi-fasted state (without caffeine or caloric consumption for 3 hours) and completed a maximal graded exercise test (GXT) to determine $VO2_{max}$. The participant determined a self-selected speed which remained constant throughout the test while only grade increased by 2% every 2 minutes until volitional exhaustion. A $VO2_{max}$ (ml/kg/min) was

reached if heart rate was ≥95% of age predicted max, RER was ≥1.05, and there was a plateau in VO_2 (< 2 ml/kg/min). During visit 2, participants first wore two heart rate monitors simultaneously (Device A and V) and were instructed to lie still for 6 minutes to allow for the devices to estimate $VO2_{max}$. After these values were obtained, these two devices were replaced by a GPS watch. Participants then completed a 15-minute submaximal outdoor run, and the GPS watch estimated $VO2_{max}$. Pearson correlations and a Repeated Measures ANOVA were utilized to compare estimated $VO2_{max}$ values from the three devices to measured $VO2_{max}$ from the GXT (p<0.05). **RESULTS**: Six participants were excluded due to having a VO2max less than 35ml/kg/min, not returning for the second visit, or a device malfunctioning. Device A (r=0.66; p<0.001), Device V (r=0.80; p<0.001), and the GPS watch (r=0.72; p<0.001) were associated with measured VO2max. A significant main effect was found among VO2max values (F (2.0, 39.6) = 14.0; p<0.05). There was a significant difference (p<0.01) between measured VO2max (51.0±9.1 ml/kg/min) compared to Device A (44.0±5.5), Device V (45.3±5.6), and the GPS watch (45.7±5.3). **CONCLUSIONS**: Even though there were moderate to strong relationships, all three watches underestimated VO2max compared to measured VO2max. However, the difference between measured VO2max and all three devices may fall within daily variation of VO2max. The three devices may serve as an appropriate measure of cardiorespiratory fitness from a submaximal effort.

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

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-101CD

1131   **Chair:** Paul D. Thompson, FACSM. *Hartford Hospital, Hartford, CT.*

(No relevant relationships reported)

1132   **Discussant:** Benjamin D. Levine, FACSM. *Texas Health Presbyterian Hospital Dallas, Dallas, TX.*

(No relevant relationships reported)

1133   **Discussant:** Rachel Lampert. *Yale University, New Haven, CT.*

(No relevant relationships reported)

1134   May 31 8:00 AM - 8:20 AM

Left Arm Cramping and Prominent Veins in a 19 year-old Women's Collegiate Soccer Player

Andrew Schleihauf, Kimberly Kaiser, Robert Hosey, FACSM. *University of Kentucky, Lexington, KY.*

(No relevant relationships reported)

History: 19-year old female collegiate soccer goalie with PMHx iron-deficiency anemia due to heavy menses presents with left arm cramping, numbness, and purple discoloration. She was doing an overhead weightlifting workout and felt numbness and a cramping sensation in her left arm while performing front squats. She then noticed a purple discoloration of her left arm along with prominent veins and presented to the training room. After being examined, she was sent to the emergency department. She denies having any previous episodes similar to this. She was on oral contraceptives due to heavy menses but has no personal or family history of clotting disorders.
Physical Exam: Constitutional: 5'9, 173 lb. BP 123/71, pulse 63, RR 14. Athletic build. *Extremities*: Left forearm pallid and mottled with engorged basilic and cephalic veins. Mild generalized edema and diffuse tenderness from forearm to upper arm. Radial pulse 2+ bounding, brachial and carotid pulse 2+
Differential Dx: Neurogenic thoracic outlet syndrome, vascular thoracic outlet syndrome, complex regional pain syndrome
Test and results: *Left UE Venous Doppler*: Occlusive DVT in mid subclavian vein near the clavicle extending to the axillary, proximal basilic and proximal brachial veins. There is thrombus in the proximal cephalic vein. The jugular, radial and ulnar veins were patent with normal augmentation, compressibility, and flow
Left UE Arterial Doppler: Normal flow and waveforms throughout
Final working diagnosis: Paget-Schroetter syndrome
Treatment and Outcome: She was placed on a heparin drip and underwent thrombolysis with catheter directed tPA. A balloon angioplasty was done of the left subclavian vein for a 3 cm occlusion and then she underwent a first rib resection 6 weeks after initial presentation. Upon arrival to school for the fall semester, she continued to have pressure, mild pain, and discoloration of her left arm with minimal exertion. Repeat ultrasound and angiogram showed no evidence of acute thrombus one-month post surgery. After continuing to get discoloration of her arm walking across campus, she underwent a venogram two months after surgery that showed a well-adhered thrombus in her subclavian vein. She is scheduled for a repeat angioplasty and has been unable to return to full soccer activity after 5 months.

Abstracts were prepared by the authors and printed as submitted.

1135 May 31 8:20 AM - 8:40 AM

Cardiovascular Football

Stephen Carek[1], Timothy Durkin[1], Michael Dillon[2], Floyd Burke[1], Katherine Edenfield[1], Guy Nicolette[1], James Clugston[1]. [1]University of Florida, Gainesville, FL. [2]Heart and Vascular Institute of Florida, Gainesville, FL.

(No relevant relationships reported)

History: A 19 year old male freshman football defensive lineman presented for his pre-participation examination. He denied any cardiac symptoms or family history of sudden cardiac death. Screening ECG did not demonstrate pathological electrocardiographic abnormalities for athletes. Screening echocardiogram was significant for moderate concentric left ventricular hypertrophy and an interventricular septal diameter of 1.41 cm. Physical Exam: African-American Male. Height 76.5 in, Weight 349.4 lbs, BMI 42.4, Arm span: height ratio 1.06, Cardiac exam without murmurs, rubs or gallops. No physical findings consistent with Marfan's Syndrome. Differential Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete's Heart), Hypertrophic Cardiomyopathy, Hypertensive Cardiomegaly Tests and Results 1. Cardiac MR (1)Moderate to borderline severe symmetric hypertrophy. Hyperdynamic left ventricular systolic function. Ejection fraction of 75%. (2) No evidence of hyper-enhancement with gadolinium. (3) Maximal interventricular septum thickness of 17 mm. (4) Left Ventricular End Diastolic Volume Index (LVEDVI)/Left Ventricular End Diastolic Mass Index (LVEDMI) ratio of 0.75 (less than 1.2 is more consistent with HCM). (5) Wall thickness to LVEDVI ratio is 0.23 (less than 0.15 suggests HCM). (6) Findings equivocal for the assessment of hypertrophic cardiomyopathy versus athlete's heart. 2. Transthoracic Echocardiogram with Color Flow Doppler and Spectral Doppler (1) Normal left ventricular size, structure, systolic function. (2) Mild LV asymmetric septal hypertrophy, septal thickness 1.6 cm, posterior wall thickness 1.3 cm. (3) No evidence of left ventricular outflow tract obstruction. (4) Normal global longitudinal strain imaging with normal strain-derived left ventricular systolic function. 3. Exercise Stress Test (1) No ischemic ECG changes or arrhythmia with stress. Final Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete's Heart) Treatment and Outcomes: After being withheld from football during this evaluation, he has since been cleared for participation and has not demonstrated any unusual symptoms, including lightheadedness, dizziness, syncope, chest pain or shortness of breath. He is scheduled for follow-up in 6 months with a repeat echocardiogram.

1136 May 31 8:40 AM - 9:00 AM

Chest Pain, Palpitations and Heart Murmur In A Basketball Player

Colin L. Conner[1], John Stock[2], Mitchell Cohen[1]. [1]Arizona Pediatric Cardiology, Phoenix, AZ. [2]Pediatric Cardiac Care of Arizona, Phoenix, AZ.

(No relevant relationships reported)

HISTORY: A 16 year old male competitive basketball player referred for a 3 month history of intermittent palpitations associated with chest pain at rest. Initially the symptoms were occurring once or twice a week, then once every 2 days, then occurring almost daily. The episodes are characterized by irregular heartbeat, followed by chest pain, with occasional shortness of breath. There is also chest pain associated with exercise. Characterized as burning which lasts 15-20 seconds. It does not change with activity level. He can usually play through the pain. He denies dizziness, presyncope or syncope. Also denies effort intolerance.
PHYSICAL EXAMINATION: Well developed in no distress. No thyromegaly. No pallor. Lungs clear. Regular rate and rhythm. Normal S1 and S2. I-II/VI nonspecific SEM heard at LUSB and RUSB in the supine position. Pulses 2+ and equal. Abdomen soft and non-tender.
DIFFERENTIAL DIAGNOSIS:
1. Musculoskeletal chest pain
2. Palpitations-probably benign
3. Innocent murmur
TESTS AND RESULTS:
ECG: sinus bradycardia, LVH, ST elevation right precordial leads, T wave inversion inferior leads
ECHOCARDIOGRAM: LVH with notable hypertrophy of left posterior wall (14 mm). Borderline LAE.
HOLTER MONITOR: rare PVC's and PAC's. One polymorphic couplet
CARDIAC MRI: borderline concentric LVH (max 12.8 mm: Z score 2.2), borderline LV wall mass. Borderline LAE. No regional wall motion abnormalities or delayed gadolinium enhancement
METABOLIC STRESS: peak VO2 93% predicted. Ventricular ectopy at rest, with exercise and in recovery: suppressed at max HR. PFT (post exercise): FVC decreased 15%; FEV1 decreased 14%; FEF 25-75% decreased 39%
CARDIAC CATHETERIZATION: normal LV end diastolic pressures. No myocardial bridge
GENE DX: negative
FINAL/WORKING DIAGNOSIS:
1. Left Ventricular Hypertrophy

2. Premature Ventricular Contractions
3. Exercise Induced Bronchospasm
TREATMENT AND OUTCOMES:
1. Implantable loop recorder
2. Allowed to return to play with AED on site
3. Albuterol MDI prior to exercise
4. Repeat Metabolic Stress in 6 months

1137 May 31 9:00 AM - 9:20 AM

New Heart Murmur in a Male Basketball Player

Emily Miller, Dena Florczyk. *UCLA, Los Angeles, CA.*

(No relevant relationships reported)

HISTORY: 20 year old African American male presents for his pre-participation examination. Upon reaching the cardiovascular screening questions answers yes to both "have you ever been told you have a heart murmur" and "sudden death before the age of 50 in a relative." At a visit two days prior he was told he had a heart murmur. His estranged father, with whom he had no relationship, passed away in his forties secondary to unknown heart disease. His father was reportedly born with "blue heart disease with a hole in his heart." The etiology behind his father's passing was unknown but he had a history of incarceration, alcohol and substance abuse. No other family history of cardiac disease. The athlete himself specifically denies any personal history of pre-syncope, syncope, chest pain with exercise, dyspnea on exertion, palpitations.
PHYSICAL EXAMINATION:
BP: 130/70 General: alert and oriented, no stigmata of Marfan's Cardiac: regular rate and rhythm, S1 S2, 1/6 systolic murmur when supine, resolved when standing or sitting, no increase with valsalva. Normal radial and femoral pulses Respiratory: clear to auscultation bilaterally
DIFFERENTIAL DIAGNOSIS: 1. Cardiomyopathy - hypertrophic vs restrictive vs dilated vs other 2. Hypertensive heart disease 3. Benign systolic ejection murmur - Still's vs VSD vs mitral valve prolapse 4. Athletic heart
TEST AND RESULTS: EKG: Normal sinus rhythm. Echocardiogram: Normal EF 55-60%, no valvular stenosis or regurgitation. No outflow tract obstruction. Apical portion of the LV with findings consistent with apical localized non-compaction of the myocardium. Normal LV wall motion and wall thickness.
FINAL WORKING DIAGNOSIS: Non-compaction of the left ventricle
TREATMENT AND OUTCOMES:
Clinically asymptomatic. Increased trabeculations noted on echo consistent with non-compaction of the LV but with preserved ejection fraction and without evidence of dilation. CAM monitor for 1 week - no evidence of arrhythmias. Treadmill stress test with stress echocardiogram - no evidence of ischemia or exercise induced arrhythmias; normal cardiac response to exercise. ASA 81 mg daily to reduce risk of stroke associated with LV non-compaction. Reassurance provided that while being physical active this risk is minimal. Cleared to participate in athletics. Repeat echocardiogram in one year.

1138 May 31 9:20 AM - 9:40 AM

Misleading Congenital Brain and Heart Abnormalities in a Syncopal Soccer Player

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

(No relevant relationships reported)

HISTORY: A 19-yr-old female collegiate soccer player reported recurrent fainting episodes during a pre-participation physical examination after transferring from another school. She reported sustaining a sports-related concussion in December 2014 and subsequently developed frequent fainting spells, headaches, and recurrent numbness in her arms and legs. Fainting spells are not provoked by Valsalva-like circumstances. Fainting spells are not associated with chest pain, palpitations, racing heart, shortness of breath, or diaphoresis. During fainting spells altered cognition may last only a few seconds or up to thirty minutes. Fainting spells are not associated with tonic-clonic movements, tongue biting, bowel incontinence, or bladder incontinence. She had already undergone evaluation for these symptoms including a Neurology evaluation that included a normal electroencephalogram and a Cardiology evaluation that included an electrocardiogram and echocardiogram. Echocardiogram revealed an atrial septal defect (ASD) which was subsequently closed and fainting spells became less frequent after ASD closure. Prior clearance to participate in soccer was provided by all evaluating providers including Cardiologist, Neurologist, and Primary Care Physician.
PHYSICAL EXAMINATION: Normal cardiac and neurologic examination.
DIFFERENTIAL DIAGNOSIS: Vasovagal syncope, postural orthostatic tachycardia syndrome, migraine variant, postconcussion disorder, psychogenic seizures, and somatization disorder.
TEST AND RESULTS: **Brain MRI:** The cerebellar tonsils descend below the foramen magnum, consistent with a Chiari I malformation. No upper cervical cord syrinx. **Brain MRI with CSF flow sequences:** The ventral foramen magnum

remains patent and the ventricles are normal. There is decreased flow across the foramen magnum at the fourth ventricular outflow and posterior to the cerebellar tonsils. **Cervical spine MRI:** No syrinx. **Neurosurgical evaluation:** Asymptomatic Chiari 1 malformation. **FINAL WORKING DIAGNOSIS**: 1. Vasovagal syncope.2. ASD status post closure.3. Asymptomatic Chiari 1 malformation. **TREATMENT AND OUTCOMES**: The athlete was allowed to participate when she expressed understanding of the associated risks. Episodes of syncope continued to occur.

1139   May 31 9:40 AM - 10:00 AM
Evaluation And Management Of Recurrent Symptomatic, Exercise-induced Tachyarrhythmia
Michael Fitzgerald. *University of Kentucky, Lexington, KY.*
(No relevant relationships reported)

HISTORY: A 15-year-old high school sophomore presented to the ED with palpitations, chest pain, and lightheadedness that began during volleyball conditioning. She reported one similar episode several months earlier and was seen by pediatric cardiology for outpatient evaluation, which included resting ECG, 24-hour Holter monitor, and echocardiogram. While participating in consecutive scrimmages, she felt her heart racing and experienced dull, non-radiating substernal chest pain. Her symptoms prevented further participation and did not resolve with rest. Her heart rate was recorded as 195bpm at home.
PHYSICAL EXAMINATION: HR 186, RR 22, BP 107/68. Patient was diaphoretic but generally well appearing and in no acute distress. Cardiovascular exam revealed rapid heart rate with regular rhythm and identifiable S1 and S2 heart sounds without murmurs or clicks. Peripheral pulses were 2+ and symmetric, no JVD. Chest pain was not reproducible. Lungs were clear to auscultation bilaterally. Abdomen was soft and non-distended. Thyroid was symmetric and without nodules.
DIFFERNTIAL DIAGNOSIS:
1. Supraventricular tachyarrhythmia (SVT)
— AVNRT
— MAT
2. Sinus tachycardia
— hyperthyroidism
3. WPW syndrome
4. Ventricular tachycardia
5. Atrial fibrillation
TESTS AND RESULTS:
1. ECG
— narrow complex tachycardia with rate 184, QTc 441, and indeterminate PR
2. CMP
— creatinine 1.09
3. Troponins
— T0 <0.010
FINAL/WORKING DIAGNOSIS:
Exercise-induced SVT likely secondary to AVNRT
TREATMENT AND OUTCOME:
1. 1L IV fluid bolus
2. Vagal maneuvers - modified Valsalva technique (strain followed by passive leg raise for 15 seconds at 45 degrees)
— synchronized cardioversion was considered unnecessary with stable vital signs
— normal sinus rhythm (NSR) was achieved after 3 attempts
3. Outpatient referral to pediatric cardiology before return to activity
— previous outpatient testing was reviewed and within normal limits
— patient was given the option for antiarrhythmic management vs. catheter ablation - opted for catheter ablation
— cleared for activity with vagal maneuver education and return precautions for refractory SVT
4. Interim ED visit for refractory SVT
— vagal maneuvers were unsuccessful - adenosine was required to achieve NSR
— patient was ultimately trialed on metoprolol while awaiting EPS and ablation

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C-15   Clinical Case Slide - **Knee II**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-200F

1140   **Chair:** Aaron Rubin, FACSM. *Kaiser Permanente Sports Medicine Program, Fontana, CA.*

(No relevant relationships reported)

1141   **Discussant:** Anthony E. Annan. *Home, London, United Kingdom.*

(No relevant relationships reported)

1142   **Discussant:** Cindy Y. Lin. *University of Washington Medical Center, Seattle, WA.*

(No relevant relationships reported)

1143   May 31 8:00 AM - 8:20 AM
Knee Pain - Exercise
Samuel T. Dona, Dean Padavan, Robert Monaco, Steven Sclafani. *Atlantic Sports Health, Morristown, NJ.*
(No relevant relationships reported)

HISTORY: A 58-year-old male presented with a 4-week history of spontaneous knee pain. One year prior to presentation, he had bariatric surgery and increased his exercise regimen resulting in a 100 lb weight loss. He denies trauma or inciting injury. His pain localized to the posterolateral knee and is described as a 5/10 cramping pain. He describes a popping sensation and experiences a snapping moment in the lateral knee with deep squatting. He denies swelling and ecchymosis. He has tried ice, physical therapy and ibuprofen without relief.
PHYSICAL EXAMINATION: Focused left knee exam revealed a palpable cystic structure in the lateral popliteal fossa. There is tenderness over the lateral joint line with no instability of the proximal tibiofibular joint or biceps femoris tendon. Range of motion was 0-140° with pain greater than 120° of flexion. When the knee is brought into deep flexion, there is an audible pop over the lateral aspect of the knee. When the knee is then brought into extension, there is reproduction of an audible pop and snapping moment of the lateral knee at end range extension. Flexion McMurray's test is positive. Strength, reflexes, sensation, and pulses are normal throughout.
DIFFERENTIAL DIAGNOSIS:
1. Snapping biceps femoris tendon
2. Snapping popliteus tendon
3. Lateral meniscus tear
4. Iliotibial band friction syndrome
5. Proximal tibiofibular joint instability
TEST AND RESULTS:
Three view x-rays of left knee:
— Medial joint space narrowing. No acute fracture.
Dynamic ultrasound of the left knee:
— Normal biceps femoris tendon. Popliteal cyst noted.
MRI of left knee without contrast:
— Incomplete discoid lateral meniscus and small multiseptated popliteal cyst noted.
FINAL WORKING DIAGNOSIS: Left knee discoid lateral meniscus with subluxation of the meniscus
TREATMENT AND OUTCOMES:
1. Patient counseled on activity modification.
2. Dynamic ultrasound revealed no evidence of hamstring irregularities.
3. Unsuccessful ultrasound-guided aspiration of popliteal cyst attempted followed by an intra-articular corticosteroid injection.
4. After MRI evaluation, orthopedic surgery performed an arthroscopic partial meniscectomy of subluxing torn posterior horn and midbody saucerization of lateral meniscus.
5. He tolerated surgery well with no further subluxation of his meniscus in physical therapy.

1144   May 31 8:20 AM - 8:40 AM
Knee Effusion-gymnast
Reno Ravindran. *Nationwide Childrens Hospital, Columbus, OH.*
(No relevant relationships reported)

HISTORY: 12 y/o gymnast comes into the office complaining of right knee swelling with minimal pain for 3 days after a gymnastics competition. She does not recall a specific injury during the competition but noticed discomfort as the day went on. The swelling worsened later that evening. They were seen by their primary care provider

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Abstracts were prepared by the authors and printed as submitted.

who referred them in to sports medicine clinic. She does endorse similar swelling and pain 6 weeks ago that responded to ibuprofen and ice and resolved in 2-3 days. Denies locking, catching, popping or instability episodes in knee. Family history: unknown; adopted

PHYSICAL EXAMINATION: Inspection: Moderate sized effusion, no erythema. Range of motion full in flexion and extension with mild discomfort in full flexion. Palpation: Mild tenderness around patellar facets, mild medial joint line tenderness. Special Tests: Negative Lachmans, Negative McMurray's, Negative patellar apprehension, Mild pain with valgus stress at 30degrees. Proprioception: Engaged Hip exam normal

DIFFERENTIAL DIAGNOSIS: 1.Patellofemoral Syndrome. 2.MCL sprain. 3.Inflammatory process: JIA, Synovitis. 4.Patellar instability

TEST AND RESULTS: X-rays 4 view Within normal limits. MRI with and without contrast: Findings consistent with an inflammatory synovitis with a moderate knee effusion and moderate synovitis.2. Signal abnormality both deep and superficial to the medial collateral ligament may be secondary to strain. Labs: ESR 20mm/h, CBC normal, CRP: normal, ANA positive, Lyme serology positive

FINAL WORKING DIAGNOSIS: 1.Lyme Synovitis 2.Grade I MCL sprain

TREATMENT AND OUTCOMES: Currently undergoing antibiotic treatment with doxycycline 75mg BID for 4 weeks. Is also going through physical therapy in regards to MCL sprain.

1145   May 31 8:40 AM - 9:00 AM

Acute Knee Pain in Adolescent Basketball Player

Kristopher Paultre. *JMH/UM, Miami, FL.*

(No relevant relationships reported)

History:

14 y/o male basketball player presents to ED after sustaining an injury to his left lower extremity. This occurred during a school basketball game while landing from a jump shot. Patient stated he felt a pop in his left knee upon landing and rated pain a 9/10 severity. Immediately after, he had swelling with decreased ROM and was unable to flex/extend his knee due to pain.

PE:

Left Knee:

Edema was present with mild discoloration over the anterior of knee and severe tenderness upon palpation over anterior patellar tendon. Patient unable to perform active ROM. Passive ROM limited secondary to pain. Full scope of exam, including assessment of ligaments, menisci, and ROM also limited secondary to pain.

Bilateral Ankles:

No deformity noted b/l. Non-tender on palpation. Neurovascularly intact.

Differential Diagnosis:

Patellar dislocation

ACL tear Patellar tendon rupture Proximal tibia fractureDistal femur fracture Meniscal tear

Tests and Results:

X-rays of left femur (3 view), left knee (AP/ lateral), and left tibia/fibula (3 view): Findings showed a displaced type-3a tibial tuberosity avulsion fracture, displaced 1.5 cm with an associated knee effusion and intra-articular extension. No additional fractures noted on left femur, knee, tibia, or fibula.

Final/Working Diagnosis:

Closed left tibial tubercle avulsion fracture, displaced type-3A with avulsion of left quadriceps infrapatellar tendon.

Treatment and Outcome:

1.Open reduction and internal screw fixation of tibial tuberosity with repair of infrapatellar tendon

2.long leg walker cast placed

3.At 6 week follow-up visit, repeat x-rays showed anatomic alignment of the fracture site,good positioning of 2 fixation screws, and articular surface which was realigned. Knee immobilizer was discontinued and he was given walker for stability. Instructed to d/c use of walker once left knee felt stable and remain out of athletic activities until further evaluation. Referred to PT for Quad strengthening and ROM exercises.

4. At 5 month post injury visit, patient showed favorable progress. He had full ROM, improved strength, and was cleared to resume sports starting at a low level intensity. He was advised to gradually increase the duration and intensity of his training. Patient advised to continue knee mobility exercises and to f/u with PCP for routine Health care.

1146   May 31 9:00 AM - 9:20 AM

Soccer Knee Injury

Kameron Bazmi[1], Caitlin Cicone[1], Richard G. Chang[2]. *[1]SUNY Downstate, Brooklyn, NY. [2]Icahn School of Medicine at Mount Sinai, New York, NY.*

(No relevant relationships reported)

HISTORY: 19 year old male presented with right thigh weakness and difficulty walking for 2 years following a soccer injury that resulted in a right patellar dislocation. Patient was managed non-operatively for 1 year after the injury before

proceeding to surgical intervention. Subsequently, the patient underwent medial patellofemoral ligament reconstruction. Since the injury, patient reported weakness and atrophy of his right quadriceps, with no improvement after surgery. He denied numbness or pain, but did complain of intermittent right lower extremity buckling.

PHYSICAL EXAMINATION: Examination in the clinic revealed right quadriceps atrophy with mild right knee effusion. There was no tenderness to palpation along right quadriceps, knee joint line, patella or patellar tendon. There was limited active range of motion secondary to weakness, with passive range of motion through 0 to 90 degrees limited by pain. Manual muscle testing was 1/5 for right knee extension, 4-/5 for right hip abduction, all else 5/5. Lower extremity reflexes were 2+ and symmetrical, bilateral. There was right knee buckling during ambulation.

DIFFERENTIAL DIAGNOSIS: 1.Disuse atrophy 2.Lumbar plexopathy 3.Lumbar radiculopathy 4.Quadriceps muscle avulsion 5.Polymyositis 6.Diabetic polyneuropathy

TEST AND RESULTS: Electrodiagnostics

-Right femoral nerve showed prolonged onset latency

-The right sural nerve showed prolonged peak latency and slowed conduction velocity

-The right superficial peroneal nerve showed prolonged peak latency and mild slowed conduction velocity

-The right saphenous showed decreased amplitude

-Right vastus lateralis, rectus femoris, and vastus medialis showed decreased insertional activity, minimal to no recruitment; vastus lateralis most affected -Right demyelinating and axonal femoral neuropathy with the lesion at or distal to the right inguinal ligament & right sural and superficial peroneal sensory neuropathies

FINAL WORKING DIAGNOSIS: Primarily axonal femoral neuropathy

TREATMENT AND OUTCOMES:

1. Patient started physical therapy with a focus of strengthening quadriceps, hip abductors and core 2. Patient prescribed Meloxicam 7.5 mg to be used as needed 3. Patient was non-compliant with therapy for over 6 months, did not return to sport and eventually lost to follow up

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1147   May 31 9:20 AM - 9:40 AM

Chronic Medial Knee Pain in a Collegiate Basketball Player and Marching Band Member

Nicholas E. Anastasio, David Hryvniak. *University of Virginia, Charlottesville, VA.* (Sponsor: Robert Wilder, MD, FACSM)

(No relevant relationships reported)

History:

Patient 1:

A 17 year-old female collegiate basketball player presented with insidious onset right medial knee pain for the last 8 months. Pain waxed and waned with activity. No history of swelling, instability or locking. No numbness or weakness. Pain located diffusely over the medial knee and proximal medial tibia. Symptoms refractory to PT, patellofemoral kinesiotaping, medial arch support orthotics and NSAIDs. No relief following Medrol dose pack, intraarticular corticosteroid injection, or pes anserine bursa corticosteroid injection.

Patient 2:

A 19 year-old female collegiate marching band member presented with insidious onset right medial knee pain present for 4 years. Patient reported intermittent swelling but denied instability or locking. Symptoms were worse with walking and marching. Previous Rheumatologic consult unrevealing. Symptoms refractory to PT, knee sleeve, and patellar straps. No relief following right pes anserine bursa corticosteroid injection.

Physical Examination:

Patient 1 - Knee without effusion. Diffuse tenderness to palpation over the medial knee at and below mid medial joint line. ROM and strength normal. No laxity. Neurovascular intact.

Patient 2 - Knee without effusion. Tenderness to palpation over the medial joint line and distally over pes anserine. Tinel's sign positive over the medial femoral condyle. ROM and strength normal. No laxity. Neurovascular intact.

Differential Diagnosis:

1. Pes anserine bursitis

2. MCL bursitis

3. Patellofemoral syndrome

4. Medial meniscal tear

5. Medial patellar plica

6. Saphenous neuralgia

Test and Results:

Patient 1:

XR Knee - No fracture or joint effusion.

MRI knee - No meniscus tear. No internal derangement. Mild increased T2 signal within the superior lateral aspect of Hoffa's fat.

Diagnostic saphenous nerve block - 0.5% bupivacaine injected 2 inches cephalad to the medial joint line - 24 hours of relief.

Patient 2:

XR Knee - No fracture or malalignment.

MRI knee - Unremarkable MRI of the knee.

Labs - ESR 8, TSH 1.7

Final/Working Diagnosis:

Saphenous Neuralgia

Treatment and Outcomes:
Patient 1:
Saphenous nerve injection - 40 mg triamcinolone/0.5% bupivacaine - 5 months of relief.
US guided hydrodissection saphenous nerve - Full resolution for 1.5 years.
Patient 2:
US guided hydrodissection saphenous nerve - 6 months of relief.

1148   May 31 9:40 AM - 10:00 AM
Lingering Right Knee Pain - Mountain Biking

Andrew McBride. *University of Colorado - Denver, Aurora, CO.*
(Sponsor: John Hill, FACSM)
(No relevant relationships reported)

Title: Lingering right knee pain - mountain biking Authors: Andrew McBride, John Hill, FACSM, Michelle Wolcott Sponsor: John Hill, FACSM Institutions: University of Colorado - School of Medicine History: Patient is a 32 y/o previously healthy male who presented to sports medicine clinic with one month of right anterior knee pain. Pain began after he swerved to avoid dogs while mountain biking. He fell from his bike and directly struck his anterior right knee on a rock. He had immediate pain and swelling but continued riding. His pain did not resolve with ice and ibuprofen, if fact it gradually worsened especially with deep knee bending and mountain biking. He felt the knee was unstable but denied locking or catching. Physical Exam: Right knee: Neutral alignment; Normal gait; No effusion; Patellar apprehension with medial facet tenderness and patellofemoral crepitus; swelling of patellar tendon; Lachman with soft endpoint; slight Anterior drawer; medial joint line pain; Normal neurovascular exam Differential Diagnosis: ACL sprain/tear, Patellar tendonitis, Medial meniscus tear, Patellofemoral syndrome, Fat pad impingement Tests and Results: X-ray of right knee showing soft tissue edema with small osseous fragment around distal patella; MRI right knee showing severe patellar tendinosis with no internal knee derangement; Diagnostic U/S showing severely thickened (1.2 cm) patellar tendon with near complete disorganized fiber pattern with only mild neovascularity seen. Final Diagnosis: Traumatic patellar tendonitis Treatment and Outcomes: The patient initially tried rest, ice and ibuprofen with minimal relief. He later tried 4 visits with PT but pain worsened during these sessions.. He was referred to U/S clinic for possible percutaneous tenotomy. At this visit the tendon appeared so disorganized that it was recommended he follow-up with our knee surgeon to discuss surgical management options. He is currently in the surgical planning process, complete follow-up will be available in May 2018.

C-16   Clinical Case Slide - **Medical Issues II**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-200E

1149   **Chair:** William W. Dexter, FACSM. *Maine Medical Center, Portland, ME.*
(No relevant relationships reported)

1150   **Discussant:** Andrea Stracciolini, FACSM. *Children's Hospital Boston, Boston, MA.*
(No relevant relationships reported)

1151   **Discussant:** Francis G. O'Connor, FACSM. *Uniformed Services University, Bethesda, MD.*
(No relevant relationships reported)

1152   May 31 8:00 AM - 8:20 AM
Abdominal Pain - Professional Singer

Tamara Rial-Rebullido[1], Fernanda Gonzalez[2], Iván Chuli-Medrano[3]. *[1]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [2]Universidad Autónoma de Durango, Durango, Mexico. [3]University of Alicante, Alicante, Spain.*
(Sponsor: Avery D. Faigenbaum, FACSM)
(No relevant relationships reported)

HISTORY: A 24-year-old male singer presented symptoms of trunk and abdominal pain, reduced breathing capacity and limited trunk mobility after six months of a laparoscopic Nissen fundoplication due to gastric volvulus associated with a paraesofagic hiatal hernia. His pain made it difficult to sing and perform sustained quality notes. He was referred to respiratory physical therapy. He was a non-smoker and not taking any medications. **PHYSICAL EXAMINATION:** Height 173 cm, weight 76 kg, body mass index 25.3 kg/m². Abdominal and thoracic examination

revealed limited thoracic amplitude, diaphragmatic hypertonicity, altered sensitivity from T7 to T10, limited range of motion and pain during right and left trunk rotations and trunk extensions. Mild epigastric tenderness. Hemodynamically stable.
DIFFERENTIAL DIAGNOSIS: 1. Dyspnea 2. Respiratory disease 3. Hernia **TEST AND RESULTS**: Visual Analog Scale revealed pain 7 under ribcage and xiphoid process. Cough hyperpressure test negative. Positive toe touch test. Breath-holding test positive. Negative thoracic amplitude test. **FINAL WORKING DIAGNOSIS**: Dysfunctional breathing and muskuloskeletal pain. **TREATMENT AND OUTCOMES**:
1. Progressive breathing exercises. 2. Diaphragm stretching exercises. 3. Hypopressive exercises. 4. Returned to singing after 10 weeks (3 sessions per week) when he had full trunk motion, no abdominal pain and was able to meet the demands of vocal performance.

1153   May 31 8:20 AM - 8:40 AM
Abnormal Weight Gain in a Collegiate Athlete - Swimming

Roberta Dennison. *Boston Children's Hospital, Boston, MA.*
(Sponsor: Kathryn E. Ackerman, MD, MPH, FACSM)
(No relevant relationships reported)

HISTORY: 21 year-old-female Division III collegiate swimmer presenting for evaluation of significant weight gain and declining performance. Patient reports 20 lb weight gain over 18 months without change in diet or exercise routine. She endorses 15+ hrs/wk of training between pool and dryland exercise. Over prior 6 months, she continued to gain weight despite diligent dietary adjustments and nutrition consultation. Patient was diagnosed with PCOS in high school. She reports long-standing issues with irregular menses, acne, and facial hair, which were previously managed with spironolactone, OCP, and metformin. Medications were discontinued 2 months prior to presentation, as they were no longer effective. Simultaneously, patient was started on bupropion as an appetite suppressant, but has not noticed any weight change since initiation.
PHYSICAL EXAMINATION:
Orthostatic Vitals:
Lying: BP: 115/75, HR: 58
Standing: BP: 110/70, HR: 64
Weight: 75.3 kg; Height: 165 cm; Body Mass Index: 27.7 kg/m²
GEN: Well-appearing young female in no acute distress. Alert and oriented x3.
HEENT: Normocephalic, atraumatic, with round facies. Significant coarse facial hair. EOMI. Thyroid is nontender without nodules. +Dorsocervical fat pad.
CV: RRR, no M/R/G
Resp: CTAB
Ext: Warm and well-perfused, no edema, moving all 4 extremities, gait stable.
Skin: Thin purple striae on breasts, abdomen, and inner thighs. + facial acne.
DIFFERENTIAL DIAGNOSIS:
1) PCOS
2) Hypothyroidism
3) Caloric surplus
4) Acromegaly
5) Hypercortisolism
TESTS AND RESULTS:
Labs:
Chemistry panel WNL
TSH 1.59 uIU/mL
Free T4 0.87 ng/mL
17-hydroxyprogesterone: 69 ng/dL
DHEAS: 559.3 mcg/dL (H)
LH: 11.8 IU/L
FSH: 4.36 IU/L
Testosterone: 53 ng/dL
Free testosterone: 11.3 pg/mL (H)
Sex hormone binding globulin: 25 nmol/L (L)
Free Androgen Index: 7.36 (H)
IGF-1: 275 ng/mL
Prolactin 19.92 ng/mL
24 hour urine cortisol: 65.5 mcg (H)
AM Cortisol following 1mg dexamethasone suppression test 8.5 ug/dL
FINAL/WORKING DIAGNOSIS:
Hypercortisolism
TREATMENT AND OUTCOMES:
Currently awaiting results of high dose dexamethasone suppression test to further determine pituitary vs. adrenal vs. ectopic origin of Cushing Syndrome.

1154 May 31 8:40 AM - 9:00 AM
Syncopal Episode in a College Football Player

Bjorn A. Jacobson, Richard A. Okragly. *TriHealth Bethesda Primary Care Sports Medicine Fellowship, Cincinnati, OH.* (Sponsor: Henry Stiene, FACSM)

(No relevant relationships reported)

HISTORY:A 20 year old African American college football player started to feel faint, walk slowly and then collapse during the end of a fitness session. Immediately triaged by his AT he was unresponsive to verbal or noxious stimuli, demonstrating brief decorticate posturing, tachypneic, with palpable pulses. The episode lasted 90 seconds. I arrived to find an alert and oriented male in no distress. Initially resistant, he did eventually agree to go to the ED. He stated he had taken 5 decongestant pills in the preceding 24 hours. He denied any preceding chest pain or palpitations, but did feel short of breath and light headed prior to collapsing. He said that he had a previous syncopal episode during exercise years ago that was reportedly secondary to dehydration.
PHYSICAL EXAMINATION: Initial exam on the field showed an alert, fully coherent and oriented well appearing male in no distress; pupils equal/reactive to light; no foaming of the mouth or tongue bite wounds; a regular rate and rhythm with no murmurs/gallops; lungs clear to auscultation; overall a benign physical exam. VS - BP 133/69, HR 63, RR 18, T 97.9F, SpO2 98%
DIFFERENTIAL DIAGNOSIS: 1) Vasovagal syncope or other reflex (neurally) mediated syncope 2) Cardiovascular syncope 3) Hypertrophic Cardiomyopathy 4) Metabolic (drug induced) syncope 5) Volume depletion orthostatic syncope 6) Seizure
TEST AND RESULTS: BMP, CBC, Cardiac Enzymes - Normal; Chest XR AP and Lateral - Normal; EKG - Sinus Rhythm, Normal Axis, ST elevation in leads V1-V5 followed by T wave inversions, Prominent QRS complexes (unchanged on 4 EKGs over 3 weeks); 2D Echo - LVEF 55-60%, mild concentric LVH, bicuspid aortic valve; Cardiac MRI - LVEF 55%, no LVH (wall thickness less than 11 mm), tricuspid aortic valve; Stress EKG (GXT) - Baseline EKG abnormalities normalized, negative for ischemia, Duke treadmill score 14 (low risk)
FINAL WORKING DIAGNOSIS: Vasovagal syncope/possibly related to pseudoephedrine
TREATMENT AND OUTCOMES: After extensive cardiac work up, baseline EKG repolarization abnormalities normalized with exercise testing. Given his normal cardiac MRI and normal stress testing he was cleared by cardiology for full athletic participation. He was advised to immediately notify us if he develops any recurrent symptoms. He is now completing his college football season without incident.

1155 May 31 9:00 AM - 9:20 AM
Headache and Near Syncope in a Soldier After Training

Robert H. Lutz. *Duke Sports Science Institute, Durham, NC.* (Sponsor: Shawn F. Kane, FACSM)

(No relevant relationships reported)

HISTORY: A 34 y/o male active duty Soldier presented to an Army clinic with headache, nausea and lightheadedness around 1000 in the morning. Symptoms started indoors in a classroom environment, two hours after conducting a challenging obstacle course. On a bathroom break he felt like he was going to pass out after urinating and knelt to the ground. He denied falling off an obstacle, striking his head or sustaining any injuries on the morning obstacle course. He was weak, nauseous, and dizzy, with a 4/10 headache. He had been previously well and reported no history of head injury, fever, or neck stiffness. He denied peri-oral tingling or numbness. During the evaluation, his headache increased in severity. Past medical history significant for radio frequency ablation for SVT 2007. The course medic verified there was no injury and reported the Soldier had recently been drinking a lot of water and protein shakes. Training for the three days prior to presentation included several prolonged, physically demanding events.
PHYSICAL EXAMINATION: Initial vitals: Pulse- 112, B/P- 115/69, respirations-28, SPO2- 99%, GCS- 15
General: Pt on gurney with eyes closed, responding appropriately to questions. Respiratory rate rapid and deep. The physical exam to include a complete neurologic exam was only remarkable for mild photophobia and a lack of carpal pedal spasms.
DIFFERENTIAL DIAGNOSIS:
1. Hyperventilation
2. Hyponatremia
3. Hypoglycemia
4. Arrhythmia
5. Migraine Headache
6. Micturition Syncope
7. Sub-acrachnoid Hemorrhage
8. Panic Attack
TESTS AND RESULTS:
-Glucose: 90, CMP and CBC normal, UA: 2+ ketones, myoglobin negative.
-ECG: sinus tachycardia, normal axis, normal intervals, no ischemic changes.
-Head CT: right-sided 2.8 cm epidural hematoma with 8mm of midline shift. No skull fracture identified.

FINAL/WORKING DIAGNOSIS:
Epidural Hematoma
TREATMENT AND OUTCOME:
1. Transfer to a tertiary care center for craniotomy and hematoma evacuation of the hematoma. There was a fine, non-displaced fracture of the temporal bone discovered at time of surgery.
2. No neurologic sequelae.
3. Cleared to return to training after 6 months of healing.
4. Investigation after the injury revealed the Soldier had sustained minor blow to the right side of the head 3 days prior to presentation.

1156 May 31 9:20 AM - 9:40 AM
Going the Distance Makes Me Tired: Seizure in a Cross Country Runner

Caitlin G. Waters, James Broadhurst, John H. Stevenson. *UMass Memorial Medical Center, Worcester, MA.* (Sponsor: Pierre Rouzier, FACSM)

(No relevant relationships reported)

HISTORY: 21 y/o M collegiate cross country runner presents to team doctor with hand shaking and body cramping after a strenuous 12 mile run. Complained of generalized weakness, abdominal and leg cramping, nausea, diarrhea, slight shaking of his hands, and thirst. Felt well prior to the run. Endorsed increased thirst this week and had been drinking water. Sent to the ER for IV hydration. On his way to the ER, he suddenly became unresponsive with stiffness, shaking, and frothing at the mouth.
PHYSICAL EXAMINATION: Temp: 36.9 Celsius, BP: 140/80, HR: 90-110, RR:21-27, SpO2: 100% on RA, GEN: Responsive, staring. Pale. NAD. Photosensitive. No rigidity. Clear speech. PSYCH: Answers "Yup." to most questions. Occ. confused. Alert. Oriented x3. HEENT: PERRL. EOMI. No LAD. Neck supple. No JVD. CARDIOPULM: CTA B/L. S1, S2, RRR, no MRG, ABD: Soft, NT, ND, no HSM, BS+ , EXT: No edema, capillary refill <2, SKIN: No rash, NEURO: CN II-XII testing limited, but grossly intact. Would not stick out tongue. Opens eyes on request. Normal grasp. Reflexes 2+ DTR's b/l.
DIFFERENTIAL DIAGNOSIS:Metabolic Derangement, Hyponatremia, Hypercalcemia, Hypoglycemia; Rhabdomyolysis/Dehydration; Toxic Encephalopathy; Drug Withdrawal; Intracranial Mass; CNS Infection; Epilepsy
TEST AND RESULTS:Initial Na 118, Anion Gap 17, Bicarbonate 15, Magnesium 1.5, initial CPK 917, CK rose to greater than 60,000 despite IV hydration, Toxicology Negative, CT head: questionable hypodensities in the medial temporal lobe, MRI Brain: normal, EEG: negative
FINAL WORKING DIAGNOSIS: Seizure induced by Hyponatremia Secondary to Psychogenic Polydipsia; Hyponatremia Induced Myopathy
TREATMENT AND OUTCOMES:Sodium corrected in the ICU over a few days. Patient drank a total of 48 oz prior to his run, and 160 oz post-run. Despite hydration and gentle correction of sodium, CK continued to rise. Rhabdomyolysis thought initially due to seizure and muscle breakdown in the setting of aggressive exercise; however, the delayed clearance of CPK raised concerns for glycogen storage deficiency vs genetic dysfunction. Referred to Genetics for a muscle biopsy to rule out glycogen storage deficiency, biopsy pending. Returned to cross country running with strict instructions regarding hydration, runs 5-8 miles without any issues.

1157 May 31 9:40 AM - 10:00 AM
Cotton Mouth In A Cross Country Runner.

Jason A. Kirkbride, Siobhan Statuta. *University of Virginia, Charlottesville, VA.* (Sponsor: John MacKnight, FACSM)

(No relevant relationships reported)

HISTORY: A 21-year-old Division I cross-country runner presented to the athletic training room the day he was to leave for ACC championships, concerned about his intolerable dry mouth, leg heaviness and worsening fatigue. He had an unintended weight loss of 15 pounds despite working with Sports Nutrition over the summer due to a baseline BMI of 17.9 and a history of a sacral stress fracture the prior year. He endorsed normal eating pattern, but often felt full secondary to increased fluid intake from his dry mouth. Over the past few days, he also noted the onset of blurry vision. His only medication was an Omega-3 supplement and he denied a family history of autoimmune diseases, but did have an uncle with Type II diabetes mellitus.
PHYSICAL EXAMINATION: Temp: 36.9 °C (Oral) HR: 54 beats per minute Orthostatic blood pressure: Supine: 112/72 Standing: 108/65 Weight: 61.3 kg BMI: 17.36 kg/m2 GEN: No acute distress, Thin. Cachectic appearing. HEENT: Eyes prominent where conjunctiva is visible around entire iris, no thyromegaly. Tongue and uvula covered with white scrapable film, no cervical lymphadenopathy. CV: Normal S1, S2, normal rhythm. No murmurs. Bradycardic (baseline for patient). NEURO: Alert, oriented x3, speech fluent, sensation intact. PSYCH: Quiet, slower to respond compared to baseline. "Spacey," but logical thinking. No tangentiality.
DIFFERENTIAL DIAGNOSIS: Relative energy deficiency in sport Overtraining syndrome Thyroid disease Anemia Viral illness/ Mononoculeosis Diabetes Mellitus Type 1 Malignancy Diabetes Insipidus

TEST AND RESULTS: Urinalysis: Color yellow, Appearance Clear, Specific Gravity 1.035, pH 6.5, Protein Neg., Glucose 3+, Ketone Moderate, Bilirubin Neg., Blood Neg., Nitrite Neg., Leukocyte esterase neg. CBC: WBC 7.3, Hgb. 16.6, Hct. 46, Plt. 268 CMP: Na 130, K+ 5.6, Cl. 88, Bicarb. 27, BUN. 39, Cr. 0.8, Glc. 870, Alk phos. 183, ALT 67, AST 35, Anion Gap 15 TSH 0.27, Free T4 0.9, Free T3 1.5 CRP 0.2 ESR 7 Ferritin 224 HIV Non-reactive Hgb. A1c 13.6
FINAL WORKING DIAGNOSIS:New onset Diabetes Mellitus Type 1 in diabetic ketoacidosis
TREATMENT AND OUTCOMES:Urgent transport to the emergency department for DKA management including insulin and intravenous fluids with several day admission. Endocrinology work-up in process. Plan to follow weekly x 6 weeks and held from sport the remainder of the semester.

C-33   Free Communication/Poster - **Acute Exercise - Cardiorespiratory Physiology**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1193   Board #1   May 31 8:00 AM - 9:30 AM
Aerobic Exercise Reduces The Pro-thrombotic Potential Of Circulating Microparticles in Healthy Individuals

Patrick J. Highton[1], David J. Stensel[1], Fernanda R. Goltz[1], Naomi Martin[2], Nicolette C. Bishop[1]. [1]*Loughborough University, Leicester, United Kingdom.* [2]*De Montfort University, Leicester, United Kingdom.*

(No relevant relationships reported)

PURPOSE: Microparticles (MPs) are extracellular vesicles shed upon cellular activation or apoptosis that possess pro-thrombotic functions via Tissue Factor (TF) expression. Aerobic exercise (AE) may impact circulating MPs, though recent research is conflicting. Previous other results may also reflect underlying circadian variations. This study investigated the impact of AE or rest with a standardized meal on MP phenotypes and pro-thrombotic potential over a morning period.
METHODS: 15 healthy males (22.9 ± 3.3 years; 81.9 ± 11.4 kg; VO_2 max 54.9 ± 6.5 mL·kg·min^{-1}; mean ± SD) completed 1 hr of AE (70% VO_2max) at 9am, and consumed a standardised meal (1170 kcal, 43% CHO, 17% PRO, 40% fat) at 10:45am. Venous blood samples were taken at 9am, 10am and 11:30am. Control trials included no exercise. MP phenotypes (platelet, neutrophil, monocyte and endothelial cell) and TF expression were assessed by flow cytometry.
RESULTS: Data are presented as mean ± SEM**.** Effect sizes are presented as η^2 (0.2 = small, 0.5 = moderate, 0.8 = large; Statistical Power Analysis for the Behavioral Sciences, Cohen, 1988). Total numbers of MP increased from 9am to 10am (1.62 ± 0.59 to 1.74 ± 0.73 x10^{10}/L, p = .016, η^2 = .105) in both conditions, but was unaffected by trial. All other phenotype counts remained unaffected by trial or time. The % of TF+ platelet-derived MPs reduced from 9am to 10am (44.0 ± 5.5 to 21.5 ± 2.4%, p = .001, η^2 = .582) in the exercise trial, but remained unchanged in the control trial (36.8 ± 4.7 to 34.9 ± 3.9%, p = .972). %TF+ neutrophil-derived MPs reduced from 9am to 11:30am (42.3 ± 4.4 to 25.1 ± 3.8%, p = 0.48, η^2 = .801) in the exercise trial, but remained unchanged in the control trial (28.5 ± 4.1 to 32.2 ± 2.5%, p = .508).
CONCLUSION: The increase in total MP count was not affected by exercise and may be due to diurnal variation – this warrants further investigation over a 24h period. Moderate intensity AE with a standardized meal seem to have little effect on absolute circulating MP
phenotype counts in this population. However, AE induced a large reduction in the % of platelet and neutrophil MPs that express TF, suggesting a mechanism via which AE can reduce cardiovascular risk via reduced TF-stimulated coagulation and thrombosis. This effect requires more investigation in clinical populations at greater cardiovascular disease risk.

1194   Board #2   May 31 8:00 AM - 9:30 AM
FURIN Variant Associations with Postexercise Hypotension are Ethnicity and Intensity Dependent

Burak T. Cilhoroz[1], Gregory A. Panza[2], Elizabeth D. Schifano[1], Garrett I. Ash[3], Lauren M.L. Corso[1], Ming-Hui Chen[1], Ved Deshpande[1], Amanda Zaleski[2], Paulo Farinatti[4], Beth A. Taylor, FACSM[2], Rachel J. O'Neill[1], Paul D. Thompson, FACSM[2], Linda S. Pescatello, FACSM[1]. [1]*University of Connecticut, Storrs, CT.* [2]*Hartford Hospital, Hartford, CT.* [3]*Yale University, New Heaven, CT.* [4]*Rio de Janeiro State University, Rio de Janeiro, Brazil.* (Sponsor: Linda S. Pescatello, FACSM)

(No relevant relationships reported)

Furin (paired basic amino acid cleaving enzyme) is a proprotein convertase subtilisin/kexin (PCSK) enzyme and important in pro renin receptor processing. *FURIN* variants have been identified to be involved in multiple aspects of blood pressure (BP) regulation, and targeting PCSKs is a promising future form of drug therapy.
PURPOSE: To examine the associations among *FURIN* variants and the immediate blood pressure (BP) response to bouts of acute exercise performed at different intensity, termed *postexercise hypotension* (PEH).
METHODS: Obese (30.9±3.6 kg m^{-2}) African American (n=14) (AF) and Caucasian (n=9) adults 42.0±9.8yr with hypertension (139.8±10.4/84.6±6.2mmHg) performed three random acute experiments: bouts of vigorous (VIGOROUS) and moderate (MODERATE) intensity cycling and control. Subjects were attached to an ambulatory BP monitor for 19 hr. We performed deep-targeted exon sequencing using with the Illumina TruSeq Custom Amplicon kit. Variant genotypes were coded as the number of minor alleles (#MA) and selected for additional statistical analysis based upon Bonferonni or Benjamini-Yekutieli multiple testing corrected p-values under time adjusted linear models for 12 hourly BP measurements, when all subjects were awake and ambulating; and for 19 hourly BP measurements, the total duration the BP monitor was worn.
RESULTS: After VIGOROUS over 19 hr, as *FURIN* #MA increased in rs12917264 (p=2.4E-04), rs6226 (p=2.4E-04), and rs75493298 (p=6.4E-04), systolic BP (SBP) decreased 30.4 to 33.7 mmHg; and in rs12917264 (p=1.6E-03), rs6226 (p=1.6E-03), and rs75493298 (p=9.7E-05), diastolic BP (DBP) decreased 17.6 to 20.3 mmHg among AF only. In addition, after MODERATE over 19 hr in *FURIN* rs74037507, as #MA increased, SBP increased 20.8 mmHg among AF only. Whereas, after MODERATE over the awake hours, as *FURIN* #MA increased in rs2071410 (p=6.1E-04), rs1573644 (p=6.1E-04), and rs6227 (p=6.1E-04), DBP decreased 12.5 mmHg among Caucasians only.
CONCLUSION: *FURIN* variants were associated with PEH after MODERATE and VIGOROUS over 19 hr among AF, and after MODERATE over the awake hours among Caucasians. *FURIN* appears to exhibit ethnicity and intensity dependent associations with PEH that merit further exploration among a larger, ethnically diverse sample of adults with hypertension.

1195   Board #3   May 31 8:00 AM - 9:30 AM
Repeatability of the Neurocardiovascular Responses to Isometric Handgrip in Young Adults

Gabrielle A. Dillon[1], Paul J. Fadel, FACSM[2], Lacy M. Alexander, FACSM[1], Jody L. Greaney[1]. [1]*Pennsylvania State University, University Park, PA.* [2]*University of Texas Arlington, Arlington, TX.* (Sponsor: Lacy Alexander, FACSM)

(No relevant relationships reported)

Blood pressure (BP) and muscle sympathetic nerve activity (MSNA) responses to isometric handgrip (HG) are primarily driven by the skeletal muscle metaboreflex. The magnitude of the pressor and sympathoexcitatory responses to isometric HG and isolation of the muscle metaboreflex with post exercise ischemia (PEI) are commonly used maneuvers to compare groups and assess aberrant neurocardiovascular regulation. However, the repeatability of these responses remains unclear. **PURPOSE:** Consistent with the NIH requirements for rigor and reproducibility in biomedical research, we sought to determine the intra-day repeatability of the neurocardiovascular responses to isometric HG and PEI in young adults. We tested the hypothesis that the increases in BP and MSNA during isometric HG and PEI would be repeatable within an individual. **METHODS**: Mean arterial pressure (MAP; finger photoplethysmography), heart rate (HR; ECG), and MSNA (peroneal microneurography) were measured in 8 (6 M; 24±1 yrs) healthy young adults at baseline and during isometric HG at 30% of maximum voluntary contraction followed by PEI to isolate the muscle metaboreflex. Subjects completed two trials separated by 15 min. Linn's repeatability coefficient (ρc) was used to assess repeatability. **RESULTS:** MAP and MSNA increased significantly during HG and PEI in all subjects during both trials (all P<0.05). The BP and HR responses to HG (MAP: Δ29±5 v. Δ32±4 mmHg, ρc= 0.68, 95%CI: 0.09 -0.92; HR: Δ14±3 v. Δ20±4 bpm, ρc= 0.56, 95%CI: 0.0-0.84) and PEI (MAP: Δ18±5 v. Δ18±5 mmHg, ρc= 0.62, 95%CI: 0.14-0.86; HR: Δ-1±1 v. Δ0±2 bpm, ρc= 0.74, 95%CI: 0.39-0.91) were repeatable. The increase in MSNA during HG (n=5; Δ14±3 v. Δ20±6 bursts/min, ρc= 0.44, 95%CI: -0.173-0.804) was only moderately repeatable; however, during

THURSDAY, MAY 31, 2018

PEI better repeatability was found (Δ12 ± 3 v. Δ15 ± 3 bursts/min, ρc= 0.86, 95%CI: 0.130 - 0.986). **CONCLUSIONS:** These preliminary data suggest that MAP and HR responses to isometric HG and PEI are repeatable within an individual. Likewise, the MSNA response to PEI was repeatable, however, there was less repeatability of the MSNA response to isometric HG. These initial findings have important implications for the assessment and interpretation of neurocardiovascular regulation during HG and PEI, particularly when group comparisons are being made.

1196   Board #4   May 31 8:00 AM - 9:30 AM

Ambulatory Blood Pressure Lower Following Aquatic Exercise than Land Treadmill Exercise

Dustin P. Joubert, Caitlin Hogan, Jessica Barnes, Taylor Todd, Joshua Warner. *Stephen F. Austin State University, Nacogdoches, TX.* (Sponsor: Stephen F Crouse, FACSM)

(No relevant relationships reported)

Blood pressure (BP) is an important marker of cardiovascular (CV) health. Aquatic (AQ) exercise training has been shown to reduce BP reactivity to exercise to a greater degree than land treadmill (LT) training. Furthermore, an acute bout of AQ exercise tended to elicit a greater post-exercise hypotensive response and augmentation in flow-mediated dilation (FMD). However, it is unclear how long the post-exercise hypotensive benefits last following an acute bout of AQ exercise. **Purpose:** To determine the effects of acute bouts of deep water aqua-jogging and land treadmill exercise on daytime ambulatory BP (AMBP) in pre-hypertensive, physically untrained men and women. **Methods:** Following resting BP screening, 12 subjects (9 male, 29 ± 13 years, 30.4 ± 6.1 kg·m^{-2}, 127 ± 8/ 82 ± 8 mmHg) completed acute bouts of both AQ and LT exercise at 55% heart rate reserve for a duration of 30 minutes. Exercise sessions began at 0700 hours. Immediately following the exercise bout, subjects wore an AMBP device (Oscar 2, Suntech Medical), which was programmed to take measurements every 15 minutes throughout the day until 1600 hours. Sessions occurred on separate days with 2-7 days off between sessions. The order that the modes were performed was counterbalanced among the subjects. Subjects were required to abstain from alcohol, caffeine, nicotine, and exercise on the day of the session and 24 hours prior. Comparisons between modes were made by a dependent sample t-test. **Results:** All results are displayed in Table 1. **Conclusion:** Daytime AMBP was significantly lower following AQ than LT exercise. This is consistent with previous findings of a greater post-exercise hypotensive response in the 1-2 hours post AQ exercise. Previous research also demonstrated improved FMD and increased atrial natriuretic peptide levels following AQ exercise, which could potentially explain the reduced BP findings. These data further support the efficacy of AQ exercise for the promotion of CV health and BP regulation.

Table 1. Ambulatory Blood Pressure Response			
Variable	Aquatic	Land	p-value
SBP (mmHg)	136 ± 9	140 ± 9	0.051
DBP (mmHg)	76 ± 6	81 ± 6	0.006*
MAP (mmHg)	96 ± 7	101 ± 6	0.007*
HR (bpm)	78 ± 12	78 ± 11	0.964
All values represent Mean ± SD. *p < 0.05			

1197   Board #5   May 31 8:00 AM - 9:30 AM

Effects of Different Exercise Modalities on Postprandial Hyperglycemia in Overweight and Obese Adults

Craig W. Berry, Conlan J. Varty, Kristina B. Arslain, Kevin D. Ballard. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)

(No relevant relationships reported)

Postprandial hyperglycemia (PPH) is directly associated with cardiovascular disease risk. A single bout of aerobic (AE) or resistance exercise (RE) lowers PPH the following morning in healthy adults. No studies have examined the extent to which prior exercise regulates PPH in overweight and obese adults, and whether differences exist between exercise modalities. **PURPOSE:** The purpose of this ongoing investigation is to determine the effects of different exercise modalities on PPH responses to an oral glucose tolerance test (OGTT) in overweight and obese adults. We hypothesize that a single bout of exercise performed 14-17 h prior to an OGTT will attenuate increases in blood glucose, independent of exercise modality. **METHODS:** Recruitment for the current study is ongoing. In a randomized, cross-over design, participants [n=6 (3 women); age=24.3±5.1 y; BMI=32.4±5.8 kg/m^2] completed three trials. For each trial, an OGTT (1 g/kg body weight) was preceded (14-17 h prior) by seated rest (control), a single bout of AE, or a single bout of RE. The AE bout consisted of 30 min of continuous moderate-intensity (~60% VO$_2$max) treadmill exercise. The whole-body RE bout consisted of 3 sets of 10 repetitions of the following exercises: leg press, chest press, seated leg extension, lat pulldown, shoulder press, and seated row. The weight used for each set was determined from the participant's previously determined 10-RM. Blood was obtained prior to and at 30 min intervals for

3 hours following glucose ingestion. Repeated-measures ANOVA and LSD post-hoc tests were used to evaluate differences within and between trials. **RESULTS:** Blood glucose did not differ between trials at baseline. A main effect due to time (P<0.001) was observed for glucose. Relative to baseline, blood glucose increased (P<0.05) by 26-53%, 18-45%, and 16-46% at 30-120 min post-ingestion in the control, AE, and RE trial, respectively. Glucose area under the curve did not differ between trials (P≥0.37). **CONCLUSION:** Preliminary findings from our ongoing study suggest that acute aerobic or resistance exercise performed the evening prior to an OGTT does not affect PPH responses in overweight and obese adults. **Supported by College of Education, Health, and Society Seed Grant and Miami University Committee on Faculty Research Grant.**

1198   Board #6   May 31 8:00 AM - 9:30 AM

Autonomic Modulation After Acute Resistance Exercise in Resistance-Trained Individuals

Alexa DeBord, Alaina Glasgow, Kathryn Geither, Leslie Sensibello, Jason C. Parks, Erica M. Marshall, Yu Lun Tai, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*

(No relevant relationships reported)

Differences in autonomic modulation between free-weight and weight machines resistance exercise is unknown. **PURPOSE:** To investigate the effects of acute free-weight (FW) and weight machines (WM) resistance exercise on heart rate complexity (HRC) and variability (HRV) in resistance-trained individuals. **METHODS:** Resistance-trained individuals were assigned to either a FW (n = 25) or a WM (n = 16) group. Autonomic modulation was collected at rest, and 15 (Rec1) and 25 (Rec2) min following acute resistance exercise (ARE) or a control. Sample Entropy (SampEn), indicative of vagal modulation, was used as a measure of HRC. HRV measurements included vagal modulation (normalized high frequency (HFnu)), and sympathovagal balance (LF/HF ratio). ARE for the FW group consisted of 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the squat, bench press, and deadlift, while the WM group utilized of 3 sets of 10 repetitions at 75% 1RM on the leg press, lat pull down, leg extension, chest press, and leg curl. A 2x2x3 ANCOVA was used to examine groups (FW, WM) across conditions (ARE, control) and time (Rest, Rec1, Rec2), with load as a covariate. **RESULTS:** The groups were similar (p>0.05) for age, height, weight, BMI, and baseline autonomic modulation, but differed for years of training. There was a significant group by condition by time interaction (p=0.03) for SampEn such that in the FW group (Rest: 1.5±0.3; Rec1: 1.1±0.3; Rec2: 1.1±0.4) it was attenuated during Rec1 and Rec2 after ARE compared to rest and the control. In the MW group, while there were no significant differences from rest to Rec1 or Rec2, there was a significant difference from Rec1 to Rec2 (Rest: 1.4±0.5; Rec1: 1.0±0.3; Rec2: 1.3±0.3) such that it differed from the control. There was also a significant group by time interaction for HFnu (Rest: 62.5±15.0%; Rec1: 29.5±18.9%; Rec2: 29.2±19.9%, p=0.002) such that it was attenuated compared to rest, and the control, in both groups. The LF/HF ratio (Rest: 61.0±52.1; Rec1: 420.0 ±424.7; Rec2: 456.7±390.2, p=0.007) was augmented such that it differed from rest, and the control, in both groups. **CONCLUSIONS:** Based on our data the use of free-weight resistance exercises results in significant reductions in vagal modulation that are immediate, and maintained, up to 30 min, which does not appear to occur when using weight machines.

1199   Board #7   May 31 8:00 AM - 9:30 AM

Daily exercise Compared To Exercise On Alternating Days On Post-exercise Hypotension In prehypertensive Men

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(No relevant relationships reported)

Purpose: Acute exercise can result in post-exercise hypotension (PEH) lasting up to 24-h. Whether exercise performed on consecutive days would lead to an accumulating PEH effect has yet to be determined. The purpose of this study was to compare daily exercise (DE) to exercise performed on alternating days (AE) and a control (CON) on PEH. **Methods**: Sedentary, PHTN men 18-30yr participated in this three-arm randomized cross-over trial. The primary comparison was the magnitude of PEH between three groups (control (CON), alternating exercise (AE), and daily exercise (DE)) and within each group over time (day 1, 2, and 3). Both exercise groups were prescribed the same exercise intensity (70-75%HRmax), and total duration of exercise (90min) on a cycle ergometer. DE performed exercise on three consecutive days (three bouts of 30min). AE performed exercise on two alternating days (2 bouts of 45min). After exercise sessions subjects remained in the laboratory for 1-h while BP was taken every 5min. **Results**: Eight overweight (BMI=29±4kg/m^2), young (22±2years), moderately fit (VO$_2$peak=34±6ml.kg.min), PHTN (126±10/73±6mmHg) male subjects completed the study. There was a significant SBP condition by day effect such that on day three SBP (CON 120 ± 9, AE 123 ± 13, DE 118 ± 12 mmHg), and DBP (CON 73 ± 6, AE 70 ± 9, DE 68 ± 7 mmHg) were lowest during the post-exercise DE condition

(P < 0.001). **Conclusion**: In conclusion, the PEH effect appeared to accumulate during DE such that day 3 was the lowest of all conditions and days. It has been suggested that the current recommendation on training frequency should be changed from accumulating 30 min on most, preferably all days of the week, to *all days* of the week. Our preliminary findings support this notion.

1200   Board #8   May 31 8:00 AM - 9:30 AM

Upper and Lower-body Resistance Exercise With and Without Blood Flow Restriction on Pulse Wave Reflection

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(No relevant relationships reported)

Acute resistance exercise (RE) with blood flow restriction (BFR) on pulse wave reflection is unclear. **PURPOSE**: To evaluate the differences between acute upper-body RE (URE) and lower-body RE (LRE) with and without BFR on pulse wave reflection in resistance-trained individuals. **METHODS**: Pulse wave reflection was assessed at rest, and during recovery at 10 (R10), 25 (R25), 40 (R40), and 55 (R55) minutes after either URE or LRE with or without BFR in twelve resistance-trained individuals. The URE consisted of the lat pulldown and chest press while the LRE consisted of knee extension and knee flexion. The BFR condition consisted of 4 set of 30, 15, 15, and 15 repetitions at 30% 1-repetition maximum (1RM) while the non-BFR condition consisted of 4 sets of 8 repetitions at 70% 1RM. A 2x2x3 repeated measures ANOVA was used to evaluate the effect of group across conditions and time on pulse wave reflection. **RESULTS**: There were no differences for any variable between conditions. There were significant group by time interactions for brachial systolic blood pressure (BSBP), brachial diastolic blood pressure (BDBP), aortic systolic blood pressure (ASBP), and aortic diastolic blood pressure (ADBP) such that BSBP (rest: 120±9mmHg, R10: URE: 115±12mmHg, LRE:126±8mmHg; p<0.001) and ASBP (rest: 104±8mmHg, R10: URE: 102±10mmHg, LRE:109±8mmHg; p=0.005) were increased at R10 from LRE compared to URE and rest, with no difference from rest to R25, R40, or R55. BDBP (rest: 64±7mmHg, R10: URE: 60±6mmHg, LRE:67±6mmHg, p=0.001; R25: URE: 62±5mmHg, LRE:67±7mmHg, p<0.001) and ADBP (rest: 65±7mmHg, R10: URE: 60±6mmHg, LRE:69±6mmHg, p≤0.001; R25: URE: 63±5mmHg, LRE:69±7mmHg, p<0.001) were elevated at R10 and R25 from LRE compared to URE and rest, and no difference at R40 or R55. There were significant group by time interactions for augmentation index (AIx) (rest: 13.3±9.8%, R10: URE: 26.4±10.5%, LRE: 15.7±8.4%; p<0.001) and AIx normalized to 75bpm (rest: 3.7±11.7%, R10: URE: 25.4±14.0%, LRE: 15.8±13.5%; p=0.001) such that they were increased at R10 from URE compared to LRE and rest, and were fully recovered by R25. **CONCLUSIONS**: These data suggest that LRE significantly elevated blood pressure more so than URE, and that URE significantly increased pulse wave reflection more than LRE, regardless of whether they were completed with or without BFR.

1201   Board #9   May 31 8:00 AM - 9:30 AM

Blood Pressure Reactivity During Short-term Water Restriction in Young Adults

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(No relevant relationships reported)

Dehydration reduces plasma volume and concentrates electrolytes, increasing plasma osmolality (pOsm). Water deprivation (WD) studies in animals demonstrate that elevated pOsm is associated with altered sympathetic outflow and blood pressure (BP) regulation. However, it remains unclear if WD augments BP responses to sympathoexcitatory stimuli in humans. **PURPOSE:** We tested the hypothesis that WD elevates pOsm and consequently augments BP reactivity. **METHODS:** Twenty healthy young adults were recruited (10M/10W; age: 24±1 yrs; BMI: 24±1 kg/m², BP: 109±2/61±2 mmHg) to complete two hydration conditions, in random order. A normal hydration (NH) and WD visit were separated by at least one week. Daily water intake for the NH condition was 23mL H_2O/kg bodyweight/day for 3 days prior to testing. The WD condition included a stepwise reduction in water intake over 3 days then a 16hr water restriction prior to testing. Beat-by-beat BP was measured continuously with finger photoplethysmography throughout a 10-min baseline, handgrip exercise (HG), post-exercise ischemia (PEI), and a cold pressor test (CPT). Isometric HG was performed at 30% of maximal voluntary contraction for 2 mins and PEI immediately followed with rapid upper arm cuff inflation to 250mmHg for 3 mins (to isolate the metaboreflex). Following HG & PEI, participants rested quietly for 10 mins prior to a 2-min hand-in-ice H_2O CPT. Peak responses were calculated as the absolute change in BP during the final minute of each perturbation from the respective baseline. **RESULTS:** Plasma volume, estimated by changes in hemoglobin and hematocrit, declined 5.6±1.4% during WD. POsm (287.0±1.0 vs. 290.0 ±1.0 mOsm/kg H_2O), urine

osmolality (481±137 vs. 708±42 mOsm/kg H_2O), urine specific gravity (1.015±0.002 vs. 1.022±0.001), and thirst rating on a 0-10 scale (1.7±0.4 vs. 6.7±0.4) were higher for the WD condition (p<0.05 for all), suggesting mild dehydration. Mean BP responses were augmented following WD during HG (Δ12.8±1.7 vs. 18.7±2.0 mmHg, p<0.05), PEI (Δ8.8±1.0 vs. 14.7±2.4 mmHg, p<0.05), and CPT (Δ14.9±2.0 vs. 18.6±2.3 mmHg, p=0.05). **CONCLUSION:** These preliminary findings suggest that short-term WD increases pOsm and augments BP responses during moderate intensity isometric HG exercise, PEI, and CPT, suggesting enhanced BP reactivity.

1202   Board #10   May 31 8:00 AM - 9:30 AM

Brachial Artery FMD Responses To Steady-State Moderate-Intensity And High-Intensity Interval Exercise In Mid-Spectrum Chronic Kidney Disease

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(No relevant relationships reported)

Brachial artery flow-mediated dilation (FMD) is a nitric oxide-dependent measure of conduit artery endothelial function that is transiently potentiated by moderate-intensity steady-state exercise (SSE) in healthy adults. Whether exercise imparts similar effects in adults with Stage 3 or 4 chronic kidney disease (CKD) has not been reported. Moreover, a comparison of SSE and high-intensity interval exercise (HIIE) may add to clinically-relevant findings for improving vascular function in mid-spectrum CKD. **PURPOSE:** To determine the influence of SSE and a comparable amount of HIIE on post-exercise brachial artery FMD in patients diagnosed with secondary Stage 3 or 4 CKD. **METHODS:** Twenty participants (n = 6 men; n = 14 women; age 62.0 ± 9.9 yr; weight 80.9 ± 16.2 kg; body fat 37.3 ± 8.5% of weight; VO$_2$max 19.4 ± 4.7 ml/kg/min) completed 30 min of SSE at 65% VO$_2$reserve or HIIE by treadmill walking (90% and 20% of VO$_2$reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~ 65% VO$_2$reserve. Ultrasound measurements of brachial artery FMD were obtained by the same technician under standardized conditions just before, 1 hr and 24 hrs after exercise. FMD responses were analyzed using 2 (condition) by 3 (sample point) repeated measures ANOVAs. **RESULTS:** Brachial artery FMD responses were augmented 1 hr after exercise in both exercise conditions (p < 0.005 versus pre-exercise FMD). SSE (pre-exercise = 11.5 ± 1.3; 1 hr = 17.2* ± 1.8; 24 hr = 14.0* ± 1.1%) HIIE (pre-exercise = 12.5 ± 1.3; 1 hr = 15.6* ± 1.5; 24 hr = 15.8* ± 1.2%) **SUMMARY:** We report for the first time that brachial artery FMD can be augmented by a single episode of exercise in mid-spectrum CKD. SSE and HIIE, averaging ~65% of VO$_2$reserve, is equally effective at transiently improving conduit artery vascular function in this clinical population.

1203   Board #11   May 31 8:00 AM - 9:30 AM

Pulmonary Responses During Exercise On Dryland Vs. Immersible Ergocycle

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(No relevant relationships reported)

Water immersion can affect respiratory responses during exercise relative to exercise on dry land. Exercise training in an aquatic environment has added benefits relative to training on land, improving central hemodynamic responses as stroke volume (SV), cardiac output (Q) and heart rate recovery (HRR) as well as increasing cerebrovascular blood flow, relative to land-based exercise of a similar intensity, in healthy humans. **PURPOSE:** We sought to compare pulmonary responses during an incremental exercise done on immersible ergocycle (IE) vs dryland ergocycle (DE) at the same external power output (P$_{ext}$). **METHODS:** Ten (10) young healthy subjects (Age: 31±9 years; BMI: 23.3±1.9 kg/m²) performed incremental exercise tests on IE at chest level immersion and DE at equal external power output (P$_{ext}$). Pulmonary responses were measured and P$_{ext}$ on IE was calculated according to the general fluid equation $F_d = \frac{1}{2}\rho Av^2C_d$. Tangential speed of the pedaling mechanism was calculated by $2 \pi r$ (rpm), $2 \pi (r/2)$(rpm) and $\omega 2 \pi (r/2)/360°$(rpm), for pedals, paddles-rods, and legs, respectively, as used in previous studies. **RESULTS:** VO$_2$ (p=0.0087) and VCO$_2$ (p=0.0138) were significantly lower during exercise on IE at every stage of the incremental test relative to DE. No differences were detected between IE and DE for respiratory exchange ratio (RER) ventilation (V$_E$), breathing frequency (f), tidal volume (V$_T$), fraction of expired O_2 and CO_2 (FetO$_2$ and FeCO$_2$, respectively), time of inspiration (Ti), time of expiration (Te), time of respiratory cycle (Ttot), duty cycle (Ti/Ttot), and partial pressure of end tidal O_2 and CO_2 (PetO$_2$ and PetCO$_2$, respectively). **CONCLUSIONS:**

Abstracts were prepared by the authors and printed as submitted.

Exercise during water immersion results in a significantly lower mean VO_2, relative to a land exercise of equivalent power output. No differences were detected in the respiratory parameters suggesting that the lower VO_2 reached with IE is not attributed to changes in ventilation, but rather to central or peripheral convection (cardiac output) or diffusion (capillary O_2 extraction) factors. We have previously shown that hemodynamic factors (convection) are modestly improved, but not sufficiently to explain the large gap in VO_2 between IE and DE. We hypothesize that diffusion is improved by an unknown mechanism that remains to be explained.

1204   Board #12   May 31 8:00 AM - 9:30 AM

Blood Pressure Responses to Intermittent Physical Activity in Elementary School-Age Children

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to compare the acute effects of prolonged sitting on resting blood pressure (BP) with a similar duration of sitting combined with intermittent physical activity (PA) performed at varying intensities in healthy weight (HW) and overweight/obese (OW/OB) preadolescent children.
METHODS: Thirty-nine children (18 males, 21 females; ages 7-11 years; 33% OW/OB; 59% non-white) completed four experimental conditions in random order: 8 hours of sitting interrupted with 20, 2-minute low-intensity, moderate-intensity, or high-intensity PA breaks, or 20, 2-minute sedentary screen-time breaks. Exercise intensity corresponded with 25%, 50% and 75% of heart rate reserve, respectively. Using a digital BP monitor, BP was measured during each experimental condition in the morning (0800 hrs), midday (1200 hrs), and end-of-day (1600 hrs).
RESULTS: Across all time points, there were no significant between-condition differences observed in systolic blood pressure (SBP) (sedentary:101±2 mmHg; low:105±2 mmHg; moderate:102±2 mmHg; high:105±2 mmHg; p>0.05). SBP did however decrease significantly throughout the day for all conditions (morning:106±1 mmHg; midday:101±2 mmHg; end-of-day:103±1 mmHg; p=0.01). OW/OB children displayed a greater decline in SBP throughout the day compared to HW children (p<0.01). Across all time points, no significant between-condition differences were observed in diastolic blood pressure (DBP) (sedentary:61±2 mmHg; low:63±2 mmHg; moderate: 61±2 mmHg; high: 65±2 mmHg; p>0.05). No significant effects of time were observed in DBP (morning:63±1 mmHg; midday:62±1 mmHg; end-of-day:62±1 mmHg; p>0.05). At all time points, higher DBP were observed in OW/OB compared to HW children (HW:60±1 mmHg; OW/OB:64±2 mmHg; p=0.03).
CONCLUSION: Contrary to previous findings in adults, both interrupted and uninterrupted sitting resulted in a similar decrease in SBP throughout the day. The decline in SBP was greater in OW/OB children compared to HW children. Future research should examine the long-term effects of interrupted and uninterrupted sitting on resting BP in preadolescent children.

1205   Board #13   May 31 8:00 AM - 9:30 AM

Comparing the Changes in Cardiovascular Function After Acute Exposure to Tai Chi or Walking

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(No relevant relationships reported)

Hypertension is a major health concern throughout the United States and is a major cause of cardiovascular disease and recent research has indicated that central aortic pressures more accurately depict of pressure within the myocardium compared to commonly used brachial measures. **PURPOSE:** The purpose of this study was to compare the responses of Tai Chi and walking on measures of central and peripheral cardiac measurements when controlling for exercise intensity. **METHODS:** 15 pre-hypertensive subjects (2 males, 13 females; age = 20.7±3.77 years; body fat percentage = 24.26±10.27%) participated in Tai Chi (TC) and walking (WK) for 30 minutes on non-consecutive days. Central systolic (CSBP) and diastolic blood pressure (CDBP), augmentation index (Alx), pulse pressure (PP), heart rate (HR), and brachial systolic (BSBP) and diastolic blood pressure (BDBP) were measured prior to exercise and following exercise every 10 minutes for a total of 60 minutes in a seated position. A repeated measures ANOVA with two repeated measure factors was computed for each outcome measure. **RESULTS:** There were no significant differences between the two exercise forms. However, CSBP decreased 10 minutes after exercise in both exercise types (TC = 6.63±3.258 mmHG, p < .05; WK = 7±4.144 mmHG p < .05), and 40 minutes after exercise in both exercise types (TC = 6.07±3.33 mmHG, p < .05; WK = 8.2±3.15 mmHG, p < .05) compared to the before exercise measurement. BSBP also decreased in both exercise forms following 10 min of rest (TC=6.99±3.776 mmHG, p = .05; WK=8.8±3.20 mmHG p = .05), and 40 min (TC=8.46±3.07 mmHG, p = .05; WK=8.87±3.87 mmHG, p = .05) when compared to the initial resting measurement. A trend indicated that heart rate was lower during the Tai Chi rest periods when compared to walking during the 30th minute (TC= 73.73±12.31 bpm,

WK = 78.40±15.82 bpm, p = .051) and the 60th minute of rest (TC= 73.0±13.95 bpm, WK= 76.0±13.85 bpm p = .06). There were no significant changes in Alx, PP, or diastolic pressures. **CONCLUSIONS:** Central aortic pressure exhibits a post exercise hypotensive (PEH) effect similar to that of peripheral blood pressure. Both Tai Chi and walking elicited similar PEH effects on systolic blood pressure in prehypertensive individuals.

1206   Board #14   May 31 8:00 AM - 9:30 AM

Metabolic Responses to a Battling Rope Protocol Performed in the Seated or Stance Positions

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(No relevant relationships reported)

PURPOSE: To compare the levels of oxygen consumption (VO2) and heart rate (HR) responses elicited by a treadmill (TM) or bicycle (BK) VO2 max test with a standing or sitting battling rope protocol (BRP) (TM vs. standing BRP) (BK vs. seated BRP). To examine the associations between the peak HR and VO2 responses elicited from the two BRP with their respective VO2 max tests (TM vs. standing BRP) (BK vs. seated BRP).
METHODS: Forty healthy subjects, 24 females and 16 males, mean age 24.83 years, performed either a ramped VO2 max TM or BK test (respiratory exchange ratio > 1.0). At least 3 days later, the subjects who performed the ramped TM test did the standing BRP, and the subjects who performed the ramped BK test did the sitting BRP. Each BRP (standing and sitting) consisted of 15 seconds of double arm swings, followed by 45 seconds of rest for 10 rounds. The highest recorded VO2 and HR values (VO2 peak and HR peak, respectively) were recorded after each round.
RESULTS: Metabolic responses were significantly lower for the BRP in both sitting (VO2 peak and HR peak: p < .001) and standing (VO2 peak and HR peak: p < .001) as compared to the HR max and VO2 max values derived from the BK and TM tests. The BRP produced a VO2 peak that was 71.87% (sitting) and 68.37% (standing) of the subjects' VO2 max assessed via the BK and TM protocol, respectively. Moderate correlations were found between the VO2 during the seated (r = .61; p =.003) and standing (r=.43; p=.03) BRP and the BK and TM VO2 max tests, respectively. The HR peak elicited by the BRP done in sitting (r = .52; p = .009) and standing (r = .67; p = .001) had a moderate correlation with the HR max derived from the BK and TM tests. **CONCLUSIONS:** Both the seated and standing BRPs demonstrated the capacity to produce acute metabolic responses that may enhance aerobic capacity. Battling ropes may be a low cost, accessible option to improve cardiovascular endurance for individuals who cannot stand or move their lower extremities in a rhythmic manner to conduct aerobic exercise.

1207   Board #15   May 31 8:00 AM - 9:30 AM

Longer vs. Shorter Intervals Elicit Similar Cardiovascular But Significantly Different Metabolic Responses During Interval Cycling

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(No relevant relationships reported)

PURPOSE: Interval training (IT) is utilised to optimise adaptations to exercise training with some recent research interest in whether low volume IT is efficacious. Therefore the purpose was to determine whether using shorter intervals would elicit similar acute cardiorespiratory responses to longer intervals.
METHODS: Nine low active participants (8 males, 1 female) performed an incremental cycle test and then two experimental IT trials on an electronically-braked cycle ergometer at least 48 hours apart in a counter-balanced repeated measures study. Ventilatory threshold (T_{vent}) and peak oxygen uptake (VO_{2peak}) were calculated from the incremental cycle test. The participants then completed the two IT trials which consisted of six blocks of work and recovery at a ratio of 2:3 minutes for LONG, and a ratio of 1:1 minutes for SHORT, for work and recovery, respectively. The 'work' intensity of each IT trial was calculated as 50% of the difference between VO_{2peak} and T_{vent} (Δ50%) and the 'recovery' intensity was calculated as 80% of Tvent. SHORT was 12 minutes and LONG was 30 minutes, plus 5 minutes warm-up and 2 minutes cool down. Oxygen uptake (VO_2), respiratory exchange ratio (RER), heart rate (HR) and power (W) were recorded continuously. Rating of perceived exertion (RPE) was collected at the end of each interval. Blood lactate [La⁻] and systolic blood pressure (SBP) were recorded pre and post-exercise. Rate-pressure product (RPP) and energy expenditure (EE) were calculated. Participants reported which was their preferred session. Paired samples analyses were applied to quantitative data.
RESULTS: Mean RPE during work (13 ± 2 vs. 13 ± 3; p=0.421), mean VO_2 (2234 ± 404 vs. 2258 ± 483 mL·min⁻¹; p=0.471), RPP (25412 ± 2456 vs. 24234 ± 2363; p=0.346), SBP (150 ± 12 vs. 140 ± 13 mmHg; p=0.204) and [La⁻] (7.30 ± 1.86 vs. 6.46 ± 2.15 mmol·L⁻¹; p=0.416) were not significantly different between SHORT and

LONG. However, mean RER (1.02 ± 0.09 vs. 0.99 ± 0.04; p=0.002) was significantly lower and energy expenditure (287 ± 81 vs. 473 ± 93 kcal; p>0.001) was significantly greater following LONG**.** SHORT was preferred to LONG by all 9 participants. **CONCLUSIONS**: LONG elicited significantly different metabolic responses with similar cardiovascular responses to SHORT but was perceived as less enjoyable.

1208   Board #16   May 31 8:00 AM - 9:30 AM

Oxygenation Characteristics during Knee Extension Exercise in Severe and Extreme Domain

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(No relevant relationships reported)

Near-infrared spectroscopy (NIRS) has been used to quantify oxygenation characteristics of skeletal muscle during exercise. Changes in total-[heme] and deoxy-[heme] have been used as an indices of diffusive and perfusive conductance, respectively. Total-[heme] and deoxy-[heme] have been shown to reach similar values at end exercise following exercise in the severe intensity domain It has further been suggested that time of exercise tolerance (T_{lim}) in the extreme domain ($T_{lim} < 2$ min) is too short for VO_2 kinetics to reach maximum values. It is unknown if total-[heme] and deoxy-[heme] characteristics reach similar values after exercise in the extreme domain as exercise in the severe domain. **PURPOSE**: We hypothesized that total-[heme] and deoxy-[heme] would be lower following exercise in the extreme domain than compared to exercise in the severe domain. **METHODS**: Six men (age 22 ± 3.1 yrs, 72.5 ± 6.5 kg; 178 ± 2 cm) performed 8 bi-lateral knee extension tests to task failure. First, one-repetition maximum (1RM) was determined by progressively increasing weight until a pre-determined range of motion could not be achieved. Subjects then performed 3 exercise tests in the severe intensity domain ($T_{lim} = 2 - 15$ min; S1 = 25.8 ± 2.7, S2 = 33.5 ± 4.3, S3 = 44.3 ± 6.9 % 1RM) and 4 in the extreme domain (60, 70, 80, 90% 1RM), in random order on non-consecutive days. A 1RM was performed 5 min before each exercise bout. Changes total-[heme], deoxy-[heme], and Sat% were measured on the L vastus lateralis. **RESULTS**: Total-[heme] at end exercise was not different between exercise intensities (p > 0.05). Total-[heme] at end exercise was not different (p > 0.05) than peak total-[heme] of the 1RM for the extreme domain exercise tests. However, total-[heme] at end exercise was greater than peak total-[heme] following severe intensity exercise (S1, p = 0.002; S2, p = 0.025, S3, p = 0.02). End exercise deoxy-[heme] and Sat% were not different (p > 0.05) compared to peak deoxy-[heme], and Sat%, respectively, of the 1RM. **CONCLUSIONS**: The current study showed that total-[heme], but not deoxy-[heme] or Sat%, is intensity- or time-dependent. These data suggest that diffusive O_2 conductance is compromised during extreme intensity exercise, whereas perfusive O_2 conductance is able to reach similar values regardless of intensity.

1209   Board #17   May 31 8:00 AM - 9:30 AM

Perceptual And Cardiovascular Responses To Very Low Load Exercise With And Without Blood Flow Restriction

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(No relevant relationships reported)

Low load (30% one repetition maximum (1RM)) exercise can produce growth if taken to failure. However, at very low loads, failure may not be possible. Applying blood flow restriction (BFR) may circumvent this by expediting fatigue and this effect may be pressure dependent. Although potentially efficacious, it is important to investigate the acute response in order to determine the utility of this stimulus. **PURPOSE**: To determine the cardiovascular and perceptual response to exercise with and without BFR. **METHODS**: Participants (n=21) completed high load (70% 1RM) and very low load (15% 1RM) exercise with (40% (15/40) and 80% (15/80) of arterial occlusion pressure (AOP)) and without BFR to failure (up to 90 reps) in the upper (biceps curl) and lower body (knee extension). AOP was determined pre and post exercise. Ratings of perceived exertion (RPE, 6-20) and discomfort (0-10+) were taken at pre and after each set. Significance was set at p ≤ 0.05. AOP presented as mean (SD) and perceptual responses presented as median (25th, 75th percentiles). **RESULTS**: There was no interaction for AOP in the upper body (p=.095) but there was a main effect of condition and time [change of 42 (16) mmHg]. The 15/80 condition [172 (23) mmHg] was greater than 15/40 [166 (22) mmHg] and 70% 1RM condition [162 (18) mmHg] but similar to 15%1RM [168 (19) mmHg]. There was an interaction for AOP in the lower body (p=.006). All conditions increased but at post the 15/40 [237 (30) mmHg] condition was greater than 15%1RM [218 (25) mmHg] and 70%1RM [200 (19)

mmHg] and the 15/80 [233 (24) mmHg] condition was greater than 70%1RM. RPE and discomfort in the upper body tended to be greatest with a high pressure. Within set 4, the RPE and discomfort were 17.5 (15, 20) and 7 (6, 8) for 15/80 which was greater than that observed with 15/40 [RPE: 15 (14, 19); discomfort: 6 (3, 8)]. In the lower body, RPE was higher for lower loads and discomfort tended to be greatest with higher pressure. Within set 4, the RPE and discomfort were 18 (15, 19) and 8 (6, 9) for 15/80 which was greater than that observed for 70%1RM [RPE: 16 (15, 17); discomfort: 4 (1, 6)]. **CONCLUSIONS**: Applying BFR with lower loads tends to augment the cardiovascular and perceptual response and often this appears greater for high pressure. These findings will need to be considered alongside any potential benefits of training with very low loads.

1210   Board #18   May 31 8:00 AM - 9:30 AM

Use of Compression Socks During a Marathon Does Not Mitigate Exercise-Associated Muscle Damage

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(No relevant relationships reported)

Compression socks have become increasingly popular with athletes due to perceived enhancement of exercise performance and recovery. However, research examining the efficacy of compression socks to reduce exercise-associated muscle damage has been equivocal, with few direct measurements of markers of muscle damage. **PURPOSE**: We investigated the influence of wearing compression socks during a marathon run on creatine kinase (CK) levels in endurance athletes running the 2013 Hartford Marathon. **METHODS**: Adults (n=20) were randomized to compression sock (SOCK; n=10) and control (CONTROL; n=10) groups. SOCK was naïve to wearing compression socks, and wore them during the marathon only. Age, anthropometrics, vital signs, training mileage, and finishing time were collected. Venous blood samples were collected 1 d before, immediately after, and 1 d following the marathon for analysis of plasma CK, a marker of muscle damage. **RESULTS**: Baseline plasma CK levels did not differ between CONTROL (89.3±41.2 U/L) and SOCK (100.0±56.2 U/L; p=0.633), and were within normal reference ranges for males and females. Immediately following the marathon (≤1hr), CK increased 273% from baseline (p=0.000 for time), with no difference in exercise-induced changes in CK from baseline between CONTROL (+293.9±278.2 U/L) and SOCK (+233.1±225.3 U/L; p=0.598 for time x group). The day following the marathon (≤24hr), CK further increased 1094% from baseline (p=0.000 for time), with no difference in changes in CK from baseline between CONTROL (+1191.9±1194.8 U/L) and SOCK (+889.1±760.2 U/L; p=0.529 for time x group). These similar trends between CONTROL and SOCK persisted despite controlling for potential covariates such as age, body mass index, and race finishing time (ps>0.291), which was also similar between groups (CONTROL: 4:20:42±0:38:33 hr vs. SOCK: 4:02:33±0:38:39 hr; p=0.333). **CONCLUSIONS**: Our results suggest the use of compression socks during a marathon do not appear to mitigate objectively measured markers of muscle damage (i.e., exercise-induced increases in CK) immediately following and 24hr after a marathon.

1211   Board #19   May 31 8:00 AM - 9:30 AM

Influence of Acute Exercise and Insulin on the Akt/ eNOS Pathway in Rodent Aortic Smooth Muscle.

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(No relevant relationships reported)

Insulin resistance can contribute to endothelial dysfunction and subsequent cardiovascular disease. An acute bout of exercise has been shown to attenuate insulin resistance and enhance endothelial function, yet the underlying molecular mechanism(s) for this benefit in smooth muscle remains unclear. **PURPOSE**: To examine key proteins in the Akt/eNOS signaling pathway in response to an acute session of exercise with and without the presence of insulin. **METHODS**: Female Sprague-Dawley rats (n=25) were assigned to one of four groups: 1) sedentary control group without insulin injection (CON-ins), 2) control group with insulin injection (10mU/g; CON+ins), 3) exercise group without insulin injection (EX-ins), and 4) exercise group with insulin injection (EX+INS). Insulin or saline injections were administered 5-min prior to sacrifice. Under isoflurane anesthesia, blood and the descending aorta was harvested. Exercise cohorts were sacrifced 3-hr after a 60-min swimming protocol. Plasma samples were analyzed for glucose, insulin concentrations, and markers of endothelial function (i.e., intracellular adhesion molecule, E-selectin, Von Willebrand factor, and adiponectin) using commercially available kits. Western immunobloting was used to determine total Akt (Akt), phosphorylated Akt (pAkt[Ser473]),

Abstracts were prepared by the authors and printed as submitted.

total eNOS (eNOS), and phosphorylated eNOS (p-eNOS^{Ser1177}). **RESULTS**: Akt, eNOS, plasma glucose, and markers of endothelial function were similar among all cohorts. As expected, plasma insulin concentration was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, however exercise blunted this increase (CON+ins > EX+ins; p<0.05). Similarly, pAkt^{Ser473} was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, this effect was also attenuated with exercise (CON+ins > EX+ins; p<0.05). Conversely, p-eNOS^{Ser1177} was only significantly (p<0.05) enhanced in the EX+ins versus the EX-ins group. **CONCLUSIONS**: Insulin and acute exercise resulted in the greatest enhancement of p-eNOS^{Ser1177}, signifying enhanced endothelial function. This response cannot be completely attributed to increased pAkt^{473} suggesting that other kinases are likely responsible for the improvement in p-eNOS^{Ser1177} in the aorta.

1212   Board #20   May 31 8:00 AM - 9:30 AM

Effect of Aerobic Exercise on Artery Stiffness and Cerebrovascular Pulsatility in Hypertensive and Non-Hypertensive Adults

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(No relevant relationships reported)

Large elastic arteries (i.e. aorta, carotid) buffer pulsatile hemodynamics by dampening changes in pressure and flow. Stiffer central arteries, as seen in hypertension, transmit greater pulsatile hemodynamics into fragile cerebral vessels. Aerobic exercise is recommended for hypertensives (HTN), but its effects on artery stiffness and pulsatility in this group are unclear. **PURPOSE:** Investigate the effect of acute aerobic exercise on artery stiffness and cerebrovascular pulsatility in HTN and non-HTN adults. **METHODS:** 30 medicated HTN and 30 age, sex, and body mass index (BMI)-matched non-HTN adults (56±6 yrs, BMI 28.2±2.9 kg/m²; 32 men) underwent hemodynamic measures pre and 10 min post a 30-min cycling bout (55% peak oxygen consumption). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cf PWV) and carotid artery (CA) stiffness was assessed with PWV-β via Ultrasound. Aortic mean (MP) and pulse pressure (PP; via radial generalized transfer function), and CA PP were measured by tonometry. CA and middle cerebral artery (MCA) blood velocity pulsatility index (PI) were measured using Doppler. **RESULTS:** cf PWV, MCA PI and CA PI increased and aortic PP decreased, post exercise compared to pre in both groups (p<0.05). Aortic MP and CA PP, PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other significant effects were detected. **CONCLUSION:** Acute aerobic exercise increases aortic stiffness and cerebrovascular hemodynamic pulsatility in both non-HTN and HTN individuals. These data suggest medicated-HTN have similar vascular responses to early recovery from acute aerobic exercise as non-HTN.
Supported by a Foundation Research Grant from ACSM and AHA Pre doctoral Fellowship

Table 1: Arterial stiffness and hemodynamic pulsatility pre/post acute exercise in non-HTN and HTN subjects.

Measure	non-HTN		HTN		Effects		
	Pre	Post	Pre	Post	G	T	GxT
Aorta							
Mean pressure, mmHg	91±8	92±7	96±10	95±9	0.047	0.531	0.136
Pulse pressure, mmHg	33±9	32±7	33±7	30±7	0.175	0.005	0.595
cf PWV, m/s	7.9±1.1	8.1±0.9	8.2±1.3	8.7±1.5	0.081	0.001	0.221
Carotid artery							
Pulse pressure, mmHg	37±10	36±8	37±8	35±8	0.816	0.070	0.888
Blood velocity PI	1.43±0.34	1.49±0.34	1.34±0.26	1.42±0.26	0.356	0.001	0.530
PWV-β, m/s	6.3±1	6.3±0.9	6.6±1.3	6.8±1.5	0.209	0.204	0.602
Middle cerebral artery							
Blood velocity PI	0.78±0.12	0.82±0.12	0.76±0.11	0.78±0.11	0.314	0.003	0.513

HTN, hypertensive; cf, carotid-femoral; PWV, pulse wave velocity; PI, pulsatility index; G, group; T, time; GxT, group-by-time interaction.

1213   Board #21   May 31 8:00 AM - 9:30 AM

Kinetics of High-Sensitivity Cardiac Troponin Release Following a Strenuous Swimming Test

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(No relevant relationships reported)

PURPOSE: Athletes are susceptible to muscle injury during strenuous exercise. Exercise-induced release kinetics of high sensitivity cardiac troponin I (hs-cTnI) and hs-cTnT are unclear. We analysed hs-cTnI and hs-cTnT kinetics after a maximal swimming test and examined differences between age and gender. **METHODS**: Fifty adolescents (25 males, 25 females) and 16 adults (7 males, 9 females) participated in a 60-min maximal swimming test. hs-cTnT (Roche, 99th percentiles male=22, female=14 ng/L, and hs-cTnI (Beckman Coulter, 99th percentiles male=11, female=9 ng/L) were measured at rest, immediately post-exercise, and at 1, 3, 6, 12, and 24 h post-exercise. **RESULTS**: Mean baseline (0h) concentrations were: hs-cTnT male 3.4 ng/L, female 3.1 ng/L; hs-cTnI male 0.5 ng/L, female 0.5 ng/L. We observed a greater percentage of hs-TnI results > 99th percentile vs. hs-cTnT for both genders. For males, this was at 6h (44% vs. 60%), 12h (20% vs. 44%) and 24 h (8% vs. 28%). For females this was at 6h (32% vs. 39%), 12h (3% vs. 19%) and 24h (0% vs. 10%). Until 3h both hs-cTnI and hs-cTnT presented similar percentages and no result over the 99th percentiles was observed for any hs-cTn value at rest. 13 subjects (10 males; 84.6%) had a maximum hs-cTnI over 50 ng/L. Medians were: hs-cTnI, 146 (IQ 89-247) ng/L and hs-cTnT, 77 (73-123) ng/L. There were no significant correlations between hs-cTn maximum concentration and age. However, significant differences (Mann-Whitney) in maximum concentration due to gender: hs-cTnT, (p=0.004) and hs-cTnI (p=0.018): hs-cTnT, (p=0.004) and hs-cTnI (p=0.018).**CONCLUSIONS**: We observed parallel increases, but different kinetics, between hs-cTnI and hs-cTnT in swimmers during maximal efforts. hs-cTnT appeared to increase earlier than hs-cTnI. Both assays peaked at 3h post-exercise, with higher hs-cTnI concentrations. Higher values were found in men, but no differences were found due to age. Clinicians need to be educated regarding these observations in healthy athletes.

1214   Board #22   May 31 8:00 AM - 9:30 AM

The Effects of Caffeine Ingestion on the Hemostatic Response to Simulated Firefighting Activities.

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(No relevant relationships reported)

PURPOSE: Sudden cardiac events are the leading cause of death among firefighters, a population that commonly overuses caffeine. The objective of this study was to examine the potential effects of caffeine on the hemostatic response to simulated firefighting activity. **METHODS**: Twelve healthy male firefighters, wearing full personal protective equipment (PPE) and self-contained breathing apparatus (SCBA), completed two trials of a simulated firefighting activities course one hour after consuming either 6mg/kg body weight of caffeine or placebo. Blood samples and air levels from the SCBA were obtained pre-exercise and post-exercise. The effects of caffeine and simulated firefighting on outcome variables were assessed using repeated measures ANOVA. **RESULTS**: Factor VIII increased more in the caffeine trial (Pre = 0.20 ± 0.13 IU/mL, Post = 0.43 ± 0.15 IU/mL) than the placebo trial (Pre = 0.21 ± 0.11 IU/mL, Post = 0.38 ± 0.15 IU/mL). tPA activity increased significantly ($P < 0.05$) by the same magnitude in both the placebo (Pre = 0.18 ± 0.18 IU/mL, Post = 3.23 ± 3.21 IU/mL) and caffeine (Pre = 0.18 ± 0.31 IU/mL, Post = 3.97 ± 3.53 IU/mL) conditions. PAI-1 activity significantly ($P < 0.05$) decreased from pre- to post-exercise in both the placebo (Pre = 33.86 ± 21.29 U/mL, Post = 28.77 ± 21.21 U/mL) and caffeine (Pre = 37.34 ± 28.81 U/mL, Post = 23.71 ± 19.42 U/mL) conditions. There was a trend (p = 0.05) for increased air consumption in the caffeine condition versus placebo condition. **CONCLUSIONS**: Results from the present study suggest that caffeine elicits a higher coagulation response without concomitant increases in fibrinolysis during simulated firefighting.

1215   Board #23   May 31 8:00 AM - 9:30 AM

Exercise Duration Augments Inter-Arm Systolic Blood Pressure Difference

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(No relevant relationships reported)

Blood pressure is a universal measurement used to aid in appropriate clinical decision-making and monitor safe exercise participation. Inter-arm systolic blood pressure difference (ISBPD; difference of ≥10mmHg between arms) at rest is associated with vascular disease, arterial stiffness, and premature morbidity and mortality. The incidence ISBPD at rest is low (i.e. commonly reported as 10%), though the occurrence of ISBPD is known to increase with short-term (i.e. <5 min at 6 metabolic equivalents) moderate-intensity aerobic exercise. **PURPOSE**: To determine the exercise-induced ISBPD response during a prolonged steady-state bout of aerobic exercise. **METHODS:** Fifty-four individuals were studied on two separate occasions. On an initial visit, anthropometric measures and a VO_{2peak} test on a cycle ergometer were completed. On a subsequent visit, participants cycled at a workload equivalent to 50% of their VO_{2peak} for 30 min. Heart rate (HR) and systolic blood pressure difference (SBPD; measured sequentially using standard auscultation in both arms) were measured at rest, 5, 10, 20, and 30 minutes of exercise (EX-5, EX-10, EX-20, EX-30), and during an active recovery (AR). Descriptive and comparative (one-way ANOVA) statistics were generated. A binary logistic regression analysis was used to determine the change in the odds ratio (OR) of ISBPD given exposure to exercise. **RESULTS:** The incidence of ISBPD at rest was 19%. The occurrence of ISBPD increased to 35% at EX-5 and EX-10, and 46% at EX-20 and EX-30. Occurrence decreased to 20% during AR. Interestingly, each additional 1mmHg difference in SBPD at rest was associated with an increased OR of ISBPD at EX-5 (1.139), EX-10 (1.335), EX-20 (1.220), and EX-30 (1.196; p<0.05). Individuals in the highest tertile of systolic blood pressure (SBP) response during exercise presented with the greatest SBPD (10.7 mmHg) at EX-5. Finally, individuals identified as underweight and obese class II were more likely to present with ISBPD at rest and EX-20. **CONCLUSION:** The occurrence of ISBPD during moderate-intensity aerobic exercise increased with prolonged steady-state aerobic exercise. Body mass index and the magnitude of the SBP response to exercise may be linked to ISBPD incidence.

1216   Board #24   May 31 8:00 AM - 9:30 AM

Effects of Acute Vibration Exercise on Endothelial Function and Inflammation in Healthy Males

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(No relevant relationships reported)

Endothelial progenitor cells (EPCs) are thought to play a key role in vascular regeneration, endothelial repair, and restoration of endothelial function. While studies have confirmed a relationship between exercise and EPCs, the mechanisms by which exercise mobilizes EPCs into circulation remains unknown. **PURPOSE**: To evaluate the effects of vibration training (VT*)* on the mobilization of angiogenic circulating progenitor cells (CPCs) and hematopoietic progenitors. We hypothesized that VT would increase the acute mobilization of angiogenic CPCs and decrease inflammatory marker levels. **METHODS**: 11 healthy males [18-30 yr (n=6) and 50-65 yr (n=5)] performed each of the following in random order on separate days: 1) standing on a vibrating platform only; 2) dynamic leg squat exercise (without vibration); and 3) in combination, i.e. leg squat with vibration. Blood samples were taken pre-and post-activity. **RESULTS**: Angiogenic CPCs increased 33% with vibration alone (p=0.02), 21% with exercise alone (p=0.02), and 34% with exercise plus vibration (p=0.004). VEGF levels were higher with vibration alone (p<0.005); TNFα increased with vibration (p<0.01); interleukin-6 (IL-6) approached a significant drop during vibration (p=0.056); and higher levels of IL-10 were found with vibration alone (p<0.03) and exercise alone (p<0.05). A decrease in IL-10 level was found when exercise and vibration were combined.
CONCLUSIONS: Our findings suggest vibration alone may have a pro-angiogenic effect taken together with higher VEGF and TNFα levels; more than with exercise alone or in combination. Furthermore, vibration alone may have greater anti-inflammatory effects, evidenced by a trend toward decreased inflammatory marker (IL-6) and a significant increase in anti-inflammatory marker (IL-10). Curiously, the anti-inflammatory effect was dampened when vibration was combined with exercise in that the drop in IL-6 did not approach significance and IL-10 levels were actually lowered, suggesting there may be a threshold for the optimal dose and/or combination effects. VT may be a viable option to increase stem/progenitor cell circulation levels and decrease inflammation with possible health benefits in multiple health conditions.

1217   Board #25   May 31 8:00 AM - 9:30 AM

Effects of Acute Resistance Exercise on Heart Rate Variability and Central Blood Pressure in Women

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(No relevant relationships reported)

INTRODUCTION: Heart rate variability (HRV) is defined as the beat-to-beat fluctuations of R wave to R wave and is an indirect measure of autonomic nervous system function, whereas central blood pressure (CBP) is indicative of the pressure load faced centrally on the aortic, coronary and carotid arteries. Both factors relate to cardiac health and are two variables that can be altered by exercise. **PURPOSE:** To determine the effects of acute resistance exercise on HRV and CBP in overweight women. **METHODS:** Eight overweight, non-resistance trained young women (BMI 27.17 ± 1.76; age 23.75 ± 4.13 years) volunteered to participate in three study sessions. The first session served to familiarize the subjects with the resistance protocol and obtain demographics. Sessions two and three consisted of either a control session of supine rest, or a resistance exercise session (composed of two sets of six total body, compound resistance exercises including a trap-bar deadlift, split squat, bench press, pull-up, bent-over row and shoulder press at a 2-0-2 tempo) lasting 30 min. A metronome and perceived exertion scale were used during exercise. HRV and CBP were measured before, and for 60 min after rest and exercise conditions. Repeated measures ANOVA's were used to analyze the data. **RESULTS:** The main finding was significantly lower values for standard deviation of N-N's (SDNN; a component of HRV) during the exercise condition, when compared to pre-exercise values (61.18 ms ± 32.15; 28.30 ms ± 17.69 immediate post exercise, p < .05, until 20 min post, 32.06 ms ± 16.55, p < .05). Values returned close to baseline at 60 min post exercise (64.33 ms ± 31.66, p > .05) No significant differences existed for systolic or diastolic CBP, or brachial blood pressures. **CONCLUSION**: Acute, total body resistance exercise depressed the SDNN component of HRV for up to 20 min post exercise, when compared to baseline values in a group of non-resistance trained, overweight women. Central blood pressure values did not change significantly after resistance exercise. Acute, resistance exercise temporarily lowers HRV in a group of overweight, young women.

1218   Board #26   May 31 8:00 AM - 9:30 AM

Cardiovascular Responses To Different Resistance Exercise Intensities In Young And Older Adults

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(No relevant relationships reported)

Older individuals are at increased cardiovascular risk both during rest and during physical effort. Acute resistance exercise (RE) conducted at high intensity significantly increases heart rate (HR), blood pressure (BP), and arterial stiffness in young individuals. The effects of high (HI) and low intensity (LI) RE performed until failure on cardiovascular responses are likely different among populations of different ages. **PURPOSE:** Compare the effects of acute HI and LI between young (Y) and older adults (O) on cardiovascular recovery responses. **METHODS:** 9 Y and 9 O performed two experimental sessions in randomized sequence, using leg press, with 4 sets until failure for HI (80% 1RM) and for LI (30% 1RM). Pre, 3-min and 30-min post-RE beat-to-beat BP waveforms were recorded by finger photoplethysmography from which the hemodynamic variables (HR, stroke volume [SV], cardiac output [CO], total peripheral resistance [TPR]) were derived. Left common carotid artery images were acquired by ultrasound and carotid compliance (CC) were calculated. Two-way ANOVAs were performed on raw (mean BP, HR, CO) and normalized (SV, TPR, CC) data. Data is presented as mean ± standard deviation. **RESULTS:** Following HI RE there was an increase in HR in Y (56 ± 8 to 95 ± 23) with no changes in O (64 ± 8 to 81 ± 12) at 3-min post-RE (interaction, p < 0.05), with similar increases in HR in Y and O following LI RE (Y: 56 ± 8 to 94 ± 12 and O: 66 ± 10 to 90 ± 13; time, p < 0.05). Y increased CO (6.1 ± 0.8 to 10.9 ± 3.2) and reduced TPR (0.81 ± 0.14 to 0.45 ±0.16) 3-min post HI RE while O did not change (CO 5.6 ± 0.9 to 7.6 ± 2.0 and TPR 1.02 ± 0.23 to 0.79 ± 0.24) (interaction, p < 0.05). No interactions were seen for the other variables. **CONCLUSION:** Aging impacts the hemodynamic recovery following HI RE but aging does not impact hemodynamic recovery following LI RE. These data suggest that LI RE may be a more desirable form of RE for older individuals.

1219   Board #27   May 31 8:00 AM - 9:30 AM

Heart Rate Variability During Submaximal Exercise And The Impact Of Gender And Race

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(No relevant relationships reported)

PURPOSE: To examine the effect of exercise duration on heart rate variability (HRV) and whether race or sex alters HRV during exercise. **METHODS**: Untrained participants (n=26, 46% male, 50% African-American [AA]) underwent fasting blood lipid and glucose tests and cardiovascular assessments (flow-mediated dilation [FMD], pulse wave analysis, and HRV). Maximal oxygen consumption (VO_{2max}) was used to prescribe a 30-min cycling bout at $50\%VO_{2max}$. Exercise intensity was similar across sex (Male 1.3±0.2L/min; Female 0.9±0.1L/min, P<0.001) and race (AA 1.1±0.3L/min; Cau 1.1±0.2L/min, P=0.23). HRV during exercise was assessed in 2 min increments before exercise (Pre-EX) and during steady-state submaximal exercise from 14-16 min (Mid-EX) and 28-30 min (End-EX). **RESULTS:** At rest, no race or sex differences were observed in blood lipids, fasting glucose, PWV or FMD (all P>0.05). VO_{2max} was significantly greater in males (29.9±6.7 vs. 25.3±4.4mL/kg/min; P<0.001). During exercise, heart rate was higher in females than males at Mid-Ex and Post-Ex (P<0.01). The natural logarithm of root mean square of successive differences (lnRMSSD) and high frequency (lnHF) significantly decreased from Pre-EX to Mid-Ex (P<0.001), and was similar from mid-EX to End-EX (lnRMSSD P=0.47; lnLF P=0.35). No race differences were observed in HRV during exercise (P>0.05). **CONCLUSION:** HRV was similar during exercise past 15 min, suggesting the time course of autonomic changes occurs early during exercise. No sex or race differences were observed in HRV during exercise, suggesting sex and race have similar cardiovascular responses during 30 min of submaximal exercise. However, it is plausible that intensity of exercise was not a sufficient stimulus for the sympathetic activity to observe differences between sex and race.

1220   Board #28   May 31 8:00 AM - 9:30 AM

Graduated Compression Socks Does Not Improve Cardio-respiratory Responses To Maximal Exercise

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(No relevant relationships reported)

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PURPOSE: The purpose of this study was to determine if the use of graduated compression socks (GCS) would improve cardio-respiratory responses to maximal exercise. **METHODS:** Eight healthy young participants (4 men and 4 women; age = 20.50 ± 1.41 years; height = 1.71 ± 0.12 m; weight = 72.34 ± 12.53 kg; body mass index = 24.65 ± 3.15kg/m²) performed a Cardiopulmonary Maximal Exercise Test (CPET) on a treadmill that consisted of 3 minutes warm-up at a speed of 4 mph at 0° grade followed by an increase in speed to 6 mph for 1 minute and then increases of 1 mph every minute until 8 mph with maintained grade (0°). After that, the grade increased 2° every minute until exhaustion, but the speed of the treadmill was kept constant. Each participant visit the laboratory twice to perform the CPET test in two different conditions: (1) wearing graduated compression socks (GCS); and (2) not wearing the graduated compression socks (NGCS) in a randomized and counterbalanced order. Peak oxygen consumption (VO_2peak), peak carbon dioxide production (VCO_2peak), peak respiratory exchange ratio (RER_{peak}), peak Heart Rate (HRpeak), and exercise time to exhaustion (ETE) were collected via metabolic cart system. **RESULTS:** There were no statistical differences in VO_2peak (NGCS = 49.94 ± 8.34 mL.kg⁻¹.min⁻¹ and GCS = 50.55 ± 8.67 mL.kg⁻¹.min⁻¹); VCO_2peak (NGCS = 4.19 ± 1.17 L.min⁻¹ and GCS = 4.34 ± 1.38 L.min⁻¹); RER_{peak} (NGCS = 1.41 ± 0.17 and GCS = 1.45 ± 0.16); HRpeak (NGCS = 191.63 ± 7.25 bpm and GCS = 190.75 ± 7.63 bpm); and ETE (NGCS = 512.36 ± 149.48 s and GCS = 528.15 ± 165.17 s) between non-graduated compression socks and with graduated compression socks, respectively. **CONCLUSIONS:** Based on the results, there were no statistical significant difference in any variables indicating that there was no effect of the passive external compression on the cardio-respiratory responses during maximal exercise. The conclusions drawn from our data need to be analyzed with extremely caution due to small sample size (n = 8). Therefore, more research need to be done to support these initial findings. **Research supported by New Hampshire-INBRE through an Institutional Development Award (IDeA), P20GM103506, from the National Institute of General Medical Sciences of the NIH".**

C-34   Free Communication/Poster - **Respiratory**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1221   Board #29   May 31 8:00 AM - 9:30 AM

Easy Breather Exercise Table: A Feasibility Evaluation of a Medical Device to Facilitate Gravity Powered Ventilation

David J. Giordano, Jared G. Kerr, Robert W. Boyce, FACSM, Justine J. Reel, Lisa K. Sprod, Susan M. Sinclair, Savannah L. Knight, Stephanie N. Spencer. University of North Carolina at Wilmington, Wilmington, NC. (Sponsor: Robert W. Boyce, FACSM)

(No relevant relationships reported)

Gravity powered ventilation is a concept that utilizes visceral pressure to facilitate pulmonary ventilation. Such a procedure may provide a form of complementary therapy for those with Chronic Obstructive Pulmonary Disease.
PURPOSE: Investigate if the Easy Breather Exercise Table (EBET) prototype is suitable for clinical studies in patients with Chronic Obstructive Pulmonary Disease (COPD). **METHODS**: The EBET bed uses arm power to tilt the supine subject from a Trendelenburg to a reverse-Trendelenburg position with the goal of assisting breathing. Healthy volunteers (N=40) operated the device for 15 minutes. Variables of interest: A body part discomfort scale (0 = no discomfort to 5 = very uncomfortable) administered at 0 and 13 minutes, a Borg scale rating of perceived exertion (0 to 10) at 14 minutes, and an end-of-session safety rating. **RESULTS**: Areas with the greatest discomfort at minute 13 and the associated percent reaching ≥ level 3 follow: Left elbow (5%), right elbow (5%), left wrist (23%), right wrist (28%), left hand (16%), and right hand (15%). Of these body parts, there was a significant (p ≤ 0.01) increase in discomfort from 0 to 13 minutes. Regarding exertion: 33% reported moderate to somewhat strong levels, while 13% reported strong levels. In terms of safety, 98% felt safe on the device, and 2% were undecided. **CONCLUSION**: Further clinical studies with the current EBET in COPD patients are not advised due to the discomfort and exertion in healthy volunteers. Safety data indicates tilting may be a viable means to achieve gravity powered ventilation, thus device modification is recommended.
Supported by grants from Exhale Fully, LLC, and University of North Carolina Wilmington

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1222   Board #30   May 31 8:00 AM - 9:30 AM

Three Weeks of Respiratory Muscle EnduranceTraining Decrease the O_2Cost of Walking In Obese Adolescents

Hailu K. Alemayehu[1], Desy Salvadego[1], Miriam Isola[1], Gabriella Tringali[2], Roberta De Micheli[2], Mara Caccavale[2], Alessandro Sartorio[2], Bruno Grassi, FACSM[1]. [1]University of Udine, Udine, Italy. [2]Istituto Auxologico Italiano, IRCCS, Milan and Piancavallo (VB), Italy.

(No relevant relationships reported)

Obese adolescents have an increased O_2 cost of exercise, attributable at least in part to an increased O_2 cost of breathing. In a previous work a short (3-wk) program of respiratory muscle endurance training (RMET) slightly reduced the O_2 cost of high-intensity cycling in these patients.
PURPOSE: We hypothesized that the effects of RMET would be more pronounced during walking on a treadmill compared to those described during cycling. **METHODS**: Sixteen obese patients (age 16.0±0.8 yrs; height 1.80±0.05 m; body mass 127.7±14.2 kg; BMI 40.7±4.0 kg/m²) participated to the study. In the experimental group (RMET, n=8), subjects followed for 3 weeks a standard RMET protocol in addition to a multidisciplinary body mass reduction program, whereas controls (CTRL, n=8) did only the latter. Among other variables, heart rate (HR), and pulmonary O_2 uptake (VO_2) were measured during incremental exercise and 12-minute constant work rate (CWR) exercises at 60 (moderate-intensity) and 120% (high-intensity) of the gas exchange threshold (GET), determined before the interventions. The O_2 cost of walking (aerobic energy expenditure per unit of covered distance) was calculated as VO_2/walking velocity. **RESULTS**: Body mass decreased both in CTRL (~4 kg) and in RMET (~5 kg). All subjects completed 12-minute CWR tests. VO_2 peak was not affected by both interventions. Both during moderate- and high-intensity walking, VO_2, the O_2 cost of walking and HR decreased in RMET, but not in CTRL. During heavy-intensity walking the positive slopes of the VO_2 and HR vs. time linear relationships from the 3rd to the 12th minute of exercise decreased in RMET, but not in CTRL. **CONCLUSIONS**: In obese adolescents a short RMET program significantly lowered the O_2 cost of moderate- and high-intensity walking and improved exercise tolerance.
Funding by "Progetti di Ricerca Corrente" from the Istituto Auxologico Italiano Istituto di Ricovero e Cura a Carattere Scientifico (Milan, Italy).

1223   Board #31   May 31 8:00 AM - 9:30 AM

Individual Variability in the Leg Blood Flow Response to Expiratory and Inspiratory Resistive Loading

Tim A. Hardy, Marcelle P. Ribeiro, Bryan J. Taylor. *University of Leeds, Leeds, United Kingdom.* (Sponsor: Lee M. Romer, FACSM)
(No relevant relationships reported)

BACKGROUND. Fatiguing inspiratory muscle work initiates the inspiratory muscle metaboreflex causing a time-dependent increase in muscle sympathetic nerve activity (MSNA) and a decrease in leg blood flow (Q_L). Fatiguing contractions of the expiratory muscles also facilitates an increase in MSNA. However, the effect of fatiguing expiratory muscle work on Q_L is somewhat unknown. **PURPOSE.** To determine the effect of expiratory resistive loading (ERL) compared to inspiratory resistive loading (IRL) on Q_L in healthy humans. **METHODS.** Five healthy men ($n = 2$, 30 ± 6 y) and women ($n = 3$, 29 ± 5 y) performed ERL and IRL at 65% of maximal expiratory and maximal inspiratory mouth pressure (MEP; MIP) to task failure. Respiratory frequency was maintained at 15 breaths/min with an inspiratory duty cycle of 0.5. Q_L (via Doppler ultrasound) and mean arterial pressure (MAP) (via finger photoplethysmography) were measured before, during and up to 3 min after ERL and IRL. Expiratory and inspiratory muscle fatigue was assessed by measuring the reduction in MEP and MIP from pre- to post-ERL and IRL. EMG was measured in each leg to ensure no muscular contraction occurred. **RESULTS.** Task failure occurred at 10.6 ± 2.4 min for ERL and at 20.6 ± 8.8 min for IRL; each subject performed ≥ 7 min of ERL and IRL. There was a $21 \pm 4\%$ reduction in MEP and a $7 \pm 5\%$ reduction in MIP from before to after ERL and IRL, respectively ($P < 0.05$). Despite an increase in group mean MAP from rest to during ERL (14 ± 14 mmHg, $P = 0.035$) and IRL (12 ± 6 mmHg, $P = 0.021$), there was no change in group mean Q_L across time during either ERL or IRL ($P > 0.05$). There was, however, substantial individual subject variability in the Q_L response to loaded breathing. During ERL, Q_L decreased relative to baseline values at min 3 ($-29 \pm 20\%$) and min 7 ($-17 \pm 6\%$) in 2 of the 5 subjects; Q_L increased by $15 \pm 7\%$ from rest to min 7 in the remaining 3 subjects. Similarly, there was a reduction in Q_L from rest to min 3 ($-23 \pm 9\%$) and min 7 ($-16 \pm 3\%$) in 2 of the 5 subjects during IRL; Q_L increased by $60 \pm 26\%$ from baseline to min 7 in the remaining 3 subjects. There was no significant change in MAP or Q_L during ERL and IRL trials at 2% of MEP and MIP. **CONCLUSION.** Leg blood flow appears to decrease in some but not all healthy humans in response to ERL. Indeed, we report substantial individual variability in the leg blood flow response to both ERL and IRL.

1224   Board #32   May 31 8:00 AM - 9:30 AM

Hypercapnic and Hypoxic Ventilatory Responses are Non-Normally Distributed: A Retrospective Analysis

Benjamin C. Skutnik, Joel T. Greenshields, Stephen R. Gagnon, Robert F. Chapman, FACSM, Joel M. Stager, FACSM. *Indiana University, Bloomington, IN.* (Sponsor: Joel M. Stager, FACSM)
(No relevant relationships reported)

Hypercapnic ventilatory response (HCVR) and hypoxic ventilatory response (HVR) are common procedures used to describe an individual's responsiveness to inhaled increases in CO_2 and decreases in O_2 respectively. To our knowledge there are no studies of HCVR or HVR of a grand enough scale to determine normative values or a 'typical' response. No description of the distribution of values, yet, is available in the literature such that little can currently be said about population-based differences. **PURPOSE:** To characterize the distribution of and establish reference values for ventilatory responses of the broad population using readily accessible sources. **METHODS:** Previously published dissertations and peer-reviewed manuscripts ($N=25$) were used to obtain subjects' responses ($N=312$, age $= 29.4 \pm 13.2$ yrs). HCVR tests ($n=262$) were analyzed using the slope of the linear regression line relating P_ACO_2 to minute ventilation (V_E), $l*min^{-1}*mmHg^{-1}$. HVR was calculated using either the calculated slope of the linear regression relating V_E to oxyhemoglobin saturation, $l*min^{-1}*\%^{-1}$ ($n=105$) or using the hyperbolic shape parameter (A) of the curve relating V_E to P_AO_2 ($n=170$). Confidence intervals for mean and median values were calculated using bootstrapping procedures. **RESULTS:** Data are presented mean/median; ±95% CI width. HCVR values displayed a right skewed non-normal distribution (skew $= 5.25$, $p <.05$), mean 2.67; ±0.70 $l*min^{-1}*mmHg^{-1}$, median 2.00; ±0.51 $l*min^{-1}*mmHg^{-1}$ (IQR: 1.50). HVR A values showed a non-normal right skewed distribution (skew $= 0.92$, $p <.05$), mean 131.8; ±23.62 $l*min^{-1}*mmHg^{-1}$, median 112.50; ±58.25 $l*min^{-1}*mmHg^{-1}$ (IQR: 118.99). Linearized HVR values using %SaO2 was also a right skewed non-normal distribution (skew=1.33, p<.05), mean 0.35; ±0.10 $l*min^{-1}*\%^{-1}$, median 0.26; ±0.23 $l*min^{-1}*\%^{-1}$ (IQR: 31.00). **CONCLUSION:** This analysis allows researchers to better place into context assessments of HCVR and HVR by providing distribution parameters derived from the literature. However, as HVR measures contrast due to methodological differences, distribution parameters remain infirm. In an effort to strengthen these distributions, researchers should include individual responses when reporting results of studies.

1225   Board #33   May 31 8:00 AM - 9:30 AM

Comparing Ventilatory Mechanics Between Face Mask and Mouthpiece During High-Intensity Exercise

Jessica Freemas. *Indiana University, Bloomington, IN.*
(No relevant relationships reported)

Purpose:
A snorkel-like mouthpiece and the Hans Rudolph mask are used interchangeably to collect ventilatory data. Since the mask has a greater amount of dead space (250ml vs. 41ml) it may affect operating lung volumes and mouth pressure. Therefore, the aim of this study was to compare ventilatory mechanics while breathing through the mouthpiece and the mask during high-intensity exercise.
Methods:
Seven recreationally active, healthy males [age (mean ± SD) = (27 ± 1 yr.); VO$_2$max $= 53.4 \pm 6.1$ ml·kg^{-1}·min^{-1}] visited the laboratory on 3 separate occasions. Visit one consisted of a VO$_2$max test and familiarization of the maximal graded flow volume loop (MFVL) procedure. During visits two and three, participants performed two 5-min cycle bouts at 90% of their power output at VO$_2$max. During one bout participants breathed through the mouthpiece; during the other bout, they breathed through the mask. The initial order of the devices used was randomized between subjects and then reversed on the subsequent visit. Both visits included a pre- and post-MFVL procedure, and participants were instructed to perform an inspiratory capacity (IC) maneuver every 30 seconds of exercise. Minute ventilation (V_E), mouth pressure (Pm) (cmH20), and tidal volumes (V_t) (L/s) were collected in the last minute of exercise.
Results:
V_E was not significantly different ($p = 0.919$) between the mouthpiece (158.1 ± 18.4 L/min) and mask (158.9 ± 11.2). Furthermore, no significant differences were observed in P_m ($p = 0.542$), V_t (p = 0.303), and percent flow limitation (%FL) ($p = 0$ .98) between the two breathing devices.
Conclusion:
The extra dead space in the Hans Rudolph mask does not significantly alter breathing mechanics. Therefore, the mask can be used as a more comfortable alternative to the mouthpiece during near maximal exercise.

1226   Board #34   May 31 8:00 AM - 9:30 AM

Cycling Time Trial Performance with Addition of External Dead Space

Vincent P. Georgescu, Aaron B. McMichael, Jayvaughn T. Oliver, Erica M. Larson, Jonathon L. Stickford. *Appalachian State University, Boone, NC.*
(No relevant relationships reported)

When athletes have the ability to self-select their work rate, it is unknown how the addition of external dead space (DS), a potent ventilatory stimulus, will influence cycling power and ventilatory dynamics. **PURPOSE:** To examine mechanical power, ventilatory dynamics, and perceptual responses during a fixed-work cycling time trial (TT) in trained male cyclists under a condition of increased DS. **METHODS:** Eleven trained cyclists completed pulmonary function testing and a peak aerobic capacity (VO$_{2peak}$) test on a cycle ergometer during the initial visit. During the second visit, subjects completed a familiarization TT. During visits three and four, subjects completed TTs with (TT$_{DS}$) or without (TT$_C$) the addition of DS. Mechanical power, elapsed time, metabolic and ventilatory parameters, and perceptual responses were measured throughout each TT. Statistical differences between TT$_{DS}$ and TT$_C$ were tested each 20% interval of the TT using Student's paired t-tests. Data are expressed as means ± SD. **RESULTS:** Subjects displayed normal pulmonary function upon study entry. Time to completion was greater in TT$_{DS}$ compared with TT$_C$ (536±34 vs. 489±34 s, p<0.05) as a result of reduced power at 40-100% of TT$_{DS}$ completion compared with TT$_C$ (Δ=-10.2±8.7%). Additionally, minute ventilation (V_E) was similar at 40-100% of TT$_{DS}$ completion compared with TT$_C$ (Δ=0.9±11.0%). However, integrated inspiratory mouth pressure (∫P$_m$) was greater throughout TT$_{DS}$ compared with TT$_C$ (p<0.05), and arterial pulse saturation (SpO$_2$) fell at a greater rate throughout TT$_{DS}$ compared with TT$_C$ (-2.2±0.8 vs. -1.3±0.4 % per interval, p<0.01). Rating of perceived breathlessness (RPB) was significantly greater at 20% and 40% of TT$_{DS}$ compared with TT$_C$, but was not different during the remaining intervals. **CONCLUSION:** Power output during a cycling time trial is reduced in response to increased ventilatory stress in an effort to balance the additional ventilatory work and potential impact to blood gas tensions. Additionally, the fact that V_E and RPB were largely similar between conditions suggests that these parameters may play an important role in the determination of self-selected work rates. Supported by the Office of Student Research and Graduate Student Association Senate at Appalachian State University.

1227 Board #35 May 31 8:00 AM - 9:30 AM

Characterizing The Mechanics Of Breathing In Swimmers

Michael G. Leahy, Mckenzie N. Summers, Carli M. Peters, Yannick Molgat-Seon, Caitlin M. Geary, A. William Sheel, FACSM. *University of British Columbia, Vancouver, BC, Canada.* (Sponsor: Dr. A. William Sheel, FACSM)

(No relevant relationships reported)

During freestyle swimming, the hydrostatic pressure of water limits expansion of the lungs and chest wall, and narrows airways >2 mm in diameter. Moreover, the horizontal body position causes blood to shift from the extremities to the chest, which reduces lung compliance. Thus, during freestyle swimming, the mechanics of breathing are altered, which likely increases the work of breathing (W_b). However, no previous studies have quantified W_b during freestyle swimming. **PURPOSE:** To compare W_b during freestyle swimming relative to cycling, and to characterize the differences in the cardiorespiratory responses to swimming relative to cycling in the same individuals. **METHODS:** Seven collegiate swimmers (n=4 male, n=3 female; age= 22±2 y) performed a graded swim test while tethered to a resistance apparatus. On a separate day subjects performed a graded cycle test. During swimming and cycling, metabolic and ventilatory parameters were measured using a customized metabolic cart, and inspired W_b was quantified using an esophageal balloon catheter. **RESULTS:** Swimming and cycling elicited statistically similar maximal oxygen uptakes (3.87±0.92 vs. 4.20±0.83 l·min^{-1}, p=0.143). However, minute ventilation (V_E) (118±3 vs. 154±25 l·min^{-1}) and heart rate (164±19 vs. 183±8 beats·min^{-1}) were significantly lower during swimming relative to cycling (both p<0.05). Total inspired W_b was higher at a V_E of 50 l·min^{-1} (+27±16 J·min^{-1}) and a V_E of 100 l·min^{-1} (+53±22 J·min^{-1}) during swimming compared to cycling (both p<0.05). Periods of inter-breath apnea were observed at lower ventilations while swimming, resulting in decreased breathing frequency (V_E=50 l·min^{-1}, 19±6 vs. 22±4 breaths·min^{-1}, p<0.05), and were not observed at higher ventilations (V_E=100 l·min^{-1}, 37±11 vs. 35±7, p>0.05). Peak inspired flow was greater while swimming, when matched for V_E (+0.26±0.73 l·sec^{-1}, p<0.05). **CONCLUSION:** We found that swimming resulted in a higher inspired W_b, at a V_E of 50 and 100 l·min^{-1} compared to cycling. We interpret our findings to mean that the horizontal body position and hydrostatic pressure on the chest wall requires swimmers to generate greater inspiratory pressures to sustain adequate V_E during exercise.

1228 Board #36 May 31 8:00 AM - 9:30 AM

Effect of Growth and Changes in Body Composition on Cycling Efficiency in Normal Weight and Obese Children

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(No relevant relationships reported)

PURPOSE: Efficiency refers to the amount of work performed for a given energy consumption. Excess body weight is known to increase resting oxygen uptake, but not net oxygen uptake or mechanical efficiency during non-weight bearing exercise such as cycling in prepubertal children. We examined whether the VO$_2$/WR slopes during incremental exercise were affected by changes in body composition after 1 year in normal weight and obese 10-12 year-old children. **METHODS**: 17 children (9 obese) underwent an incremental exercise test on a cycle ergometer and dual energy x-ray absorptiometry at baseline and at 1-year follow-up. A VO$_2$/WR slope was calculated from measured VO$_2$ and WR (r^2 = 0.97 ± 0.1). No intervention was prescribed during the year between testing. **RESULTS**: There were no mean differences in the VO$_2$/WR slope between normal weight and obese children during the incremental exercise test at baseline or 1-year follow-up (P=0.715). Over 1 year, obese children gained 8.1±4.6kg and normal weight children gained 4.3±1.9kg of body mass (P=0.048). Obese children gained 2.6kg more lean body mass than normal weight children (P=0.018), with no differences in percent fat or fat weight gained over 1 year. There were no significant associations between changes in body mass, percent fat, fat mass, or lean body mass and changes in VO$_2$/WR slope in normal weight or obese children. **CONCLUSIONS**: Muscular efficiency (VO$_2$/WR slope) during cycling exercise is similar between normal weight and obese children and does not appear to be related to relatively short-term changes in body composition.
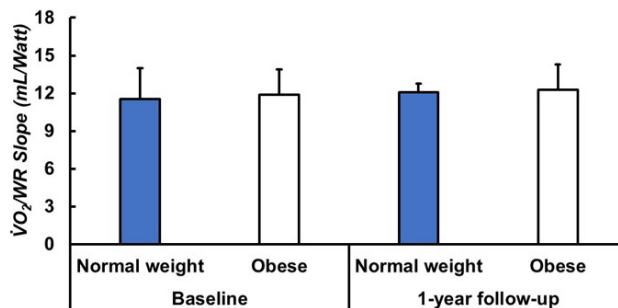

Figure 1: $\dot{V}O_2$/WR slope was not different between normal weight and obese children at baseline or at 1-yr follow-up.

1229 Board #37 May 31 8:00 AM - 9:30 AM

Blunted Sympathetic Vasomotor Outflow To Inspiratory Resistive Breathing During Exercise In Women Compared to Men

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(No relevant relationships reported)

It has been reported that in young men high inspiratory muscle work at rest and during exercise reflexively increases muscle sympathetic nerve activity (MSNA), with corresponding increases in arterial blood pressure (ABP). This sympathoexcitation occurs through an inspiratory muscle-induced metaboreflex. Young women have attenuated inspiratory muscle metaboreflex-induced increases in ABP compared to age-matched men. One potential mechanism is less sympathetic vasomotor output in women compared to men. **PURPOSE:** We compared changes in MSNA and cardiovascular variables during leg cycle exercise with increased inspiratory muscle resistance in men and women. **METHODS:** Eight young women (19.5±0.2) and seven men (20.3±0.3) completed the study. The subjects performed two 10-min submaximal cycle ergometer exercises in a semirecumbent position. The first 5-min was spontaneous breathing, and latter 5-min half was voluntary hyperventilation with or without inspiratory resistive breathing. Mean arterial blood pressure (MAP) was measured using finger photoplethysmography and MSNA was recorded via microneurography of the arm at the elbow. **RESULTS:** During exercise with inspiratory resistive breathing, MSNA burst frequency was significantly increased accompanied by an increase (p<0.05) in MAP in both men and women. Women had significantly less of an increase in MSNA (Women: +9.6±1.0 vs. Men: +14.6±2.4 bursts/min) and MAP (Women: +22.8±5.7 vs. Men: +32.2±2.0 mmHg) as compared to men. **CONCLUSION:** These results suggest that lesser sympathetic vasomotor outflow partially contributes the attenuated inspiratory muscle-induced metaboreflex during exercise in young women. Supported by JSPS KAKENHI Grant Number 15H3079.

1230 Board #38 May 31 8:00 AM - 9:30 AM

Spirometry Values In Recreational Runners Are Acutely Lower After Prolonged Exercise

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(No relevant relationships reported)

PURPOSE: Prolonged endurance running may acutely reduce spirometric lung function. This study examined changes in spirometric lung function before and immediately after prolonged endurance exercise (running/walking) in a large sample. This study also examined if presence or absence of exercise-induced bronchoconstriction (EIB) was related to finishing time. **METHODS**: Recruitment was obtained at the pre-race expo, where an informed consent form was signed. Pre- and post-race spirometry measurements were obtained in seventy-nine participants who participated in the 2008 ING (Internationale Nederlanden Groep) Georgia half-marathon (n = 66) or marathon (n = 13). Mean ambient temperature was 47ºF (range 43-50ºF); mean ambient relative humidity was 88% (range 76-100%). Spirometry was performed 24 hours before the marathon or half-marathon and then again about 25 minutes (SD 7) after finishing it.

RESULTS: The post-race forced expiratory volume in 1 second (FEV_1) and forced vital capacity (FVC) were statistically lower by ~10% compared to pre-race, and peak expiratory flow decreased by ~8% compared to pre-race. About 30% of the participants, regardless of sex, demonstrated a post-exercise reduction in FEV_1 by at least 10% compared to pre-race. EIB was the most probable explanation for the reduction in FEV_1 post-race. There was no difference in spirometric lung function changes between men and women, nor between participants completing the marathon versus half-marathon. Presence or absence of a 10% reduction in FEV_1 (i.e., EIB) did not predict finishing time, only the distance run, age, body mass index, and sex affected finishing time (adjusted R^2 = 0.82).
CONCLUSIONS: Prolonged endurance exercise reduced spirometric lung function by about 10%, but did not affect finishing times among recreational runners/walkers.

1231   Board #39   May 31 8:00 AM - 9:30 AM

Exercise-Induced Diaphragmatic Fatigue Is Determined By The Work Of Breathing In Healthy Men

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[2]*University of British Columbia, Vancouver, BC, Canada.*
(Sponsor: A. William Sheel, FACSM)
(No relevant relationships reported)

It has been purported that diaphragmatic fatigue (DF) may occur relatively early during high-intensity exercise. However, studies examining the temporal characteristics of exercise-induced DF are limited by incongruent methodology. **PURPOSE**: To determine the time-course of exercise-induced DF during high-intensity exercise. **METHODS**: Eight healthy adult males (25 ± 5 yrs, 182 ± 8 cm, 74.5 ± 5.8 kg) performed a maximal incremental exercise test on a cycle ergometer on Day 1. A constant load time-to-exhaustion (TTE) exercise test was conducted on Day 2 at 60% delta between the calculated gas exchange threshold and peak work rate (85-90% of maximal oxygen consumption). On Days 3 and 4, constant load exercise tests were performed at the same intensity to either 50 or 75% TTE in random order. Assessment of DF was made by measurements of transdiaphragmatic twitch pressure ($P_{di,tw}$) using cervical magnetic stimulation. **RESULTS**: DF ($\geq$ 20% decrease in $P_{di,tw}$) was present in 2/8 subjects after 50% TTE, 6/8 subjects after 75% TTE and all subjects after 100% TTE. The magnitude of fatigue at 100% TTE (35.0 ± 12.1%) was significantly greater than 75 (23.6 ± 6.4%) and 50% TTE (15.5 ± 5.7%) (both $P < 0.01$), and 75 to 50% TTE ($P < 0.01$). Ventilation, the mechanical work of breathing (WOB), and pressure-time products responded similarly between trials ($P > 0.05$). The accumulated WOB was significantly greater after 100 (3,420 ± 1,093 J) compared to 75 (1,792 ± 611 J) and 50% (877 ± 427 J) TTE (both $P < 0.01$), and after 75 compared to 50% TTE ($P < 0.01$). A significant relationship was found between the magnitude of DF and cumulative diaphragmatic force output ($r = 0.785$; $P < 0.001$). **CONCLUSION**: Our data indicate that exercise-induced DF is proportional to the cumulative WOB; thus, the ability of the diaphragm to generate pressure progressively declines throughout exercise.
Supported by NSERC and FAPESP (grants no. 2016/08999-5 and no. 2014/10145-9).

1232   Board #40   May 31 8:00 AM - 9:30 AM

Prevalence of Exercise Induced Bronchoconstriction in Recreational Adult Hockey Players as determined by Sport Specific Field Exercise Challenge Test

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(No relevant relationships reported)

BACKGROUND: Exercise induced bronchoconstriction (EIB) is provoked by exercise and results in narrowing of the airways. Studies have shown an EIB prevalence of 11-50% in athletic populations. The diagnosis of EIB is dependent upon objective measurement of respiratory function, as respiratory symptoms are unreliable. Cold and dry ambient conditions contribute to the severity of EIB. The environmental conditions and manner of exertion an athlete is exposed to in ice hockey are significantly different than any current standardized laboratory test to evaluate for EIB. In a prior study of elite women hockey players, 39.5% presented symptoms of asthma and 21% demonstrated EIB. Sport-specific field exercise challenge tests (SSFECT) have been validated for the assessment of EIB, and are more sensitive than laboratory challenges in elite winter athletes. **PURPOSE**: To use a SSFECT to determine the prevalence of EIB in adult recreational ice hockey players, and the correlation between reported symptoms and diagnosis by this method.
METHODS: Participants were 18 males and 2 females (mean age of 34.7 yrs, mean height of 1.78 m); who participated in 1 of 2 recreational ice hockey leagues in Chicago, IL. Using a Piko-1 portable spirometer, FEV1 was measured prior to the hockey game and immediately following periods 1, 2, and 3. All respiratory measurements occurred with hockey equipment adorned. Airway response was expressed as the percent fall in FEV1 from the baseline value. Diagnosis of EIB was given if athletes had a greater than 10% decrease in FEV1 from baseline measured at any time point. Athletes also completed an intake questionnaire prior to testing which included clinical symptoms, exercise history, and past medical history.
RESULTS: EIB was diagnosed in 3/20(15%) athletes. A prior diagnosis of asthma or exercise induced asthma was reported in 5/20 (25%) athletes, yet only one of these had a decrease of > 10 % of FEV1 as measured by this test. Of the three EIB+, two were symptomatic (67%); and of the EIB-, 9/17 (53%) reported respiratory symptoms. Diagnosis of EIB was consistent for all three periods in all but one athlete. Mean FEV1 for the three periods was 4.08, 4.07, and 4.07 respectively.
CONCLUSIONS: Symptoms remain unreliable for diagnosis of EIB. SSFECT can be utilized for diagnosis of EIB in ice hockey athletes.

1233   Board #41   May 31 8:00 AM - 9:30 AM

Improving The Accuracy Of A Turbine Spirometer At Low Flow Rates

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(No relevant relationships reported)

The turbine spirometer is a popular laboratory device used to measure respiratory volumes and flows during exercise, and while performing gross, voluntary respiratory manoeuvres (i.e., inspiratory capacity efforts). Indeed, these devices have been incorporated into many commercially-available pulmonary function and metabolic systems. Yet, while the turbine spirometer may provide accurate/reliable measurements of respiratory volumes at modest-to-high flows, these devices perform poorly at low flow rates. **PURPOSE:** To improve the accuracy of a turbine spirometer over an extended range of low flows using the "weighted averaging technique" described by Yeh *et al.* (*J Appl Physiol*, 53(1): p280, 1982). **METHODS:** A commercially-available turbine spirometer was interfaced with a custom-designed microcontroller unit (MCU). The MCU recorded discrete rotations of the turbine rotor, and the corresponding rotational frequency (*f*rot). Repeated 5-fold cross-validation was used to determine the optimal number of bins in *f*rot and iterations used in the Weighted Averaging algorithm. This method yielded a discrete array of calibration constants (K) across a relevant range of *f*rot (<1-1800 Hz). The accuracy of this "nonlinear" calibration curve was compared to that obtained by assuming a constant K across all frequencies (i.e., flows). Over 200 calibrations strokes were recorded using a 3 L syringe. **RESULTS:** By assuming a constant K (15.6 mL·pulse[-1]), the turbine spirometer exhibited an average volume error of +94 mL (+3.1%) over a 95% confidence interval ($CI_{95\%}$) of -856 to +375 mL (-28.5 to 12.5%). Conversely, applying the nonlinear K curve resulted in an average volume error of <0.001 mL (<0.001%) and a $CI_{95\%}$ ranging from -60 to +60 mL (-2.0 to 2.0%). Importantly, the nonlinear K curve provided accurate (within ±3%) volume measurements down to 0.33 Hz (~7 mL·s^{-1}). **CONCLUSIONS:** The "weighted averaging technique" improved the accuracy/reliability the turbine spirometer to within ±3% across an interval of flows ranging between ~0.01 to 20 L·s^{-1}.

1234   Board #42   May 31 8:00 AM - 9:30 AM

Baseline Ventilatory Thresholds Determine Cardiorespiratory Adaptations to High-Intensity Interval Training in Obese Participants

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(No relevant relationships reported)

PURPOSE: To study if cardiorespiratory fitness (CRF) evolution after high intensity interval training (HIIT) depends on training intensity relative to ventilatory thresholds (VTs).
METHODS: A sample (*n*=134) of sedentary participants with obesity (54±9 years, BMI 31.6±5.6 kg·m^{-2}, 42% female) trained for 16 weeks, 3 days·week[-1] alternating bouts of 70-90% of peak heart rate (HR). CRF was evaluated before and after training using a graded cycle-ergometer exercise tests (GXT) until exhaustion. Starting at rest, oxygen consumption (VO_2), power output (PO), and HR, were determined at ventilatory threshold (VT_1), respiratory compensation threshold (VT_2) and at maximal values ($_{PEAK}$). Participants were separated in two groups according to the relationship between the training intensity (target-HR based) and the VTs location. One group (BelowVTs) was composed for those who trained below their VTs (*n*=74), whereas the other group (AboveVTs) for those who trained above their VTs (*n*=60).
RESULTS: Before intervention, age and body composition were similar in both groups. While at baseline, VO_2 at $_{PEAK}$ was higher in AboveVTs (P=0.005), at VT_1, and VT_2, was similar in both groups. After training, both groups improved their VO_{2PEAK} by 11-12% (*P*<0.001) without differences between groups (*P*=0.880). However, in BelowVTs group, 54% of the VO_2 improvement occurred below VT_1, 12% between VTs and 33% above VT_2, whereas for AboveVTs, 96% of the VO_2 improvement occurred below VT_1, 0% between VTs and 4% above VT_2.

Abstracts were prepared by the authors and printed as submitted.

CONCLUSIONS: Target-HR based HIIT improves VO_{2PEAK} in middle-aged individuals with obesity independently of the VTs location. However, the extent of the widening of exercise workloads tolerated after the onset of metabolic acidosis (i.e., improvements above VT_2) and exercise workloads supplied solely with oxidative metabolism (i.e., improvements at VT_1) depends if the workload chosen for training fall above or below the workload at both VTs.

1235   Board #43   May 31 8:00 AM - 9:30 AM

The Impact Of An Eight Week Apnea Training Program On Spleen Volume And Hematological Values

Janne Bouten, Kevin Caen, Jan Stautemas, Filip Lefevere, Wim Derave, Leen Lootens, Peter Van Eenoo, Jan G. Bourgois, Jan Boone. *Ghent University, Gent, Belgium.*

(No relevant relationships reported)

PURPOSE: Apnea training has recently been proposed as a simple and cheap method to stimulate erythropoietin (EPO) production and increase hemoglobin (Hb) concentration and hematocrit (Hct). This study aimed to investigate both acute and chronic effects of apnea on spleen volume and hematological values through an 8-week apnea training program.
METHODS: Thirteen subjects daily performed five static apneas. Before, halfway through and after the apnea training period, subjects performed five maximal breath-holds at the laboratory. Baseline values for and changes in splenic volume, [Hb], Hct, reticulocyte count (RET%) and EPO were assessed.
RESULTS: A strong spleen contraction in response to acute apnea was observed with volume reductions of 50 ±10% (p<0.001). An acute increase in [Hb] from 156 ±11 g L^{-1} to 159 ±9 g L^{-1} (+2%, p<0.05) was seen immediately after the last apnea. Apnea training did not improve acute effects for neither spleen volume (p=0.868), [Hb] (p=0.358) nor Hct (p=0.421). Although no differences in baseline Hct, RET% and EPO were found (p>0.05), the apnea training program did increase baseline spleen volume by 24 ±27% (p<0.05) and baseline [Hb] by 3.3 ±5% (p<0.05).
CONCLUSIONS: Our results show an apnea-specific training effect, as it was demonstrated that both baseline spleen volume and [Hb] had increased after eight weeks of apnea training. These increases suggest improved oxygen storage and transport capacity which might be beneficial for both elite athletes and anemic patients. In contrast, acute spleen contraction and temporarily increases in Hb remained unaltered after training.

1236   Board #44   May 31 8:00 AM - 9:30 AM

Sex Differences in Diaphragmatic Fatigue: Implications for Performance

Joseph F. Welch, Bruno Archiza, Jordan A. Guenette, Christopher R. West, A. William Sheel, FACSM. *University of British Columbia, Vancouver, BC, Canada.* (Sponsor: William Sheel, FACSM)

(No relevant relationships reported)

Inspiratory muscle fatigue (IMF) is associated with a sympathetically mediated metaboreflex, resulting in time-dependent sympathoexcitation, including increased heart rate, mean arterial pressure and limb vascular resistance that impairs tolerance to exercise. Women may be more resistant to IMF relative to men and therefore, may experience an attenuated inspiratory muscle metaboreflex. **PURPOSE**: To examine sex-based differences in *a*) the cardiovascular response to inspiratory pressure-threshold loading (PTL) and *b*) the effect of prior-induced IMF on subsequent exercise performance. **METHODS**: Healthy men ($n = 9$) and women ($n = 9$) completed a maximal incremental cycle test on day 1. On day 2, subjects performed PTL to task failure followed by a constant load submaximal time-to-exhaustion (TTE) exercise test (85% peak work rate). On day 3, subjects performed the same exercise test without prior-induced IMF. Diaphragmatic fatigue was assessed by measuring transdiaphragmatic twitch pressure ($P_{di,tw}$) in response to cervical magnetic stimulation. Heart rate (HR) and mean arterial pressure (MAP) were measured beat-by-beat throughout PTL via photoplethysmography, and low-frequency systolic pressure (LF_{SBP}, surrogate for sympathetic vasomotor tone) calculated from arterial waveforms using power spectrum analysis. **RESULTS**: At task failure of PTL, the severity of IMF was similar between sexes (W = 23 ± 6%, M = 24 ± 8% reduction in $P_{di,tw}$, $p = 0.33$). However, time to task failure was significantly longer in women than men (27 ± 11 vs. 16 ± 11 min, $p = 0.02$) and consequently, women tended to produce greater cumulative diaphragmatic pressure (46,805 ± 16,723 vs. 32,288 ± 20,752 $cmH_2O \cdot s^{-1}$; $p = 0.06$). Furthermore, women exhibited less of an increase in HR (13 ± 8 vs. 19 ± 12 bpm, $p = 0.01$) and MAP (10 ± 8 vs. 14 ± 9 mmHg, $p = 0.02$) during PTL, and significantly lower LF_{SBP} (27 ± 12 vs. 38 ± 7 mmHg[2], $p = 0.04$) compared to men. Prior-induced IMF resulted in the premature termination of exercise that did not differ on the basis of sex (W = 15 ± 19%, M = 16 ± 19% decrease in TTE, $p = 0.89$). **CONCLUSIONS**: Inspiratory muscle endurance time is significantly longer in women than men. Fatiguing contractions of the diaphragm elicit a blunted cardiovascular response in women, whilst IMF contributes to exercise impairment independent of sex.

C-35   Free Communication/Poster - **Blood Flow Restriction**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1237   Board #45   May 31 8:00 AM - 9:30 AM

Corticomotor Function During Blood Flow Restricted Arm Crank Ergometry

Mikaela L. Frechette[1], Ann-Maree Vallence[2], Brendan R. Scott[2], Summer B. Cook, FACSM[1]. [1]*University of New Hampshire, Durham, NH.* [2]*Murdoch University, Perth, Australia.* (Sponsor: Summer B. Cook, FACSM)

(No relevant relationships reported)

Low-intensity exercise with blood flow restriction (BFR-LI) may be used as an alternative to high-intensity (HI) exercise. The underlying neurophysiological mechanisms of adaptation remain elusive. **PURPOSE:** To examine corticomotor and metabolic function during HI and BFR-LI arm ergometry. **METHODS:** Twelve males (age: 23.9±3.75 yrs, BMI: 25.3±4.26 kg•m^{-2}) completed three 15-minute arm ergometry conditions: HI, low-intensity (LI), and BFR-LI. HI was completed at 60% of maximal power output, while LI and BFR-LI were completed at 30% of maximal power output. In the BFR-LI condition, cuff pressure to the proximal biceps brachii was set to 70% of occlusion pressure. Single-pulse transcranial magnetic stimulation was delivered to the left primary motor cortex to measure motor evoked potentials (MEPs) in the right biceps brachii at baseline, 1, 10, and 15 minutes post-exercise. Blood lactate (BL) was measured at baseline, immediately and 5-minutes post-exercise. Relative VO_2 and HR were recorded at 2 minute intervals during the exercise protocol. Each dependent variable was analyzed using within-subject repeated-measures ANOVA to evaluate condition x time interactions. **RESULTS:** MEP amplitudes throughout exercise were not different between conditions ($p = 0.883$). A significant main effect of time indicated an overall elevation in all conditions in MEP compared to baseline (0.80±0.51 mV), 10 minutes (1.16±0.74 mV), and 15 minutes (1.04±0.47 mV; $p < 0.001$). BL following HI was 45% greater ($p = 0.03$) and 50% greater ($p < 0.001$) than the BFR-LI and LI conditions, respectively. A similar trend was seen at 5-minutes post-exercise. The HI condition resulted in HR values of (162 bpm±4 bpm) at the completion of exercise. This was higher than LI (117±5 bpm) and BFR-LI (125±5 bpm; $p < 0.001$). VO_2 values were significantly higher with HI (24.0±1.1 ml•kg•min^{-1}) when compared to LI (11.4±1.2ml•kg^{-1}•min^{-1}) and BFR-LI (13.7±0.8ml•kg^{-1}•min^{-1}) ($p < 0.001$). **CONCLUSION:** High intensity arm ergometry elicited the highest VO_2, HR, and BL values, suggesting greater metabolic demands. Despite higher physical demands, MEP amplitudes increased for all conditions, suggesting similar responses in corticospinal excitability. Supported by: 2017 International Research Opportunities Program from the University of New Hampshire.

1238   Board #46   May 31 8:00 AM - 9:30 AM

Acute Muscle Fatigue In Men And Women Following Upper-limb Low-intensity Blood-flow Restricted Exercise

Afonso Borges[1], Carolina Teodósio[1], Pedro Matos[1], Pedro Pezarat Correia[1], Pedro Mil-Homens[1], Pedro Fatela[2], Goncalo V. Mendonca[1]. [1]*Faculdade de Motricidade Humana, Lisboa, Portugal.* [2]*Universidade Europeia, Lisboa, Portugal.* (Sponsor: Bo Fernhall, FACSM)

(No relevant relationships reported)

Low intensity blood flow restricted exercise (LIBFRE) elicits acute changes in torque output and muscle activation. The magnitude of these changes affect the chronic adaptions to this type of training. Despite its widespread use by men and women, it is not known whether the acute impact of LIBFRE follows a sexually dimorphic pattern. This is important because, when compared to men, women have muscle fibers of smaller diameter, higher density of type I muscle fibers, higher muscle capillarization and heightened muscle perfusion. All these factors likely influence blood flow, as well as acute muscle fatigue, during LIBFRE. **PURPOSE**: To explore whether muscle fatigue post-acute LIBFRE and high intensity resistance (HI) training follows a sexually dimorphic pattern. **METHODS** 62 healthy young persons (31 men: 21.7 ± 2.3; 31 women: 22.0 ± 2.0 yrs) were included in this study. One-repetition maximum (1RM) was determined in each participant before training. Participants completed 4 sets of unilateral biceps curl with (30+15+15+15 reps) and without BFR (10+10+10+10 reps). HI was performed at 75% 1RM and LIBFR at 20% 1RM with BFR (60% of arterial occlusion pressure). Maximum voluntary contraction (MVC) was measured at pre- and post-training time points. Muscle fatigue was quantified as the percent difference between pre- and post- training MVC. **RESULTS**: Both HI and LIBFR training protocols induced significant muscle fatigue in men and women from pre- to post-training (p<0.05). HI was more fatiguing than LIBFRE in both sexes (HI: ~ 35 vs. LIBFRE: ~ 25%, p<0.05). These results were sustained even after controlling

for the differences in volume load between protocols. As importantly, the magnitude of torque decrement was similar between men and women after HI and LIBFR training (p>0.05). **CONCLUSIONS:** Performing upper-limb LIBFRE, using a multiple-set training protocol, is less fatiguing than HI resistance exercise in both men and women. Additionally, this effect is independent of differences in volume load between exercise protocols. Torque decrements in response to LIBFR and HI do not follow a sexually dimorphic pattern, providing evidence that there is no need to establish different guidelines for men and women when prescribing upper-limb LIBFR exercise. Supported by the Portuguese Science Foundation PTDC/DTP-DES/5714/2014.

1239   Board #47   May 31 8:00 AM - 9:30 AM

Postactivation Potentiation during Blood Flow Restricted Complex Training

Christopher J. Cleary, Dylan A. DiScenza, Summer B. Cook, FACSM. *University of New Hampshire, Durham, NH.* (Sponsor: Summer B. Cook, FACSM)

(No relevant relationships reported)

Complex training incorporates a high-load (HL) resistance exercise, such as the back-squat, with a biomechanically similar plyometric exercise, like a vertical jump (VJ), to elicit postactivation potentiation (PAP). This often results in an enhanced rate of muscular force development in the form of a higher VJ. Low-load blood flow restricted (BFR) resistance exercise is an alternate modality to HL resistance exercise, but its use during complex training has never been evaluated. **PURPOSE**: To compare how HL and BFR complex training impacts PAP measured through VJ height and electromyography (EMG). **METHODS:** Twelve healthy males that had been resistance training at least 3 times per week for the past 2 years (mean $\pm$ SD; age: 20.4 $\pm$ 0.9 years, body mass: 83.6 $\pm$ 6.7 kg, stature: 1.81 $\pm$ 0.5 m, back-squat 1-RM: 147.9 $\pm$ 25.2 kg) completed two randomized exercise sessions separated by ~1-week. Prior to each session, the VJ was performed, then either the HL (2 sets of 5 repetitions at 85% 1-RM) or BFR (2 sets of 30 at 30% 1-RM with BFR) complex training sessions, with a VJ 4-minutes after each set were performed. EMG data of the left vastus lateralis and hamstrings were collected, quantified to root-mean square values, and expressed as a percentage of the 1-RM squat. PAP percent was defined as the post-squat VJ height divided by the pre-squat VJ height and multiplied by 100. Data were analyzed using a within-subjects repeated-measures ANOVA between the two conditions and sets. Post-hoc tests in the form of t-tests were conducted if data reached significance. **RESULTS:** Neither condition induced PAP (PAP percent > 100%), but the HL condition was greater than the BFR condition (96.1 $\pm$ 4.8% to 90.8 $\pm$ 8.5%, p = 0.034). EMG activation was greater during the HL condition in the vastus lateralis (HL: 104.6 $\pm$ 27.7% to BFR: 79.6 $\pm$ 33.4%, p = 0.002) and the hamstrings (HL: 112.3 $\pm$ 59.6% to BFR: 51.9 $\pm$ 30.2%, p = 0.001). **CONCLUSION:** Despite EMG amplitude being greatest for the HL condition, PAP did not occur. Similarly, BFR complex training also did not produce PAP. Fatigue and unsatisfactory rest periods should be investigated in future protocols. Supported by: 2017 Summer Undergraduate Research Fellowship Grant from the University of New Hampshire.

1240   Board #48   May 31 8:00 AM - 9:30 AM

Muscular Responses To Very Low Load Resistance Exercise With Blood Flow restriction In The Upper Body

Samuel L. Buckner, Matthew B. Jessee, Scott J. Dankel, J Grant Mouser, Kevin T. Mattocks, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*

(No relevant relationships reported)

Low load exercise performed to failure appears to elicit a similar skeletal muscle response to that of high load exercise. There may be a point where a load becomes too low to elicit an anabolic response. In situations where the load becomes too low, blood flow restriction (BFR) might augment the response. **PURPOSE**: Examine the acute skeletal muscle response to high load exercise and low load exercise with and without BFR. **METHODS**: 20 participants completed four conditions in the upper body (one condition per arm) over 2 visits. Conditions consisted of elbow flexion exercise to failure using a traditional high load [70% 1RM, (HL)], low load [15% 1RM, (LL)], low load with moderate BFR [15% 1RM + 40%BFR (BFR40)], or low load with greater BFR [15% 1RM + 80%BFR (BFR80)]. Torque and muscle thickness were measured prior to, immediately post, and 15 min post exercise. Muscle electromyography (EMG) amplitude was measured throughout. Repeated measure ANOVA was used to determine differences. Results are displayed as mean (SD). **RESULTS**: There was an interaction (p < 0.001) for changes in muscle thickness. Immediately post-exercise all low load conditions demonstrated greater swelling compared to the HL condition [Pre to Post Change: LL= 0.56cm (0.22), BFR40 = 0.53cm (0.19), BFR80= 0.55cm (0.20), HL = 0.28cm (0.13)]. Muscle thickness remained elevated above baseline 15 min post exercise in all conditions, but was maintained to a greater extent in the low load conditions relative to HL exercise [Pre to 15 min post difference: LL= 0.46cm (0.16), BFR40 = 0.39cm (0.13), BFR80= 0.44cm

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(0.19), HL = 0.21cm (0.12)]. There was an interaction for acute changes in torque (p $\leq$ 0.001). The LL, BFR40 and BFR80 conditions decreased 20 Nm (11), 24 Nm (11), 26 Nm (13) respectively, and to a greater extent compared to the HL condition [15 Nm (9)]. Torque remained depressed at 15 min post. In the last three repetitions, there was a main effect of time (p < 0.001). EMG amplitude was higher during set 2 [70 (23) %MVC] compared to set 1 [65 (22) %MVC], set 3 [62 (20) %MVC] and set 4 [64 (21) %MVC]. **CONCLUSIONS:** Very low load exercise (with or without BFR) appears to result in greater acute muscle swelling, greater muscular fatigue and similar EMG amplitude compared to HL exercise. Further study is needed to determine if these acute changes would manifest muscular adaptations.

1241   Board #49   May 31 8:00 AM - 9:30 AM

Sex Differences In The Estimation Of Blood Flow Restriction Before Exercise

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(No relevant relationships reported)

Arterial occlusion pressure (AOP) is typically used to normalize blood flow restriction (BFR) during low intensity blood flow restricted exercise. AOP varies as a function of individual factors such as limb circumference and systolic blood pressure (BP). Despite strong evidence for sexual dimorphism in muscle blood flow, sex-related differences in AOP estimation have not been previously explored. **PURPOSE:** To determine whether the relationship of upper-limb AOP with arm circumference and systolic BP differs between men and women. **METHODS:** 62 healthy young persons (31 men: 21.7 $\pm$ 2.3; 31 women: 22.0 $\pm$ 2.0 yrs) were included in this study. Arm circumference, resting BP and AOP were taken during a single testing session. Resting BP and AOP were measured twice (post-5 and 30 min of seared rest) to examine their stability over time. Multiple linear regression analysis was used to determine whether the relationship of AOP with arm circumference and resting BP differed between sexes. Prediction accuracy was assessed with the mean absolute percent error and Bland-Altman plots. **RESULTS**: Men had higher systolic BP and larger arm circumference than women (p<0.05). Nevertheless, AOP was similar between sexes (men: 138.5 $\pm$ 11.8; women: 136.4 $\pm$ 11.3 mmHg). Arm circumference, systolic BP and sex were all significant predictors of AOP (p<0.05), explaining 42% of its variance. For women, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP). For men, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP) - 5.704. The absolute percent error was similar in both sexes (men: - 0.55 $\pm$ 7.12; women: - 0.39 $\pm$ 6.31%, p>0.05). Bland-Altman plots showed that the mean difference between actual and estimated AOP was nearly zero in both groups (men: -0.14; women: -0.01 mmHg), with no systematic over or under-estimation. **CONCLUSIONS**: Arm circumference, systolic BP as well as sex are all significant predictors of upper-limb AOP. Their measurement allows the indirect estimation of BFR pressure within the context of exercise training. Supported by the Portuguese Science Foundation PTDC/DTP-DES/5714/2014.

1242   Board #50   May 31 8:00 AM - 9:30 AM

Blood-flow-restricted Training Augments Improvements In Muscle K+ Handling, Antioxidant Capacity And Exercise Performance In Men

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(No relevant relationships reported)

Exercise performance is partly limited by the muscle potassium ion (K^+) transport capacity, which is determined by the function of the Na^+,K^+-ATPase (NKA). Studies *in vitro* suggest high levels of reactive oxygen species (ROS) compromise NKA function, and increased antioxidant content protects against NKA dysfunction. However, it remains unknown in humans if ROS affect muscle K^+ handling, and if this capability is related to the antioxidant capacity. Exercise with reduced muscle blood flow (blood flow restriction, BFR) promote ROS production, which is important for increases in NKA and antioxidant content. Whether BFR may augment increases in muscle K^+ handling and NKA content in humans are yet to be explored. **PURPOSE**: To examine if BFR can augment training-induced improvements in muscle K^+ handling and exercise performance, and if these changes are related to an increased antioxidant capacity in men. **METHODS**: Ten healthy men (25 $\pm$ 4 y) performed 6 weeks of interval cycling without (CON-leg) or with BFR (170 mmHg, BFR-leg). Before and after training, catheters were inserted into the fem. artery and vein in both legs, and blood flow was assessed by ultrasound Doppler, to determine thigh K^+ release during single-legged, knee-extensions at 25% (Ex1) and 90% W_{max} (Ex2) under intravenous infusion of placebo (saline) or N-acetylcysteine (NAC). A muscle biopsy was collected before and after Ex2 to assess catalase activity, and NKA and antioxidant content in type-I and II fibres. **RESULTS**: Performance of the CON-leg (11%) and BFR-leg (23%) increased with training (p<0.05), with a greater increase in BFR-leg (p<0.05, 12%). After training, K^+ release was attenuated in Ex2 in the BFR-leg (p<0.05), but

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Abstracts were prepared by the authors and printed as submitted.

not in CON-leg (p>0.05). Before training, NAC attenuated K^{+} release in Ex1 (p<0.05), but not in Ex2 (p>0.05), in both legs. After training, the effect of NAC was blunted and catalase activity increased in the BFR-leg only (p<0.05). NKA-isoform and antioxidant content are currently being analysed. **CONCLUSION**: BFR training augments improvements in muscle K^{+} handling and exercise performance in men. These effects are related to an increased muscle antioxidant capacity. In addition, ROS appear involved in the regulation of muscle K^{+} release during submaximal exercise in humans. Supported by the Danish Ministry of Culture (FPK.2015-0017)

1243   Board #51   May 31 8:00 AM - 9:30 AM

Very Low Load resistance Exercise Is Augmented By Blood Flow Restriction In The Lower Body

Matthew B. Jessee, Samuel L. Buckner, Kevin T. Mattocks, J Grant Mouser, Scott J. Dankel, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*

(No relevant relationships reported)

Low load exercise to failure has been shown to elicit muscle hypertrophy similar to high load exercise. However, if the load is very low [i.e. 15% of one repetition maximum (1RM)], the contraction intensity may not disrupt blood flow enough to induce failure. Although unknown, the application of blood flow restriction (BFR) during very low load exercise may be necessary in order to reach failure. **PURPOSE**: To compare the acute responses associated with a hypertrophic stimulus during lower body exercise using a traditional high load (70% 1RM), very low load (15% 1RM) with no BFR, or in combination with moderate (40% arterial occlusion pressure (AOP)) or high (80% AOP) BFR pressure; coded as 70/0, 15/0, 15/40, and 15/80 respectively. **METHODS**: 22 participants completed 4 sets of unilateral knee extensions to failure (up to 90 repetitions) with each condition. Muscle thickness (MTh) and maximal voluntary contractions (MVC) were assessed before (Pre), immediately following (Post), and 15 minutes after exercise (15-Post). Electromyography (EMG) amplitude of the rectus femoris (RF) and vastus lateralis (VL) was assessed during the last 3 repetitions of each set. Data presented as mean (SD) with p≤0.05. **RESULTS**: There was an interaction for MTh, however, follow up tests revealed no differences within time points. Overall, MTh increased from Pre to Post [0.48 (0.17) cm], decreased at 15-post [-0.11 (0.18) cm], but remained elevated over Pre [0.36 (0.07) cm]. There was an interaction for MVC and follow up tests revealed differences at Post [15/80 < 15/0, 15/40, < 70/0] and 15-Post [15/0 < 15/80, 70/0]. All conditions decreased MVC at Post [-111.1 (48) Nm] and increased from Post to 15-Post [79.2 (43.1) Nm]. There was a main effect of condition for RF EMG, with 70/0 being greater than 15/80 [83 (37) vs. 57 (27) %MVC]. For VL EMG, there was a main effect of condition [70/0 > 15/80, 15/40, 15/0] and time [set 1< 2, 3, 4]. Typically, VL EMG was greater for 70/0 [106 (70) %MVC] compared to 15/0 [73 (21)], 15/40 [72 (30)], and 15/80 [64 (21)]. **CONCLUSIONS**: BFR with a higher pressure seemed to augment the acute muscular response to very low load exercise, making it closer to the response observed during high load exercise. This suggests that a higher BFR pressure may be necessary to induce hypertrophy when resistance training with very low loads.

C-36   Free Communication/Poster - Measurement of Physical Activity and Sedentary Behavior

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1244   Board #52   May 31 9:00 AM - 10:30 AM

The National Collaborative on Childhood Obesity Research's Measures Registry and User Guides: Highlights and Reach

David R. Brown, FACSM[1], Rachel Ballard[2], Jill Reedy[2], David Berrigan[2], Amanda Samuels[3]. *[1]Centers for Disease Control and Prevention, Atlanta, GA. [2]National Institutes of Health, Bethesda, MD. [3]FHI 360, Washington, DC.*

(No relevant relationships reported)

There are many types of physical activity and food intake measures. These measures often lack validity and reliability, making it difficult to compare findings across childhood obesity research and evaluation studies.
Purpose: The National Collaborative on Childhood Obesity Research's (NCCOR) Measures Registry (nccor.org/mruserguides) promotes consistent use of high-quality, comparable measures and methods across childhood obesity studies. The Registry User Guides extend the reach and usefulness of these resources. Herein we describe the Registry and User Guides and examine their reach to nutrition, physical activity, and obesity researchers and practitioners.

Methods: A search of peer reviewed literature published 1999-2009 was conducted. Measurement experts reviewed and abstracted articles meeting inclusion criteria in four domains: physical activity, diet, physical activity environment, and food environment. The Registry was launched in 2011 and has been updated on an ongoing basis since August 2015. In 2017, subject matter experts authored four User Guides for the measurement domains. The Guides include case studies to help users' select appropriate measures. The number of web visitors to the Registry and Guides was tracked providing an indicator of reach.
Results: The Registry contains 1207 published studies of validation research using measures of physical activity (n=403), diet (n=330), physical activity environment (n=273), and food environment (n=331). Measures include GIS (n=127); 24-hour dietary recall (n=52); food frequency (n=69); electronic monitor (n=121); environmental observation (n=153); questionnaire (n=498); record or log (n=97), and other (n=207). Over 17,100 unique visitors have accessed the Registry since its launch, including visitors from 41 countries. Since their release there have been over 8000 page views of the User Guides from 3633 unique visitors.
Conclusion: The NCCOR Measures Registry and User Guides can assist researchers and practitioners conducting childhood obesity prevention research and evaluation to select high quality, comparable measures of physical activity, diet, and the environments in which these behaviors occur. Website traffic reflecting access to the materials indicates a large reach.
Supported by the JPB Foundation

1245   Board #53   May 31 9:00 AM - 10:30 AM

The Effect of Activity Courses on Student's Physical Activity In and Out of Activity Courses

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(No relevant relationships reported)

Recent research indicates that 51.7% of adults meet the 2008 Physical Activity (PA) Guidelines (Tainya et al, 2017). Activity courses are offered at 87% of 4-year colleges and Universities which directly facilitate some increase levels of PA during class time (Strand et al, 2010) and have been shown to increase PA outside of class (Annesi et al, 2017). The Physical Activity Vital Sign is a clinical tool designed to screen for PA in adults. **PURPOSE:** The aim was to use PAVS to analyze the relationship between PA level changes throughout the semester, PA intensities spent in class, and how many students met the 2008 PA Guidelines for Americans. **METHODS:** Subjects self-enrolled in one PA course. Each subject (n=41; 31 females, 10 males; 21.4 years ± 4.50) completed an emailed questionnaire (Qualtrics) at the beginning, middle, and end of the class term (weeks 2-3, 8, and 16), and wore an accelerometer (Actigraph wGT3X-BT accelerometers with a 15 second epoch collection rate) while in the class at the same three timepoints (Freedson 1998 counts). The Qualtrics Survey included: Demographic information (at timepoint 1 only), and PAVS Survey. **RESULTS:** The mean PAVS score was 180.1 minutes ± 146.6, 217.2 minutes ± 167.5, and 226.76 minutes ± 173.3 for each timepoint respectively. The percent of subjects who met PA recommendations increase from 41.6% to 63.4%. PAVS score was not significantly different from time point one to timepoint three $t_{(40)}$=-1.949, p=0.058, even when controlling for sex (Males: $t_{(9)}$ = -1.340, p=0.213; Females: $t_{(31)}$ = -1.594, p=0.122). For the each timepoint, PAVS scores were not significantly correlated to time spent in PA intensities during the activity class: $r_{PAVS-1-Sedentary}$=-0.28, p=0.864; $r_{PAVS-1-Light}$= 0.022, p=0.890; $r_{PAVS-1-Moderate}$=0.021, p=0.897; $r_{PAVS-1-Vigorous}$ = 0.144, p=0.370, : $r_{PAVS-2-Sedentary}$=0.081, p=0.613; $r_{PAVS-2-Light}$= -0.050, p=0.757; $r_{PAVS-2-Moderate}$=-0.111, p=0.491; $r_{PAVS-2-Vigorous}$ = 0.022, p=0.893, : $r_{PAVS-3-Sedentary}$=0.078, p=0.628; $r_{PAVS-3-Light}$= -0.214, p=0.179; $r_{PAVS-3-Moderate}$=-0.169, p=0.290. **CONCLUSION:** PAVS was not a significant predictor of PA intensity in college level activity course nor did it significantly change throughout the semester. However, students who met PA requirement increased from (41.6%) to (63.4%) at the end of the semester.

1246   Board #54   May 31 9:00 AM - 10:30 AM

Comparison of Previously Used Methods for Analyzing Global Positioning System Plus Accelerometry Data from Recess

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(No relevant relationships reported)

Global Positioning System (GPS) receivers plus accelerometry can identify how physical activity (PA) varies by schoolyard location, but the accuracy and comparability of existing approaches to analyzing this data are unknown. **PURPOSE**: To compare previously used methods for analyzing GPS plus accelerometry data from recess. **METHODS**: Children (N=23) wore an accelerometer and GPS on their hip for two recesses to determine location and PA intensity (counts/sec or classified by cut-points). Recesses were videotaped, and location and PA intensity were coded. Five approaches for interpreting GPS and accelerometer data were used and compared to the video: 1) graduated color *dot* map, 2) 1 m fishnet *grid*, 3) *hot spot* analysis with

Getis Ord G* statistic, 4) *zonal* approach, and 5) *interpolation* of a continuous surface of intensity over the schoolyard. For the *zonal* approach, weighted kappa compared GPS and video location second-by-second, and paired t-tests compared proportion of time in each location and intensity for GPS plus accelerometry versus video (*p<0.05*). **RESULTS**: *Hot spot* analysis revealed significant (*p<0.01*) clusters of high counts/ sec on the field and court and near the swings, which was supported by *dot* and *grid* maps. *Interpolation* indicated a high intensity peak in the court. These patterns were supported by video observation. Weighted kappa was 0.76, and there were no differences in time spent in each zone according to GPS versus video (court: 45.2 vs. 43.7%, fixed equipment: 31.1 vs. 33.2%, field: 23.7 vs. 26.2%). Sedentary behavior was higher according to GPS versus video overall (22.1 vs. 12.1%) and for court (21.9 vs. 10.1%) and fixed equipment (19.7 vs. 7.1%). Moderate-to-vigorous PA was lower according to GPS versus video overall (43.9 vs. 62.2%) and for court (42.6 vs. 68.6%) and fixed equipment (45.2 vs. 80.6%). **CONCLUSIONS**: GPS plus accelerometry accurately classified location, and the PA patterns identified by *dot*, *grid*, and *hot spot* were similar to video. Quantification of the proportion of time in each intensity by location was not similar to video, possibly due to missing data or differences in how accelerometer and video intensity are classified. Interpolation is not an appropriate analysis for this research question and is not recommended for future use.
Funded by OU Interdisciplinary Research Grant

1247   Board #55   May 31 9:00 AM - 10:30 AM
Implications Of Direct Observation Methods For Describing Drivers Of Children's Physical Activity

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(No relevant relationships reported)

Direct observation (DO) is a popular objective method to describe children's physical activity (PA) and setting context. DO is a category of methodologies that vary by the time unit of analysis (e.g., total setting time or segmented setting time) and sampling method (e.g., momentary or continuous). We propose that the DO method determines the temporal variability in data collected, and therefore defines the ecological processes that can be studied.
Purpose: To examine implications of DO methods for observing drivers of children's PA.
Methods: Research assistants (RA) video-recorded basketball practices (*n* = 24) from 12 boys' and girls' teams (2 practices/team) where children (*n* = 105, 7-12y, mean ± *SD* = 9.4 ± 1.1y) wore ActiGraph GT1M accelerometers. RAs coded each practice using two DO systems. SOFIT uses momentary time sampling and observes every 20 seconds over total practice time (TPT) to assess percentage of TPT in PA, in different contexts types (e.g., fitness, skill), and in PA within context across TPT. Our alternate method (CLOUDEE) uses continuous sampling to define continuous context time segments during practice. Metrics calculated from CLOUDEE were frequency, duration, and order of segments, and %time spent in PA within segments. Inter-rater reliability was calculated on a subset of practices (*n* = 5/system). We analyzed accelerometer data using Evenson et al. cut-points and paired the data with context time segments from CLOUDEE. **Results:** Inter-rater reliability was >85% for both systems. Most of TPT, assessed by SOFIT, was spent in skill (mean ± *SE* = 47.4 ± 0.8%). Fitness had the greatest percentage of MVPA (moderate-to-vigorous physical activity) (mean ± *SE* = 81.6 ± 3.2%) across TPT. Using CLOUDEE, we identified 256 time segments (mean/practice ± *SE* =10.7 ± 2.5) during practices. Skill segments occurred most frequently (mean/practice ± *SE* = 3.5 ± 2.3; mean length ± *SE* = 4.75 ± 3.41 minutes). Free-play segments were the most frequently occurring first segment in the practice routine (81.8%; mean length ± *SE* = 4.32 ± 2.51) and had the greatest %time spent in MVPA (mean ± *SE* = 57.7 ± 2.8%). **Conclusion:** The systems comprise distinct methods and thus examined different processes as drivers of children's PA. When using DO, researchers should ensure appropriate methods are used to examine the ecological process of interest.

1248   Board #56   May 31 9:00 AM - 10:30 AM
Evaluation Of In-School Physical Activity During Recess, P.E., And Academically-Related Movement Activities

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(No relevant relationships reported)

PURPOSE: Schools provide ample opportunity to address physical inactivity patterns, which have been established as a crucial risk factor of health concerns. As evidence of associations between morbidity and progression of childhood obesity to adult obesity expand along with the inverse relationship between school year and physical activity (PA), an urgency remains for schools to implement mandatory policies addressing the accumulated moderate-to-vigorous physical activity (MVPA) per week. The purpose of this study was to quantify in-school PA levels among elementary students during recess, P.E., and academically-related movement activities (ARMA) and determine if state-wide recommended levels of MVPA are being met.
METHODS: Third through sixth grade students (N=71) volunteered to participate in the evaluation of PA levels during recess, P.E., and ARMA during summer school. Accelerometry data was obtained to quantify the amount of PA being achieved. Data collection commenced at the beginning of and ceased at the end of each school day for five consecutive days. Accelerometers were used to provide tri-axial movement analysis according to 5-second 'epochs' to quantify levels of PA. A one-way ANOVA was employed to examine PA between grades.
RESULTS: Of the weekly recess minutes offered (332.39 ± 24.49), 31% classified as MVPA while 35.44% was completely sedentary. Combining sedentary and light accounted for 68.09% of the total time. Of the weekly P.E. minutes offered (72.75 ± 31.29), 23.83% classified as MVPA while 41.44% was completely sedentary. Combing sedentary and light accounted for 72.8% of the total time. Of the weekly ARMA minutes offered (14.93 ± 17.65), 15% classified as MVPA while 35.37% was completely sedentary. Combining sedentary and light accounted for 63.5% of the total time. Percentages significantly increased across each category after omitting 6th grade due to inflation.
CONCLUSION: Overall, students failed to achieve recommended amounts of MVPA during school hours and recommended amounts of P.E. of at least moderate intensity although there was opportunity to achieve both. This research provides insight to PA levels and potential health status of children during school hours, which confirms the need for enhanced attention to meeting state standards of school-related PA.
Grant Funding: N/A

1249   Board #57   May 31 9:00 AM - 10:30 AM
Accuracy of Wrist-Worn Activity Monitors during Wheelchair Use

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(No relevant relationships reported)

Activity monitors are used to track activity and exercise intensity in the bi-pedal population, however, there is a lack of studies examining these devices for those using manual wheelchairs. **PURPOSE**: To assess activity monitor accuracy during wheelchair use (WC). **METHODS**: Forty-four subjects (non-wheelchair users; age=26.7±4.9 yrs, ht=1683.7±10.2 cm, wt=76.75±16.7 kg) wore six commercially-available wrist activity monitors (FF, FC, & PL on the right wrist; GV, MV, & LT on the left wrist) and a heart rate (HR) monitor while walking 150m in an indoor hallway at a self-selected pace. Subjects traversed the same path in a wheelchair. Video was used to determine actual counts using a hand tally (AC). During WC, a count was recorded as the hand went forward and again as the hand recovered for each hand. Repeated measures ANOVA determined significant differences between the counts. Error was calculated as [(monitor counts-actual counts)/actual counts]*100. Alpha was set at .05 for all tests. **RESULTS**: During walking, FF, FC, PL and MV (263.7±37.3, 270.5±29.6, 228.5±49.9, & 264.6±30.3 counts, respectively) were significantly lower than AC (286.4±24.4 counts), p<.05, except for LT (267.3±41.4 counts) and GV (281.1±24.4 counts), p>.05. During WC use, FF (305.7±83.7 counts) and FC (306.6±80.8 counts) were significantly greater than AC (273.9±101.3 counts), p<.05. PL (279.2±92.7 counts) was not significantly different than AC. Similarly, MV (248.1±63.8 counts) and LT (344.6±128.2 counts) were significantly different than AC (297.1±98.1 counts), p<.05, whereas GV (299.0±116.8 counts) was not significantly different than AC. During walking, PL had greatest error (20.8±15.3%), followed by FF (7.8±11.3%), MV (7.4±8.2%), LT (6.8±13.5%), FC (5.9±7.4%), and GV (2.3±4.1%). Error was high in all conditions during WC use, with LT exhibiting the greatest error (29.6±21.0%), followed by FC (23.5±20.3%), FF (21.9±20.1%), GV (18.9±21.75%), MV (18.5±14.3%), and PL (16.2±12.8%). **CONCLUSION**: Although substantial error is still evident, PL seems to be the most accurate for wheelchair use among the devices assessed. Manufacturers should consider developing an activity monitor specifically for wheelchair users.

1250   Board #58   May 31 9:00 AM - 10:30 AM
Assessment of Physical Activity & Sedentary Behavior in Individuals with Chronic Low Back Pain

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(No relevant relationships reported)

Low back pain affects >80% of adults in their lifetime, with 4-14% experiencing chronic low back pain (CLBP). Exercise training can reduce pain in CLBP patients, but activity patterns in this population have yet to be well-described, with existing data coming solely from self-report measures. **PURPOSE:** Our aim was to describe physical activity (PA) and sedentary (SED) behaviors and compare patterns assessed using objective vs. self-report measures in individuals with CLBP. **METHODS:**

Measures of PA and SED were obtained from ActiGraph and activPAL accelerometers and the International Physical Activity Questionnaire (IPAQ) in individuals with CLBP (N=57; 52% female; 43±10 years old). Accelerometer data were processed using the Sojourns Including Posture (SIP) method and the IPAQ was scored to calculate time spent in moderate and vigorous PA (MVPA) and SED. Minutes of MVPA and SED from each method were analyzed descriptively (means (SD)) and compared using correlation coefficients and Bland-Altman Plots. **RESULTS:** Objective data demonstrated that few (12.3%) participants met recommended levels of PA. Contrasting this, self-report data showed that 81.7% were active enough to meet guidelines. Average minutes of MVPA per week in bouts of 10+ minutes measured objectively and subjectively were 57.1 (59) and 430.1 (330) minutes, respectively. Objective and subjective measure of MVPA were weakly correlated (r=0.25), and the Bland-Altman plot demonstrated wide limits of agreement (311.3 and -1097) and a systematic bias for over-reporting PA. For SED, mean minutes per day measured objectively and subjectively were 530.3 (85.7) and 458.3 (138.8), respectively. Measures were also weakly correlated (r=0.13). The Bland-Altman plot had wide limits of agreement (373.2 and -229.3) and demonstrated a systematic bias for under-reporting SED. **CONCLUSION:** Objective data demonstrate that patients with CLBP are inactive and highly sedentary. Their tendency to under-report SED and over-report MVPA indicates they may lack awareness regarding their actual levels of these behaviors. The identified disconnect between perceived and actual PA and SED behavior in the CLBP population suggests that addressing these misconceptions may be critical for the success of future interventions aiming to alter movement patterns to reduce pain.

1251　　Board #59　　　　　　　May 31 9:00 AM - 10:30 AM

Development of Step Count Cut-Points for School Day Sedentary Behavior

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(No relevant relationships reported)

PURPOSE: No study has established step count cut-points for varying minutes of accelerometer-assessed sedentary behavior accrued during the school day in children. The purpose of this study was to establish step count cut-points for discriminating children meeting sedentary behavior ranging from 3-hours to 6-hours per 7-hour school day.
METHODS: Participants were a convenience sample of 2,119 children (mean age = 8.5 (1.9) years) recruited from 5 schools from the Mountain West region of the U.S. Step counts and time in sedentary were assessed using ActiGraph wGT3X-BT triaxial accelerometers that were worn during the entirety of a 7-hour school day for one school week. Average censored step counts and minutes in sedentary behavior were calculated across 3 to 5 days. Receiver operating characteristic (ROC) curves were employed to derive step counts discriminating children that met 3-hours (180 minutes) to 6-hours (360-minutes) of sedentary time ($\leq$ 100 accelerometer counts per minute) per school day via calculation of the maximum Youden's J statistic. The sedentary count cut-points were derived from Evenson et al. (2008) using 15-second epochs (25 counts per 15-seconds). However, within the ActiLife software, sedentary cut-points were multiplied by four to align with 60-second epochs.
RESULTS: Area-under-the-curve (AUC) scores ranged from AUC = 0.92 (95% C.I.: 0.90-0.93; p < 0.001) for meeting at least 3-hours per school day of sedentary to AUC = 0.78 (95% C.I.: 0.75-0.81, p < 0.001) for meeting at least 6-hours of school day sedentary. Approximately 4,090 steps best-discriminated children meeting 3-hours of school day sedentary (Sensitivity = 87.4%, Specificity = 78.3%, Accuracy = 85.5%) and approximately 2,465 steps best discriminated children meeting 6-hours of school day
sedentary (Sensitivity = 60.9%, Specificity = 75.9%, Accuracy = 74.1%).
CONCLUSION: Step counts can discriminate with reasonable accuracy children that meet at least 6-hours of school day sedentary and with good accuracy children that meet 3-hours of school day sedentary.

1252　　Board #60　　　　　　　May 31 9:00 AM - 10:30 AM

Comparing Two Generations of ActiGraph Accelerometers: Coronary Artery Risk Development in Young Adults (CARDIA)

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(No relevant relationships reported)

PURPOSE: To examine the comparability of the ActiGraph 7164 uniaxial accelerometer and the ActiGraph wGT3X-BT triaxial accelerometer (low frequency extension) in wear time, count based estimates (vertical axis), and average time/day in physical activity of different intensities. **METHODS:** Data are from 87 CARDIA

participants, aged 48-60 years, who simultaneously wore the 7164 and wGT3X-BT accelerometers at the waist in 2015-16, with wear time $\geq$4 of 7 days, $\geq$10 hr/day. Freedson adult cut points (ct/min) were used to define sedentary (<100), light (100-1951), moderate (1952-5724), and vigorous activity ($\geq$5725). Paired difference tests were used to compare mean or median values between the two accelerometers. Agreement was evaluated using intraclass correlation coefficients and Bland-Altman plots. A calibration formula applied to the wGT3X-BT values was obtained by linear regression. **RESULTS:** Minute by minute within-person correlations of ct/min/day averaged r=0.74, despite the $\geq$10 year age of the 7164 devices. Total recorded wear time min/day was nearly identical between the 7164 and wGT3X-BT (881.5 ± 70.9 vs. 880.3 ± 78.1, p=0.72). Linear regression of the wGT3X-BT on the 7164 ct/min/day passed very close to the origin; therefore, the slope of the 7164 ct/min/day (1.088) was the calibration proportionality. After calibrating the wGT3X-BT values (dividing by 1.088), no differences were observed between the 7164 and wGT3X-BT in total accelerometer ct/day (310,184 ± 129,189 vs. 307,085 ± 135,362, p=0.48), average ct/min/day (349.5 ± 139.5 vs. 346.5 ± 147.2, p = 0.54), sedentary (513.2 ± 93.6 vs. 509.6 ± 98.6, p=0.23), light (335.3 ± 81.5 vs. 338.7 ± 81.1, p=0.22), or moderate min/day (31.0 ± 21.9 vs. 30.3 ± 23.4, p=0.31). A significant difference was observed for vigorous min/day in the total sample (0.2 ± 1.0 vs. 0.0 ± 0.3, p<0.01), and also among those with >0 vigorous min/day (N=28, 2.8 ± 4.5 vs. 1.3 ± 2.9, p=0.01). Intraclass correlation coefficients showed excellent agreement for all measures (ICC range = 0.97-0.99). Bland-Altman plots demonstrated acceptable levels of agreement. **CONCLUSIONS:** After applying a calibration formula, the 7164 and wGT3X-BT are comparable for total wear time, count based estimates, and average min/day in sedentary, light, and moderate activity, but not for vigorous activity.

1253　　Board #61　　　　　　　May 31 9:00 AM - 10:30 AM

Statistical Assessment of Yoga Posture Acquisition using a 3D Room Sensor

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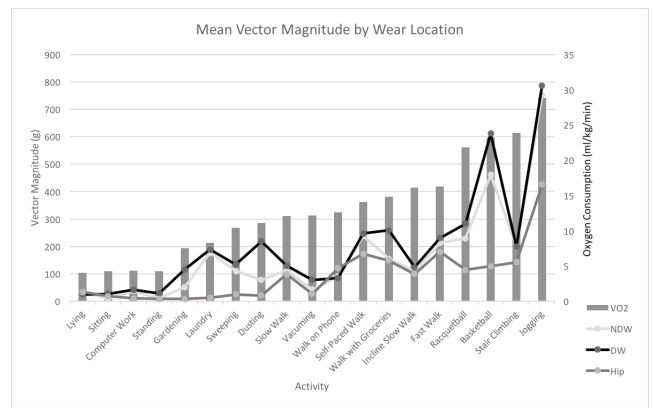
(No relevant relationships reported)

Many innovative information technology applications use gestures as input. We are exploring gesture analysis for incorporation into exergames for personalized medical interventions using yoga as therapy (YT). **PURPOSE:** A data-driven machine learning solution for gesture detection was used to classify captured yoga poses with high accuracy. The research goal is to test whether a machine learning algorithm in a basic computer video exergame can assess yoga skill acquisition in targeted select populations as a means to promote healthy physical activity. **METHODS:** Convenience sample of 20 adult students, male and female of any race/ethnicity, were briefly instructed and shown poses to perform, while recorded by the Kinect attached to a PC. Three yoga sessions (pre-test, mid-way and a post-test) were captured during the regularly scheduled yoga class which met twice weekly for 75 minutes, over a 10-week period. **RESULTS:** We recorded 6 yoga instructors while performing a series of yoga postures, and recorded clips were tagged or labelled in all of the frames in the recordings that defined a yoga gesture by consensus of two yoga instructors. Default settings produced solutions with high True Positives (99.5%) and low False Positives (0.03%) for most yoga postures sampled. Depth stream and skeleton coordinates for the 20 participants were acquired and analyzed against the previous trained solution. Analysis of summary statistics was done for five yoga poses comparing initial, mid-session, and final session captures. Sensitivity showed consistent trends for Mountain, Forward Bend, and Upward Salute. For Mountain, Sensitivity went from 0.78 to 0.87, while the expert test clip scored 0.94. Informedness also showed similar consistent trends for those poses. Based on these results the higher sensitivity score predicts greater training and closer the postures were to the "gold standard". **CONCLUSIONS:** Gesture analysis for yoga alignment training may be a useful tool for the development of home and clinical yoga therapy for hard to reach populations. The experimental exergame developed here provides a tool that scores the performance of yoga postures and provides improvement metrics. Our plans are to target special aging populations with YT, and study the potential effects of body mass and age on posture alignment and limb stretch.

1254   Board #62   May 31 9:00 AM - 10:30 AM

Muscular Strength Attenuates Adverse Effects Of Overweight On Cardiometabolic Risk Factors But Not In Its Counterparts With Higher Fat Among Collegiate Students

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(No relevant relationships reported)

PURPOSE: The aims of the study were to: 1) analyze differences in composite metabolic syndrome score (MetScore) and fatness across body mass index (BMI) categories in college students; and 2) to determine whether fit individuals have significantly lower MetScore, fewer individual metabolic syndrome components, and less fatness than unfit individuals in each BMI category. **METHODS**: A total of 1,795 college students (61.4% female, mean age = 20.7 ± 2.9 years old), ranging between the ages of 18 and 30 years participated in the study. Muscular strength was estimated using a hand-held dynamometer and used to classify adults as fit or unfit. A MetScore was computed as a sum of the typified Z-scores per age and gender from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. **RESULTS**: MetScore, percentage of body fat, and visceral adiposity increased linearly across the BMI categories among college students (all $p<0.001$). Individuals who were overweight and fit had lower MetScore (-0.6 SD; P =0.02), body fat percentage (-2.6%; P <0.001) and visceral adiposity (-0.2; P =0.01) than unfit peers. Moderately fit, obese individuals had significantly lower visceral fat levels than unfit, obese peers (-3.0; P =0.03). **CONCLUSIONS**: These results suggest that adequate muscular strength may help to attenuate cardiometabolic risk that is associated with being overweight and obese, and that weight loss could be recommended to all individuals with obesity, including those who are currently defined as fit.

1255   Board #63   May 31 9:00 AM - 10:30 AM

Accelerometer Positioning Issues and Implications for Contemporary Analysis Methods

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(No relevant relationships reported)

PURPOSE: While accelerometry is widely used to objectively measure physical activity (PA), methods are not standardized. The aim of this work was to understand how accelerometry output (vector magnitude, VM) differs between accelerometers worn on the non-dominant wrist (NDW), dominant wrist (DW), and hip, and if their relationships differ by activity type and intensity.
METHODS: Forty participants (16.8 - 64.2 yr) completed sedentary and PAs in a laboratory while wearing accelerometers on the NDW, DW, and hip. 1-s VM values were compared across locations by activity type and intensity. Oxygen consumption was measured with a portable VO_2 analyzer.
RESULTS: The figure shows mean VM for all activities, by increasing intensity. When grouped by intensity, the DW and hip had significantly different VM for light (LPA), moderate (MPA), and vigorous (VPA) PA. The NDW and hip had significantly different VM for LPA and VPA. The DW and NDW had significantly different VM for LPA and MPA.
CONCLUSION: The differing trajectories, and the differential relationships between VM from the NDW, DW, and hip indicate that accelerometer output differ based on activity type and intensity. This non-systematic error prevents scaling or comparing data collected at different wear locations, including the NDW and DW. Additionally, accelerometer data were processed using the accelerometer software. MVPA estimates from the NDW, DW, and hip differed by an average of 13.8 mins (range: 0 - 36), for the 3 hours analyzed. This indicates that substantial error is possible, and analysis methods are not interchangeable across locations. Site-specific analysis methods are needed for accurate, comparable estimates of PA.
This work was funded by the University of Iowa Graduate & Professional Student Government, the National Institute of Dental and Craniofacial Research R01-DE12101 and R01-DE09551, and the General Clinical Research Centers Program from the National Center for Research Resources, M01-RR00059.

Mean Vector Magnitude by Wear Location

1256   Board #64   May 31 9:00 AM - 10:30 AM

Evaluation Of Physical Activity And Sedentary Time In Women Of Varying BMI Using Accelerometers And IPAQ

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(No relevant relationships reported)

Purpose: To evaluate measures of physical activity in women among varying body mass index (BMI) categories using accelerometers worn on the wrist and thigh. In addition, to determine if measures of sedentary time among women are similar among BMI categories using the International Physical Activity Questionnaire (IPAQ) and an accelerometer worn on the thigh. **Methods**: Thirty five women (24.0 ± 0.7 y) participated in this study. There were 13 normal weight (18.5-24.9 kg m^{-2}), 10 overweight (25.0-29.9 kg m^{-2}), and 12 obese (≥ 30.0 kg m^{-2}) participants that wore the ActivPal (AP) on the thigh and Actigraph GT3x-BT (AG) on the wrist twenty four hours per day for seven consecutive days. After seven days participants completed the IPAQ. **Results**: The AG recorded significantly more steps per day than the AP within each BMI category ($p<0.01$). There were no differences among BMI categories for physical activity or sedentary time using objective measures ($p>0.05$). There was an insignificant trend for IPAQ Met minutes to increase with higher BMI categories. Sedentary time was similar among BMI categories using IPAQ ($p>0.05$). **Conclusion**: Steps per day may vary depending on the location of the accelerometer which may limit comparisons to other reported findings. Obese groups may tend to report more physical activity when using questionnaires. However, physical activity recorded using objective monitors may tend to find smaller differences among BMI categories. BMI category does not appear to impact measures of sedentary time by objective monitor (AP) or questionnaire (IPAQ).

1257   Board #65   May 31 9:00 AM - 10:30 AM

Comparing Hip and Wrist Accelerometer Estimates of Moderate-Vigorous Physical Activity Across Activity Domains

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(No relevant relationships reported)

PURPOSE: Both hip/thigh and wrist-worn accelerometers are used to estimate moderate-vigorous intensity physical activity (MVPA). Few studies have directly compared these MVPA estimates in free-living environments across distinct activity domains. The purpose of this study was to compare AG wrist estimates of MVPA to AG-hip and the thigh-worn AP in five activity domains.
METHODS: Fifteen adults (10F and 5M; age 18-36y) participated in two, 2-hr sessions that were categorized by activity domains; household (H, N=5), active leisure (AL, N=8), sedentary leisure (SL, N=6), work (W, N=7), and transportation/ errands (TE, N=4). Participants were given general instructions (e.g., at least 45 min spent on household-related behaviors), but sessions took place in the participants' natural environment. During the sessions, participants wore AG (non-dominant wrist, right hip) and AP on the right thigh. MVPA was estimated for AG-hip using machine learning (S3x), Freedson (F), Crouter (C2), and Sasaki (VM) methods. The AG-wrist data was processed using a random forest (RF). Pearson correlations and paired t-tests were used to compare MVPA estimates across methods. Linear mixed effects models were used to test if there was a significant difference in MVPA estimates between wrist and hip methods across activity domains. P-values <0.05 were considered statistically significant.

RESULTS: Correlation between wrist RF and the hip methods ranged from R=0.63-0.66, while hip/thigh methods were all highly correlated (R=0.94-0.99). The AL domain had the highest time spent in MVPA (between method range: 50.7-60.6 min), while SL (range: 1.3-15.8 min), and W (range: 2.0-23.5 min) were the lowest. Wrist estimates of MVPA were significantly higher than the S3x (+10.8 min), F (+15.3 min), AP (+12.7 min), and VM (+12.1 min), all p<0.01. The estimates of MVPA from the RF were not significantly different than C2, p=0.11. Agreement between methods did not differ by activity domain (p>0.05).
CONCLUSIONS: The wrist RF method was moderately correlated with hip/thigh measures and consistently produced higher estimates of MVPA compared to hip/thigh algorithms, across all activity types. Future research using direct observation as a criterion measures is needed. Supported by Bill and Linda Frost Fund.

1258   Board #66   May 31 9:00 AM - 10:30 AM
Impact Of Placement Of Wrist-worn Activity Monitors During The Lab And Free-living Settings

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(No relevant relationships reported)

Wrist-worn activity monitors have been widely used to measure heart rates, step counts, and/or calories. While the versatility of altering the wearing locations (i.e., left vs. right; distal vs. proximal) may prove appealing, the influence of monitor placement on the outcome measurements needs to be examined. **PURPOSE:** This study was to examine the difference in measurements of heart rates, step counts, and calories estimated from the Fitbit monitors worn at different locations. **METHODS:** Thirty-two healthy male and female, aged 26.03 ± 6.59 years, participated in this study. Participants wore Fitbit monitors at four different locations [Right Proximal (RP), Right Distal (RD), Left Proximal (LP), Left Distal (LD)]. Lab testing consisted of four 5-min phases: slow and brisk walking and jogging at 53.6, 107.3, 160.9 m/min on a treadmill and a recovery. Free living activities involved ten 5-min activities with different intensity levels (e.g., stretching, climbing stairs, jogging). Heart rates, step counts, and calories were recorded during various activities. Repeated measures ANOVAs were performed with a monitor placement as a within-subjects factor on 14 lab and free-living activities for each outcome measurement. Bonferroni technique was used to adjust the alpha level of .004 (.05/14). The Greenhouse-Geisser (G-G) adjusted F and degrees of freedom were reported. **RESULTS:** Overall, there were no significant differences in measurements of heart rates, step counts, and calories estimated from the four Fitbit monitors during the lab activities. In free-living activities, step counts were significantly different during climbing stairs, $F(2.86, 88.76) = 5.16$, G-G p = .003 and sports, $F(1.24, 38.40) = 27.93$, G-G p < .001. Step counts estimated from LD (446 ± 49) were significantly higher than Fitbit monitors worn at RP (413 ± 61) and RD (417 ± 49) when climbing stairs. Fitbit monitors worn at LP (649 ± 64) and LD (642 ± 70) estimated significantly higher step counts than Fitbit monitors worn at RP (587 ± 75) and RD (565 ± 73) as participated in sports. **CONCLUSION:** This study revealed that monitor placement does not make a significant influence on the measurements of heart rates and calories during the lab and free-living settings. Further studies on the impact of monitor placement against criterion measures are warranted.

1259   Board #67   May 31 9:00 AM - 10:30 AM
Pregnancy Walking Cadence Does Not Vary By Trimester

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(No relevant relationships reported)

PURPOSE: Walking is the most commonly reported mode of physical activity among the general population and also among pregnant women. Pregnancy-related changes in walking speed, gait dynamics, and total physical activity have been reported in past research, but free-living step cadences and their rates of change across pregnancy have not been studied. The purpose of this study was to describe free-living stepping cadence in pregnant women and examine differences between second and third trimester women. **METHODS**: Fifty pregnant women were recruited for this study and n=45 was the analytic sample size; 46.7% were in their second trimester (13-25 weeks) while 53.3% were third trimester (≥ 26 weeks). Participants completed a survey of demographic characteristics and wore an accelerometer on their non-dominant wrist for 7-8 days; they were instructed to wear the device as much as possible during waking hours. These accelerometer data were downloaded in 60-sec epochs, allowing for determination of min-by-min walking cadence, defined as steps/min. Mean steps/day, mean cadence, median cadence, maximum cadence, peak cadence (average cadence over the 30 minutes of highest cadence in each day), mean time spent in moderate- to vigorous-intensity physical activity (MVPA, time spent with cadence ≥ 100 steps/min), and mean daily time spent in several cadence

ranges (0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99, 100-109. 110-119, 120-129, 130-139, 140-149, 150-159, 160-169, <50, <100, ≥ 100, and ≥ 130 steps/min) were calculated for each participant. Between-trimester differences were determined using independent-samples t-tests. **RESULTS**: Average daily steps were $11,060.1 \pm 2,955.3$; 66.7% of second trimester and 54.2% of third trimester women met daily step recommendations of 10,000 steps/day, but 0.0% of the sample accumulated the recommended 150 min/wk of MVPA. There were no differences by trimester for cadence at any step rate. **CONCLUSIONS**: Overall, pregnant women accumulated high numbers of steps per day but at low cadences; neither daily steps nor cadence varied from second to third trimester. These data suggest that steps and MVPA recommendations are not equivalent and therefore should not be used interchangeably, especially during pregnancy.

1260   Board #68   May 31 9:00 AM - 10:30 AM
Application of Geographic Information Systems (GIS) Methods in Walkability Assessment

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(No relevant relationships reported)

PURPOSE: Walkability is a measure of how friendly an area is to walking. Emerging evidence has shown that neighborhood walkability has the potential to increase physical activity and reduce the risk of chronic diseases. Increasing the amount of walking is a prevalent topic for many urban planners and policymakers. A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, and present spatial or geographic data and it offers good promise for walkability assessment. The purpose of this study was to provide a systematic overview of the applications of GIS in the measurement of walkability. **METHODS**: Keyword and reference searches were conducted in PubMed and Web of Science, and the inclusion criteria included: (1) study design: cohort studies, pre-post studies, or cross-sectional studies; (2) research topic: walkability assessment through geographic information systems (GIS) methods; (3) language: articles written in English; and (4) article type: peer-reviewed articles or theses. A total of 397 articles were identified in the search, among which 328 were excluded in the title and abstract screening and 15 were excluded after full-text review. The remaining articles (n = 54) were carefully evaluated and results were summarized. **RESULTS**: The primary applications of GIS data/methods in the walkability-related research included (1) visualization of the spatial distribution of roads, walking trails, and basic environmental features; (2) construction of advanced walkability environmental indicators; and (3) assessment and comparison of the walkability of the built environment. Study design and features, including population density, street pattern, land-use mix, access to recreational facilities, varied considerably across studies, and this is probably because of lack of established guidelines and protocols in this field. Meanwhile, unique features of GIS methods such as relating information from different sources and capability of collaborating with pedometer data had a very promising future in measuring walkability. **CONCLUSIONS**: The GIS-based approach has great potential to supplement walkability assessment. However, there is still little evidence supporting the efficacy of GIS, and more studies investigating this promising area of research are called for.

1261   Board #69   May 31 9:00 AM - 10:30 AM
Moderate And Vigorous Intensity Walking Cadence (Steps/min) Thresholds In 41-60 Year Old Adults

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(No relevant relationships reported)

Research establishing a strong relationship between cadence (steps/min) and intensity has primarily been conducted with young adult samples. **PURPOSE:** To identify reasonable heuristic (evidence-based, rounded, practical) cadence thresholds associated with absolutely-defined moderate (3 metabolic equivalents; METs) and vigorous (6 METs) intensity ambulation in middle-aged adults. **METHODS:** Ten men and 10 women from each 5-year age group between 41-60 years of age performed a series of 5-min treadmill bouts separated by 2-min rest. Bouts began at 0.5 mph and increased in 0.5 mph increments until participants: 1) chose to run, 2) achieved 75% of their predicted maximum heart rate, or 3) reported a rating of perceived exertion (RPE) > 13. Cadence was determined via direct observation. Oxygen consumption (VO_2) was measured using an indirect calorimeter. METs were calculated from the final two minutes of each stage by dividing VO_2 in mL/kg/min by 3.5. Receiver Operator Characteristic (ROC) models were used to predict moderate and vigorous intensity from cadence. Optimal cadence thresholds were identified using Youden's index. The cadence-intensity relationship was also quantified using a segmented regression model with random coefficients. Optimal positive predictive values of candidate thresholds were assessed to determine final heuristic values. **RESULTS:** Data were complete for

all 80 participants (40 men, 40 women; age=50.2±5.9 years; BMI=26.0±4.0 kg/m²; height=171.0±9.2 cm). ROC cadence thresholds for moderate and vigorous intensity were 98.5 and 117.3 steps/min, respectively. All sensitivity values were over 90% and all specificity values were over 80%. The relationship between cadence and METs was explained by two distinct linear regression trends displaying a breakpoint at 97.6 steps/min. Cadence explained 78% of the overall variance in intensity. Cadence thresholds (95% Prediction Intervals) for 3 METs and 6 METs were 101.7 (54.9 - 111.8) and 132.1 (122.0 - 142.2) steps/min, respectively. Heuristic values for moderate and vigorous intensity were 100 and 130 steps/min, respectively. **CONCLUSIONS:** Cadences of 100 and 130 steps/min are reasonable heuristic values respectively identifying moderate and vigorous intensity walking in middle-aged adults.

1262   Board #70   May 31 9:00 AM - 10:30 AM

Comparison of Physical Activity Guideline Compliance Estimates Among Active Youth Using Different Step-Based Definitions

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(No relevant relationships reported)

Among youth, several investigations have quantified steps/day thresholds corresponding to compliance with current physical activity guidelines (≥ 60 min/day of moderate-to-vigorous physical activity [MVPA]) while other reports have identified cadence (steps/min) cut-points consistent with MVPA. However, empirical applications of these two methods for use in estimating compliance to current physical activity guidelines are scant within the literature. **PURPOSE:** To compare physical activity guideline compliance estimates using steps/day thresholds and step-defined MVPA methods among a sample of active adolescents. **METHODS:** Step-based physical activity was assessed minute-by-minute using the waist-worn Fitbit Zip™ over a 7-day period among 291 adolescent soccer players (64.9% female, age: 15.2 ± 1.2 yrs, BMI: 22.1 ± 3.4 kg/m²) providing ≥ 4 days of valid data (≥ 10 hr/day of wear time). Compliance to current physical activity guidelines was quantified as: 1) mean steps/day ≥ 10,500 for boys or ≥ 9,500 for girls, and 2) mean step-defined MVPA (time spent at 100+ steps/min) ≥ 60 min/day. Compliance estimates were compared between methods using McNemar's test. **RESULTS:** Participants accumulated 11,100 ± 3,217 steps/day (boys: 12,201 ± 3,543 steps/day; girls: 10,506 ± 2,865 steps/day) and 36.9 ± 16.8 min/day of step-defined MVPA (boys: 42.9 ± 18.7 min/day; girls: 33.7 ± 14.8 min/day). Compliance to current physical activity guidelines among the overall sample significantly varied between the steps/day thresholds and step-defined MVPA methods (63.2% and 9.6%, respectively; χ^2 = 154.0, $p < 0.001$). Within sex compliance estimates also varied for the steps/day thresholds and step-defined MVPA methods among boys (65.7% and 15.7%, respectively; χ^2 = 49.0, $p < 0.001$) and girls (61.9% and 6.3%, respectively; χ^2 = 103.0, $p < 0.001$). **CONCLUSION:** Significant heterogeneity in physical activity guideline compliance estimates was observed between the steps/day thresholds and step-defined MVPA methods. It is possible that the sporadic nature of physical activity observed among youth is being obscured by the 1-min measurement epoch used herein, thereby lowering expected values of daily step-defined MVPA and associated physical activity guideline compliance estimates. Support: USDA-AFRI 2013-67001-20418

1263   Board #71   May 31 9:00 AM - 10:30 AM

Physical Activity Category Classification Using The Actigraph Gt9x In Youth

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(No relevant relationships reported)

The ActiGraph GT9X includes an inertial measurement unit (IMU) equipped with a triaxial gyroscope which has been shown to be a perfect classifier of sedentary behavior (SB) in adults. To date, there has been no research to explore the application of the gyroscope in youth. **PURPOSE:** The purpose of this study was to compare the use of the accelerometer and gyroscope for classifying SB and continuous walking and running (CWR) in youth. **METHODS:** Participants (N=52, mean±SD; age, 13.3±3.1 years; BMI, 20.5±5.0 kg/m²) completed sixteen activities ranging from SB to vigorous intensity. Activities were grouped as SB (lying, computer gaming, internet, reclining, and book reading), CWR (fast over-ground walking, slow over-ground walking, and over-ground running), and intermittent activities (e.g. stair walking, sweeping, stationary cycling, basketball). A GT9X was worn on the right hip, both wrists, and both ankles. Primary accelerometer data were sampled at 90 Hz and converted to the Euclidean norm minus one (ENMO) in milli-G's per second. Gyroscope data were sampled at 100 Hz and converted to vector magnitude (GVM) and reported in mean degrees per second. ENMO and GVM were assessed for classifying the following: 1). SB from all other activities and 2). SB first, then CWR from the remaining 11 activities using the mean coefficient of variation (CV) per 10-s. Thresholds were developed using receiver operating characteristics (ROC) Performance was assessed using area under the curve (AUC), sensitivity, and specificity. Performance **RESULTS:** ENMO and GVM classify SB well across all attachment sites (AUC ≥ 95.7%).

When classifying CWR after removing SB, ENMO CV had AUC between 85.0%-87.9%, while GVM was lower and more variable with AUC between 53.3%-74.7%. **CONCLUSION:** Overall, ENMO and GVM are excellent classifiers of SB in youth across all attachment sites. GVM is less effective than ENMO for classifying CWR, but has potential for future use and should continue to be explored.

		Threshold		Sensitivity		Specificity		AUC	
	Site	ENMO	GVM	ENMO	GVM	ENMO	GVM	ENMO	GVM
SB	Hip	36.46	8.25	0.90	0.92	0.91	0.92	95.70	96.90
SB	Left Wrist	24.09	13.87	0.92	0.90	0.94	0.92	97.50	96.00
SB	Right Wrist	26.02	18.46	0.90	0.87	0.95	0.93	96.50	95.60
SB	Left Ankle	50.21	10.21	0.96	0.95	0.93	0.93	97.70	98.00
SB	Right Ankle	62.20	11.48	0.93	0.93	0.94	0.94	97.90	98.00
CWR	Hip	17.65	57.21	0.81	0.55	0.91	0.56	85.00	53.30
CWR	Left Wrist	27.35	49.31	0.82	0.51	0.87	0.67	86.30	59.10
CWR	Right Wrist	28.29	46.38	0.84	0.62	0.88	0.61	87.20	60.70
CWR	Left Ankle	16.86	45.89	0.83	0.68	0.88	0.72	87.40	73.00
CWR	Right Ankle	16.48	45.08	0.83	0.71	0.91	0.72	87.90	74.70

1264   Board #72   May 31 9:00 AM - 10:30 AM

Validation of Automatic Activity Detection on Wearable Activity Trackers

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(No relevant relationships reported)

Purpose: If sufficiently valid, wearable activity trackers are promising tools for health-related research. Recent models claim to identify the type of activity being performed, but no studies have reported the validity of these features. The purpose of this study was to determine the accuracy of automatic activity detection on 4 wrist-worn, physical activity trackers; specifically, the correct type, duration, and start time of select activities.

Methods: 69 healthy adults were recruited via flyer, email, or word of mouth to complete at least one of four activity modules, comprised of activities automatically detectable by the trackers. Module A, completed on a treadmill, consisted of 3 activities separated by a 10-min rest (15-min walk, 15-min run, and 25-minute continuous series of 5-min walk, 15-min run, 5-min walk). Module B, consisted of 3 activities separated by a 10-min rest (15-min outdoor walk, 15-min outdoor run, and 15-min bout on an elliptical trainer). Module C consisted of 15 min of outdoor cycling and Module D consisted of 15 min of freestyle swimming (only one tracker was used in Module D as others are not waterproof). The actual activity type, duration, and start/stop times were recorded, then compared to device data (recognized activity type, duration, and start times).

Results: Participants (N=69) were 26.3 ± 8.7 years old, had a BMI of 23.8 ± 4.0 kg/m², and were 60.9% female. Participants reported an average rating of perceived exertion of 11.9 (6 - 19). The percentage of correctly identified activities by the four trackers was 94.7% (93.5 - 97.1) for treadmill walking, 97.7% (93.8 - 100.0) for treadmill running, 45% (35.3 - 59.4) for running in the treadmill series, 97.8% (97 - 100) for outdoor walking, 100% for outdoor running, 70.4% (3.1 - 93.9) for the elliptical, 83.1% (44.1 - 97.1) for outdoor cycling, and 87.5% for swimming. Lower accuracy for the elliptical was driven down by a low accuracy of 3.1% for one tracker.

Conclusion: The four wearable activity trackers were best at detecting outdoor running and worst at detecting running in the 25-minute treadmill series. Overall, the trackers were better at detecting ambulatory activities, apart from running in the treadmill series, than detecting swimming, cycling, or using an elliptical. This research was funded through startup funds through UW - Madison.

1265   Board #73   May 31 9:00 AM - 10:30 AM

Dominant Vs Non-dominant Wrist: A Comparison Of Steps Per Day

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(No relevant relationships reported)

With the increased popularity of activity monitors over the past decade, step counting has become a prevalent method of assessing physical activity. Although most manufacturers suggest to wear monitors on the non-dominant (ND) wrist, some consumer-grade devices can be initialized to be worn on the dominant (D) wrist. Only one study has compared the step count accuracy of devices worn on the D and ND wrists across various treadmill speeds and it found no significant differences between the D and ND wrist step counts. However, the effect of D vs ND wear on step count may be different under free-living conditions. **PURPOSE:** To compare

THURSDAY, MAY 31, 2018

step counts between D and ND wrist-worn devices and hand-counted steps, under free-living conditions. **METHODS:** Twelve participants (mean±SD, age 35±13 years) wore an ActiGraph GT9X and Fitbit Charge (FC) on the D and ND wrists. The FC was initialized for each participants' D or ND wrist. A GoPro was affixed to the participant's chest and pointed down at the feet to video record the steps taken during all waking hours of one day and hand-counted steps from the video served as the criterion. Raw GT9X data were processed with the ActiLife step counting algorithm, with and without low frequency extension (AGL and AG, respectively), as well as the company's Moving Average Vector Magnitude algorithm (AGM). Fitbit step counts were recorded by the participant at the beginning and end of the day and used to obtain steps/day. Repeated measured ANOVAs were used to compare estimates between devices (AGL, AG, AGM, FC) and wrists (D and ND). For each step counting method, accuracy was determined by calculating percent of hand-counted steps. **RESULTS:** There was no significant device x wrist interaction (p<0.05). Across all step counting methods, there was a significant difference in steps per day between D and ND wrist ($F_{(1,11)}$=11.81, p=0.006) with the D wrist recording 1,253 more steps than the ND wrist. Percent of hand-counted steps for devices worn on the D wrist were: FC: 4%, AG: 122%, AGL: 220%, AGM: 91% and for ND wrist: FC: 77%, AG: 109%, AGL: 196%, AGM: 84%. **CONCLUSION:** Users of activity monitors should be aware of the differences in steps per day when using the D and ND wrists, even for the devices that allow the user to enter the appropriate wrist location during initialization.

1266   Board #74   May 31 9:00 AM - 10:30 AM

Revising Free Text Inputs In Physical Activity Self-report Methods: Lessons From The ACT24

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(No relevant relationships reported)

PURPOSE: To examine the change in total Metabolic Equivalent of Task (MET) minutes reported by the Activities Completed over Time in 24 Hours (ACT24) physical activity self-report method for different activity types after recoding free text entries and assigning updated MET values. **METHODS**: Men and women aged 50-70 years participating in a measurement error study on diet and physical activity were administered 6 ACT24 recalls spaced evenly over 12 months. Participants that completed at least 1 recall (n=1,023) were included in the analyses. Free text activity entries were recoded and either assigned to an existing ACT24 activity category or placed into a new activity category. Recoded free text activities, pre-defined activities, and gaps (no information recorded) were then assigned MET values from the 2011 Compendium of Physical Activities. The subsequent change in MET minutes was calculated after each of these adjustments. **RESULTS**: Participants completed 5,311 ACT24 recalls, of which 2,712 (51.1%) contained at least 1 free text entry; free text entries constituted less than 5% of all activities. Recoding free text entries increased the total reported MET minutes by 0.004% (+434.8 MET minutes), and applying the updated compendium values to all entries further increased the total by 6.3% (+743,920.9 MET minutes). Recoding free text had the largest positive effect for the "caring for or playing with others" activity category (+36.3%, or +6,455.1 MET minutes), and the largest negative effect for the "shopping, errands, and appointments" activity category (-15.4%, or -4,925.0 MET minutes). Updating MET values had the largest positive effect on "bicycle repairs" (+81.9%, or +1,226.5 MET minutes), and the largest negative effect on "covering plants" (-49.0%, or -202.0 MET minutes), although these activities were rarely reported (12 and 3 times, respectively). **CONCLUSIONS**: Recoding free text activities negligibly changes the total MET minutes reported in the ACT24, although more dramatic adjustments do occur within certain specific activity categories. Presence of free text is a data management burden that may provide little additional information, and efforts should be made for best activity classification in instrument design to eliminate the need for free text.

1267   Board #75   May 31 9:00 AM - 10:30 AM

Diurnal Patterns of Physical Activity Illustrate Important Time-of-Day Differences Between Younger and Older Adults.

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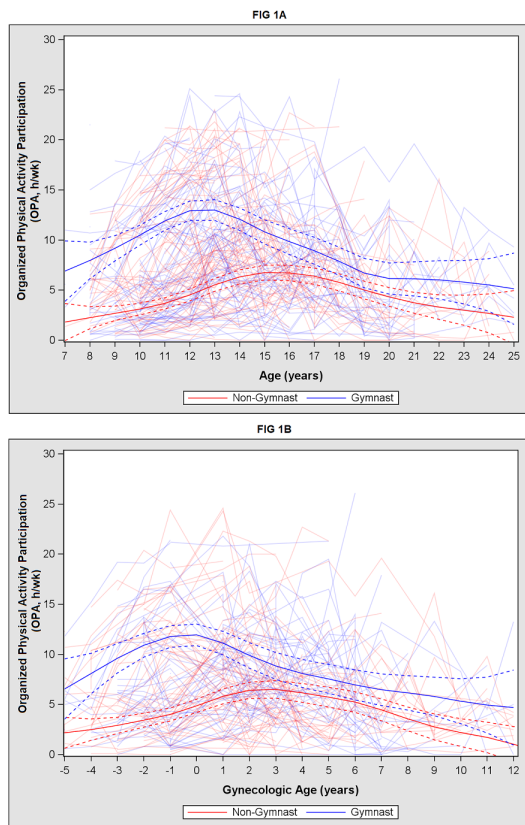*(No relevant relationships reported)*

Physical activity is an important risk factor for disease and functional outcomes across the age spectrum. Measurement of objective physical activity by accelerometry has become common in recent years and is often reported as total or average daily physical activity. However, accelerometry data provides the opportunity to also quantify differences in diurnal patterns of physical activity that may elucidate contributors to changes in physical activity with aging. **PURPOSE:** To evaluate differences in objectively measured PA, overall and by time of day, between younger and older

adults. **METHODS:** Physical activity (PA) was measured using wrist-worn ActiGraph accelerometers continuously over 7 days in 58 older adults (50% women, aged 72±6 yrs) and 56 younger adults (54% women, age 21±2 yrs), and body composition was measured using dual energy x-ray absorptiometry. PA data was smoothed into one-minute intervals and expressed as the vector magnitude of counts (VMC) per minute across the three axes. Diurnal patterns of activity were modeled as the average VMC over six 4-hour time bins. Subjects were categorized by age group (young or old), and the association between the mean of the VMC and age group was modeled overall and across each time bin using linear regression, adjusting for sex, fat-free mass, and fat mass. **RESULTS:** Total 24-h PA was lower in older adults compared to younger adults ($2.1 \times 10^6 \pm 0.8 \times 10^6$ vs. $2.8 \times 10^6 \pm 0.9 \times 10^6$ VMC, p < 0.0001). However, when examining diurnal patterns, early morning (4:00am-8:00am) and morning (8:00am-noon) PA was higher in older adults compared to younger adults (p<0.001 for each period) in fully adjusted models. In the remaining time bins, younger adults had higher PA than older adults (p<0.01 for each period). **CONCLUSION:** Consistent with previous studies, total daily PA was lower in older adults compared to younger adults. Importantly, examining PA across the day highlighted significant differences in activity volumes between younger and older adults that provide evidence to inform future interventions to improve PA profiles in both younger and older individuals.

1268   Board #76   May 31 9:00 AM - 10:30 AM

Organized Physical Activity Participation From Pre-puberty To Adulthood: A Longitudinal Study In U.S. Females

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(No relevant relationships reported)

PURPOSE: Physical activity yields health benefits across the lifespan. Longitudinal data are needed to evaluate translation of childhood activity patterns to adult activity habits. We hypothesized that activity patterns would differ in gymnasts (GYM) vs. non-gymnasts (NON), and childhood activity would correlate with young adult levels. **METHODS**: Female GYM and NON were recruited in 3 cohorts: 1997/8, 2003/4, 2008-12. Organized physical activity participation (OPA h/wk) was recorded to yield annual means, excluding physical education. Pediatric OPA was recorded quarterly (1997-1999) and semi-annually (1999-2017), with parental assistance as needed. After age 18 yrs, OPA was recorded annually. GYM were defined by training ≥6 h/wk for ≥1 yr. Separate GYM and NON OPA curves were generated using cubic smoothing spline mixed effect models with 95% confidence intervals (Fig 1a, chronological age: CA; Fig 1b, gynecological age: GA, centered at menarche= time 0). Intra-individual (intraclass) correlation coefficients were evaluated (ICC). **RESULTS**: Data are included for 211 girls. GYM OPA is highest circum-menarche, peaking before high school (GA -2 to +1 yrs; CA 10-15 yrs). NON OPA is highest post-menarche, during high school (GA 0 to +5 yrs; CA 14-17 yrs). GYM OPA is significantly higher than NON throughout school and peak lean mass accrual, but curves converge at GA +3 yrs or CA 18 yrs. Inter- and intra-subject variability was higher in GYM (10.4; 22.7) than NON (4.7; 8.6), with similar, medium effects for ICC (GYM= 0.32, NON= 0.35), suggesting activity level tracking across growth. **CONCLUSIONS**: GYM are active early and maintain high activity throughout growth, while NON increase OPA parallel with middle & high school sport programs. OPA dropped in both groups after high school. These data suggest that girls who start life active maintain high activity. Our data likely represent "health-conscious" individuals; future research is needed in more generalizable cohorts.

FIG 1A

FIG 1B

1269   Board #77   May 31 9:00 AM - 10:30 AM
Predicting Resistance Training Exercise Repetitions Using A Wrist-worn Activity Monitor

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(No relevant relationships reported)

While wrist-worn physical activity monitors have been used to quantify exercise volume for aerobic activities, limited research has utilized activity monitors to quantify resistance training exercises. **PURPOSE**: The purpose of this study was to develop an improved method for predicting repetitions during resistance training exercises. The validity of this method was tested during an unstructured training session. **METHODS**: While wearing a wrist-worn, accelerometer-based activity monitor, 144 participants (73 M, 71 F) completed 12 different upper- and lower-body dumbbell resistance training exercises. Each participant completed one set of 12 repetitions using a lightweight (<7 kg) set of dumbbells. This data was used to develop a repetition counting algorithm by comparing minimum and maximum values for the largest X, Y, or Z plane acceleration peak/valley during each exercise. Participants were then asked to complete an unstructured, free-living resistance training exercise session. Within the training session, they were asked to complete at least one set of at least five reps of the original 12 dumbbell resistance training exercises used in the algorithm development phase of the study. A research assistant observed the training session and recorded details about the exercises, resistance, and repetitions for each exercise. A mixed-model RM ANOVA was utilized to compare the predicted repetitions to the observed repetitions for the 12 exercises. Pairwise comparisons with Bonferroni adjustment were utilized to identify the location of differences. **RESULTS**: During the free-living training sessions, a total of 2293 sets of the 12 dumbbell exercises were completed by the study participants. Mixed-model RM ANOVA indicated a significant main effect ($p<0.05$). Post-hoc analysis indicated significant differences between the predicted and observed repetitions for five of the 12 exercises. However, the differences for all exercises were within 1.2 repetitions of the actual repetitions. Across all exercises, the predicted algorithm was within 0.3 repetitions of the actual repetitions (range: 0.0 to 1.2 reps). **CONCLUSION**: While some significant differences occurred for five of the 12 exercises, the repetition prediction model was a valid method for predicting repetitions for the selected dumbbell exercises.

1270   Board #78   May 31 9:00 AM - 10:30 AM
Modifying Accelerometer Cut-points Affects Criterion Validity in Free-living Youth and Adults

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(No relevant relationships reported)

In accelerometer-based physical activity (PA) measurements, it is common to scale a cut-point so it can be applied to data with a shorter epoch length. For example, 2020 counts per min (60-s epochs) could be divided by 4, giving 505 counts per 15 sec (15-s epochs). Researchers assume that scaling to a shorter epoch results in more moderate-to-vigorous PA (MVPA), compared to long epochs. However, no studies have compared modified estimates to a criterion measure (CM) of indirect calorimetry. **PURPOSE:** To assess the criterion validity of accelerometer estimates when using cut-points as intended (i.e. the epoch length for which they were originally developed, usually 60-s), versus modifying them for use with a different epoch length. **METHODS:** Free-living data were collected in 53 youth (2 hr each) and 29 adults (6 hr each) wearing a hip-worn accelerometer and a portable indirect calorimeter. Measured oxygen consumption (VO_2, $mL \cdot kg^{-1} \cdot min^{-1}$) was converted to metabolic equivalents (METs), by dividing by measured resting VO_2 (youth) or $3.5\ mL \cdot kg^{-1} \cdot min^{-1}$ (adults). METs were then coded as sedentary behavior (SB, METs ≤ 1.5), light PA (LPA, 1.6-2.9 METs), and MVPA (METs ≥ 3.0). Accelerometer data were processed using 3 youth and 3 adult cut-points as intended, plus 5 other epoch lengths, totaling 6 estimates (1, 5, 10, 15, 30, and 60-s epochs). Mean SB, LPA, and MVPA times were compared to the CM using one-way repeated measures ANOVAs and Bonferroni-adjusted post-hoc tests. **RESULTS:** For youth, mean MVPA time in shorter epochs was further from the CM than when using the cut-points as intended, and 1- and 5-second epochs differed significantly from the CM by 23.7%-62.7% for all cut-points ($p \leq 0.04$). In contrast, mean MVPA time using shorter epochs was closer to the CM than when using cut-points as intended, although all estimates differed non-significantly by 6.6%-50.9% ($p = 0.10$-0.99). For both groups, mean SB and LPA time when using cut-points as intended differed non-significantly from the CM by 7.3%-41.0% ($p > 0.05$), while using shorter epochs led to significant differences in some cases. **CONCLUSION:** Modifying cut-points led to variable error for different intensities in youth and adults. Therefore, it is most appropriate to use accelerometer cut-points as intended, which also ensures comparability between studies.

1271   Board #79   May 31 9:00 AM - 10:30 AM
Harmonizing Physical Activity Data across Cohorts in the Lifetime Risk Pooling Project

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(No relevant relationships reported)

PURPOSE: The Cardiovascular Lifetime Risk Pooling Project (LRPP) is an individual-level pooled data set from 20 U.S. cohort studies. LRPP is used to describe the development of cardiovascular disease (CVD) risk across decades of follow-up and different race and sex groups. Many of the cohorts have participant-reported physical activity (PA); however, before PA data can be used in pooled cohort analyses we must harmonize the original units (i.e. convert to a common scale and distribution). **METHODS**: We tested the feasibility for harmonization of moderate-vigorous intensity PA (MVPA) using 8 of 20 the cohorts (ARIC, Atherosclerosis Risk in Communities; CARDIA, Coronary Artery Risk Development in Young Adults; CHS, Cardiovascular Health Study; FHS, Framingham Heart Study; FOS, Framingham Offspring Study; JHS, Jackson Heart Study; MESA, Multi-Ethnic Study of Atherosclerosis; and WHI, Women's Health Initiative). We recomputed MVPA variables with varying degrees of granularity ranging from MET-min/week, cohort specific z-scores, and a dichotomous variable of active (meeting 2008 PA Guidelines) vs. insufficiently active (not meeting guidelines). To examine concurrent validity, we examined unadjusted cross-sectional associations of MVPA (at first visit with PA data) with BMI separately in all 8 cohorts and then pooled. **RESULTS**: When evaluating the concurrent validity of MVPA variables with BMI, 7 of the 8 cohorts demonstrated similar inverse associations with BMI (CHS, MESA, CARDIA, FOS, FHS, JHS, ARIC; pooled z-score: n=46865, β= -0.53, CI -0.58 - -0.47, p<.0001). Harmonization of MET-min/week was possible for 2 cohorts (CHS, MESA; n=11965, median=846.3, q1=241.9, q3=2004.6); and dichotomous variable for 3 cohorts (CHS, MESA, CARDIA, n=17106, 62% meeting 2008 PAGs). **CONCLUSIONS**: A cohort specific z-score allows for inclusion of a reliable measure of MVPA to be pooled from most cohorts. Detailed PA research on specific patterns and doses is possible within the subset of cohorts with more granular measures available. We plan to harmonize additional cohorts and develop and test the validity of other variables for use in the LRPP. This harmonization provides a valuable dataset to explore longitudinal patterns in PA and their associations with the development of CVD across the life course in a large, diverse cohort.

THURSDAY, MAY 31, 2018

1272   Board #80   May 31 9:00 AM - 10:30 AM

Automated Detection of Wheelchair Propulsion Using a Single Wrist Accelerometer

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(No relevant relationships reported)

Purpose: Physical activity (PA) provides important health benefits such as improved cardio-metabolic health, mental health, and cognitive functioning. However, the majority of this evidence is based on research conducted in ambulatory populations. Research informing the relationship between PA and health among manual wheelchair users (MWU's) is limited. One of the barriers is the lack of valid and reliable PA measures for the population. In the current study, machine learning (ML) techniques were used to develop activity recognition models to automatically identify episodes of active self-propulsion in manual MWU's wearing a single wrist-mounted accelerometer.
Methods: 11 adult MWU's (males= 8; 7 paraplegic; 4 tetraplegic) completed a series of activity trials while wearing an ActiGraph GT9X accelerometer on the non-dominant wrist. Activities included: sitting quietly, being pushed, self-propulsion, and completing manual tasks such as drinking water, working on an iPad, and folding laundry. Trials were categorised into 3 classes: sedentary (SED), manual tasks (MT), and self-propulsion (SP). 15 time-domain features from the X, Y, and Z axis were extracted from 1 s windows with 50% overlap and inputted into 3 supervised learning algorithms Decision Tree (DT), Random Forest (RF), and Support Vector Machine (SVM). Performance was evaluated using leave-one-subject-out (LOSO) cross validation. To determine if the resultant models generalized to new data, performance was also evaluated in an independent sample of MWU's (n = 14).
Results: Cross-validation F1-scores for the DT, RF, and SVM classifiers were 0.83, 0.84 and 0.85, respectively. Classification accuracy was consistently good to excellent for SED (86.0% - 92.7%), MT (76.0% - 82.4%), and SP (76.0% - 76.8%). In the independent sample, F1-scores for the DT, RF, and SVM classifiers were, 0.80, 0.81, and 0.82, respectively. Classification accuracy remained good to excellent for SED (83.9% - 92.0%), MT (70.5% - 79.3%), and SP (74.2% - 77.6%)
Conclusion: ML models trained on simple time-domain features from a single wrist-worn accelerometer can be used to differentiate active self-propulsion from other activities in MWU's. The models generalized well to new data and could help researchers evaluate the effectiveness of interventions to promote PA in MWU's.

1273   Board #81   May 31 9:00 AM - 10:30 AM

Validity And Reliability Of The Past Questionnaire Among Women

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(No relevant relationships reported)

Purpose: To determine the validity and reliability of the Past-day Adults' Sedentary Time (PAST) questionnaire using the activPAL (AP) as the criterion measure.
Methods: Thirty four women (23.7 ± 4.6 y; 25.4 ± 6.2 kg m^{-2}) wore the AP on the thigh and Actigraph GT3x-BT (AG) on the wrist for twenty four hours. The PAST was administered the day after the assessment day (T1) and within twenty four hours of T1 (T2). The AG was used to determine sleep time for the day assessed, which was then subtracted from the total sit/lie time recorded by the AP (sit/lie time-sleep time) to determine total sedentary time. Spearman correlation coefficients and Bland-Altman plots were calculated to determine validity and reliability of the PAST using AP. **Results:** The correlation between T1 and T2 for all PAST questions demonstrated good positive correlations ($p < 0.001$) including total sedentary time except for the last question on "sitting/lying for other purposes" which was fair ($r = 0.431$, $p = 0.011$). The Bland-Altman plot revealed a mean difference of 33.7 minutes of T2 and T1 of the PAST with no significant bias ($p > 0.05$). However, using the AP as the criterion the mean difference for T1 (T1-AP) was 167.0 mins while the mean difference for T2 (T2-AP) was 200.7 mins with both demonstrating significant positive bias ($p \leq 0.001$).
Conclusion: The PAST is a reliable instrument when re-administered within twenty four hours. However, participants tend to over-report their sedentary time especially once reported sedentary time is >600 minutes per day. Therefore, researchers should be cautious when using the PAST in populations that report a high amount of sedentary time (e.g., >600 minutes).

1274   Board #82   May 31 9:00 AM - 10:30 AM

Comparing Accelerometry Methods in an Older Adult Physical Activity Intervention and Associations with Health Outcomes

Katie Thralls[1], Suneeta Godbole[2], Todd Manini, FACSM[3], Eileen Johnson[4], Jacqueline Kerr[2]. [1]*San Diego State University/ Univeristy California San Diego, San Diego, CA.* [2]*Univeristy California San Diego, San Diego, CA.* [3]*Univeristy of Florida, Gainesville, FL.* [4]*Univeristy California Berkeley, Berkeley, CA.*

(No relevant relationships reported)

BACKGROUND: Advancements in accelerometry have led to different methods to process the data for physical activity (PA) in older adults.
PURPOSE: The purpose of this study was to: 1.) Compare five different methods for analyzing PA in older women; 2.) Assess the relationship between changes in PA and changes in physical function and depressive symptoms over six months for each analysis method.
METHODS: Older adult females (N=144, M$_{age}$ = 83.3 ± 6.4yrs) wore a hip accelerometer for 6 days and completed measures of physical function and depressive symptoms at baseline and 6 months. Accelerometry data were processed by 5 different methods to estimate PA: a 1041 vertical axis cut point, a 15-sec vector magnitude (VM) cut point (Evenson), a 1-sec VM algorithm (Activity Index) , a machine learned (ML) algorithm from 39 features, and an individualized cut point derived from the median counts of rapid 400-meter walk. Generalized estimating equations and a confusion matrix were used to compare and contrast PA minutes/day. Linear mixed models for each processing method tested the associations between changes in PA and changes in physical function and depressive symptoms.
RESULTS: Baseline comparisons between methods for minutes/day of PA and for each minute of PA are in Table 1. There were significant differences between some methods but not others, and methods estimated 6-month change in PA from 4 minutes to over 20 minutes. All methods, except the individualized cut point had a significant positive relationship between change in PA and improved physical functioning. There was also a significant relationship between changes in PA and decreased depressive symptoms for all methods except the individualized cut point.
CONCLUSIONS:
Time spent in PA differs by the choice of data processing method. Results from individualized cut points are counter to methods that use absolute cut points. Additional research is needed to understand these discrepancies.

Table 1.					
Confusion Matrix for each method with percent (%) overlap between methods for each minute of PA and differences (*) between methods for total minutes/day at baseline					
Method	Individual 400MW	Evenson	Activity Index	1041cpm	ML
Individual 400MW		31%*	25%*	42%*	17%*
Evenson			61%	69%*	42%*
Activity Index				63%	60%
1041cpm					43%
ML					

Note. * indicate significant differences based on total minutes/day ($p < .05$); cpm: counts per minute; ML: Machine Learned; MW: meter-walk

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1275   Board #83   May 31 9:00 AM - 10:30 AM

Accuracy And Reliability Of A Consumer-grade Activity Tracker Among Older People: A Pilot Study

Catherine Patrick, Michael A. Smith, Antonio Harris, Melissa Powers. *University of Central Oklahoma, Edmond, OK.*

(No relevant relationships reported)

Activity trackers are popular devices used to track and encourage physical activity; although the accuracy of activity trackers among older people is unknown.
PURPOSE: The purpose of this pilot study was to evaluate the accuracy and reliability of step counts from a consumer-grade activity tracker by comparing step counts to a research-grade accelerometer and video recording. **METHODS:** Ten volunteers (mean age = 71.20±6.00 years) agreed to participate. Two participants did not complete the second round of testing. Researchers collected height, weight, and age. The activity tracker and accelerometer were set-up using manufacturer's procedures. Participants wore the activity tracker and accelerometer as they walked 96 meters around an indoor gym floor at their normal walking pace. The walk was also video recorded to determine observational step count confirmed by two researchers. The same procedures were repeated on a second, non-consecutive day. Data collected from the activity tracker were compared to the accelerometer and observed step count. In addition, step counts from the first walk were compared to step counts from the second walk. **RESULTS:** At

the first walk, the activity tracker was found to significantly underestimate step counts by 16.00 steps when compared to the observed step count, t (7) = -2.69, p = .031. The activity tracker step count was not different than the accelerometer step count. At the second walk, no differences in step counts were observed between the activity tracker and the accelerometer or the observed step count (p > .05). In addition, no differences in step counts were observed between walk 1 and walk 2 using the activity tracker, accelerometer, and observed step count. **CONCLUSION:** Although preliminary, these data indicate fair accuracy and good reliability of a consumer-grade activity tracker when compared to the research-grade accelerometer and observed step count. We suggest this pilot study be extended to include additional participants and comparisons of other activity trackers. Activity trackers are widely used to measures physical activity, but their accuracy and reliability remains questionable especially among older people. Additionally, products and upgrades are made available so quickly that research on the accuracy and reliability of these devices is difficult to obtain.

1276   Board #84   May 31 9:00 AM - 10:30 AM

Accuracy of Fitbit Surge and Smartphone Apps at Measuring Cycling Distance and Speed

Jose L. Gamez, Ivan A. Figueroa, Merrill D. Funk. *University of Texas Rio Grande Valley, Brownsville, TX.*
(No relevant relationships reported)

Purpose
To determine the accuracy of Fitbit Surge and two smartphone applications at measuring distance and speed while cycling outside.
Methods
Thirteen college-aged students (Mean±SD; BMI: 25.2±3.0kg/m²; 10 males, 3 females) consented to participate in one measurement session. A 0.75 mile trail along a sidewalk around the university campus was used for 3 separate trials using a mountain bike, Android smartphone running Google-Fit (G-Fit) and S-Health (SH), and Fitbit (FB) provided to each participant. A researcher rode along with each participant the entire study using a cycle computer as the standard for speed and distance. The first lap consisted of walking 0.25 miles, cycling 0.15 miles at a slow speed, cycling 0.20 miles at a fast speed, and cycling 0.15 miles at a moderate speed. The second lap consisted of 1 lap at a moderate speed. The third lap consisted in 1 lap at a slow speed. After every lap a researcher recorded the data from the phone and the Fitbit. Mean bias and mean absolute percent error (MAPE) were calculated to describe speeds and distances recorded on each device compared to the cycle computer.
Results
Thirteen participants completed all 3 trials though 2 were excluded due to a malfunction with the smartphone apps causing partial data to be collected, leaving 11 included in this analysis. Results are as follows:

Trial 1	FB Mean Bias±SD	FB MAPE	G-Fit Mean Bias±SD	G-Fit MAPE	SH Mean Bias±SD	SH MAPE
Distance (miles)	0.02±0.01	2.5	0.03±0.06	7.7	0.02±0.01	2.75
Average Speed (mph)	0.41±0.27	6.1	0.93±0.6	13.2	0.63±0.4	0.1
Max Speed (mph)	0.83±0.53	6.5	4.17±0.6	33.0	1.65±1.36	14.1
Trial 2						
Distance (miles)	0.02±0.02	4.9	0.02±0.06	7.0	0.02±0.02	3.5
Average Speed (mph)	0.45±0.2	4.8	1.31±0.82	13.6	0.53±1.36	14.1
Max Speed (mph)	5.98±1.19	41.5	4.43±1.0	29.2	0.44±2.03	11.5
Trial 3						
Distance (miles)	0.02±0.01	3.1	0.02±0.04	5.4	0.04±0.04	5.3
Average Speed (mph)	0.29±0.26	5.0	0.43±0.32	7.4	-1.37±2.07	23.7
Max Speed (mph)	1.51±0.57	9.2	6.59±2.14	37.4	1.44±0.59	8.6

Conclusion
The Fitbit Surge was most accurate at measuring speed and distance for cycling followed by the S-Health app and lastly the Google-Fit app.

1277   Board #85   May 31 9:00 AM - 10:30 AM

Smartphone Carrying Location and Accuracy of Popular Pedometer Smartphone Apps While Jogging

Merrill D. Funk, Murat Karabulut. *University of Texas Rio Grande Valley, Brownsville, TX.*
(No relevant relationships reported)

Common pedometer smartphone apps suggest multiple acceptable sites where the phone may be carried to obtain accurate measurements, however, the phone location may have a significant effect on outcomes reported by the app. **PURPOSE:** To determine if smartphone location has a significant effect on the accuracy of popular smartphone pedometer applications at measuring steps while jogging on a treadmill. **METHODS:** Fifty-two participants (Mean±SD; 22.9±4.2yrs; BMI: 24.8±4.1kg/m²; 22 Male, 30 Female) consented to jog on a treadmill at 5 mph for 500 steps, while using a pedometer and 4 smartphones placed in commonly used locations (pocket, armband, waistband, hand). All smartphones were simultaneously running 5 applications throughout the trial: Moves, Google-Fit (G-Fit), Runtastic, Accupedo, and S-Health. Steps were verified using a hand tally counter. Zero, negative, and significant outlier values were replaced with the mean value for that app. A separate one-way repeated measures ANOVA was used for each app with the pedometer and tally counter. Significance was set at p<0.05. Pairwise comparisons with Bonferroni corrections were used for post-hoc analysis. Mean bias scores were calculated between the step count for each app and the tally counter. **RESULTS:** Repeated Measures ANOVA detected significant differences between phone locations and the step counter for only G-Fit (p=0.029) and Runtastic (p<0.01), while other apps were not different by location (p>0.05 for all). Using pairwise comparisons, G-Fit did not show significant differences with the tally counter for any of the phone locations (p>0.05) while pairwise comparisons for Runtastic indicated differences between the arm and hand locations compared to the tally counter (p=0.039, p=0.007, respectively). Lowest mean bias values for each app were as follows: Moves, arm (mean bias ± SD; 5.8 steps ± 103.3 steps); G-Fit, hand (13.7 ± 135.4); Runtastic, waist (8.6 ± 37.1); Accupedo, pocket (17.5 ± 46.9); S-Health, arm (-1.6 ± 26.9). **CONCLUSION:** The pocket, arm, waist, and hand all appear to produce relatively accurate step counts for pedometer smartphone apps while jogging on a treadmill. Although the phone location and app did not result in significant changes in step count, some locations and apps were better at providing more consistent and accurate results.

C-37   Free Communication/Poster - **Physical Activity and Health in Older Adults**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1278   Board #86   May 31 9:00 AM - 10:30 AM

Predictors of Central Blood Pressure in Older Adults

Emma Albin, Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose: To investigate the predictors of central blood pressure (BP) in older adults, which is suggested as an emerging marker of future cardiovascular diseases, independent of peripheral BP.
Methods: This cross-sectional study included 304 older adults aged ≥65 years (mean age 72). Central and peripheral BP were measured using Uscom BP+ while seated. Demographic (age, sex), lifestyle (smoking, alcohol intake), body composition by DXA (body weight and fatness), cardiometabolic (peripheral BP, resting heart rate [RHR], blood glucose and lipids), and physical activity (PA) (sitting time, daily steps) and fitness variables (cardiorespiratory fitness [CRF], handgrip strength) were identified as potentially predictive of central BP and included in the prediction model.
Results: Univariate regression revealed that age (p<0.001), body weight (p=0.041), percent body fat (%BF) (p=0.049), total cholesterol (TC) (p=0.042), fasting glucose (p=0.032), CRF (p=0.001) and peripheral systolic BP (PSBP) (p<0.001) were significant for central systolic BP (CSBP). Body weight (p<0.001), %BF (p<0.001), TC (p=0.005), RHR (p=0.002) and peripheral diastolic BP (PDBP) (p<0.001) were significant for central diastolic BP (CDBP). Stepwise multivariate linear regressions with p<0.2 for entry and p<0.05 for staying in the model were used to identify significant predictors of central BP. In the multivariate regression, PSBP (β=0.89, p <0.001) and male sex (β=-1.94, p<0.001) were identified as significant predictors for CSBP, and PDBP (β=0.99, p<0.001) and TC (β=0.01, p <0.011) for CDBP that accounted for 91.6% and 93.5% of the total variance in CSBP and CDBP, respectively. When stratified for BP medication, PSBP and PDBP remained significant in participants both with (33%) and without (67%) BP medication, but sex and TC remained significant only in participants without BP medication, suggesting a possible effect modification by BP medication. When stratified by PA and CRF (400m walk

test), the CSBP model was stronger for the active group (≥5,000 steps/day; R^2=0.97) than the inactive (R^2=0.89) and stronger for the high (upper third; R^2=0.95) CRF than moderate (middle third; R^2=0.91) or low (lower third; R^2=0.90) CRF groups.
Conclusion: The results suggest that peripheral BP is the strongest predictor of CBP for older adults.

1279 Board #87 May 31 9:00 AM - 10:30 AM

Physical Activity Patterns Among Older Central Pennsylvania Cancer Survivors: A Comparison With BRFSS National Data

Wayne Foo, Kathryn Schmitz, FACSM. *Penn State Cancer Institute, Hershey, PA.* (Sponsor: Kathryn Schmitz, FACSM)

(No relevant relationships reported)

Adults can participate in a variety of physical activities to meet current federal physical activity guidelines. The differences between activity patterns of cancer survivors and the general population are not well understood. This knowledge may be useful in modifying physical activity promotion guidelines specific to cancer survivors.
PURPOSE: To compare physical activity patterns of older cancer survivors living in Central Pennsylvania (CPA) to that of a national sample of Americans using the Behavioral Risk Factor Surveillance System (BRFSS) data (≥50 years old).
METHODS: We mailed BRFSS-based questionnaires to cancer survivors living in CPA, identified using the Pennsylvania Cancer Registry. Using this data (N=541) and the 2015 BRFSS national data (N=441,456), we categorized specific types of physical activity (PA) into ten major activity types using classifications from the Compendium of Physical Activities. We fit multivariate logistic regression models to estimate the prevalence odds ratios of activity participation for each activity type. Bonferroni method was used to control for inflated error due to multiple testing (p<0.005). Effect modification by sex was analyzed for activity types that were significant in the model.
RESULTS: Walking was the most common activity in both cohorts (CPA: 58%; BRFSS: 49%), followed by garden/lawn activities (CPA: 19%; BRFSS: 14%), and then conditioning activities (CPA: 9%; BRFSS: 11%). A higher proportion of CPA cancer survivors reported at least one activity (87%) compared to the national sample of Americans (66%). Compared to the national sample, CPA cancer survivors were 1.5 times more likely to report walking (OR=1.51; 99.5% CI: 1.16-1.97), 1.4 times more likely to report garden/lawn activities (OR=1.43; 99.5% CI:1.03-1.97), 1.7 times more likely to report household activities (OR=1.67; 99.5% CI:1.06-2.61), and 3.8 times more likely to report fishing/hunting (OR=3.79; 99.5% CI: 1.38-10.46). No significant effect modification by sex was found.
CONCLUSIONS: In general, CPA cancer survivors were more likely to report participating in at least one PA. Programs aimed to increase PA among CPA cancer survivors may want to focus on walking, domestic activities such as household and garden/lawn activities, as well as outdoor activities such as fishing and hunting.

1280 Board #88 May 31 9:00 AM - 10:30 AM

Associations of Body Fatness and Cardiorespiratory Fitness on Central Blood Pressure in Older Adults

Markus H. Flynn, Nathan F. Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-Chul Lee, FACSM)

(No relevant relationships reported)

Purpose: To investigate the associations of percent body fat (PBF) and cardiorespiratory fitness (CRF) on central blood pressure (BP), which is suggested as a greater predictor of cardiovascular disease (CVD) than peripheral BP and more closely related to CVD risk factors.
Methods: This cross-sectional study included 302 older adults aged ≥65 years (mean age 72) from the Physical Activity and Aging Study (PAAS). PBF was assessed via a DXA scan and divided into sex-specific quartiles. CRF was evaluated by a 400-meter walk test and divided into sex-specific quartiles based on completion time in minutes. Central BP was analyzed using an Uscom BP+ (Uscom Ltd., Australia). Elevated central BP was defined as sex-specific, central systolic or diastolic BP above the 75th percentile in this sample. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having an elevated central BP across PBF and CRF.
Results: In this study, 106 older adults (34.9%) had elevated central BP. Compared to the lowest PBF quartile 1 (lowest 25%), ORs (95% CIs) of having an elevated central BP in the next quartiles 2, 3, and 4 were 1.79 (0.81-3.94), 2.86 (1.31-6.23) and 4.23 (1.85-9.70), respectively, after adjusting for age, sex, blood pressure medication usage, current smoking status, and CRF. However, CRF was not significantly associated with an elevated central BP after adjusting for the previously listed confounders and PBF (trend P=0.21). In the stratified analyses by CRF, we found that higher PBF was associated with increased prevalence of elevated central BP in both lower CRF (lower 50%) (trend P<0.01), and higher CRF (upper 50%) halves (trend P=0.02).
Conclusion: These results suggest that higher PBF, independent of CRF, is associated with an increased prevalence of elevated central BP in older adults. However, further prospective studies are warranted.

1281 Board #89 May 31 9:00 AM - 10:30 AM

Predictors of Diagnostic Variables of Sarcopenia in Older Adults

Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)

(No relevant relationships reported)

Purpose: To investigate potential predictors of diagnostic variables of sarcopenia in older adults including demographic factors (e.g., age and sex), aerobic and resistance physical activity (PA), cardiorespiratory fitness (CRF), and body composition.
Methods: This cross-sectional study included 304 older adults ≥65 years (mean age 73, range 65-95). PA and sedentary variables were assessed using a self-report survey and daily steps using an accelerometer based pedometer (Omron HJ-321). CRF was the time to complete a 400m walk in minutes, thus higher number in minutes indicates a slower walking, which is a lower level of CRF. Body composition was percentage body fat (%BF) measured by DXA and body mass index (BMI). Diagnostic variables of sarcopenia include appendicular lean mass (ALM) (kg/height in meter^2) measured by DXA, handgrip strength (kg), and gait speed (m/s) from 4 meter walk test. **Results:** Univariate regression revealed significant relationships between ALM and CRF (p=0.012), light intensity (1.5-3.0 METs) aerobic PA (p<0.001), vigorous intensity (≥6.0 METs) aerobic PA (p=0.008), age (p<0.001), male sex (p<0.001), and %BF (p<0.001). Handgrip strength was related to CRF (p<0.0001), light intensity aerobic PA (p=0.002), vigorous intensity aerobic PA (p=0.002), resistance PA (p=0.031), age (p<0.001), male sex (p<0.001), and %BF (p<0.001). Gait speed was related to CRF (p<0.0001), daily steps (p=0.003), age (p<0.0001), and %BF (p=0.018). Stepwise variable selection (p<0.2 to enter the model, p<0.05 to remain in the model) was used to find significant predictors of diagnostic variables of sarcopenia. ALM was predicted by CRF (β=-0.15, p<0.001), %BF (β=-0.12, p<0.001), BMI (β=0.25, p<0.001), and male sex (β=0.29, p<0.001) (model R^2=0.93); grip strength was predicted by CRF (β=-2.50, p<0.001), age (β=-0.26, p<0.001), and male sex (β=14.6, p<0.001) (model R^2=0.63); and gait speed was predicted by CRF (β=-0.11, p<0.001) (model R^2=0.24).
Conclusion: Cardiorespiratory fitness, measured by a simple 400m walk test, was identified as a significant predictor of all three diagnostic variables of sarcopenia in older adults.

1282 Board #90 May 31 9:00 AM - 10:30 AM

The Difference of Body Composition According to Smart Phone Proficiency in Korean Elderly

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(No relevant relationships reported)

Purpose : Previous studies have shown associations of sedentary behavior with biomarkers of cardiometabolic risk, however the relationship between the proficiency of smart phone usage and obesity has not yet been studied. We examined the difference of body mass index (BMI) according to smart phone proficiency in the elderly.
Method : Experimental subjects included 101 elderly (50 male, 51 female) over the age of 60 who participated the local senior education program at several senior welfare service centers in Seoul, South Korea. They were divided into three groups according to proficiency of smart phone usage. Fitness characteristics related to smart phone usage were evaluated by measuring cardiorespiratory endurance, grip strength, pinch strength, eye-hand coordination and body composition. Also, smart phone proficiency was evaluated by a self-reported questionnaire and a smart phone usability task that composed of two categories: usage of the smartphone device itself and usage of phone applications. The differences in BMI of the subjects was analyzed by ANCOVA adjusting for independent variables including age, grip and pinch strength, eye-hand coordination, education and incomes. **Results** : There was a significant difference in BMI among the three groups after adjustment of age, grip and pinch strength, eye-hand coordination, education and incomes. The self-reported questionnaire showed a significant difference in BMI between high proficiency and low proficiency groups (high 25.07±2.51, low 23.52±2.19; *p*=.015). Smart phone usability task results also showed a significant difference in BMI among the three groups (high 25±2.64, low 23.08±2.59; *p*=.002 and high 25±2.64, middle 23.7±1.61; *p*=.011). **Conclusions** : These results suggest that high smart phone proficiency shows increased BMI in the elderly. This study suggests that people over 60 who have high smartphone proficiency should be cautious of an increased BMI score.

1283　Board #91　May 31 9:00 AM - 10:30 AM

Associations of Cardiorespiratory Fitness and Percent Body Fat with Health-Related Quality of Life in Elderly

Heather Danzer, Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)

(No relevant relationships reported)

Purpose: To investigate the cross-sectional associations of cardiorespiratory fitness (CRF) and percent body fat (PBF) with Health-Related Quality of Life (HRQoL) in older adults.

Methods: Participants comprised 282 older adults aged ≥65 years (mean age 74) from the Physical Activity and Aging Study (PAAS)**.** CRF was assessed by time in minutes to complete a 400-meter walk, and PBF was assessed by Dual-energy X-ray absorptiometry (DXA) and categorized into sex-specific quartiles for each CRF and PBF. HRQoL was assessed by the 36-Items Short Form Health Survey (SF-36) and categorized based on physical component scores (PCS) including physical health, physical role, bodily pain, and general health dimensions and mental component scores (MCS) including vitality, social functioning, emotional role, and emotional health dimensions. Average score below 50 (range 0-100) was used to define both low PCS and low MCS, indicating lower HRQoL, based on the population mean score of 50. However, due to having limited cases (n=20) for both low MCS and low PCS groups were combined into one overall HRQoL for analysis. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having a low overall HRQoL across CRF and PBF quartiles.

Results: Compared to the lowest CRF quartile 1 (lowest 25%), ORs (95% CIs) of having a low overall HRQoL in the next higher CRF quartiles 2, 3, and 4 were 0.29 (0.08, 1.01), 0.16 (0.03, 0.85), and 0.14 (0.02, 0.85), respectively, after adjusting for age, sex, smoking, alcohol intake, physical activity, and PBF (trend p=0.01). This result indicates that the two higher CRF levels (quartiles 3 & 4) are significantly associated with lower odds of having a low level of HRQoL, suggesting better overall HRQoL. However, PBF was not significantly associated with overall HRQoL after adjusting for the confounding including CRF in this study population (trend P=0.24). In the stratified analysis by PBF, although not significant due to further reduced number of cases, similar trends were observed for both low (lower 50%, lean) and high (upper 50%, fat) PBF groups.

Conclusion: This study suggests that higher CRF, independent of PBF, is associated with better HRQoL in older adults. However further exploration from prospective studies are needed.

C-38　Free Communication/Poster - Nutrition Status and Assessment

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1284　Board #92　May 31 8:00 AM - 9:30 AM

Preschool Breakfast Menus That Meet Dietary Guidelines: Comparing What Is Served And Consumed By Children

Stacie M. Kirk, Erik P. Kirk, FACSM. *Southern Illinois University Edwardsville, Edwardsville, IL.*

(No relevant relationships reported)

Preschool menus must meet the Dietary Guidelines for Americans. However, what is actually served and consumed by children is not restricted, potentially affecting consumption of a balanced diet. **PURPOSE:** Compare preschool breakfast menus meeting dietary guidelines to what is actually served and consumed by children. **METHODS:** Fifty-two preschool children (mean±SD, age 3y and 10m ± 8m) from a university early childhood center participated in the 10-week study. Each day, 15 children were randomly selected for nutritional analysis of their breakfast. Prior to and immediately after consumption, a picture of the child's tray was taken using digital photography. If a child had additional servings, additional pictures were taken. Analysis of energy and nutrient content for menus, food served, and food consumed was completed using Food Processor Nutrition Analysis by ESHA. Food color (white, brown, orange, yellow, red, green, other) was determined by observation during analysis. A food preference survey was administered verbally to children immediately after each meal. **RESULTS:** There was a significant (p<0.05) difference for total kilocalories (kcals) between menu (356 ± 117), served (330 ± 157) and consumed (184 ± 136). There was a significant (p<0.05) difference for grams of carbohydrate between menu (59.0 ± 17.6g) and served (54.2± 29.5g) compared to what was consumed (29.0 ± 19.6g). There was a significant (p<0.05) difference for grams of fat between menu (9.3 ± 6.8g), served (8.6 ± 8.1 g) and consumed (5.1 ± 7.2g). There was a significant (p<0.05) difference for protein between menu (11.7 ± 3.3g), served (11.2 ± 6.6g) and consumed (6.7 ± 6.6g). The majority of food served was white (47.7%), brown (18.7%), or orange (14.8%) with minimal yellow (8.8%), red (7.0%) or green (0.0%)

foods. Children described food as yummy (77.0%), okay (9.4%), and yucky (13.6%). Consumption of vegetables (0.0%) was significantly (p<0.05) lower than dairy (79.9%), fruits (66.1%), grains (70.8%), and meats (70.4%). Children consumed a high percentage (50.0%) of fats/sweets. **CONCLUSION:** The amount of food consumed at breakfast was significantly less than was indicated on the menu and amounts served, indicating that children were not meeting the dietary recommendations as intended, potentially contributing to long-term health consequences.

1285　Board #93　May 31 8:00 AM - 9:30 AM

Risk Behaviors, Energy Balance and Physical Activity of University Students of a Nutrition School

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(No relevant relationships reported)

The development of chronic noncommunicable diseases during youth could affect the performance and professional achievements of university students. Differences in consumption of alcohol or tobacco, energy balance and physical activity levels may have an influencing effect in the levels of obesity that affect Mexico.**PURPOSE**: To analyze the differences regarding the consumption of alcohol or tobacco in the relationship between energy balance and the physical activity level among students of a Nutrition School.

METHODS: In this study, we engaged a group of 380 university students from a Nutrition School (292 female). Habitual behaviors including consumption of alcohol and/or tabacco, 24-hour reminder, energy balance (caloric-nutritional consumption between energy expenditure) and physical activity level (International Physical Activity Questionnaire) were measured.

RESULTS: No differences were found between the energy balance and the physical activity level in men. In the whole sample alcohol consumption ($OR = 1.215$, *IC 95% = .721 - 2.045*) was associated with increased risk of low physical activity level (<600 METs). In participants who consumed alcohol a negative association was found between energy balance and the physical activity level ($r = -.132$, $p < .05$), with greater values for women ($r = -.184$, $p < .05$). Women who consumed tobacco showed a tendency to decrease their level of physical activity ($r = -195$, $p < .05$).

CONCLUSIONS: Alcohol and tobacco consumption affected the energy balance and the physical activity level of university students of a Nutrition School. Especially in women, these habits should be modified to prevent the development of diet-dependent diseases.

1286　Board #94　May 31 8:00 AM - 9:30 AM

Nutritional Status of Rock Climbers

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(No relevant relationships reported)

The physically intense nature of rock climbing requires that athletes maintain optimal nutrition to meet physical demands and minimize predisposition to injury. Although the sport of rock climbing has grown, limited research has been conducted on nutritional intake of these non-traditional athletes. **PURPOSE:** To quantify nutritional intake of rock climbers. **METHODS:** Following written informed consent, 3-day food recalls were obtained from 25 female and 15 male rock climbers [mean ± SD; age = 22.4 ± 3.2 yr; ht = 170.5 ± 10.4 cm; wt = 64.9 ± 8.9 kg; basal metabolic rate (BMR) = 2687.6 ± 354.6 kcals] to ascertain energy, macronutrient, and micronutrient intake. **RESULTS:** MANOVAs indicated a significant main effect between DRIs and rock climber nutrient intake by macronutrients ($F_{30,197} = 12.243$; $P < .0001$), vitamins ($F_{30,197} = 12.091$; $P < .0001$), and minerals ($F_{18,201} = 20.475$; $P < .0001$). Post hoc analyses indicated that female climbers were significantly lower in energy intake (1878.1 ± 542.9 vs. 2400.0 kcals; $P < .0001$), protein (77.1 ± 24.0 vs. 135.0 g; $P < .0001$), carbohydrates (240.8 ± 79.6 vs. 330.0 g; $P < .0001$), vitamin D (3.8 ± 5.0 vs. 15.0 μg; $P < .0001$), vitamin E (5.7 ± 4.0 vs. 15.0 mg; $P < .0001$), magnesium (219.7 ± 116.4 vs. 310.0 mg; $P = .002$), and potassium (1992.2 ± 803.1 vs. 4700.0 mg; $P < .0001$), but higher in sodium intake (2689.1 ± 933.9 vs. 1500.0 mg; $P < .0001$) than DRIs, respectively. Male climbers were significantly lower in energy intake (2124.8 ± 472.3 vs. 3000.0 kcals; $P < .0001$), protein (91.5 ± 23.0 vs. 169.0 g; $P < .0001$), carbohydrates (270.0 ± 76.5 vs. 413.0 g; $P < .0001$), fiber (27.6 ± 12.3 vs. 38.0 g; $P = .002$), unsaturated fat (55.0 ± 20.6 vs. 69.0 g; $P = .034$), saturated fat (22.4 ± 9.3 vs. 33.0 g; $P < .0001$), vitamin D (3.5 ± 3.8 vs. 15.0 μg; $P < .0001$), vitamin E (8.2 ± 64.0 vs. 15.0 mg; $P < .0001$), and potassium (2467.3 ± 910.7 vs. 4700.0 mg; $P < .0001$), but higher in vitamin C (139.2 ± 80.3 vs. 90.0 mg; $P = .021$), riboflavin (1.8 ± 0.9 vs. 1.3 mg; $P = .011$), niacin (20.9 ± 11.6 vs. 16.0 mg; $P = .021$), iron (16.2 ± 9.1 vs. 8.0 mg; $P = .009$), and sodium (2658.5 ± 684.0 vs. 1500.0 mg; $P < .0001$) than DRIs, respectively. **CONCLUSION:** Both gender differed significantly from nutritional recommendations. Given that energy and macronutrient intake are closely related to athletic performance, ensuring that optimal nutrition is achieved must be a priority.

1287   Board #95   May 31 8:00 AM - 9:30 AM

Nutrition and Energy Expenditure of Retired Professional Contact Sport Athletes and Non Contact Sport Controls

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(No relevant relationships reported)

Background: Chronic traumatic encephalopathy (CTE) is a neurodegenerative disorder suspected to be caused by repetitive mild traumatic brain injuries from playing contact sports. Other possible etiologies linked to brain health, nutrition, and general lifestyle have received far less attention. **Purpose:** To compare physical health, diet, and Exercise Energy Expenditure (EEE) of retired professional contact sport athletes and healthy non contact athlete controls. **Methods:** Participants completed an extensive battery of cognitive tests, were assessed on advanced imaging, and were evaluated for psychological and physical health. Participants completed the Yale Physical Activity Survey to determine EEE/physical activity and the Food Frequency Questionnaire to obtain a yearlong diet recall using Nutritionist Pro software. **Results:** Contact Athletes (n=21, 56 ± 11 yrs, 29.7 ± 3.6 kg/m^2) were significantly more overweight (n=21, 57 ± 9 yrs, 24.5 ± 2.6 kg/m^2, $p < 0.001$). Calculated kilocalorie intake was not significantly different, however, the total hours spent doing common types of physical activities was significantly lower in Contact Athletes (22.5 ± 18.7 hrs/wk vs 51.1 ± 15.0 hrs/wk, $p < 0.001$). No significant differences were seen in intake of macronutrients, but intake of many brain healthy micronutrients, including copper ($p = 0.019$), selenium ($p = 0.037$), folate ($p = 0.02$), manganese ($p = 0.002$), and riboflavin ($p = 0.047$) was significantly lower in Contact Athletes. **Conclusion:** Although retired professional contact sport athletes have similar energy intake as controls, they spend less time doing physical activities per week and consume a diet deficient in some brain healthy nutrients. This may relate to the greater degree of being overweight in the former Contact Athletes. Nutritional and cardiovascular factors should be considered in the evaluation of cognitive disorders in former contact sport athletes.

1288   Board #96   May 31 8:00 AM - 9:30 AM

Nutritional Habits And Body Composition Assessment In International Soccer Referees

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(No relevant relationships reported)

PURPOSE: Soccer referee has responsibility to verify and enforce the rules of the game and control players' behavior during matches. In order to be able to directing a football game, to have a good decision-making ability and to be close to the action the referee must be in optimal physical condition. Physical demands and nutrition are highly interrelated: the study of body composition is a method for assessing the balance between these two aspects closely related to sport performance. The aim of the present study was to evaluate nutritional habits and resulting body composition in international soccer referees called for the FIFA World Cup 2018. **METHODS:** 60 soccer referees (SR) (39.2 ± 4.2 years) were enroll in this study. The variables of body mass, height, skinfold thicknesses, body circumferences (waist, hip and biceps) were collected with the purpose of estimating Sum of 7 skinfold thicknesses ($\sum$7sk), Fat Mass (FM %), Fat Mass, Fat Mass index (FMI kg/m^2). The skinfold thickness are been evaluated with International Society for the Advancement of Kinanthropometry methodology. For the evaluation of nutritional habits (NH), athletes answered a 24 h food recall. The variables of carbohydrates (CHO), protein (PRO) and fat (FAT) are expressed in % and g/kg. Micronutrients in terms of vitamins and minerals are been collected. The data are been compared with the international guidelines. **RESULTS:** The data collected regarding the body composition describe a normal weight population (BMI = 23.3 ± 1.5 kg/m^2), but with a FM% of 11.4 ± 2.5 and a FMI of 4.9 ± 1.3 kg/m^2 above the normal range. The $\sum$7sk was 63.7 ± 17.3 mm. About NH we observed: -CHO 44.6 %, 3.1 g/kg; -PRO 16.5 %, 1.1 g/kg; -FAT 41.4 %, 1.3 g/kg; The minerals below the normal range was Calcium (661.8 ± 187.3 mg/die), Zinc (10.3 ± 2.5 mg/die), Magnesium (295.6 ± 81.8 mg/die) Iodine (21.2 ± 9.3 µg/die). The vitamins below the normal range was Folic Acid (381.0 ± 118.4 µg/die) and Vitamin A (1282.4 ± 484.1 UI/die). **CONCLUSIONS:** NH are inadequate for this category, CHO and PRO are below and the FAT above the international guidelines. These data suggested that nutritional intervention would be appropriate. Therefore, the nutritional habits must be adapted to their daily physical activities, during match refereeing, to obtain better performance.

1289   Board #97   May 31 8:00 AM - 9:30 AM

Examination of Female Athlete Triad Components in a College Dance Company

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(No relevant relationships reported)

Dancers are at an increased risk for the female athlete triad (Triad) due to the discipline required in dance training and the importance placed on aesthetic appearance. Subjective judging and body size expectations may promote restrictive eating behaviors, which can lead to menstrual disturbances and poor bone mineral density (BMD). **PURPOSE:** To examine the prevalence of: (1) Triad components in collegiate, female dancers, and (2) low energy availability (LEA) in collegiate, female dancers with or without disordered eating. **METHODS:** A cross-sectional cohort study examined dancers (n=26) in a collegiate dance company (height: 165 ± 6.9 cm; weight: 56.41 ± 7.0 kg). Dependent variables for this study included Triad risk (e.g. LEA with or without eating disorder (ED), menstrual dysfunction, and low BMD). Participants completed a demographic survey, menstrual cycle questionnaire, Eating Disorder Inventory-3, ED symptoms checklist, a 7 day online dietary and exercise log, and were measured for height, weight, DXA scan (BMD), and resting metabolic rate (RMR) through indirect calorimetry (MedGem). Exercise energy expenditure (EEE) was calculated using Ainsworth equation and energy availability (EA) was calculated by EA= ((EI-EEE)/fat free mass). **RESULTS:** Overall, 73.0% of dancers were at risk for the Triad [1 component (69.2%); 2 components (3.8%)]. Most dancers were at risk for LEA (69.2%), with 61.5% of dancers with LEA and ED risk combined. Menstrual dysfunction lasting greater than 6 months was present in 7.7% of the dancers, and no low BMD was present in any participants. Overall, 88.5% of dancers displayed ED Risks (risk by EDI-3 and/or EDI SC). Energy assessment included: RMR = 1155.8 ± 206.5 kcal/day; energy intake (EI) = 1473.9 ± 321.5 kcal/day; EEE = 884.7 ± 324.9 kcal/day, and EA = 22.3 ± 19.4 kcals/kg^{-1}FFM/day. Average bone mineral density Z-score was $1.15 \pm .76$. **CONCLUSIONS:** Almost 75% of the dancers were at risk for 1 component of the Triad. Specifically, LEA with ED risk was the most common Triad component displayed in this collegiate dance population. Overall, collegiate dancers are a high-risk population not only for the Triad, but also for ED risk. Early recognition is key and qualified healthcare professionals should be accessible for these populations to integrate prevention and intervention strategies.

1290   Board #98   May 31 8:00 AM - 9:30 AM

Examination of Female Athlete Triad Components in College Softball Athletes

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(No relevant relationships reported)

Softball athletes are commonly overlooked when examining the Female Athlete Triad (Triad - low energy availability [LEA], menstrual cycle dysfunction [MCD], and low bone mineral density [BMD]) and eating disorder risk (ED). However, they engage in lengthy practices/games and anecdotally have poor eating habits and weight management issues which in turn may put them at risk. **PURPOSE:** Estimate the prevalence of Triad components in collegiate softball athletes. A secondary purpose is to examine LEA with or without ED. **METHODS:** Female NCAA Division I Softball athletes (n = 17; age 19.6 ± 1.1; height 168.6 ± 5.2 cm; weight 72.5 ± 11.23 kg) participated in this cross-sectional study. Participants completed a demographic survey (age, academic status, etc.), Eating Disorder Inventory-3 (EDI-3), EDI-3 symptom checklist and menstrual cycle questionnaire. Each participant completed a DXA scan to examine BMD and completed a 7-day online dietary and exercise log. Ainsworth equation calculated exercise energy expenditure (EEE), and energy availability (EA) was calculated by EA= ((EI-EEE)/FFM). **RESULTS:** All collegiate softball athletes (n=17) were at a high risk for LEA with EA below 30 kcal/kg FFM/day for 6 of 7 days and 70.6% having LEA for 7 of 7 days of the study. Additionally, 82.3% (n = 14) were at risk for LEA with ED behaviors. None of the participants were at risk for low BMD (3.28 ± 0.9); however 29.4% (n = 5) of the participants were at risk for amenorrhea and LEA. Energy needs revealed: RMR 1874 ± 276.9 kcal, EI was 1338 ± 313.5 kcals and EEE 811 ± 130.5 kcals, and EA 7.8 ± 6.4 kcals^{-1}kg^{-1}FFM. Eating Disorder behaviors consisted of 47.1% dieting, 17.6% binge eating, 5.9% purging, 11.8% diet pills, and 47.1% used exercise to control weight 25-50% of the time. Additionally, 82.3% were at risk for EDs. **CONCLUSIONS:** Overall softball athletes are indeed at risk for at least 1-2 Triad components, more specifically LEA with ED risk behaviors and LEA with menstrual dysfunction. Education on energy needs specific for their sport demands may be beneficial for long term health and overall performance. Additional prevention and intervention strategies to decrease the risk for EDs is warranted in collegiate softball athletes.:

1291　　Board #99　　　　　May 31 8:00 AM - 9:30 AM

Pre-competition Weight Loss Strategies To Achieve The Desired Category Weight In Combat Sports Collegiate Athletes

Andrea Patricia Rohan-Lopez, Alejandro Gaytan-Gonzalez, Roberto Gabriel Gonzalez-Mendoza, Edtna Elvira Jauregui-Ulloa, Juan R. Lopez-Taylor. *Universidad de Guadalajara, Guadalajara, Mexico.*

(No relevant relationships reported)

PURPOSE: To describe the proportion of college combat athletes that follow some dietary and non-dietary strategies to loss body weight before a competition.
METHODS: We evaluated 80 college athletes (21.1 ±2.7 y; 51 males, 29 females) from different combat sports (wrestling 23, boxing 7, judo 21, karate 14, and taekwondo 15; 77.5% of the sample had competitions at national level and 21.3% at international level). We applied a questionnaire to account for some of the followed dietary and non-dietary strategies to achieve the desired competition weight three months before a state tournament. The questionnaire consisted of 35 items. The questions asked the subject if he/she usually perform that strategy for pre-competition weight loss. Also, the questionnaire asked the subjects about if they showed some of the most common side effects of weight loss. The results were reported as frequencies and proportions.
RESULTS: The most common dietary strategies for pre-competition weight loss were to reduce or avoid the consumption of fats and flours and sugars (Table 1). On the other hand, the most common non-dietary strategies to pre-competition weight loss were increasing physical activity and using sauna (Table 1). The most common side effect related to pre-competition weight loss was overall fatigue (39, 48.8%), followed by low performance in trainings (30, 37.5%), susceptibility to diseases (29, 36.3%) and irritability or aggressiveness (27, 33.8%).
CONCLUSIONS: The reduction of fat consumption and the increase of physical activity were the most common strategies for pre-competition weight loss. Some extreme strategies were also reported but not as common. Some of the mechanisms of these strategies may be related to the side effects of weight loss and not just for the weight loss itself. A comparison by sex and by type of sports deserves further analysis.

Table 1. Proportion of dietary and non-dietary strategies for pre-competition weight loss		
Dietary strategies	(n=80)	(%)
Reduce the amount of food consumed	41	51.3
Reduce water and beverages consumption	30	37.5
Increase physical activity and reduce consumption of food and beverages	38	47.5
Reduce or avoid fat consumption	69	86.3
Reduce or avoid flours and sugars consumption	63	78.8
Reduce or avoid animal source foods consumption	13	16.3
Reduce or avoid dairy consumption	39	48.8
Non-dietary strategies		
Use of sauna	24	30
Use of laxatives	8	10
Use of diuretics	7	8.8
Induce vomiting	1	1.3
Increase physical activity	69	86.3

1292　　Board #100　　　　　May 31 8:00 AM - 9:30 AM

Fulfillment Of The Daily Protein Intake Recommendations In College Athletes Compared By Sex

Ana Gabriela Gutierrez-Muñiz, Alejandro Gaytan-Gonzalez, Roberto Gabriel Gonzalez-Mendoza, Sergio Alejandro Copado-Aguila, Marisol Villegas-Balcazar, Juan R. Lopez-Taylor. *Universidad de Guadalajara, Guadalajara, Mexico.*
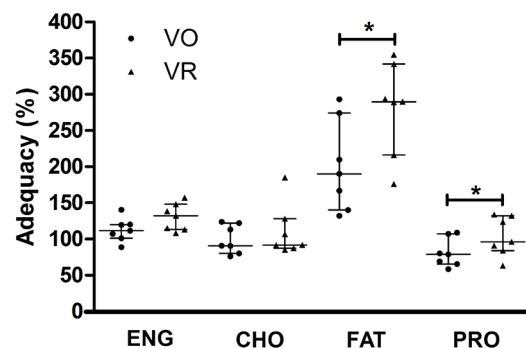
(No relevant relationships reported)

PURPOSE: To compare by sex the proportion of college athletes that consume protein below, inside and above the recommended amount.
METHODS: We evaluated 341 athletes (192 males and 149 females) from different sports. Food intake was evaluated through a 24-hour reminder for a habitual training day. Afterwards, daily protein intake was estimated and then calculated for g/kg body weight. Afterwards, subjects were categorized into one of three categories according to their daily protein intake: below (<1.4 g/kg/day); inside (1.4 to 2.0 g/kg/day), and above (>2.0 g/kg/day) the recommended amount (as suggested by the International Society of Sports Nutrition). The results were counted and expressed as percentage of subjects at each category. The 95% confidence interval (CI) was calculated for each percentage. This analysis was performed in both male and female athletes and compared by sex
RESULTS: The general characteristics of the evaluated subjects for age, weight, height and BMI were 21.2 ± 2.1 y, 74.7 ± 14.1 kg, 176.2 ± 6.9 cm, 24.0 ± 3.8 kg/m^2 for males, and 20.6 ± 1.9 y, 61.5 ± 11.2 kg, 163.4 ± 6.6 cm, 23.0 ± 3.7 kg/m^2 for females, respectively. We observed that the number of male athletes that consumed protein below and inside the recommended amount was the same (61 subjects each; 31.8%, CI 25.2 - 38.5), and the remaining 70 subjects (36.4%, CI 29.5 - 42.3) consumed above the recommended amount of protein. Similarly, the majority of the female athletes consumed above the recommended protein amount (55 subjects; 36.9%, CI 29.1 - 44.7), followed for those who ingested below (53 subjects; 35.6%, CI 27.8 - 43.4) and inside (41 subjects; 27.5%, CI 20.2 - 34.8) the recommended amount. There were no significant differences by sex (p >0.05).
CONCLUSIONS: The proportion of athletes consuming protein below, inside and above the recommended amount were similar regardless of sex. Most of the male and female athletes consumed more than 2.0 g/kg/day.

1293　　Board #101　　　　　May 31 8:00 AM - 9:30 AM

Adequacy Of The Nutritional Intake In Volleyball Male College Athletes After Receiving Nutritional Counseling

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(No relevant relationships reported)

PURPOSE: To compare the adequacy of nutritional intake in male volleyball athletes after receiving nutritional counseling for two different training sessions.
METHODS: 13 volleyball male college athletes were enrolled. The athletes carried out a training plan which was based on training volleyball only (VO) 4 days/week and volleyball plus resistance training (VR) 2 days/week for 12 weeks. Athletes received nutritional plans according to the nutritional requirements for both VO and VR. We evaluated their food intake with a 24-h dietary recall. This evaluation was performed three times for each training day. The days evaluated were randomly selected during the study. The mean intake for each training type was calculated and compared with the indicated nutritional plan to calculate the % of adequacy. Data were reported as median, minimum - maximum, and compared between training types.
RESULTS: Only 7 athletes completed the study. It was observed that the athletes were closer to 100% of the total energy (ENG) requirement on VO (112.6%, 88.9-140.4) compared to VR (130.4%, 108.4-157.3), although there wasn't a significant difference (p = 0.10). For carbohydrates (CHO), the days of VO were closer to 100% (99.5%, 76.1-123.9) while in VR they were above (110.9%, 85.3-185.3), but not significanlyt different (p = 0.29). Otherwise, the protein intake (PRO) was adequate on VR (103.4%, 63.2-133.8) compared to VO (81.1%, 58.4-108.7) which were below the indicated and different compared with VR (p = 0.01). Fat intake were well above the indicated amount for both training types, nonetheless there was a significant difference (p = 0.01) between the days of VO (200.9%, 132-293.3), which were closer to the indicated plan than the VR days (280.2%, 176-354.7) (Figure 1).
CONCLUSIONS: In this study, subjects showed better adequacy to the indicated plan for protein intake on VR days, the opposite was true for fat intake. Similar adequacy was observed for carbohydrate and energy regardless of the day.

1294   Board #102   May 31 8:00 AM - 9:30 AM
Comparison Of Blood Markers In College Athletes With Different Protein Intake

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(No relevant relationships reported)

PURPOSE: To compare the concentration of several blood markers between different absolute and relative protein intake groups by sex in college athletes.
METHODS: We evaluated 248 athletes (138 men [21 ± 3 y, 74 ± 14 kg, 176 ± 7 cm], 110 women [21 ± 2 y, 62 ± 12 kg, 164 ± 7 cm]) that competed at national level. We estimated the protein intake by a 24-hour reminder of a habitual training day. Subsequently the ingestion of absolute (g/day) and relative (g/kg/day) protein of each athlete was estimated. Then, the sample was divided by sex and by quartiles (Q) of protein intake (absolute and relative). In addition, blood chemistry was performed to evaluate uric acid, urea, creatinine, cholesterol, and triacylglycerides, which were compared between protein Q. We only analyzed the data of subjects who had the 24-hour reminder and their blood chemistry within a period of no more than 30 days difference.
RESULTS: The concentrations in creatinine, urea, uric acid and cholesterol in males showed no significant differences between absolute protein intake Q. However, there was a trend (p = 0.10) for differences on triacylglycerides concentration between Q2 and Q4 of absolute protein intake. No blood marker showed significant differences between Q of relative protein intake. In the case of females, no blood marker had a significant difference between Q of absolute protein intake. Similarly, there were no significant differences in the concentration of creatinine, uric acid, triacylglycerides and cholesterol among Q of relative protein intake. However, there was a significant difference (p=0.04) in urea concentrations between Q2 and Q4 of relative protein intake. All the mean concentrations fell within the normal ranges.
CONCLUSIONS: In this study, no significant differences were found in blood markers among both male and femlae college athletes who consumed more protein than those consuming less. However urea may differ with different protein intake amounts in female athletes.

Table 1. Blood markers according to different protein intake levels by sex								
	Q1		Q2		Q3		Q4	
	g/day	g/kg/day	g/day	g/kg/day	g/day	g/kg/day	g/day	g/kg/day
Males (n 34 per Q)								
Creatinine	0.97 ±0.20	0.99 ±0.19	1.04 ±0.18	1.0 ±0.16	1.01 ±0.16	1.04 ±0.21	0.99 ±0.24	1.0 ±0.21
Urea	21 ±3	29 ±4	29 ±2	29 ±2	28 ±3	29 ±4	29 ±4	28 ±3
Uric acid	4.7 ±1.3	4.6 ±1.1	4.6 ±1.1	4.7 ±1.2	4.2 ±1.0	4.3 ±1.2	4.6 ±1.0	4.5 ±1.0
Triacylglycerides	79 ±31	82 ±33	70 ±26	75 ±31	76 ±24	79 ±30	97 ±47	87 ±42
Cholesterol	170 ±27	171 ±25	164 ±21	159 ±22	163 ±28	167 ±34	169 ±32	168 ±26
Females (n 27 per Q)								
Creatinine	0.87 ±0.20	0.88 ±0.20	0.91 ±0.17	0.90 ±0.17	0.94 ±0.21	0.89 ±0.19	0.93 ±0.18	1.00 ±0.18
Urea	27 ±4	28 ±4	27 ±3	26 ±3	27 ±4	27 ±3	28 ±2	29 ±3
Uric acid	4.0 ±1.2	3.9 ±1.2	3.7 ±0.9	3.7 ±0.9	4.1 ±1.2	4.1 ±1.0	4.4 ±1.2	4.4 ±1.3
Triacylglycerides	76 ±39	79 ±37	70 ±25	66 ±26	69 ±30	69 ±23	81 ±31	83 ±37
Cholesterol	163 ±22	166 ±21	167 ±21	164 ±28	168 ±30	164 ±27	162 ±26	166 ±25

1295   Board #103   May 31 8:00 AM - 9:30 AM
Blood Markers In College Athletes According To Their Vegetable/Animal Protein Intake Rate

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(No relevant relationships reported)

PURPOSE: To compare the blood markers of a group of college athletes with low vegetable/animal protein intake rate against a group of college athletes with high vegetable/animal protein intake rate.
METHODS: We included 141 college athletes (83 males; 58 females). We evaluated their total protein intake (vegetable and animal protein) with a 24-h dietary recall.

Their vegetable/animal protein intake rate was calculated and the sample was divided in tertiles adjusted by sex. We also evaluated cholesterol, triacylglycerides, glucose, uric acid, urea, and creatinine levels by blood samples. The blood markers were compared between the first (low vegetable/animal protein intake ratio, T1) and the third (high vegetable/animal protein intake ratio, T3) tertiles.
RESULTS: The absolute (151±82 g vs 106±4 g; p=0.03) and relative (2.1±1.0 g/kg vs 1.4±0.6 g/kg; p=0.02) protein intake was higher in males in the T1 than T3. The animal protein intake was higher in T1 than T3 (126±76 g vs 60±28 g; p=0.001), and vegetable protein intake was higher in T3 than T1 (24±14 g vs 48±17 g; p=0.001). There were no significant differences in the blood markers between males in T1 vs T3. In females, the absolute (140±51 g vs 63±2 g; p=0.001) and relative (2.2±1.0 g/kg vs 1.1±0.6 g/kg; p=0.001) protein intake was higher in T1 than T3. Similarly, the animal protein intake was higher in T1 than T3 (118±46 g vs 34±15 g; p=0.001), however, the vegetable protein intake was similar for both tertiles (T1 23±10 g vs T3 29±16 g; p=0.19). The creatinine blood concentration was significantly higher in T1 compared with T3, and there was a trend for difference in urea blood concentrations (table 1). All other blood markers did not show significant differences; and all markers were within normal values.
CONCLUSIONS: A low vegetable/animal protein intake rate may not affect the blood markers in male athletes. However, in female athletes it may be related with higher creatinine blood levels.

Table 1. Blood markers according to the vegetable/animal protein intake rate by sex.				
Sex	Blood marker	T1	T3	p
Males (n 28 per tertile)	Urea	29 ±4	28 ±3	0.35
	Uric acid	4.6 ±0.9	4.4 ±1.1	0.36
	Creatinine	1.01 ±0.21	0.97 ±0.16	0.42
	Triacylglycerides	94 ±44	81 ±34	0.30
	Cholesterol	159 ±33	167 ±31	0.36
	Glucose	73 ±10	72 ±9	0.79
Females (n 19 per tertile)	Urea	29 ±3	27 ±3	0.09
	Uric acid	4.5 ±1.4	3.8 ±1.2	0.12
	Creatinine	0.95 ±0.16	0.85 ±0.15	0.04
	Triacylglycerides	75 ±29	83 ±36	0.45
	Cholesterol	162 ±29	167 ±19	0.59
	Glucose	75 ±10	75 ±9	0.92

1296   Board #104   May 31 8:00 AM - 9:30 AM
Carbohydrate Intake in Mexican Soccer Players in Different Training Sessions

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Reported Relationships: S.A. García Castrejón: *Contracted Research - Including Principle Investigator; This study was funded by the Gatorade Sports Science Institute. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc..*

PURPOSE: To investigate if carbohydrate intake in professional soccer players is the same during moderate and high intensity training and whether intake is within the recommended range established by the American College of Sports Medicine (ACSM) (30-60 g/h).
METHODS: A cross-sectional study was conducted in professional soccer players (17-37 years old) of four Mexican First Division teams (N=123) in which carbohydrate (CHO) intake in grams per hour was determined by drinking ad libitum a sports beverage with 6% of CHO or water, or any other source of CHO (gels, fruit) preferred by the player during moderate training intensity (CHI n=24, Wet Bulb Globe Temperature (WBGT) 23 °C, humidity 51%, duration 100 min; RAYm n=25, WBGT 34°C, humidity 42%, duration 80 min) and high intensity (SAN n=22, WBGT 32 °C, humidity 41%, duration 125 min; XOL n= 25, WBGT 25°C, humidity 13 %, duration 90 min; and RAYh n=27, WBGT 17°C, humidity 69%, duration 80 min), determined by their coach. Moderate intensity versus high intensity CHO intake comparisons were analysed by Student's T test for independent samples.
RESULTS: CHO intake of soccer players in moderate intensity training was (mean ± SD) 17 ± 14 g/h and in high intensity was 14 ± 13 g/h. For moderate intensity training sessions, only 14% of the players met the CHO intake recommendations and for high intensity training sessions only 12% of the players met the recommendations When comparing moderate intensity versus high intensity between RAYm versus Rayh there was not significant difference in the ingestion of CHO (p>0.05).
CONCLUSIONS: Soccer is a high intensity intermittent sport that requires a large supply of energy from the glycolytic pathway; thus, CHO intake is important to have a constant fuel supply during training sessions with moderate to high intensity beyond 60 minutes and games. We observed that Mexican professional soccer players do not consume the minimum recommended CHO intake for moderate-high intensity

training exercise (30-60 g/h) as recommended by ACSM for exercise lasting 1-2 hours. Therefore, it is important to educate soccer players about the importance of consuming the recommended amount of CHO during training sessions and games.

1297   Board #105   May 31 8:00 AM - 9:30 AM

Omega-3 Index in Division I Collegiate American FootballAthletes

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(No relevant relationships reported)

American football athletes are exposed to repetitive head impacts (RHI) that, even in the absence of a clinically discernible head injury, result in quantifiable neurological damage. Pre-clinical studies utilizing rodent models indicate that traumatic brain injuries (TBI) can cause a reduction in neuronal omega-3 fatty acids (n-3FAs), specifically docosahexaenoic acid (DHA). Pre-injury administration of n-3FAs, however, has shown to effectively allay the pathological response to TBI. Furthermore, one study has demonstrated the potential neuroprotective effect of DHA supplementation in American football athletes evidenced by a marked reduction in blood biomarkers of axonal injury. Given that the American diet is scarce in the n-3FAs DHA and eicosapentaenoic acid (EPA), the potential neuroprotective effect of n-3FA supplementation may uniquely benefit American football athletes. **PURPOSE:** This descriptive study sought to examine the omega-3 index, an indicator of n-3FA status, in American collegiate football athletes not supplementing with n-3FAs. **METHODS:** One hundred twelve (n = 112) athletes participated in this study. Blood was obtained via finger stick and collected on blood spot cards pre-treated with an antioxidant cocktail. The dried blood samples were analyzed by gas chromatography for fatty acid (FA) levels (expressed as a % of total blood FAs). A regression formula (r = 0.98) was used to estimate the percentage of DHA and EPA in red blood cell phospholipids (omega-3 index). **RESULTS:** Levels of DHA, EPA, and alpha-linolenic acid (ALA) were (mean ± SD) 2.27% ± 0.01% (range = 1.1% - 5.2%), 0.39% ± 0.00% (range = 0.2% - 1.2%) and 0.39% ± 0.00% (range = 0.1% - 1.0%), respectively. Mean omega-6 levels were 9.55 ± 1.72 (range = 4.5 - 13.9) times higher than n-3FAs levels. The mean omega-3 index was 4.35% ± 0.01% (range = 2.8% - 8.0%). Sub-optimal n-3FA levels (i.e., an index < 8.0%) were observed in 99.12% of participants. **CONCLUSION:** These data suggest that dietary intake of the n-3FAs DHA and EPA may not be adequate in American collegiate football athletes. Though the current evidence relates n-3FA deficiency to an increased risk for cardiovascular risk, American football athletes may derive neuroprotective benefit from n-3FA supplementation with little to no risk.

1298   Board #106   May 31 8:00 AM - 9:30 AM

Association between Leptin and Measures of Bone Density and Lean Mass in Long Distance Runners

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(No relevant relationships reported)

Leptin levels have been associated with greater bone mineral content (BMC) and lean mass (LM) in women. **PURPOSE**: To explore the association of fasting leptin levels and BMC and LM in female collegiate long-distance runners.
METHODS: BMC (g) and LM (g) was determined via dual-energy X-ray absorptiometry in 10 female collegiate long-distance runners (age: 22.2 ± 3.3 years; weight: 53.2 ± 6.0 kg; height: 163.6 ± 8.4 cm) with a mean BMI of 19.8 ± 1.4 kg/m² within the same running team. Fasting leptin (ng/mL) was measured via enzyme-linked immunosorbent assay. Regression analyses with leptin and fat mass (g) as predictors and BMC and LM as outcomes were used to explore the association between leptin and BMC and LM.
RESULTS: Fasting leptin (3.39 ± 1.45 ng/mL) showed a statistically significant positive association with BMC (2079.57 ± 195.30g; r=0.89, p = 0.001) explaining 75% of the variance. Adding fat mass (10333.48 ± 1903.25 g) into the model increased the variance by 22%. The association between leptin and LM (39620.11 ± 5361.65 g) was also positive (r=0.87, p = 0.001) with LM explaining 77% of the variance. Adding fat mass as predictor did not change the model.
CONCLUSIONS: Leptin is directly associated with bone health and muscle mass showing the importance of leptin towards homeostasis of these two body tissues.

1299   Board #107   May 31 8:00 AM - 9:30 AM

Effects Of 6-week Resistance-type Exercise Training On Serum 25-hydroxyvitamin D Concentrations In Young Men

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(No relevant relationships reported)

Previous studies suggest that higher levels of physical activity is positively related to serum 25-hydroxyvitamin D [25(OH)D] concentrations, regardless of the sun exposure duration. However, the response of 25(OH)D concentrations to resistance-type exercise training is unclear.
PURPOSE: To clarify whether there is a direct effect of a 6-week resistance-type exercise training on serum 25(OH)D concentrations in young men.
METHODS: Eighteen young men were randomized into a no-exercise control group (n=9; 26.7 ±2.1 years; body mass index (BMI) =22.4 ±0.7 kg/m²) and a resistance-type exercise training group (supervised resistance-type exercise training was performed 3 times/wk for a 6-wk period from March to April; n=9; 24.4 ±1.1 years; BMI =22.9 ±1.0 kg/m²). Serum 25(OH)D concentrations and iPTH were assessed using commercial ELISA kits. Lean body mass and percent body fat were determined by dual energy X-ray absorptiometry (DXA). Muscle strength was assessed regularly by 1-repetition maximum strength testing. Physical activity (PA) was assessed using an ActiGraph GT3X triaxial accelerometer and quantified as time spent in moderate- and vigorous physical activity (MVPA). Two-way repeated measures ANOVA was used to detect time, group, or time x group interaction effects.
RESULTS: Serum 25(OH)D concentrations were unchanged after 6-week resistance-type exercise training (Pre: 27.8±2.0 nmol/L, Post:31.0±2.2 nmol/L, P=0.65). But a significant increase was found in the no-exercise control group (Pre: 26.2±1.4 nmol/L, Post: 34.3±2.9 nmol/L, P < 0.05). After 6-week resistance-type exercise training, lean body mass and muscle strength was significantly increased (P<0.05), while percent body fat was not changed (P=0.06).
CONCLUSION: The present study indicates that 6-week resistance-type exercise training could inhibit the seasonal increase in serum 25(OH)D concentrations. Further research is needed to determine the underlying mechanisms explaining the negative effects of resistance-type exercise training on 25(OH)D concentration.

1300   Board #108   May 31 8:00 AM - 9:30 AM

Limited Knowledge about the Potential Chronic Effects of Excessive Iron Intake among College Distance Runners

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(No relevant relationships reported)

While distance runners' knowledge related to iron deficiency has been previously examined, knowledge of the potentially negative chronic effects of high iron intake has never been assessed. **PURPOSE:** To investigate college distance runners' knowledge concerning issues related to basic iron-related nutrition and chronically high iron intakes, as well as influences on the choice to supplement with iron. **METHODS**: Ninety-eight college distance runners (54 F; 44 M) were recruited from three Division I programs in the northeastern U.S. to participate in a 22-question, pen-and-paper questionnaire. The questionnaire examined respondents': 1) prior diagnosis of iron deficiency (yes/no); 2) knowledge of foods containing iron (100 points possible); 3) confidence in their ability to identify iron-rich foods (5-point Likert scale from no confidence to high confidence); 4) status for currently taking a multivitamin containing iron or standalone iron supplement (yes/no and mg consumed/day); 5) knowledge index of the positive and negative health and performance effects of iron (score range 0-24); and 6) whether or not a coach has ever recommended they take an iron supplement (yes/no). Descriptive statistics were used to describe the data. **RESULTS**: Only 29.6% of respondents reported an iron deficiency diagnosis at some point in life; however, 46.3% were taking either a standalone iron supplement or a multivitamin that contains iron. Of those supplementing with iron, 88.9% reported taking more than 45 mg/day, the tolerable upper limit. Approximately three-fourths (73.6%) of respondents reported moderate or high confidence in their ability to identify iron-rich foods; however, respondents' mean score on the iron knowledge index was 43/100 points. Respondents' mean score on the knowledge index of positive and negative health and performance effects of iron was only 7.5 out of 24 possible points. Finally, 52% of respondents reported that a coach has suggested iron supplementation at some point in their running career. **CONCLUSION:** College distance runners demonstrated limited knowledge about iron-rich foods as well as the potential negative chronic effects of high iron intake. Coaches may often be operating outside of their scope of practice by directly recommending iron supplementation to runners.

Abstracts were prepared by the authors and printed as submitted.

1301   Board #109   May 31 8:00 AM - 9:30 AM

Macronutrient And Supplementation Distribution Evaluation From Athletes Training For The Ironman Triathlon.

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(No relevant relationships reported)

PURPOSE: We aimed to evaluate the macronutrient and supplementation distribution of athletes training to an Ironman triathlon. **METHODS**: 13 athletes of both genders were training to the 2017 Florianópolis Ironman and were selected to be part of the study. We registered the complete food and supplements amount ingested during one day of long training (>5h). All records were calculated for calories and divided in 3 periods, before, during and after the training session (and the rest of the day). We calculated total caloric ingestion and the macronutrient distribution was relativized to each athlete body weight. **RESULTS**: Before: All athletes had most of the calories from carbohydrates, and in 77% of the athletes, protein ingestion was less than 15% of the ingested amount for this period. During: 92% of the reports showed that carbohydrate was more than 70% of the ingested calories to this period. 85% of the athletes ingested up to 10% of protein and 61% up to 10% of lipids, and 23% of the athletes ingested 0 calories from lipids during the training session. After: Protein was heavily ingested after the training session when compared to the other periods, however the most prevailing nutrient of the period was still the carbohydrates. Total consumption: all athletes consumed more than 50kcal/kg of body weight, with most of the calories coming from carbs. Regarding the supplements, more than half of the evaluated group consumed palatinose before and/or during the training. Beta alanine, glutamine and BCAA were also reported by most of the group. **CONCLUSIONS**: Our study reassures carbohydrates as the most used energy source to endurance activities and puts in evidence the importance of nutritional advising in this kind of activity, since most of the athletes have had problems with feeding during the competitions, fact that reinforces the importance of training the intestine to tolerate a larger amount of carbohydrate during exercise.

1302   Board #110   May 31 8:00 AM - 9:30 AM

Comparison Of Dietary Habits Between Volunteer Firefighters And Non-firefighters

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(Sponsor: Christian K Roberts, FACSM)
(No relevant relationships reported)

As the global burden of cardiovascular disease (CVD) rises, public health-related interventions aimed at prevention have gained increased attention. Physicians and public health officials may be unaware that CVD or cardiac events are related to more than half of the line-of-duty deaths in firefighters (FF). Diet is one of the main modifiable CVD risk factors, yet poor diet and the risk factors it contributes to, including obesity, continue to be an issue as the prevalence of obesity is high in FF. Dietary patterns can also influence other risk factors like blood pressure, lipid levels, body composition and glucose metabolism. However, healthy diets are not always feasible for FF, due to the fast-paced unpredictable nature of work, and thus FF often rely on quick meals that may not be nutritiously optimal. Limited research has examined FF dietary intake and preferences. **PURPOSE:** To examine the dietary habits of local volunteer FF and compare these to adult non-FF in the area. **METHODS:** 76 adults (36 FF, 37.0 ±11 years, BMI 30.4 ±5.7 kg/m²; 40 non-FF, 30.6 ±11 years, BMI 28.3 ±5.7 kg/m²) were studied. All participants completed a 3-day dietary recall, and had height and weight measured. Three-day diet recalls were obtained from volunteer FF who attended dietary workshops in their firehouse and from non-FF adults in the area who were interested to find out their dietary habits. Data was analyzed using Diet Analysis Plus. **RESULTS:** Macronutrient composition of the diets were similar. The FF average diet was 2037.9 ±597.3 calories; including 34.8% fat, 46.0% carbohydrates, and 17.8% protein. The average diet for non-FF adults was 2185.7 ±405.9 calories; including 34.1% fat, 48.6% carbohydrates, and 17.8% protein. FF had significantly lower levels of vitamin B-6 (1.7 ±0.9 vs 2.3 ±1.2 mg), folate (498.3 ±253 vs 685.7 ±375 μg), and vitamin C (50.8 ±48.5 vs 111.9 ±87.8 mg) intake compared to non-FF, respectively, p<0.05. FF diets were lacking in several key micronutrients, including calcium (961.8 ± 410 mg), magnesium (227.1 ±138mg), potassium (2177.7 ± 1059 mg), and vitamin D (4.2 ±4.6 μg). For these, >90% of the

FF diets did not meet recommended levels. **CONCLUSION:** These data suggests that volunteer FF exhibit deficiencies in several micronutrients and may benefit from diets that encourage increased consumption of fruits and vegetables.

1303   Board #111   May 31 8:00 AM - 9:30 AM

Effects of Recovery Nutrition on Body Composition and Session RPE in Collegiate Tennis Players

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(No relevant relationships reported)

Athletes often overlook the psychological and physiological importance of recovery nutrition in athletic performance. Little research has investigated the role of recovery nutrition on perceived exertion in college athletes. **Purpose:** To examine the perceived and physiological effects of regular, whole food, recovery nutrition on session rating of perceived exertion (RPE) and body composition in collegiate athletes. **Methods:** Female tennis players (n=8, age 20.1±1.4 years; weight 66.8±6.9 kg) volunteered for the 8-week study during their competitive season. Air displacement plethysmography was used to estimate fat mass (FM) and fat-free mass (FFM) at baseline, 4-week, and end of the 8-week intervention. Seven training sessions (60 min), consisting of high intensity strength and power exercises, were performed during each 4-week phase of the study. Athletes continued their normal pattern during the first 4-weeks (T1) and were provided with standardized recovery nutrition at the conclusion of each training session for the second 4-weeks (T2). RPE on a scale of 0-10 was reported immediately after each training session. Recovery nutrition consisted of a 3" red apple, 7" banana, 1.05 oz. peanut butter spread, and an 85g bagel or 99g gluten-free bagel. Nutritional composition for a standard snack bag was 680kcal, 106g carbohydrate, 17.8g protein, 24.7g fat, while a gluten-free snack bag totaled 740kcal, 107g carbohydrate, 18.8g protein, 31.7g fat. Participants were instructed to consume all foods within an hour of the training session. Repeated measures ANOVA was used to examine changes in session RPE and body composition over time. **Results:** There was a main effect of recovery nutrition on session RPE (p<0.001) with a lower RPE reported in T2 (3.53±1.24) than T1 (4.50±1.44). FM and FFM decreased 0.05kg and 0.28kg, respectively; however, changes were not significant (p>0.05). Athletes reported an increased quality of training with recovery nutrition. **Conclusions:** Four weeks of recovery nutrition resulted in a ~10% decrease in session RPE in female tennis players. Further, athletes perceived they trained harder during the sessions with recovery nutrition. Future research would be beneficial to determine the direct effects of recovery nutrition on performance.

1304   Board #112   May 31 8:00 AM - 9:30 AM

Does Exclusion of Trunk Region Improve Accuracy of DXA Lean Soft Tissue from Non-Fasted Assessments?

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(No relevant relationships reported)

PURPOSE Although body composition assessment ideally takes place after an overnight fast, this is not always possible. When assessed by dual-energy x-ray absorptiometry (DXA), the trunk region is most affected by acute food and fluid intake. Therefore, the purpose of this analysis was to determine if DXA appendicular lean soft tissue (ALST) and ALST-derived skeletal muscle mass (SMM) are less susceptible than total lean soft tissue (LST) to error introduced by acute food and fluid intake due to the exclusion of the trunk region.
METHODS Forty-eight adults were assessed by whole-body DXA scans after an overnight fast and again the same afternoon following the consumption of a standardized diet (51 ± 37 min after food consumption). Body regions were manually specified by a single trained operator based on the NHANES Body Composition Procedures Manual. Whole-body LST and ALST were obtained from DXA output, and ALST-derived SMM was calculated using a validated equation. ALST, SMM and LST were analyzed using ANOVA with repeated measures, and metrics of reliability were calculated (constant error [CE], total error [TE] and 95% limits of agreement [LOA]).
RESULTS Acute food and fluid consumption artificially increased the quantity of ALST (p<0.001), SMM (p=0.003) and LST (p<0.001). The changes were smaller for ALST (CE: 196 grams; 0.9% of mean) and SMM (CE: 222 grams; 0.9% of mean) than LST (CE: 755 grams; 1.6% of mean). However, TE relative to mean values was higher for ALST (2.7%) and SMM (2.7%) than LST (2.1%). The 95% LOA were similar for ALST (±1072 g), SMM (±1212 grams) and LST (±1277 grams), but were greater for ALST (5.0%) and SMM (5.0%) than LST (2.7%) when expressed relative to the mean.
CONCLUSIONS Use of the ALST or ALST-derived SMM minimizes the systematic error (CE) associated with acute food and fluid ingestion as compared to total LST. However, due to greater variability in individual CEs, the TE is slightly higher for ALST and SMM than LST. This is likely due to the variability introduced when designating the appendicular and truncal regions, which appears to outweigh the error removed by exclusion of the trunk region. Although elimination of the trunk region is

theoretically appealing for non-fasted DXA assessments (i.e. ALST and SMM), it is apparently inferior to utilizing whole-body LST as indicated by the higher 95% LOA and TE.

1305   Board #113   May 31 8:00 AM - 9:30 AM

Food Intake And Fluid Balance Varies Between Individuals During A 120 Km Running Race

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(No relevant relationships reported)

Continuous data collection on fueling and food strategies of ultramarathoners during competition is scarce. Existing publications mostly report nutrient intake without much detail of fluid balance and foods consumed.
PURPOSE: To provide an overview of the consumption of carbohydrates and fluids, fluid balance and types of foods during a race comprising 10-14 hours of continuous exercise.
METHODS: Pre-race height, cm (Cescorf stadiometer) and pre- and post-race body weight, kg (Seca scale S760 mechanical) were measured. All food products were labeled and weighed (g) pre- and post-race (Cresta, CKS750). Continuous observation of food and beverage intake was performed as all runners were accompanied by a research team member on a bicycle using pre-defined lists and action cams (SJCAM, SJ4000) to record all items consumed. Fluid excretion collection was done using urine bags (Roadbag®). Results are expressed as mean±SD and range (min-max) or as percentage (%).
RESULTS: The average temperature was 7.0°C with a humidity of 67%. Five runners performed the 120 km run with an average duration of 12:19±1:29 hours (9:50-13:49). They reported 38±10 (25-48) food and beverage consumption events over the race which consisted of 4-7 different preferred food items per person. This resulted in an average carbohydrate intake of 44±19 g/h and fluid intake of 421±127 ml/h. Runners lost 2.5±1.6 kg (-0.2-3.8) of total weight during the race. The average urine excretion was 0.8±0.5 kg (0.3-1.4). This resulted in an estimated sweat loss of 6.6±2.3 kg (4.6-10.1) and four out of five runners reported a lower post-race body weight of 4±2% (0-6). During the first 60 km of the race the preferred foods and beverages were energy gels, water and sports drinks. After this, food preferences suggested a more mixed pattern including the use of cola, chocolate milk and fruit.
CONCLUSIONS: Runners consume, on average, fewer carbohydrates and fluids than recommended due to a high variability in intake. As urine excretion was relatively low, mostly a high sweat rate contributed to a lower post-race weight. Although non-specific sports nutrition foods and beverages were used, runners preferred the use of commercial sports nutrition products the most.
Supported by regional grant Eat2Move of the province of Gelderland, The Netherlands.

C-39   Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1306   Board #114   May 31 9:00 AM - 10:30 AM

Physical Activity, Sedentary Behavior and Sleep in Adolescents - Weekday and Weekend Patterns

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(No relevant relationships reported)

In adolescents sleep behavior differs markedly between weekdays and weekend days. The implications of this disparity for the associations among sleep, physical activity and sedentary behavior are unclear. **PURPOSE:** To determine if there are significant differences in physical activity and sedentary behavior between students who experience adequate vs. inadequate sleep, analyzing weekday and weekend data separately. **METHODS:** The School Sleep Habits Survey was used to measure total sleep time on weekends and weekdays. Sleeping ≥8 hours per night was considered adequate sleep (AS), while sleeping <8 hours was considered inadequate sleep (IS). Accelerometry was used to measure sedentary behavior (SB) and total physical activity (PA) on weekdays and weekends. SB was determined by the total minutes/day below 100 counts/minute, while PA was determined by the total minutes/day at, or above 100 counts/minute. The sample consisted of 261 9th grade adolescents. Over half were male (59%). A majority were African American (52%). Average weekday PA was compared between the AS group and the IS group using weekday sleep data. The same was done using weekday SB. Average weekend PA was compared between the AS group and the IS group using weekend sleep data. The same was done using weekend SB. T-tests were used to determine significant differences between groups. **RESULTS:** There were more students in the AS group (n = 156) than the IS group (n = 96) on weekends,

and more students in the IS group (n = 169) than the AS group (n = 92) on weekdays. There were no statistically significant differences between PA and SB levels by sleep group, on weekends and weekdays. **CONCLUSION:** Students who experienced adequate levels of sleep did not differ in their levels of PA from those who experienced inadequate sleep. This was the case on weekends and weekdays. Similarly, students who experienced adequate levels of sleep did not differ in their levels of SB from those who experienced inadequate sleep. This was also the case for weekends and weekdays. Supported by NHLBI Grant 2R01HL091002-07. This publication was made possible in part by Grant Number T32-GM081740 from NIH-NIGMS. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIGMS or NIH.

1307   Board #115   May 31 9:00 AM - 10:30 AM

Social Cognitive Theory Role in Physical Activity Behavior and Health-Related Quality of Life in Parkinson's

Melinda S. Hill, PhD. *The Ohio State University, Columbus, OH.* (Sponsor: Brian C. Focht, PhD, FACSM, CSCS, FACSM)
(No relevant relationships reported)

Parkinson's disease (PD) is a chronic neurodegenerative disease of the brain, characterized by motor symptoms-tremor, rigidity, bradykinesia, slowness/smallness, and postural instability-as well as non-motor symptoms including anxiety, depression, sleep disorders, and cognitive deficits. Physical activity (PA) may slow the progression of PD and improve the health-related quality of life (HRQoL) of patients. **PURPOSE:** This observational cross-sectional study examined correlates of lifestyle behaviors and health-related quality of life by analysis of the relationships between demographic, PA, and psychosocial variables in this population of 500 idiopathic PD patients. **METHODS:** Study aims included examining: the relationship of self-efficacy (SE), outcome expectations (OE), and self-regulation (SR) with PA and HRQoL; the relationship between PA and HRQoL; determination if social cognitive theory (SCT) constructs mediate the relationship between PA and HRQoL in Parkinson's patients. Statistical analysis included: descriptive statistics on all variables; bivariate correlations to determine the significance of relationships between SCT constructs, PA, and HRQoL using Pearson's correlations for scale level data and Spearman's correlations for ordinal data. Data analysis of primary study aims was conducted using multiple linear regression analysis. The indirect effects in the mediation model were analyzed using Dr. Andrew Hayes' PROCESS. **RESULTS:** Participants self-reported a mean of slightly over 200 minutes of moderate to vigorous physical activity (MVPA) per week. SE and SR were the most significant predictors of PA (p&lt.001). SE, OE, and SR were predictive of physical HRQoL (p&lt.001). To a smaller extent, SE, OE, and SR were predictive of mental HRQoL (p&lt.001). Results further indicated that SCT correlates mediated the relationship of PA and physical HRQoL (p=.0851). **CONCLUSIONS:** These results suggest self-selected participation based on a high interest in PA. Self-reported average weekly mMVPA was much higher than expected. Future studies should attempt to validate self-reported physical activity with some type of validated exercise measurement tool. These results suggest further consideration of SCT constructs in the design of interventions targeted to Parkinson's patients.

1308   Board #116   May 31 9:00 AM - 10:30 AM

Self-Selected Intensity of Four Different Modes of Aerobic Exercise in Sedentary Adults

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(No relevant relationships reported)

The prescription of self-selected intensity (SSI) exercise has shown promise as a method to increase physical activity and cardiorespiratory fitness. SSI allows control over the exercise stimulus, promotes positive affect, and is often an intensity known to induce health-fitness benefits.
PURPOSE: To compare SSI between Treadmill, Elliptical, Upright Cycle, and Recumbent Cycle exercise in sedentary adults (<90 min of aerobic activity per week). **METHODS**: Ten subjects (8 w, 2 m; 31 ± 10 yr, VO_2max: 33 ± 9 ml·kg^{-1}·min^{-1}) completed five submaximal exercise trials on separate days. The first four, one trial per mode completed in random order, were 30-min each: 5 min warm-up, 20 min SSI, 5-min cool-down. Oxygen consumption (VO_2; ParvoMedics) and heart rate (HR; Polar) were monitored continuously. Ratings of perceived exertion (RPE; OMNI Scale) and affective responses (AR; Feeling Scale) were collected every 5 min. The fifth trial was a submaximal graded treadmill test to predict VO_2max. The mean values from the 20-min SSI were compared between modes using repeated-measures ANOVA. Pairwise comparisons were performed using Bonferroni corrections for significant ANOVAs.
RESULTS: ANOVAs were significant for VO_2 ($F_{3,27}$=8.6, p<.05), %VO_2Reserve ($F_{3,27}$=7.8, p<.05), Kcal ($F_{3,27}$=9.7, p<.05), and HR ($F_{3,27}$=4.2, p<.05). For each, Elliptical was significantly greater than Recumbent Cycle (20.4 ± 5.3 vs 15.4 ± 3.6

ml·kg⁻¹·min⁻¹; 58.5 ± 14 vs 41.3 ± 11 %VO$_2$Reserve; 218 ± 51 vs 160 ± 39 Kcal; 87.0 ± 7 vs 72.5 ± 9 %APMHR). Treadmill was also significantly greater than Recumbent Cycle for VO$_2$ (20.8 ± 6.4 ml·kg⁻¹·min⁻¹) and Kcal (211 ± 57 Kcal).
CONCLUSIONS: The mean SSI during all four modes of exercise is in line with the ACSM position stand for developing and maintaining cardiorespiratory fitness, which states that subjects with a mean VO$_2$max <40 ml·kg⁻¹·min⁻¹ can improve cardiorespiratory fitness with intensity prescriptions as low as 30% VO$_2$Reserve.

1309   Board #117   May 31 9:00 AM - 10:30 AM

Using Ecological Momentary Assessment to Explore Proposed Indices of Exercise Readiness and Subsequent Exercise Behavior

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(No relevant relationships reported)

Flexible Nonlinear Periodization (FNLP) was developed to preserve training quality in athletes by matching workload demand to pre-exercise mental and physical states. The degree of "readiness to train" is purportedly determined via a six-part checklist: coach-athlete interactions, injury status, hydration, fatigue ratings, vertical jump power, and initial performances. Prior to adapting FNLP for untrained populations, it is important to examine if similar factors predict exercise behavior in a free-living context. **PURPOSE**: Use ecological momentary assessment to determine time-lagged and concurrent effects of factors suggestive of readiness on exercise behavior. **METHODS**: Participants (N=29, 24±6y, 55% female, 76% white) received text message prompts to their personal smartphones at 9:30am, 1:30pm, 5:30pm, and 9:30pm over 14 consecutive days. Each prompt contained a link to a survey (Qualtrics) that assessed perceptions of core affect, fatigue, bodily discomfort (e.g. pain, stiffness), and hydration, as well as self-efficacy to exercise in the subsequent four-hour block. Exercise type and duration were also collected in each survey and used to calculate bout volume expressed as MET-minutes. On average, participants were active, accumulating 1116±596 MET-minutes of structured exercise per week (min=150, max=2074). Lagged and concurrent prediction analyses were conducted using three-level (time of day, day of week, individual) linear mixed models in SAS. **RESULTS**: Self-efficacy was the only variable predictive of MET-minutes in a subsequent four-hour time block (t=7.18, p<0.0001, R²=0.43). Fatigue was the only variable concurrently related to self-efficacy (t=-3.38, p=0.0017, R²=0.18). Concurrent correlates of fatigue (R²=0.60) included core affect (t=-8.51, p<0.0001) and discomfort (t=8.66, p<0.0001) with a trend for perceived hydration (t=-1.72, p=0.09). **CONCLUSIONS**: These findings continue to support self-efficacy as a strong predictor of future exercise behavior. While measures of fatigue, affect, discomfort, and hydration did not directly predict exercise behavior, the observed inter-relationships provide some support for the key assumption of FNLP. Replication of these results in relevant target populations is necessary prior to implementing FNLP-based interventions.

1310   Board #118   May 31 9:00 AM - 10:30 AM

Affect, Eating Attitudes, And Exercise Dependence Of Personal Trainers With Different Years Of Experience

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(No relevant relationships reported)

PURPOSE: To examine the affect, eating attitudes, and exercise dependence of personal trainers with different years of experience. **METHODS:** Data were collected from female personal trainers (*n* = 17; 36±10 yrs of age; 146±21 lbs) at health/fitness centers in the Midwest. Participants completed a demographic survey, Positive Affect and Negative Affects Scale, Eating Attitudes Test (EAT-26), and Exercise Dependence Scale-Revised (EDS-R). Pearson correlation coefficients were calculated between the personal trainer's years of experience (*M* = 6.9±1.7yrs, *Md* = 4yrs, *Range*: 25yrs) and the dependent variables of affect, eating attitudes, and exercise dependence. One-way ANOVAs also were performed with personal trainers (PT) categorized in three groups based on years of experience as a PT: Novice (NPT: *n* = 6; *M* = 1.8±0.9yrs), Intermediate (IPT: *n* = 6; *M* = 5.2±1.6yrs), and Experienced (EPT: *n* = 5; *M* = 15.2±7.4yrs). **RESULTS:** Personal trainer's years of experience was related to positive affect (*r* = .58, *p* = .01), EAT-26 Diet subscale (*r* = -.43, *p* = .08) and Total score (*r* = -.47, *p* = .05), and EDS-R subscales of Withdrawal Effects (*r* = -.44, *p* = .08), Reduction in Other Activities (*r* = -.50, *p* = .04), and Intention (*r* = -.42, *p* = .09). Compared to IPT and EPT, NPT reported less Positive Affect (*Ms* = 32.3, 39.3, 45.8, *p* = .001). On the EAT-26, IPT reported more Oral Control than EPT but not NPT (*Ms* = 1.8, 3.8, 0.60, *p* = .07). As for EDS-R, NPT reported more Withdrawal Effects than IPT but not EPT (*Ms* = 12.8, 6.7, 8.0, *p* = .04) and more Reduction in Other Activities than EPT but not IPT (*Ms* = 7.8, 5.7, 4.6, *p* = .08). **CONCLUSION:** In general, novice personal trainers reported less positive affect, more symptoms of exercise dependence, and poorer eating attitudes. If left unchecked, novice PTs may be at risk of developing clinical levels of exercise dependence and eating disorders, and these dangerous behavioral patterns may be passed along to their clients. These findings suggest that

less experienced personal trainers may benefit from strategies aimed at increasing awareness of eating disorder and exercise dependence behavior patterns. As with most new professionals, establishing a good support network is important, and connecting with more experienced personal trainers may help improve affect and more positive eating and exercise behaviors.

1311   Board #119   May 31 9:00 AM - 10:30 AM

Explore Factors Associated with Exercise Behavior among the Older Chinese Adults in the Rural Area

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(No relevant relationships reported)

Purpose. The purpose of the study was to explore factors that are associated with exercise behavior among the older Chinese adults in the rural area.
Method. The data of 2586 older Chinese adults (males=1320, females=1259, age M=69.65, SD=8.0) in the rural area were analyzed from the National Health Service survey in Fujian, China. The t-test and χ2-test were carried out to compare the differences between older Chinese adults living in the rural area who did not exercise and who exercised at least once a week, on age, family income, education level, whether having partner, whether having chronic disease or pain, as well as the physical function levels. All data were collected in 2013.
Results. The results showed that there were significant differences between individuals who did not exercise and who exercised at least once a week on the following variables: age (M=69.8, SD=8.1, M=68.6, SD=7.1, respectively, p<.01), family income (M=32178¥, SD=34430, M=38017¥, SD=30991, respectively, p<.05), education level (with elementary education or above, 49.5% vs. 68.3% respectively, P<.001), having a partner (72.9% vs. 80.8%, respectively, P<.05), having difficulties on movement (16.0% vs. 8.4%, respectively, P<.05), having difficulties on self-care (10.7% vs. 5.8%, respectively, P~.05), and having difficulties on daily activity (14.6% vs.7.2%, respectively, P<.01). There were no significant differences between individuals who did not exercise and who exercised at least once a week, on the following variables: having at least one chronic disease (44.7% vs. 45.3%, respectively) and suffering from pain (28.1%vs. 22.7%, respectively), both Ps>.05.
Conclusion. The older Chinese adults in the rural areas were more likely to exercise if they were younger, had higher income and education level, had a partner, and had no difficulties on physical functions.

1312   Board #120   May 31 9:00 AM - 10:30 AM

Physical Activity Postings On Social Media: Physical Activity And Self-presentation Differences Between Sharers And Non-sharers

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(No relevant relationships reported)

Purpose: Sharing about physical activity (PA) on social media (SM) provides an opportunity for receiving social support from online social networks and may be related to PA levels (Pinkerton et al, 2017). People desire to be perceived positively by others, this is particularly true for SM users (Kaplan & Haenlein, 2010). As an individual shapes the content shared over SM networks, that individual may idealize their character rather than presenting an authentic version (Goffman, 2002). This study examined whether people who post about PA on SM differed in their PA levels and self-presentational efficacy (SPE) when compared to those who do not post. A secondary purpose was to describe the type of SM use across both sharers and non-sharers. **Methods:** A convenience sample of 113 kinesiology students (62M, 44F) completed a cross-sectional survey that included the Godin Leisure Time Exercise Questionnaire (Godin & Shepard, 1985) and the self-presentational efficacy scale (15 items; Gammage, Hall, & Ginis, 2004). This scale asked about confidence to present themselves in a positive fashion with regards to specific outcomes such as 'being in good shape' and 'looking fit and toned' in terms of SPE. Independent t-tests were conducted to compare sharers with non-sharers. **Results:** Students self-identified as sharers of PA on SM (*n*=39, 34.5%; 23M, 16F) or non-sharers (*n*=66, 58.4%; 38M, 28F). There were significantly different levels of PA, with those who posted about PA on SM reporting higher levels of activity (*M*=51.4, *SD*=22.5) than those who did not post about PA on SM (*M*=42.2, *SD*=22.3; *p*=.046). There were also significantly different levels of SPE, with those who posted about PA on SM having higher levels of SPE (*M*=75.1, *SD*=17.6) than those who did not post about PA on SM (*M*=64.5, *SD*=22.4; *p*=.014). Minutes spent on SM reported was similar between sharers (*M*=86.2min/day, *SD*=60.8) and non-sharers (*M*=104.8min/day, *SD*=84.9; *p*=.245). The most commonly used SM platforms for both sharers and non-sharers were Instagram (sharers: *n*=34, 87.2%; non-sharers: *n*=57, 86.3%) and Snapchat (sharers: *n*=33, 84.6%; non-sharers: *n*=54, 81.8%). **Conclusion:** Students who use SM to post about PA had higher levels of SPE and PA, suggesting the need for future research to explore how SM use may affect or be affected by self-presentation and PA levels.

1313   Board #121   May 31 9:00 AM - 10:30 AM

Exploring Physical and Mental Readiness to Exercise in Inactive Men and Women: A Thematic Analysis

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(No relevant relationships reported)

Flexible Non-Linear Periodization (FNLP) was designed by Kraemer & Fleck to optimize athletic performance and prevent burnout by basing athletes' daily training regimens on their personal "readiness to train" (physical/mental states pre-exercise). FNLP-based prescriptions may be an effective approach in improving exercise behavior of inactive adults. However, it is necessary to operationally define readiness in specific populations, particularly between genders. **PURPOSE**: Identify and compare the underlying themes relating to readiness to complete low-demand (LDB) and high-demand (HDB) aerobic bouts between men and women who do not engage in regular aerobic activity. **METHODS**: Via Qualtrics, 1,059 respondents completed the online survey. After quality control, 166 respondents (49$\pm$13y, 61.4% female) met the criteria of reporting <90 min/week of moderate aerobic activity (25.7$\pm$26.3 min/week). Respondents described mental/physical states necessary to complete a LDB (10-min slow stroll) and a HBD (60-min jog). Data were analyzed using content and thematic analysis. **RESULTS**: To complete the LDB and HDB, themes among men and women included *body integrity* (free from pain/illness) and *positive affect*. A unique theme emerged for the LDB, in that many men and women indicated it could be completed under *normal or worse circumstances*. A primary difference between genders is, to complete the LDB, women needed to feel *rested*, which was not reported by men. While a theme relating to *motivation* emerged for both bouts, it appears motivation to complete the LDB is rooted in a need for change (change of scenery, clear head), where as motivation for the HDB related more to completing the bout itself (focused, determination, committed). For the HDB bout only, men and women indicated a need to feel *fueled* (enough food, hydrated), adequately *conditioned*, and *energized*. **CONCLUSIONS**: Little difference was noted between inactive men and women regarding indices of readiness. Three uncovered themes (body integrity, fueled, energized) parallel factors from Kramer & Fleck's proposed six-item readiness checklist: injury status, hydration level, and fatigue ratings. These factors represent the more personal, non-performance aspects of the checklist, providing initial support for adapting FNLP for inactive populations.

1314   Board #122   May 31 9:00 AM - 10:30 AM

Examination of Personality Related to Individuals' Reported Primary Mode of Exercise

Allyson G. Box[1], Yuri Feito, FACSM[2], Chris Brown[2], Steven J. Petruzzello, FACSM[1]. *[1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]Kennesaw State University, Kennesaw, GA.* (Sponsor: Steven J. Petruzzello, FACSM)

(No relevant relationships reported)

Personality has been linked to various exercise behaviors. It is possible that personality dimensions are associated with the type of exercise one chooses to engage in. **PURPOSE**: To examine the relationship between personality dimensions, based on the Five Factor Model (FFM), and primary exercise modalities. **METHODS**: 576 adults (34.5$\pm$11.4 yrs; 46.7% male), currently participating in any form of regular exercise, completed an online survey. The survey included questions related to their primary mode of exercise (PME) and items for the Big Five Inventory (BFI). The BFI assesses the FFM dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. PMEs were divided into 5 main groups: CrossFit® Training (n=90), Group Exercise (n=59), Aerobic Training (n=116), Resistance Training (n=142), and Sport (n=142), with two other categories concurrently assessed: High Intensity Training (n=13) and Other (n=14). **RESULTS**: Significant ($P < 0.05$) Spearman's correlations were observed between frequency of exercise and Agreeableness (ρ = 0.160), Conscientiousness (ρ = 0.284), Neuroticism (ρ = -0.256), and Openness (ρ = -0.083). A multivariate ANOVA revealed significant differences ($P<0.001$) between PME and Extraversion ($P<0.001$, η^2_p=0.062), Agreeableness ($P<0.001$, η^2_p=0.165), Conscientiousness ($P<0.001$, η^2_p=0.323), Neuroticism ($P<0.001$, η^2_p=0.129), and Openness ($P<0.001$, η^2_p=0.073). **CONCLUSIONS**: These findings suggest that differences exist between personality dimensions and individuals' preferred exercise modality. As physical inactivity is a growing prominent public health concern, identifying an individual's personality and suggesting exercise modalities based on these differences may aid in exercise interest and adherence.

1315   Board #123   May 31 9:00 AM - 10:30 AM

The Relationship Among Resilience, Personality, Anxiety and Fitness in Recruit Firefighters

Dakota G. Morales, Allyson G. Box, Steven J. Petruzzello, FACSM. *University of Illinois at Urbana-Champaign, Urbana, IL.* (Sponsor: Steven J. Petruzzello, FACSM)

(No relevant relationships reported)

Resilience (R), the ability to adapt to and rebound from adversity, has been linked to Post-Traumatic Stress Disorder (PTSD) susceptibility and to buffer against stressful events. Fitness has also been related to psychological health, thus it is of interest to examine whether R is related to personality and anxiety, as well as indices of fitness in firefighters (FFs), a group exposed to various stressors. **PURPOSE**: Examine R, personality, anxiety and fitness among recruit FFs. **METHODS**: Recruit FFs (N=145 males, 26.4$\pm$4.0 yrs, BMI=27.1$\pm$4.5) entering a 6-week FF training academy completed individual difference measures [e.g., Dispositional Resilience Scale (DRS-15), Trait Anxiety Inventory (TAI; 32.3$\pm$8.0), International Personality Item Pool 50 (IPIP-50)]. The DRS-15 provided a Total score (49.5$\pm$4.8) and subscores for Challenge (Ch: 13.9$\pm$2.4), Commitment (Cm: 17.6$\pm$2.1), and Control (Cl: 18.0$\pm$2.0). The 5 personality dimensions of Extraversion (E: 33.9$\pm$7.0), Emotional Stability (ES: 39.3$\pm$6.6), Conscientiousness (C: 38.8$\pm$4.7), Openness (O: 36.1$\pm$5.4), and Agreeableness (A: 40.0$\pm$5.2) were derived from the IPIP-50. **RESULTS**: Only C was associated with aerobic capacity (r= 0.20); no other fitness relationships were found. Significant ($P<0.005$) relationships were found between total R and TAI (r= -0.57) along with the personality dimensions of ES (r= 0.46), A (r= 0.38), O (r= 0.35), C (r= 0.35), and E (r= 0.24). Of the R subscales, Cm had the most consistent and strongest relationships with personality (r_s= 0.30 - 0.57). **CONCLUSIONS**: Findings support the relationship between R (especially sense of Commitment) and personality, but not fitness, in these FFs. Including the relationship between anxiety and personality, levels of resilience may influence susceptibility to PTSD (i.e., interpretation of stressful events), symptom severity of PTSD, and recovery from PTSD. With respect to traumatic experiences encountered during firefighting, these relationships may aid in understanding how FFs handle stress.

1316   Board #124   May 31 9:00 AM - 10:30 AM

Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences

Christopher P. Connolly, Gretchen G. Stolte, Bryce W. Magee. *Washington State University, Pullman, WA.*

(No relevant relationships reported)

Perceptions that pregnant women have towards physical activity (PA) appear to affect levels of participation. Qualitative findings indicate that past adverse prenatal experiences may elevate pregnant women's PA concerns regarding the health of the baby. **PURPOSE**: We investigated whether PA outcome expectancy differed among pregnant women with past miscarriage or infertility experiences compared to pregnant women without. Additionally, we examined whether moderate-to-vigorous PA (MVPA) and PA discussion with a healthcare provider (HCP) differed between these two groups. **METHODS**: Pregnant women (N=497) completed an online survey and answered multiple questions about past pregnancy experiences, and current PA perceptions and behavior specific to various PA modalities. These included: walking, light and intense jogging, cycling, and swimming, prenatal yoga, aerobic dance, and resistance training exercises. PA outcome expectancy for each modality was assessed on an 11-pont Likert scale. Participation in each was defined as PA > 0 min/wk. MVPA was dichotomized as meeting the guideline (MVPA $\geq$150 min/wk) or not. Participants were also asked questions regarding PA discussion with a current HCP. Mann-Whitney U-tests were performed to examine outcome expectancy differences between women with past adverse prenatal experience and those without. Chi-square analyses were conducted to examine differences in meeting the MVPA guideline, HCP discussion, and PA modality participation. **RESULTS**: A total of 170 women (30.5%) reported past miscarriage or infertility experiences. PA outcome expectancy for these women did not significantly differ from women without past adverse prenatal experience for any specific modality of activity. However, women with past miscarriage or infertility were less likely to meet the current MVPA guideline [χ^2(1) = 4.32, p=.04]. Participation in specific PA modalities was not significantly greater for women without past adverse prenatal experience, nor was the occurrence of PA discussion with a HCP. **CONCLUSIONS**: Pregnant women with past miscarriage or infertility did not perceive PA differently but did perform less MVPA than women without past adverse experiences. Longitudinal examinations of PA perception and behavior are needed among this subpopulation.

1317   Board #125   May 31 9:00 AM - 10:30 AM

Older Adults' Narratives Of Physical Activity And Health: Intrinsic Goal Pursuits, Autonomy, And Healthy Identities

Christina Johnson, Neil Pagdin, Thomas Greene. *Cornell College, Mount Vernon, IA.*

(No relevant relationships reported)

The benefits of physical activity extend across the lifespan, but the psychological processes supporting active aging are not often addressed for older adults. This research explores older adults' narratives of health and physical activity experiences and applies a Self-Determination Theory (SDT) framework for understanding how basic needs are accommodated in physical activity contexts. **PURPOSE:** To examine the life-history narratives of older adults with regard to physical activity, sport participation, and health.
METHODS: Narrative interviews were conducted with 51 older adults (65-95 yrs) to elicit life-history narratives regarding 1) experiences in physical activity and sport; 2) current perceptions of health, and 3) identity as a healthy or unhealthy person. The semi-structured interviews ranged from 1-3 hours and fostered in-depth accounts of individual's life histories. Interviews were transcribed verbatim and data was subjected to thematic narrative analysis.
RESULTS: Data supported a SDT approach (Ryan & Deci, 2001; Ryan, Huta, & Deci, 2006) to understanding the connection between goal pursuits, achievement, and well-being. Contexts and activities that supported participants' perception of autonomy (e.g., "I have choices about the activities that are available"), competence (e.g., "I can successfully participate"), and sense of belonging (e.g., "The people are very supportive and I feel welcome") were related to participants' articulation of healthy activity as a first-order, intrinsic goal (e.g., "I golf because I love movement, not for any other reason"). Participants demonstrated an age-related shift in understanding physical activity and health. Older participants (88±5 yrs) more often narrated physical activity as a first-order, intrinsic goal (e.g., movement for movement's sake), whereas younger participants (70±5 yrs) more often narrated physical activity as a lower-order, extrinsic goal (e.g., "I am physically active because my doctor told me I needed exercise and/or I want to be healthier"). **CONCLUSIONS**: This research supports the SDT contention that intrinsic goal pursuits relate to greater well-being and highlights the importance of fostering perceptions of autonomy support, competence, and relatedness for physical activity among older adults.

1318   Board #126   May 31 9:00 AM - 10:30 AM

Examination Of The Association Between Values And Physical Activity In A Behavioral Program

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(No relevant relationships reported)

Theory-based approaches imply that values may be a construct that influences motivation and adherence to health behavior change.
PURPOSE: This study examined the associations between individual values and change in physical activity in adults enrolled in a 6-month behavioral weight loss intervention.
METHODS: Baseline data for 67 participants (age = 44.2±9.0 years; body mass index = 32.6±3.9 kg/m²) and 58 participants at 6 months (age = 43.9±9.2 years; body mass index = 32.6±4.0 kg/m²) were analyzed. The 6-month behavioral weight loss intervention included prescribed moderate-to-vigorous physical activity of 150 to 250min/wk. Only participants prescribed physical activity within the intervention were included in the statistical analysis. Assessments at baseline and 6 months included: 1) self-reported leisure-time physical activity, 2) personal values, 3) perception of engaging in physical activity would have on their values.
RESULTS: At both baseline and 6 months, the three most frequently identified values were marriage/couples/intimate relationships (75.9%), family (60.3%), and parenting (56.9%). Spearman correlation coefficients were not statistically significant between change in leisure-time physical activity and perception of the impact engaging in a physical activity will have on their values at baseline (range of r's: -0.029 to 0.154, p's range: 0.364 to 0.927) and 6 months (range of r's: -0.018 to 0.098, p's range: 0.564 to 0.916).
DISCUSSION: Self-reported values did not change following participation in a behavioral weight loss intervention. Perceptions of how engagement in physical activity would alter values were also not associated with change in leisure-time physical activity. These results suggest that linking physical activity to values would not impact the magnitude of improvement in leisure-time physical activity within the context of a comprehensive behavioral weight loss intervention. However, this warrants additional investigation to determine if interventions specifically linking values to physical activity would elicit similar effects.

1319   Board #127   May 31 9:00 AM - 10:30 AM

Anthropometry, Physical Functioning, And Quality Of Life In The Exercising Diabetic Patient

Lena K. Perry[1], Cynthia Villalobos[1], J. Mark VanNess[1], Paul D. Vosti[2], Courtney D. Jensen[1]. *[1]University of the Pacific, Stockton, CA. [2]St. Joseph Hospital, Stockton, CA.*

(No relevant relationships reported)

Among U.S. adults, more than 35% are obese and 9% are diagnosed with diabetes. Obesity and diabetes impair daily functioning and associate with poorer subjective quality of life (QOL). Exercise is an effective intervention for weight loss, functional improvement, and amelioration of psychological symptoms; however, the precise characteristics of prescription to optimally enhance QOL in this population are not well defined. **PURPOSE:** To evaluate QOL predictors in subjects with type 2 diabetes undergoing structured exercise. **METHODS:** 61 subjects with diabetes were randomized into one of two 10-week exercise interventions; 38 subjects completed the program. Group 1 (n=23) participated in organized interval training with professional supervision twice weekly; group 2 (n=15) performed the same supervised interval training but also performed two 60-min unaccompanied walking sessions per week. At baseline and follow-up, demographic, anthropometric, functional, and QOL data were collected. Multiple linear regression determined the effect of exercise, physical functioning, and anthropometric indices on QOL outcomes. **RESULTS:** At baseline, subjects were 67.9 ± 9.1 years of age, 42.1% male, and they had a composite QOL score of 58.9 ± 18.1. Older age and three assessments of physical functioning associated with higher baseline QOL; obesity associated with a trend for higher QOL (p=0.054). From baseline to posttest, QOL improved 17.7% (p<0.001). Group assignment was not a significant predictor of this change (p=0.998). Women improved more than men (p=0.031), and improvement in physical function associated with greater improvements in QOL. At the end of the intervention, age (p=0.022) and physical function corresponded to elevated QOL. Group assignment was not a significant predictor (β=9.3; p=0.098). At baseline (p<0.001), change scores (p=0.021), and at follow-up (p<0.001), the six-minute walk was the most pronounced variable of physical functioning to correspond to QOL. **CONCLUSION:** Exercise improved QOL for subjects with diabetes. Additional walking didn't help. Older men and especially women improved more. This may be a consequence of attention, as supervised sessions provided marked improvement. It may be important for exercise aimed at improving psychological wellbeing to include companionship.

1320   Board #128   May 31 9:00 AM - 10:30 AM

The Role of Gratitude in Intrinsic and Extrinsic Exercise Motivation

Allison Hicks, Savannah Neace, Marci DeCaro, Paul Salmon. *University of Louisville, Louisville, KY.*

(No relevant relationships reported)

PURPOSE: To determine the role of positive psychology in the prediction of exercise motivation. Specifically, we examine the construct of gratitude in association with intrinsic and extrinsic exercise motivation.
METHODS: One hundred predominantly female (84%) undergraduate participants (age: M=19.78, SD=2.43) responded to online survey questionnaires including demographics, subjective health, gratitude (GRAT-R) and Exercise Motivation (EMI-2).
RESULTS: Hierarchical regressions including theoretically derived control variables (age, sex, minority status and subjective health) explored the role of gratitude in the prediction of intrinsic and extrinsic exercise motivation. Gratitude was significantly positively associated with intrinsic motivation (β=.397, p<.001), but not extrinsic motivation (β=.225 , p=.07). In analyzing gratitude subscales, Sense of Abundance was positively associated with intrinsic motivation (β=.296, p<.01), and Social Appreciation was positively associated with both intrinsic (β=.497, p<.001) and extrinsic motivation (β=.401, p<.001). In further examining subscales of the EMI-2, total gratitude scores were significantly positively correlated with Stress Management (r=.411, p<.001), Revitalization (r=.386, p<.001), Enjoyment (r=.411, p<.001), Challenge (r=.390, p<.001), Affiliation (r=.254, p<.01), Ill-Health Avoidance (r=.250, p<.05), Positive Health (r=.356, p<.001), Weight Management (r=.201, p<.05) and Strength/Endurance (r=.310, p<.01).
CONCLUSIONS: Gratitude positively predicted exercise motivation, particularly intrinsic motivators of exercise. These findings suggest that positive psychological practices are associated with attitudes that encourage health behavior change.

1321   Board #129   May 31 9:00 AM - 10:30 AM

Mindfulness and Intrinsic Exercise Motivation—The Mediating Role of Exercise Self-Efficacy

Savannah M. Neace, Allison Hicks, Paul Salmon, Marci DeCaro. *University of Louisville, Louisville, KY.*
(No relevant relationships reported)

TITLE: Mindfulness and Intrinsic Exercise Motivation: The Mediating Role of Exercise Self-Efficacy
AUTHORS: Savannah Neace, Allie Hicks, Marci DeCaro, Paul Salmon
University of Louisville, Louisville, KY
PURPOSE: We examined the role of mindfulness in predicting exercise motivation. Mindfulness is associated with health, but its influence on exercise motivation is largely unexamined. We tested the relationship between mindfulness and exercise motivation, using self-efficacy as a possible mediator of this relationship.
METHODS: Undergraduates (N = 100; 84% Female, 80% Caucasian) completed online questionnaires assessing demographics, Mindfulness (MAAS), exercise self-efficacy (SEE), and exercise motivation (EMI-2).
RESULTS: Hierarchical regressions controlling for age, sex, and minority status examined relationships among mindfulness, exercise self-efficacy, and exercise motivation. Mindfulness was positively associated with intrinsic (β=.210, p<.05), but not extrinsic motivation (β=.086, p<.438). Mindfulness was also positively associated with exercise self-efficacy (β=.244, p<.05. Exercise self-efficacy was positively associated with both intrinsic motivation (β=.484, p<.000) and extrinsic motivation (β=.218, p<.05). Mediation analysis revealed that exercise self-efficacy fully mediated the relationship between mindfulness and exercise motivation (β=.210, p<.05; β= .186, p<.285). Exploratory analyses examined correlations between facets of the EMI-2 and mindfulness and exercise self-efficacy. Mindfulness was significantly correlated with two intrinsic facets [Revitalization (r=.220, p<.028), Enjoyment (r=.254, p<.011)]. Exercise self-efficacy was significantly correlated with five intrinsic facets [Revitalization (r=.500, p<.000), Enjoyment (r=.499, p<.000), Challenge (r=.508, p<.000), Affiliation (r=.216, p<.05), Positive Health (r=.284, p<.01)] and one extrinsic facet [Competition (r=.344, p<.000)].
CONCLUSIONS: Mindfulness is moderately predictive of intrinsic exercise motivation, however, exercise self-efficacy largely mediates this relationship.

1322   Board #130   May 31 9:00 AM - 10:30 AM

The Mediating Effect of Perceived Health on the Relationship Between Physical Activity and Subjective Well-being

Zhanjia Zhang[1], Bo Chen[2], Qiang Li[3], Weiyun Chen[1]. *[1]University of Michigan, Ann Arbor, MI. [2]Beijing University of Chemical Technology, Beijing, China. [3]Nanjing Sport University, Nanjing, China.*
(No relevant relationships reported)

Subjective well-being (SWB) is a critical indicator of positive youth development. Physical activity (PA) has been identified as a potential correlate of SWB. But the underlying mechanism for the association between PA and SWB has remained largely unexplored.
PURPOSE: To examine the association between the PA and SWB in college students, and to determine if the perceived health mediated the association between them.
METHODS: 1209 college students (631 male and 578 female, mean age = 19.63 years) voluntarily completed a questionnaire consisting of four parts: Subjective Happiness Scale with four 5-point Likert items assessing Happiness, Satisfaction with Life Scale with five 7-point Likert items measuring life satisfaction, two questions adapted from the National Health and Nutrition Examination Survey (NHANES) asking the time (in minutes) spent on PA per week, and one 5-point Likert item adapted from NHANES measuring the perceived health. According to a widely used procedure to test mediation, three multiple regression models were performed. First, the perceived health (mediator) was regressed on the PA (independent variable). Second, happiness and life satisfaction (dependent variables) were respectively regressed on the PA (independent variable). Finally, happiness and life satisfaction (dependent variables) were respectively regressed on both the PA (independent variable) and perceived health (mediator). Age, gender, and weight status were obtained by self-report and added to all models as covariates.
RESULTS: The first model revealed that PA was a significant predictor of perceived health (t = 5.30, p < 0.01). In the second model, PA significantly contributed to the happiness (t = 3.43, p < 0.01) and life satisfaction (t = 3.62, p < 0.01), respectively. However, after including the perceived health to the second model, the coefficient of PA was no longer significant for both happiness and life satisfaction (p's > 0.05). Our result showed that the independent variable had no effect when the mediator was controlled, suggesting a mediating effect of the perceived health on the relationship between PA and SWB.
CONCLUSIONS: The increased time spent on PA is associated with a higher level of SWB among college students. Moreover, this positive association is mediated by the individual level of perceived health.

1323   Board #131   May 31 9:00 AM - 10:30 AM

Testing The Effects Of Message Framing On Physical Activity Motivation: Does Stage Of Change Matter?

Derek J. Hevel, Anthony J. Amorose, Kristen M. Lagally, FACSM, Anna Rinaldi-Miles, Scott Pierce. *Illinois State University, Normal, IL.*
(No relevant relationships reported)

PURPOSE: Understanding how to best "sell" physical activity (PA) is a critical goal. This study investigated the effects of message framing on motivation to participate in a PA program, and tested whether the effectiveness of messages framed to promote either affective benefits, physical health benefits, or a combination benefits varied based on one's current PA status. **METHODS**: Adult participants (*N*=188) from a Midwestern university, who were recruited via email, completed an online survey assessing demographic information and current stage of change. They then viewed one of four randomly assigned promotional flyers for a PA program offered on campus. The flyers mentioned either the: (a) affective benefits of program participation (e.g., improved mood), (b) physical health benefits (e.g., improved fitness), (c) a combination of affective and physical health benefits, or (d) a control message noting some generic aspects of the program (e.g., clean facilities). After viewing the flyer, participants responded to a series of questions about the content of the flyers (manipulation checks) and their perceived behavioral control for participating in the program, followed by their interest in the program, intention to participate, the likelihood of participating, and whether they wanted to sign-up. **RESULTS**: A series of 2 (PA status: active, non-active) x 4 (message: affective, physical health, combination, control) ANOVAs found that, after accounting for perceived control, the effectiveness of the different promotional messages on intention and likelihood of participating varied based on the respondents' PA status. The major finding was the message promoting affective benefits led to significantly greater intention and likelihood of participation than the other messages for those who were active, but the opposite occurred for non-active participants. No group or message differences were found with regard to interest in the program. Further, a chi-square analysis found no differences in participants' yes or no response to wanting to schedule a session in the program at that time. **CONCLUSIONS**: Using message framing to sell PA may help increase intention to participate. However, the type of message that effectively promotes PA appears to vary depending on the message receiver's current physical activity.

1324   Board #132   May 31 9:00 AM - 10:30 AM

Race and Types of Motivation in Indoor Group Cycling

Alvin L. Morton, Derrick T. Yates, Miguel Aranda, Lyndsey Hornbuckle. *University of Tenessee, Knoxville, TN.*
(No relevant relationships reported)

As racial health disparities persist in the U.S. for conditions that can be mitigated by regular exercise (e.g. cardiovascular disease, type II diabetes), identifying the types of motivation that drive various racial groups to participate in exercise may be a strategy to help inform intervention efforts and reduce these health disparities. **PURPOSE:** To identify racial differences in the type of motivation (autonomous, controlled, or amotivation) that influence regular participation in indoor group cycling classes. **METHODS:** Twenty-one indoor group cyclists currently participating in classes $\geq$ 1 day/week for $\geq$ 3 consecutive months (non-Hispanic Whites (NHW) = 14, non-Hispanic Black (NHB) = 4, mixed-race = 3; age: 43.6 ± 14.5 yrs.; body mass index: 26 ± 3.8 kg/m²) were recruited for this study. Participants completed the Treatment Self-Regulation Questionnaire (TSRQ) using a 7-point Likert scale to indicate why they continue to utilize indoor group cycling classes as an exercise modality. Average TSRQ scores of autonomous and controlled motivation, and amotivation were examined by race. One-way ANOVA was used to examine between-group differences. Significance was accepted at p < 0.05. **RESULTS:** There were no racial differences in autonomous (p = 0.44) or controlled motivation (p = 0.84) by race, but there was a significant difference in amotivation (p = 0.02). Tukey post hoc analyses showed that NHB had higher amotivation (3.5 ± 1.0) compared to NHW (2.0 ± 1.1) and mixed-race (1.3 ± 0.4) participants. **CONCLUSION**: Compared to the other race groups in this sample, NHB had higher amotivation despite continued participation in indoor group cycling. This suggests that other factors (e.g. group dynamics, environment) may be driving NHB to continue participation. Further research using racially diverse samples is needed to identify possible factors related to motivation in NHB and other race groups, as they may be valuable in the development of culturally relevant exercise programs.

1325   Board #133   May 31 9:00 AM - 10:30 AM

Cardiorespiratory Fitness, Physical Activity, and Psychological Effects of an Acute Bout Of Cycling Exercise in People with Epilepsy

Kristen E. Johnson, Patrick J. O'Connor, FACSM. *University of Georgia, Athens, GA.* (Sponsor: Patrick O'Connor, FACSM)
(No relevant relationships reported)

PURPOSE: The primary purpose of this study was to test if an acute bout of cycling exercise in a sample of young adults with epilepsy would improve feelings of energy and enhance executive function. Secondary aims included evaluating cardiorespiratory fitness and physical activity level. **METHODS:** A within-participants crossover design was used to compare seated rest to 20 minutes of moderate-intensity cycling. Ten people diagnosed with epilepsy completed the Profile of Mood States (POMS) and the Wisconsin Card Sorting Task (WCST) before and twice after the treatments. Cardiorespiratory fitness was assessed with a standardized, graded maximal cycling exercise test. Physical activity level was assessed with a hip-worn accelerometer (ActiGraph GT3X+) and a self-reported past-year physical activity questionnaire (CARDIA Physical Activity History). **RESULTS:** Within-participants repeated measures ANCOVAs controlling for initial values and order of treatments showed a significant interaction for POMS Vigor, $F(2,32)=4.21$, $p=.024$. Immediately after exercise, vigor scores were higher than after seated rest. WCST performance was not influenced by acute exercise. Independent t-tests revealed that this sample of people with epilepsy was similarly fit and similarly active compared to reference groups of young adults without epilepsy. **CONCLUSION:** Acute cycling transiently increases feelings of energy without altering executive functioning in normally active and fit people with epilepsy.

1326   Board #134   May 31 9:00 AM - 10:30 AM

Machines versus Free Weights: Does Exercise Mode Influence Affect and Perceived Exertion?

Daniel J. Cavarretta, Walter R. Bixby, FACSM, Eric E. Hall, FACSM. *Elon University, Elon, NC.*
(No relevant relationships reported)

Resistance exercise reduces the risk of chronic disease and promotes numerous health benefits. Due to the low rates of participation in resistance exercise, research is needed to create a more positive affective response from exercise. This has been shown to increase rates of adherence in aerobic exercise. **PURPOSE:** To compare the affective responses of performing resistance exercise on machines (MA) and free weights (FW). **METHODS:** Novice participants (4 Males: 20.8±0.5yrs; 75.2±17kg; 180±2.4cm; 14 Females: 25.7±9.8yrs; 67.9±19kg; 163±5.6cm) completed a MA workout consisting of the leg press, row, chest press, and leg curl and a FW workout consisting of a goblet squat, row, bench press, and stiff leg deadlift. Each exercise was performed at 80% 10RM for 3 sets of 9-11 repetitions with 90 secs of rest between each set. Feeling Scale (FS) and Felt Arousal Scale (FAS) were assessed before exercise, after the completion of the 7th repetition of the 2nd set of each exercise, after the 3rd set of each exercise, immediately after, 30 min after, and 60 min after. **RESULTS:** Repeated measures ANOVA from before to after exercise revealed a condition x time interaction for FS where FS in the MA condition increased immediately and 60 minutes following exercise, there was no change across time for FW, and FS for MA was significantly higher at 60 minutes following exercise than FW, $F(3, 51) = 3.26$, $p = 0.040$. For FAS before and after exercise, FAS significantly increased immediately following exercise and then decreased to below exercise levels at 30 and 60 min regardless of condition, $F(3, 51) = 11.91$, $p < 0.001$. Repeated measures ANOVA for RPE during the exercise revealed a condition x time interaction where RPE was higher in FW for all exercises except those of the chest where RPE was higher for MA, $F(7, 119) = 3.285$, $p = 0.015$. **CONCLUSION:** The more positive affective response from the MA workout immediately and 60 minutes after exercise suggests that MA exercises may be better for novice lifters when beginning a resistance training regimen.

C-40   Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity in College Students

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1327   Board #135   May 31 9:00 AM - 10:30 AM

The Impact of Body Fat Percentage on Appearance and Weight Management Related Motivations to Exercise in College Age Men

Elizabeth A. Easley, Molly N. Melton, Rhiannon J. Schofield, Ashley M. Garris, Sarah H. Sellhorst, William F. Riner, FACSM. *University of South Carolina Lancaster, Lancaster, SC.*
(No relevant relationships reported)

Physical activity and exercise levels have been shown to decline throughout childhood and adolescence with a noticeable decrease occurring during the transition to college. The Exercise Motivation Inventory-2 (EMI-2) has been used to identify factors that potentially affect exercise levels in adults. There is little known research regarding the motivation to exercise in college students at a rural, commuter-based, two-year University campus. **PURPOSE:** The purpose of this study was to determine whether differences existed in enjoyment, appearance, and weight management related motivations and MVPA based on body fat percentage levels in male college students. **METHODS:** Thirty-nine, traditional-age (18-25 y), full-time (>12 credit hours) male college students were recruited for this study. The participants completed the EMI-2 instrument and then anthropometric measures (height, weight, and BF%; dual energy x-ray absorptiometry) were collected. All participants were then asked to wear an accelerometer for 7 consecutive days to measure MVPA. Participants were then divided into two groups, a healthy body fat group, (HBF; ≤ 22 BF%, n = 16) and an overfat group (OBF; > 22 BF%, n = 23). A one-way MANOVA was used to determine differences in exercise motivations and physical activity levels based on body fat percentage. **RESULTS:** A significant main effect was determined for body fat category, Wilks' lambda=.533, $F(4, 34) = 7.439$, $p <0.001$, $\eta_p^2 = .467$. Pairwise comparisons of EMI-2 scores determined that OBF men had greater motivation scores based on appearance (3.565 vs. 2.703, $p = .026$) and weight management (3.685 vs 1.781, $p < .001$) compared to their healthy-fat counterparts. There were no significant differences in enjoyment scores (3.533, OBF vs. 3.203, HBF, $p = .465$) or time spent in MVPA (OBF, 289 min/week vs. HBF, 371 min/week, $p = .064$). **CONCLUSION:** Body fat percentage can impact the motivations to exercise in college age men. OBF reported stronger motivations to exercise based on appearance or weight management compared to the HBF. Despite these stronger motivations, this did not translate into greater time spent in MVPA compared to their HBF counterparts. More research is necessary to determine motivation and barriers to exercise in this population, while considering the impact of body composition.

1328   Board #136   May 31 9:00 AM - 10:30 AM

Self-Reported Wellness Benefits of Recreational Sports Use in College Freshmen

Kerri L. Vasold[1], Samantha J. Deere[2], James M. Pivarnik, FACSM[1]. *[1]Michigan State University, East Lansing, MI. [2]Saginaw Valley State University, University Center, MI.*
(No relevant relationships reported)

Previous research has shown a positive relationship between academic success and recreational sports participation. Few studies have investigated the relationships between recreational sports participation and psychosocial/physical health indicators. **PURPOSE:** To investigate the impact of recreational sports on psychosocial and physical health indicators in college freshmen, and determine differences in impact between high and low users. **METHODS:** Participants included freshmen students who participated in an online survey and consented to recreational sports usage tracking. Usage was collected via ID card swipe each time the student utilized the University fitness centers, group fitness classes, and participated in intramural sports games. Users were categorized as high or low (median split) based on total usage during their 1st year. The survey was administered during the 2nd semester of participants' 1st year. Participants reported the impact (1=very negatively to 5=very positively) of their usage on psychosocial and physical health variables. Responses were categorized into negative/no impact (1-3) and positive impact (4,5). Frequencies were calculated for variables of interest. Logistic regression was utilized to investigate the impact of recreational sports use on psychosocial and physical health variables. **RESULTS:** The sample (N=131) was 51.1 percent male and primarily Caucasian (82.4%). On average, high users had 48.1±39.2 ID card swipes per year; low users had 6.1±3.3. Most participants reported that recreational sports participation had a positive impact on psychosocial and physical health: overall well-being (86.3%); sense of belonging (83.2%); stress management (77.9%); self-confidence (77.9%); time

management (68.7%); overall health (90.8%); fitness level (89.3%); weight control (64.9%); balance and coordination (74.8%); and sleep (61.8%). High users were more likely than low users to report positive impacts on overall well-being (OR: 3.2; 95%CI: 1.1-9.5), fitness level (OR: 4.4; 95%CI: 1.2-16.7), and self-confidence (OR: 3.0; 95%CI: 1.2-7.1). **CONCLUSIONS**: Recreational sports participation had a positive impact on self-reported psychosocial and physical health in college freshmen, and frequency of participation played a role in some of these relationships.

1329   Board #137   May 31 9:00 AM - 10:30 AM

Academic and Non-Academic Stress of College Students Enrolled in Physical Activity Classes

Lauren Kizlik, Kristin Nassen, Dr. Jessica Albers. *Minnesota State University, Mankato, Mankato, MN.*

(No relevant relationships reported)

College students often see a decline in their physical activity, in pair with an increase in psychological stress. Many universities aim to increase physical activity and spark new interest by offering a wide variety of health and physical activity classes for all students.
PURPOSE: To explore demographic differences among students in the physical activity classes and to examine how stress relates to how students self-select into different types of physical activity classes.
METHODS: Potential participants were students who self-enrolled in physical activity classes at the University. Participants (n=155) completed consent forms, a demographics questionnaire, and two surveys were sent out electronically through Qualtrics during the first, ninth, and fifteenth week of the semester. The surveys assessed psychological stress, both academically related (Academic Stress Scale) and non-academically related (Perceived Stress PSS-10). Between group differences were analyzed using One-Way ANOVA's to find using SPSS.
RESULTS: Results of the One-Way ANOVA on Academic Stress showed female students (mean = 9.61) to have statistically significant higher academic stress levels compared to male students (mean = 7.82) (p < .001). While not significant, the students on the spectrum of gender identity reported higher academic stress levels than both male and female students (mean = 9.82). Females also reported higher overall (non-academic) stress (mean = 17.53) than males (mean = 15.42) (p = .030). Female students reported more academic stress (mean = 9.67) than males (mean = 7.63). Students in the College of Education reporting the highest overall stress (mean = 20.33) on the Perceived Stress Scale. Time point three will be analyzed to assess changes in stress through the semester.
CONCLUSIONS: This study explored the descriptive statistics of students self-enroll in physical activity classes and examine differences in their stress levels through the semester. The results of this study can be used to reach students who's major may not require physical activity classes. Results can also be used to try to get more students involved in physical activity classes, or which courses certain colleges should consider requiring students to take.

1330   Board #138   May 31 9:00 AM - 10:30 AM

Gender Differences In College Student Physical Activity Based On The Use Of Wearables, Apps, And Social Media

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(No relevant relationships reported)

College students Physical Activity (PA) continues to remain low and decline, whilst the utilization and availability/accessibility of wearables, apps and social media continues to increase. Understanding the relationship between the use of such technologies and PA may provide insight valuable to college student PA promotion.
PURPOSE: To investigate gender differences in PA between users and non-users of wearables, physical activity and weightless apps, as well as those who shared their PA on social media and those who did not. **METHODS:** This cross-sectional study collected data using an online survey from a volunteer sample of students enrolled in a PA class. The survey examined a range of variables, including demographic information, self-reported PA levels and height, weight, as well as the use of wearables, PA apps, and weightloss apps, and social media to share about PA. Basic descriptives were computed, and differences in technologies usage were assessed using independent sample *t*-tests **RESULTS:** The final sample included 2341 participants, 56% women; 78.7% Non-Hispanic White, with an average age of 21.1±1.5y. Among students, 85.9% met or exceeded PA recommendations, 27.1% reported using a wearable, 30.1% a PA app, and 16.7% a weightloss app, and 12.7% reported sharing their PA on social media. Wearable users reported greater MPA ($p<.001$, $\eta^2=.009$), PA app users reported greater VPA ($p=.001$, $\eta^2=.004$), and weightloss app users reported higher BMIs ($p=.001$, $\eta^2=.004$) compared to non-users of such technologies respectively. Those who shared their PA on social media reported greater MPA ($p=.033$, $\eta^2=.002$), and VPA ($p<.001$, $\eta^2=.011$). Among males, wearable users reported greater MPA ($p<.001$, $\eta^2=.015$),

whereas female users reported greater MPA ($p=.005$, $\eta^2=.006$), and VPA ($p<.001$, $\eta^2=.013$). Male PA app users had higher BMIs, ($p=.018$, $\eta^2=.006$) and reported more VPA ($p=.012$, $\eta^2=.007$), whereas female PA app users reported significantly higher MPA ($p=.050$, $\eta^2=.003$), and VPA ($p<.001$, $\eta^2=.012$). Males who shared about PA on social media reported higher MPA ($p=.004$, $\eta^2=.009$), and VPA ($p<.001$, $\eta^2=.013$), whereas females reported only higher VPA ($p<.001$, $\eta^2=.016$). **CONCLUSION**: Technologies had positive associations with PA, indicating that they have the potential to increase and/or sustain PA in certain individuals.

1331   Board #139   May 31 9:00 AM - 10:30 AM

Cellular Telephone Use Predicts the Likelihood of Being an "Active Couch Potato" in College Students

Hannah Altsman, Andrew Lepp, Jacob E. Barkley. *Kent State University, Kent, OH.* (Sponsor: Ellen Glickman, FACSM)

(No relevant relationships reported)

The term "active couch potato" was developed to describe individuals who participate in regular, planned physical activity yet are also highly sedentary. These individuals are of interest as participation in excessive amounts of sedentary behavior, even in individuals which are regularly physically active, increases the risk for cardio-metabolic disease. Our group has demonstrated that cellular telephone (cell phone) use is positively associated with sedentary behavior, but not related to physical activity. Therefore, it is possible that individuals who use their cell phone heavily may participate in large amounts of sedentary behavior while also regularly participating in physical activity. In other words, cell phone use may predict the likelihood of being an "active couch potato." **PURPOSE:** To assess the relationship between cell phone use and the likelihood of being an "active couch potato."
METHODS: A sample of 228 college students completed validated survey items to assess their daily cell phone use, physical activity, and sedentary behavior. Tertile splits were performed and participants were categorized into *low, moderate* or *high* groups for each of these three variables. Participants were then categorized as "active couch potatoes" if they were a) in the *high* physical activity group and also in a *high* or *moderate* sitting group, or b) in the *moderate* physical activity group and also in the *high* sitting group. Mann-Whitney U tests compared the number of "active couch potatoes" across the three cell phone use groups and binary logistic regression was used to test if cell phone use group predicted being an "active couch potato."
RESULTS: There were a greater ($Z \geq 1.9$, $p \leq 0.05$) number of "active couch potatoes" in the *moderate* ($n = 21$) and *high* ($n = 28$) cell phone use groups versus the *low* ($n = 11$) use group. The likelihood of being an "active couch potato" was significantly ($\chi2 = 11.0$, $p = 0.01$) associated with cell phone use. Specifically, individuals in the *moderate* and *high* cell phone use groups were 2.3 and 3.5 times more likely (Wald ≥ 3.9, $p < 0.05$), respectively, to be an active couch potato than *low* users.
CONCLUSION: Among a sample of college students, *moderate* and *high* cell phone users were significantly more likely to being categorized as "active couch potatoes" than their *low* use peers.

1332   Board #140   May 31 9:00 AM - 10:30 AM

Motivations for Moving: An Analysis of Physical Activity in Residential College Students

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(No relevant relationships reported)

Physical activity (PA) habits developed in college can have health effects that extend well into adulthood. **PURPOSE**: To examine the relationship between social and ecological determinants of PA in residential college students. **METHODS**: A random sample of 162 students from a liberal arts college was surveyed. A 35-question web survey was used to collect data about on-campus residence, demographics, access to walking resources pre-college, knowledge and use of the college PA resources, and PA patterns. A hot spot analysis was conducted to determine geographic patterns of PA level or use of PA resources. The Wilcoxon signed-rank test was used to compare median energy expenditure (METs) per week between demographic groups. Multiple linear regression was used to find predictors of log METs per week based on demographic groups that were found to have significantly different median METs per week; a log transformation was used to correct for a skewed distribution. Logistic regression was used to find predictors of respondents having used the cardiovascular exercise room (CR). **RESULTS**: Residence halls and apartments closest to the CR were more likely to have residents who had used the CR. Having used the CR was significantly positively related to log METs (p<.05). There was a trend for a positive relationship (p=.055) between having used the racquetball courts and log METs and a trend for a negative relationship (p=.054) for having access to walking resources before attending the college and log METs. Holding other variables constant, the odds of having used the CR were 15% higher among respondents who lived in apartments (beta=.16, odds=1.17) vs. those who lived in residence halls, 50% higher among respondents who had used the weight room (beta=.41, odds=1.50), 58% higher among only white respondents (beta=.46, odds=1.58) vs. non-white respondents, 67% higher

among multiracial white respondents (beta=.51, odds=1.67) vs. non-white respondents, and 15% higher among respondents who had not used exercise equipment in the residence halls (=.14, odds=1.15). **CONCLUSIONS**: Colleges may be able to enhance participation in PA by providing well-distributed resources throughout campuses. Colleges should be aware that social and ecological factors may also influence PA and associated health benefits.

1333   Board #141   May 31 9:00 AM - 10:30 AM
An Examination of Obligatory Exercise, Eating Attitudes, and Perceived Body Image Among Collegiate Males and Females

Cherilyn McLester, Bethany Wheeler, Emily Bechke, Cassie Williamson, John R. McLester, FACSM. *Kennesaw State University, Kennesaw, GA.* (Sponsor: John R. McLester, FACSM)
(No relevant relationships reported)

Eating and exercise behaviors among college students remains an area of interest as habits formed during these years may affect future behavior. Additionally, individuals who engage in extreme eating and exercise behaviors may be at risk for compromised health and well-being. **PURPOSE:** To investigate the relationship between obligatory exercise, eating attitudes, and perceived body image among collegiate males and females. **METHODS:** 222 females aged 20.1 ± 1.9 yrs, and 136 males aged 20.1 ± 2.2 yrs voluntarily completed a demographic questionnaire, the Obligatory Exercise Questionnaire (OEQ), Compulsive Exercise Teat (CET), Social Physique Anxiety Scale (SPAS), and the Eating Attitudes Test (EAT). Variables were analyzed with one-way ANOVA and Pearson product coefficient correlations. **RESULTS:** Overall 15% of women and 6% of men scored higher than 20 on the EAT indicating a high level of concern about dieting, body weight or eating behaviors where counseling is recommended. One-way ANOVA revealed that men were more obligated to exercise than women (47.7 ± 8.4 vs. 44.7 ± 9.3, p = 0.004), men had lower SPAS scores compared to women (28.7 ± 10.9 vs. 36.5 ± 11.3, p < 0.001), and men had lower scores on the EAT (7.2 ± 6.3 vs. 10.5 ± 9.3, p < 0.001). Correlations by sex revealed that men had a significant correlation for OEQ and CET (r = 0.618, p < 0.001), CET and EAT (r = 0.313, p < 0.001), and SPAS and EAT (r = 0.234, p = 0.007). Women had a significant correlation for OEQ and CET (r = 0.685, p < 0.001), OEQ and EAT (r = 0.261, p < 0.001), SPAS and CET (r = 0.328, p < 0.001), SPAS and EAT (r = 0.490, p < 0.001), and CET and EAT (r = 0.446, p < 0.001). **CONCLUSION:** While it may appear that a low percentage of participants had concerning scores on the EAT, this sample indicated that approximately 1 in 10 college students may need proper counseling in this area. Although women were more likely to have higher scores on EAT and SPAS, both males and females demonstrated relationships between OEQ, CET, SPAS, and EAT. Further investigation is warranted to determine the extent of these relationships and to possibly use these data to direct health and wellness initiatives on campuses to best serve young adults.

C-41   Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity in Youth and Teens

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1334   Board #142   May 31 9:00 AM - 10:30 AM
Understanding the Relation Between Physical Fitness and Executive Function among Adolescents: An Expectancy-value Approach

Xiaoxia Zhang, Joonyoung Lee, Georgina Vint, Xiangli Gu, Tao Zhang. *University of North Texas, Denton, TX.*
(No relevant relationships reported)

Research indicated that maintaining adequate physical fitness may benefit cognitive health among adolescents. It was noticed that psychosocial process may be the underlying mechanism to understand cognitive health (Lubans et al., 2016). Current literature has no sufficient evidence to conclude the responsible mechanism to cognitive health.
PURPOSE: Guided by expectancy-value theory (Eccles et al., 1983), this study was to explore how psychosocial process (i.e., expectancy-value beliefs) interact with fitness components (i.e., cardiovascular fitness, muscular fitness, flexibility, and body mass index [BMI]) to affect cognitive health (i.e., executive function) among adolescents. The direct and indirect effects of expectancy-value beliefs on executive function through fitness were tested.
METHODS: Participants were adolescents ($N = 424$; 58% female; $M_{age} = 12.7$, $SD = .93$) recruited from Southwest region of the U.S. to complete this cross-sectional study.

FITNESSGRAM® test battery was utilized to measure fitness components. Participants self-reported their expectancy-value beliefs (Xiang et al., 2003). The Behavior Rating Inventory of Executive Function–Self-Report Form (BRIEF-SR®, Guy et al., 2004) was used to assess executive function. Higher scores of BRIEF-SR® indicate lower executive function.
RESULTS: Correlation analysis demonstrated that expectancy-value beliefs were significantly related to each component of physical fitness. Cardiovascular fitness and muscular fitness were negatively associated with executive function, while BMI was positively correlated with executive function. The structural equation modelling (AMOS 22.0) supported the significant indirect effect of expectancy-value beliefs on executive function ($\beta = -.11$) through physical fitness ($\chi^2/df = 284.16/113$, p < .001; NFI = .85; IFI = .90; CFI = .90; RMSEA = .06; 90% CI [.05, .07]). The variance explained by the model was 12% for physical fitness and 9% for executive function.
CONCLUSION: The findings support the psychosocial mechanism towards adolescents' cognitive function proposed by Lubans et al.'s conceptual model (2016). School-based interventions focused on building perceived confidence and values may directly augment physical fitness and may serve to enhance executive function during adolescence.

1335   Board #143   May 31 9:00 AM - 10:30 AM
School'S Physical Environment And Children'S Physical Activity Self-efficacy

Maria E. Santiago-Rodriguez[1], Mercedes Rivera[2], Farah A. Ramirez-Marrero, FACSM[2]. *[1]University of Illinois at Chicago, Chicago, IL. [2]University of Puerto Rico, Rio Piedras, PR.*
(No relevant relationships reported)

Physical activity self-efficacy (PASE) and the school's physical environment (SPE) can influence children's moderate-to-vigorous physical activity (MVPA) participation. However, the association between PASE and the SPE has not been clearly established in this population. **PURPOSE**: To evaluate the relationship between PASE and SPE among elementary school children in Puerto Rico. **METHODS**: Sixty-eight girls and 63 boys (age= 7.8 ± 0.7 years) completed a questionnaire to assess PASE by interview. SPE was evaluated taking into consideration the physical education class, recess time, and use of facilities that promoted PA. Time in physical education and recess was provided by the school's administration. To determine the use of facilities, a score was generated based on self-reported activities and time spent in each. Children wore a GT3X+ accelerometer during 5 consecutive school days to determine MVPA and sedentary time (ST) during school time. MVPA and ST data was included if participants wore accelerometers ≥ 3 school days for ≥ 3 hr/day. Correlation analysis was conducted to test the relationship between the use of facilities and PASE. Mann-Whitney U-test was conducted to test the difference in PASE by recess time and Kruskal-Wallis test was used to evaluate difference in PASE by physical education time. Secondary correlation analyses were conducted to test the relationship between 1) PASE and MVPA (min/wk); and 2) PASE and ST (hr/wk). **RESULTS**: Participants accumulated 110.94 ± 21.81 min/wk in MVPA, and 3.48 ± 0.48 hr/wk in ST. No significant correlations were observed between: 1) use of facilities and PASE ($r_s = 0.122$, p = 0.22); 2) PASE and MVPA ($r_s = 0.010$, p = 0.91); and 3) PASE and ST ($r_s = 0.068$, p = 0.45). No significant differences were found in PASE by recess time (U = 1815.00, p = 0.86) and by physical education time (H(2) = 0.830, p = 0.66). **CONCLUSIONS**: School time allowed participants to comply with one fourth of the PA recommendation (60 min/day ≈ 420 min/wk). Lack of relationship between SPE and PASE could be explained by an overall high PA self-efficacy score, which requires further investigation. Funded by University of PR -FIPI Institutional Grant.

1336   Board #144   May 31 9:00 AM - 10:30 AM
Childhood Experiences in Physical Education May Have Long-term Implications

Matthew A. Ladwig, Panteleimon Ekkekakis, FACSM, Spyridoula Vazou. *Iowa State University, Ames, IA.*
(No relevant relationships reported)

PURPOSE: The transition from childhood to adolescence is marked by a dramatic decrease in physical activity (PA). While many mediating factors have been suggested to explain this drop, one of the most influential may be the experiences children derive from physical education (PE). Scholars have been voicing concerns about the potential long-term implications of early PE experiences for nearly 100 years. However, there has been surprisingly little empirical investigation into this subject. Using a retrospective survey, we examined whether memories of enjoyment or non-enjoyment of PE relate to present-day attitudes and intentions for PA, and PA participation, among adults. **METHODS**: An online questionnaire was completed by 1,028 adult respondents (18-45 years), representing 47 of the 48 contiguous United States. The participants rated their retrospective enjoyment of PE and their present attitudes and intentions for PA, as well as their present PA and sedentary behavior. In addition, participants recorded their best and worst PE memories in an open-ended fashion. **RESULTS**: Retrospective enjoyment of PE as a child was significantly and positively associated with present-day attitude ($r = .37$) and intention ($r = .23$) for PA, days per

week engaging in vigorous-intensity PA (r = .11) and moderate-intensity PA (r = .13), as well as negatively associated with sedentary time both on the weekdays (r = -.13) and on the weekend (r = -.14). Of the worst memories, 34% related to embarrassment during PE, 18% to lack of enjoyment, 17% to bullying, 14% to social-physique anxiety, 16% to injury, and 2% to being punished by the PE teacher. "Worst" memories increased sharply between 6th and 10th grades. Notably, participants reported being ridiculed by teachers or peers and feeling that they lacked physical competence for the sport or fitness tests. **CONCLUSIONS**: An important relationship may exist between childhood memories of PE and present-day PA attitude and behavior as an adult. As also demonstrated in other domains of development, negative PE experiences during childhood may be influential throughout the lifetime. Intensified research efforts should be directed toward understanding the factors and processes that lead to the formation of negative memories of PE.

1337   Board #145   May 31 9:00 AM - 10:30 AM

Weight Dependent Disparities in Adolescent Girls: The Impact of Brief Interventions on Exercise and Healthy Eater Identity

Eydie N. Kramer, Daheia J. Barr-Anderson, FACSM. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

Adolescents girls report low efficacy in healthy behavior engagement, and are disproportionately affected by obesity. Short-term interventions, such as behavior change summer camps, may positively influence psychological correlates of healthy behavior, particularly Exercise Identity (EI) and Healthy Eater Identity (HEI). However, previous studies lack family involvement, and do not take into consideration potential disparities in EI and HEI based upon weight status (healthy vs. obese).
PURPOSE: To determine if the combination of a 1-week intervention and an 8-week family-oriented eHealth program will increase EI, HEI, and subsequent healthy behaviors in adolescent girls. Additionally, we sought to determine if EI and HEI scores differ between normal-weight and obese groups.
METHODS: Twenty-one participants (age=11.3±1.0 years, BMI=20.2±6.4 kg/m^2) were recruited from a prevention camp (no BMI inclusion criteria), and twenty participants (age=12.4±1.5 years, BMI=31.6±6.6 kg/m^2) were from a treatment camp (elevated BMI inclusion criteria). Both camps ran 1-week in duration, and had similar intervention components. Participants self-reported EI, HEI, physical activity, screen-time, and dietary behavior at baseline and post-intervention. All families were given access to an 8-week eHealth program, and measures were repeated three months following camp.
RESULTS: EI and HEI role-identities significantly differed between the prevention and treatment groups at baseline (ΔEI=4.0, p=0.007; ΔHEI=4.5, p=0.001). Positive trends in increasing EI and HEI scores were seen in both groups following the 1-week intervention; however, mean role-identity disparities remained between groups. Participation in the eHealth program was low-moderate. At follow-up, the treatment group had increased EI and HEI role-identities in such that the groups no longer significantly differed (ΔEI=3.2 p=0.161; ΔHEI=1.5, p=0.464). Minimal changes in health behaviors were experienced in each group.
CONCLUSION: Findings indicate that EI and HEI role-identities may differ in adolescent girls based upon weight status; 1-week interventions may positively influence EI and HEI, mitigating these differences. Further investigation is warranted to address eHealth compliance, and subsequent changes in health behavior.

1338   Board #146   May 31 9:00 AM - 10:30 AM

Positive Body Image And Compliance With Physical Activity Recommendations Across Physical Activity Contexts In Adolescents

Christine Sundgot-Borgen[1], Kethe M.E Engen[1], Jan H. Rosenvinge[2], Gunn Pettersen[2], Oddgeir Friborg[2], Monica K. Torstveit[3], Elin Kolle[1], Jorunn Sundgot-Borgen, FACSM[1], Solfrid Bratland-Sanda[4]. *[1]Norwegian School of Sport Sciences, Oslo, Norway. [2]UiT -The Arctic University of Norway, Tromsø, Norway. [3]University of Agder, Kristiansand, Norway. [4]University College of Southeast Norway, Bø, Norway.* (Sponsor: Jorunn Sundgot-Borgen, FACSM)
(No relevant relationships reported)

Introduction: Being physically active is associated with a positive body image (PBI). Gyms offer a popular physical activity (PA) context for adolescents, and such contexts may motivate adolescents to meet PA recommendations. However, it has been suggested that exercising at gyms has been associated with a negative body image, i.e. unhealthy appearance and body composition focus. It is however, unknown whether gyms as opposed to a context of organized sports or a non-member context is differently associated with body image and PA recommendations for adolescents. **Purpose:** To investigate 1) the degree of PBI in different PA contexts and 2) if the criteria for PA recommendations are met in the different PA context groups. **Methods:** Baseline data was used from an ongoing RCT aiming to promote

PBI and prevent disordered eating among high-school students in Norway. Students aged 16-17 years (630 boys and 1073 girls) with BMI values within normal range completed the Experience of Embodiment Scale (EES) measuring PBI (score range 34-170). PA context (gym, organized sports, mixed and non-members) and meeting PA recommendations (PA ≥7 hours/week) or not (PA<7 hours/week) were assessed. ANOVA was used to investigate group differences in EES score.
Results:
Table 1: Mean PBI scores (SD) between PA contexts and compliance with PA recommendations.

Context	PBI (SD)	Meeting criteria	PBI (SD)	Meeting criteria
	BOYS		GIRLS	
Non-member	117.00 (18.4)*	No	112.00 (18.4)	No
Organized sport	125.00 (16.1)	Yes	117.93 (17.1)*	Yes
Gym	124.33 (16.2)	Yes	112.74 (19.2)	No
Mixed	126.04 (15.6)	Yes	112.30 (18.8)	Yes

* Differed significantly (p < .001) from other groups.
"Non-member" boys had a significantly lower PBI score than boys in other PA contexts. Girls in organized sports had a significantly higher PBI score than girls in other PA contexts.
Conclusion: For boys and girls, being a non-member, and for girls, being a gym member, are associated with not meeting PA recommendations. Further research is needed to validate these findings. The fact that non-members in agencies that offer organized PA display a low degree of PBI and not meeting PA recommendations is a matter of societal concern in the pursuit of promoting physical and mental health as well as PBI.

1339   Board #147   May 31 9:00 AM - 10:30 AM

Exploring Predictors of Concussion Concerns in Youth Sport Parents

Nathan D'Amico[1], RJ Elbin[1], Philip Schatz[2], Anthony Kontos[3]. *[1]University of Arkansas, Fayetteville, AR. [2]Saint Joseph's University, Philadelphia, PA. [3]University of Pittsburgh Medical Center, Pittsburgh, PA.* (Sponsor: Dr. Matthew Ganio, FACSM)
(No relevant relationships reported)

PURPOSE: To explore predictors of parental concerns about sport-related concussion (SRC) and chronic traumatic encephalopathy (CTE). **METHODS:** A 22-item online survey was emailed to 5,366 youth sport parents, assessing parents' perceptions of the long-term effects of SRC and CTE. A series of chi-squares, odds ratios (ORs), and logistic regressions (LRs) were used to analyze the data. **RESULTS:** Total response rate was 14% (739/5,366). Parents that were ≥ 18 years, had a child aged 5-12 years, and did not have a child that currently played football were included, resulting in 434 (8%) respondents. The parents were 42 ± 4.82 years, 64% (277/432) female, and the majority did not report SRC history (83%, 358/434). Their children were 9 ± 2.13 years and the majority did not have a SRC history (78%, 335/431). Key findings include: 60% (257/431) of the respondents perceive SRC as a problem in youth sports. 39% (163/416) have attended a SRC talk, 72% (297/415) have talked with their child about SRC, 77% (320/418) are concerned that their child will get a SRC, 96% (403/418) believe there are long-term effects from SRC, 45% (186/418) claim to know about CTE, and 41% (172/418) have considered not allowing their child to play youth sports due to concerns about long-term effects of SRC or CTE. Respondents were more likely to consider not allowing their child to play youth sports if their child had a SRC history (OR=1.93, p=.005), thought SRC was a problem (OR=1.54, p=.03), and were concerned their child might have a SRC (OR=1.92, p=.008). Respondents' gender, SRC history, attendance at a concussion talk, and knowledge about CTE were not significant predictors of not allowing their child to play youth sports. Results of the LR (X^2 (3, N= 414) = 12.829, p<.001) for predictors of not allowing their child to play youth sports were significant, with child SRC history as the only significant predictor in the model (adjusted OR=1.72, p=.04). **CONCLUSION:** A majority of parents perceive long-term effects from SRC to be a problem and are concerned about CTE. A child's SRC history and parental concerns about SRC influence decisions to allow youth sport participation. There is a need for accurate information on the benefits/risks of youth sports, factors that influence parents' concerns about SRC and CTE, and decisions to allow their children to play youth sports.

1340 Board #148 May 31 9:00 AM - 10:30 AM

Understanding Mothers And Daughters Physical And Emotional Health

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(No relevant relationships reported)

Compared to boys, adolescent girls have a higher prevalence of obesity, are more sedentary, and suffer more from psychosocial distress. It has been theorized that girls imitate their mothers' body image concerns and physical activity habits. **PURPOSE:** The aim of this study was to explore the relationship between adolescent girls' and mothers' perceived physical and emotional health. **METHODS:** Adolescent girls (N = 44) and their mothers (N = 19) participated in seven and four focus groups, respectively. Each focus group lasted 30-45 minutes and included an average of six and five participants for girls and mothers, respectively. Questions focused on physical activity behaviors of mothers and daughters as well as their perceptions of body image and self-esteem. The focus groups were analyzed using "Framework Analysis". Intercoder reliability was addressed through an iterative coding process (initial coding, code modification, recoding) whereby three of the authors developed and agreed upon the codes and subsequent collapsed themes. **RESULTS:** The thematic analysis resulted in four major themes and five subthemes: 1) Health related conversations are complex and result in a) daughters feeling frustrated and b) mothers feeling confused, 2) Social expectations influence body image through a) social networks and b) women's changing bodies, 3) Social comparison is common in women and girls in a) their comparison of one another which b)influences the daughter's perception of herself, and 4) Mothers' health behaviors are noticed by daughters who report very little physical activity participation with mothers. **CONCLUSION:** Results from this study highlight the type of health communication that mothers and daughters perceive as most challenging; daughters struggled with indirect conversations with their moms about health, whereas their mothers struggled with direct communication about health. Potential implications of this research include the support for targeting mothers, in addition to adolescent girls, in interventions aimed at improving mother-daughter communication as well as adolescent girls' health. Other possible implications include targeting psychosocial health (e.g., body image) and including a mothers' educational component for programs aimed at improving adolescent girls' health.

1341 Board #149 May 31 9:00 AM - 10:30 AM

Physical Activity and Play Behaviors during Indoor and Outdoor Free Play in Toddlers

Tyler Kybartas, Jake T. Ramsey, Dawn P. Coe, FACSM. University of Tennessee, Knoxville, TN.
(No relevant relationships reported)

Young children should be provided with physical activity (PA) opportunities that promote both skill and cognitive development. Unstructured free play, both indoors and outdoors, allows young children to accumulate PA while engaging in diverse types of play behaviors, which include social and cognitive components. Cognitive play behaviors focus on the purpose of the children's activity and are classified as constructive, dramatic, exploratory, functional, and game play. **PURPOSE:** To determine PA levels and cognitive play behaviors in toddlers during indoor and outdoor free play time. **METHODS:** Participants were 25 toddlers (2.9±0.6y) enrolled in a university laboratory school, who were observed for four 20-min free play segments (2 indoor and 2 outdoor). PA was assessed using the ActiGraph GT3X+ accelerometer worn on the right hip. Each free play assessment was video recorded for analysis using the Noldus Observer XT system. The Play Observation Scale was used to classify cognitive play behaviors (constructive, dramatic, exploratory, functional, and game). The percentage of time spent in each play behavior was averaged for indoor and outdoor segments. Paired samples t-tests were used to determine differences in mean vector magnitude (VM; counts/15sec) between environments (indoors and outdoors). A 2X5 repeated measures ANOVA was used to determine the main effects of environment (indoor, outdoor) and play behavior (constructive, dramatic, exploratory, functional, game) and the interaction between these variables. **RESULTS:** There were no differences in VM counts between indoors and outdoors (541±173 vs. 657±327 counts/15sec, $p>0.05$). A significant interaction ($p<0.05$) was found between the environment and play behavior. Compared to outdoors, the participants engaged in 8.5% and 8.9%, more time in constructive and dramatic play, respectively, indoors ($p<0.05$). The children engaged in 1.4% more time in exploratory play ($p<0.05$) outdoors compared to indoors. There were no differences in percent time spent in functional (6.3%) and game (2.3%) play between environments ($p>0.05$). **CONCLUSIONS:** While there were no differences in VM counts, it appears that environment has an impact on the type of play behaviors children engage in. Indoor and outdoor play opportunities may encourage a variety of play behaviors.

1342 Board #150 May 31 9:00 AM - 10:30 AM

Activity Type, Play Context, and Group Composition during Indoor and Outdoor Free Play in Toddlers

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(No relevant relationships reported)

PURPOSE: To determine the type of physical activity (PA), play context, and group composition in toddlers during indoor and outdoor free play time. **METHODS:** Twenty-five toddlers (2.9±0.6y; 12 male) were video-recorded during four 20-minute free play segments (2 indoor and 2 outdoor). Each free play assessment was coded for type of PA, play context, and group composition using the Noldus Observer XT system and the percentage of time spent in each variable was averaged for indoor and outdoor segments. The Observational System for Recording Physical Activity in Children – Preschool (OSRAC-P) was used to classify the type of PA and play context. The three most common PA types (sit/squat, stand, and walk), indoor (transition, manipulatives, and sociodramatic), and outdoor (open space, portable equipment, and fixed equipment) contexts were included in the analyses. Group composition (solitary, parallel, or group) was assessed using the Play Observation Scale. Multiple repeated measures ANOVAs with post hoc analysis (LSD) were used to determine the effects of environment (indoors vs. outdoors) and PA type, environment and context, and environment and group composition as well as any interactions among these variables. **RESULTS:** The children spent 5.6% more time walking outdoors and 15.5% more time sitting/squatting indoors ($p<0.05$). The children spent less time on fixed equipment and in sociodramatic play compared to using manipulatives/portable equipment (13.7%) and transitioning or being in an open space (9.9%; $p<0.05$). Finally, the participants engaged in 13.5% more parallel and 11.1% more group play compared to solitary play ($p<0.05$). **CONCLUSION:** The type of PA varied by environment and consisted primarily of sitting/squatting, standing, and walking. The contexts were similar despite differing environments. The children spent most of their time transitioning and in open spaces and playing with manipulatives or portable equipment and playing with or in close proximity to other children. These results provide insight into children's play and PA choices during indoor and outdoor free time.

1343 Board #151 May 31 9:00 AM - 10:30 AM

Youth Sport Coaches Perceptions and Prioritization of Sport Safety

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(No relevant relationships reported)

Youth sport coaches set the stage for athletes' and parents' future sport involvement, experiences, and perceptions as well as attitudes toward playing safely. If youth level coaches do not see safety as a priority, athletes and parents may not either. **PURPOSE:** To determine youth sport coaches' safety perceptions and prioritization. **METHODS:** Youth sport coaches (males: n=28; females: n=2; age=46.2±12.1yrs; yrs coached=12.1±10.6) from 10 sports completed a validated survey and participated in a qualitative focus group (FG) examining prioritization, challenges, and barriers related to implementing safety policies. Coaches reported their agreement level (1-strongly disagree to 5-strongly agree) with statements about their perceptions of sport culture, education, and preparation. Descriptive statistics described each factor's agreement. Data were analyzed separately then triangulated. **RESULTS:** 97% of youth sport coaches agreed/strongly agreed that sport safety is important (n=29, 4.3±0.5), although only 77% actually make safety a priority within their sport (n=23, 3.9±0.9). Less mean agreement existed in league mandates including: coach safety education (3.8±0.9), emergency action plans (EAP) (3.2±1.1), coaches' EAP awareness (2.7±1.0, range=1-5), concussion management policies (CMP) (3.4±1.0), coaches' CMP awareness (3.1±1.0), and being encouraged to share safety information (3.8±0.9). Challenges to implementing sport safety include: parental involvement, education, sport culture and tradition, win-at-all-costs mentality, athlete physical development, lacking medical personnel, and time. These findings are reinforced qualitatively by three main FG themes affecting youth sport safety and culture including education and athlete development, others' influence and expectations, and sport safety overall. **CONCLUSION:** These data suggest a gap among youth sport coaches who think sport safety is important at the youth level versus those who actually make it a priority. Some challenges they experience with implementation may provide future targets for sport safety initiatives at the youth level. By targeting these challenges, we can minimize the gap between importance and prioritization. Supported in part by a UNC-Chapel Hill Junior Faculty Development Award

1344   Board #152   May 31 9:00 AM - 10:30 AM

Relationships among Weight Perception, Exercise Behaviors and Physical Fitness in Korean Elementary School Children

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(No relevant relationships reported)

PURPOSE: This study evaluated whether young children perceive their body weight correctly, and to investigate relationships among weight perception, exercise behavior and physical fitness in elementary school children.
METHODS: We recruited 200 boys (9±1 yrs, 138±6 cm, 37±10 kg, 19±4 kg/m²) and 197 girls (9±1 yrs, 138±6 cm, 36±9 kg, 19±3 kg/m²). Their physical fitness such as endurance shuttle run (63±26 vs. 51±20 laps), sit-and-reach (5.8±6.5 vs. 8.8±5.6 cm), grip strength (15±3 vs. 14±3 kg), and standing long jump (137±21 vs. 123±21 cm for boys vs. girls) were measured. They responded to a questionnaire reporting weight perception, exercise participation, physical activity time, physical activity preference. Their relative weight status (BMI percentile) was categorized as; underweight (<5%, UW), normal weight (5-85%, NW), and overweight/obese (85%<, OW). Data analyses were performed using Chi-square test, Fisher's exact test, Independent t-test and One-way ANOVA.
RESULTS: More than one third (36.8%) of children misperceived their body weight compared with the actual weight. In particular, body weight misperception rate was higher in NW than UW and OW. Girls considered themselves more to be overweight while boys did more to be underweight. Physical activity time and physical activity preference were not related to weight perception. Exercise participation showed differences according to gender. Physical fitness level was related to exercise behaviors. Physical fitness was higher for children who liked to exercise or were being active than those who were not. Endurance run and standing long jump were more strongly associated with physical activity preference than physical activity time, and a dose-response relationship was observed.
CONCLUSIONS: Overall, weight perception of the children was not quite accurate when compared with their actual body weight. However, there was no difference in exercise behaviors according to weight perception. Physical fitness level was associated with exercise behaviors. Endurance run and standing long jump were more strongly associated with physical activity preference than physical activity time(NRF-2013M3C8A2A02078508).

1345   Board #153   May 31 9:00 AM - 10:30 AM

The Effect Of Goal Structure On Vo₂ And Motivation In 6-10 Year Old Children During Exergame Play.

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(No relevant relationships reported)

Previous research has examined contexts which may promote playing physically interactive video games (exergames) in place of traditional, sedentary video games in children. In one such study the presence of a friend did not increase children's motivation to play an exergame versus a sedentary alternative. This lack of an effect may have been due to the competitive goal structure of the exergame studied. Children may prefer a cooperative game structure when playing with a friend. **PURPOSE:** To examine physiologic response and relative reinforcing value (RRV, i.e., motivation) for playing an exergame with a friend under two different goal structures: competitive and cooperative. **METHODS:** Participants ($N = 7$, 7.9 ± 1.5 years old) and a same-sex friend each completed three, 10-minute conditions: supine rest, competitive, and cooperative game play. During competitive game play, participants played Nintendo Wii Tennis against their friend. During the cooperative condition, subjects and their friend played together against a computer avatar. During each 10 minute session oxygen consumption (VO_2 ml·kg⁻¹·min⁻¹) was recorded and children reported their liking, via visual analog scale, for that condition. After completing all three conditions, children completed an RRV computer task to assess their motivation to play the competitive versus cooperative goal structures. During the task children performed work (button presses) to gain access to competitive play, cooperative play or a combination of the two. The output maximum (O_{max}) or maximum amount of work (presses) for each goal structure was used as the measure of RRV. **RESULTS:** VO_2 was significantly ($p \le 0.009$) greater for cooperative (8.88 ± 3.29 ml·kg⁻¹·min⁻¹) and competitive (10.24 ± 3.24 ml·kg⁻¹·min⁻¹) game play than the resting condition (5.75 ± 1.59ml·kg⁻¹·min⁻¹). Liking was also significantly ($p \le 0.004$) greater for cooperative (8.92 ± 2.03 cm) and competitive (8.59 ± 2.39 cm) game play than rest (3.07 ± 2.59 cm). There were no differences ($p > 0.05$) between cooperative and competitive game play for: VO_2, liking, or O_{max}. **CONCLUSION:** In children, VO_2 and liking were both greater during exergame play versus the resting condition. However, motivation to play the competitive and cooperative game structures was not significantly different.

1346   Board #154   May 31 9:00 AM - 10:30 AM

Using Self-determination Health Behavior Model To Examine Adolescents' Need Support, Need Satisfaction, And Health-related Outcomes

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(No relevant relationships reported)

Given the fact that adolescence is a critical period for establishing independent healthy lifestyle, the prevalence of physical inactivity and mental health problems should be addressed (Cai et al., 2017). Research has indicated that health-related behaviors can be promoted by satisfying individuals' basic psychological needs if we create a need-supportive social environment (Ryan & Deci, 2017). Thus, it is essential to investigate the relations among need support, need satisfaction, physical activity, and health outcomes among adolescents. **PURPOSE:** Guided by self-determination health behavior model (Ryan et al., 2008), the aim of this study was to examine the relations between perceived need support, need satisfaction, and health-related outcomes (i.e., physical activity and well-being) among middle school adolescents in China. **METHODS:** Participants were adolescents ($N = 300$; 50.3% female; $M_{age} = 14.48$) recruited from five middle schools in Shanghai, China. In this cross-sectional study, participants completed previously validated questionnaires assessing their perceived need support from PE teachers (i.e., autonomy support, competence support, and relatedness support), need satisfaction (i.e., autonomy, competence, and relatedness), physical activity, and well-being. **RESULTS:** Correlation analysis revealed significant positive associations among need support, need satisfaction, physical activity, and well-being (rs ranged from .15 to .82). The structural equation modelling (AMOS 22.0) supported the hypothesized model with a good fit to the data ($\chi^2/df = 58.08/18$, p < .001; NFI = .95; IFI = .97; CFI = .97; RMSEA = .09; 90% CI [.06, .11]). The need support had a large influence on need satisfaction (β = .80), and need satisfaction also had a significant contribution on health-related outcomes including physical activity and well-being (β = .89). **CONCLUSION:** The findings highlighted the importance of need-supportive environments, and supported the theoretical tenets of self-determination health behavior model and its generalizability among Chinese adolescents. To maintain adolescent's healthy lifestyle, school teachers and health professionals need to create a need-supportive environment to enhance adolescents' need satisfaction and health-related outcomes during adolescence.

1347   Board #155   May 31 9:00 AM - 10:30 AM

Physical Literacy, Anxiety, And Depression In Sixth-grade Physical Education Students

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(No relevant relationships reported)

In the past decade, physical literacy has been given increased research attention among educational organizations and researchers (Edwards et al., 2017). Physically literate individuals are said to have the ability, confidence, and desire to be physically active for life (SHAPE America, 2014). Though relationships among physical activity, anxiety, and depression are well-established, relationships among physical literacy, anxiety, and depression have yet been explored. **PURPOSE**: To investigate the relationships among physical literacy, anxiety, and depression in early adolescents. **METHODS**: Participants were 419 sixth-grade physical education students (58% female; $M_{age} = 11.51 \pm 0.5$ years) from two public middle schools located in Southwestern United States. To assess physical literacy, anxiety, and depression, participants completed the PE Metrics® Overhand Throwing (SHAPE America, 2010), FITNESSGRAM® (The Cooper Institute, 2013), and Plank (NHANES, 2012) assessments, as well as three brief surveys assessing self-efficacy (Gao, Newton, & Carson, 2008), intrinsic motivation (Ryan & Connell, 1989), self-esteem (Harter, 2012), knowledge and understanding (Healthy Active Living and Obesity Research Group, 2013), and anxiety and depression (Lovibond & Lovibond, 1995). Structural Equation Modeling was used to investigate the fit of the measurement and structural models of the factors and the proposed relationships. **RESULTS**: Analyses revealed good model fit for the physical literacy, $\chi^2(167) = 343.38$, $p < .01$, RMSEA = .05, CFI = .96, SRMR = .07, and the anxiety and depression measurement models, $\chi^2(34) = 73.72$, $p < .01$, RMSEA = .05, CFI = .95, SRMR = .05. Physical literacy was variant between sexes; thus, boys' and girls' data were analyzed separately. Analyses indicated physical literacy was negatively related to anxiety (γ = -.41, $p < .01$) and depression (γ = -.38, $p < .01$) with female and male data (γ = -.20, $p < .01$; γ = -.22, $p < .01$, respectively). **CONCLUSION**: In both female and male six-grade physical education students, higher physical literacy related to lower levels of anxiety and depressive symptomologies. These results were consistent with previous research that suggests increasing physical literacy in children may improve psychological well-being (Olive, Telford, Telford, & Byrne, 2015).

1348   Board #156   May 31 9:00 AM - 10:30 AM

Learning Through Play: Positive Effects Of Active Playing On Cognition In Children

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(No relevant relationships reported)

The utility of physical activity, fitness to improve cognition and academic achievement is important to make pleasant learning disturbs and difficulties. **PURPOSE**: To verify the effects of three months of interdisciplinary physical education program on academic achievement and selective attention in children. **METHODS**: 60 boys and girls from 4th grade of public elementary brazilian school, underwent a Education by Movement group (EduMove) (n=39, 9.7±yr; 31.6 ± 6.2 kg; 1.4 ± 0.1 m; 17.9 ± 7.2 %body fat) with math, written and reading classes through physical education activities during a school journey (172.8±16.31bpm) (60min each class, twice a week), and a control group (Con) (n=21, 9.9±0.8yr; 30.0 ± 5.1 kg; 1.4 ± 0.1 m; 17.1 ± 8.6 %body fat) which participated at traditional classes (92.4±8.9bpm). Children performed an academic achievement standardized test (reading, writing and math), selective attention test (Stroop Go/NoGo) and anthropometric measures before and after three months. **RESULTS**: ANOVA revealed tricipital skinfold reduction for EduMove in comparison with CON at post test (11.8 ± 5.6 vs 12.7 ± 5.3; p=0.008), it was observed higher physical activity level for EduMovi vs CON (Δ 23.3 vs 2.9 METs; p=0.09). Children showed better results at reading capacity for EduMovi vs CON (65.2 ± 4.9 vs 64.7 ± 3.0; p=0.038). Regarding selective attention EduMovi was faster and committed less mistakes in comparison with pre test (236.1 ± 39.9 vs 327.9 ± 45.88 ms/%, Δ -90ms e -2% of mistakes p=0.09). **CONCLUSIONS**: A short term interdisciplinary physical education program can improve reading capacity, and selective attention in children. These results may suggest that activity breaks during a school journey could contributing to learning.

1349   Board #157   May 31 9:00 AM - 10:30 AM

High School Adolescents' Physical Activity and Physical Fitness: A 3 × 2 Achievement Goal Approach

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(No relevant relationships reported)

Previous research has showed the majority of high school adolescents are not physically active and fit (CDC, 2010). The literature indicates that individuals' goal orientations would influence their healthy behavior (Elliot et al., 1999). The 3 × 2 Achievement Goal Model aims to understand individuals' six goal orientations (i.e., task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance; Elliot et al., 2011). Therefore, it is important to identify high school adolescents' goal orientations toward their physical activity and fitness. **PURPOSE:** Guided by 3 × 2 achievement goal approach, this study attempted to examine the relations between six goal orientations, physical activity, and physical fitness among high school adolescents. **METHODS:** Participants were 792 adolescents (360 males, 432 females; M_{age} = 16.9) recruited from four high schools in Shanghai, China. They completed previously validated survey to measure their 3 × 2 goal orientations (Elliot et al., 2011), physical activity (Kowalski et al., 1997), and physical fitness (i.e., 50-meter run and standing long jump). **RESULTS:** Correlation analysis demonstrated that task-, self-, and other-approach goals were significantly correlated to physical activity and fitness (rs ranged from -.10 to .27). While task-, self-, and other-avoidance goals were positively related to physical activity (rs ranged from .10 to .13), they were not significantly associated with physical fitness. The results of three multiple regressions revealed that other-approach goal (β = .19), self-approach goal (β = .18), and task-avoidance goal (β = -.09) were significant predictors of physical activity (R^2 = 9.0%). Other-approach goal (β = -.19) and self-avoidance goal (β = .10) significantly contributed to 50-meter run (R^2 = 2.5%). Only self-approach goal (β = .14) significantly predicted standing long jump (R^2= 1.9%). **CONCLUSION:** The findings supported the 3 × 2 achievement goal model can be utilized to understand physical activity and fitness among high school adolescents. Specifically, creating a self- and other-approach oriented environment and designing developmentally appropriate class contents based on adolescents' level could be effective strategies to augment high school adolescents' physical activity and fitness.

1350   Board #158   May 31 9:00 AM - 10:30 AM

Understanding High School Adolescents' Physical Activity and Depressive Symptoms from a Psychosocial Perspective

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(No relevant relationships reported)

Although regular physical activity (PA) produces significant health benefits, the majority of adolescents were physically inactive and adopting sedentary lifestyle (Zahl et al., 2017). Further, the mental health problems such as depressive symptoms were prevalent among adolescents (Schubert et al., 2017). The theory of planned behavior (TPB; Ajzen, 1991) suggests attitude, subjective norm, and perceived behavioral control can shape individuals' PA intention and PA, but there is limited empirical evidence of relationships among TPB variables, PA, and depressive symptoms among adolescents. **PURPOSE:** Guided by the TPB, this study attempted to fill the research gap and test a hypothesized model of TPB variables (i.e., attitude, subjective norm, perceived behavioral control, and intention) related to PA and depressive symptoms among high school adolescents. **METHODS:** 792 Chinese adolescents (432 females; 360 males; M_{age} = 16.9) who enrolled into four high schools in Shanghai completed previously validated questionnaires assessing their TPB variables, PA, and depressive symptoms. Correlations were used to examine the relationships among the variables, and the hypothesized model was tested using structural equation modeling (SEM; AMOS 22). **RESULTS:** Correlation analysis revealed significant positive associations among TPB variables and PA, while depression was negatively related to TPB variables and PA. The SEM analyses indicated that the hypothesized model produces a good fit to the data (χ²/df =33.9/6, p < .01; NFI = .98; IFI = .98; CFI = .98; RMSEA = .08; 90% CI [.05, .10]). Specifically, the model accounted for 23.8% and 1.0 % of the variance in PA and depression, respectively. Path coefficients suggested that attitude (β = .33), subjective norm (β = .21), perceived behavioral control (β = .28) were positively associated with intention. Intention (β = .11) and perceived behavioral control (β = .42) significantly predicted PA. PA negatively predicted depression (β = -.09). **CONCLUSION:** The findings support the theoretical tenets of TPB and provide empirical evidence of the relationships among key TPB variables, PA, and depressive symptoms in Chinese adolescents. These findings have significant practical implications for PA intervention strategies aimed at promoting adolescents' PA and reducing depression.

C-42   Free Communication/Poster - **Correlates and Behavioral Aspects of Sport**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1351   Board #159   May 31 9:00 AM - 10:30 AM

Athletic Coping Skills of Female Ultrarunners

Shad K. Robinson, Ashley M. Bullers, Michael C. Meyers, FACSM. *Idaho State University, Pocatello, ID.*
(No relevant relationships reported)

A female ultrarunner's ability to cope with stressful situations during competition is crucial for optimal development. Therefore, the ability to cope under these circumstances is essential for creating a strong mental capacity that leads to competitive success. PURPOSE: To quantify the athletic coping skills of female ultra runners. METHODS: Following written informed consent, 76 female ultra runners (mean age 38.9 ± 9.4) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR). Data were grouped by distance (<50 miles, 50-99 miles, 100+ miles), experience in years (novice-3, 4-9,10+), age (20-39 years, 40+ yrs), number of ultra races completed (1-2, 3-4, 5+), ethnicity (Caucasian, other), and competitive injuries (0, 1-2, 3+). RESULTS: MANOVAs (Wilks' λ) indicated significant main coping affects by distance (F 14,134 = 1.912; P = 0.030), experience (F 14,134 = 2.123; P = 0.014), and age (F 7,68 = 2.329; P = 0.034); but not by ultra competitions completed (F 14,134 = 1.239; P = 0.255), ethnicity (F 7,68 = 1.183, P = 0.324), and number of competitive injuries (F 14,134 = .899, P = 0.562). Post hoc analyses (T scores; T = 50, SD = 10) indicated 100+ ultra milers responded significantly higher in FREE (44 vs 34 vs 41; p = 0.011) and COAC (34 vs 30 vs 30; p = 0.019) than middle and low distance class runners, respectively. Runners with 10+ years of experience responded significantly higher than less experienced (4-9 and Novice-3) in GOAL (58 vs 54 vs 51; p = 0.013), CONC (53 vs 48 vs 44; p = 0.012) and CONF (50 vs 46 vs 41; p = 0.022), respectively. Runners 40+ yrs responded higher in COPE (51 vs 47;

p= 0.025), CONC (53 vs 44; p = 0.001), and lower in FREE (37 vs 45; p = 0.013) than younger runners, respectively. **CONCLUSION:** Coping skills among this group reflected subnormal responses when compared to normative values across other athletic populations. It is recommended that ultra athletes incorporate time within their workout routines to conduct coping skills training involving sport psychologists familiar with ultra running.

1352   Board #160   May 31 9:00 AM - 10:30 AM

Learning Effect of Anchoring Bias in Combination with Action-Perception Coupling in Novice Golf Putting

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(No relevant relationships reported)

Quality of instruction significantly influences skill acquisition and performance in sport related tasks, such as golf putting. Instruction for novice individuals should promote external focus, and constantly emphasize the relationship between motor action and task outcome. **PURPOSE:** To analyze the influence of an anchoring bias, while also examining the learning benefits of integrating action-perception external foci. **METHODS:** The putting protocol consisted of three trials: pre-test, acquisition, and post-test. Each trial was performed from a distance of eight feet on artificial turf. Subjects (6 males, 6 females) did not receive instructions or cues for any of the ten putts during the pre- or post-tests. Two counter balanced groups were made upon the completion of the pre-test. Immediately before the start of the acquisition trial subjects were provided an anchor number and asked to estimate whether their average putt would stop closer or further than the number. Group one (High) was given an anchor of 12 inches and group two (Low) was given an anchor of 3 inches. External cues were positioned in front of and behind the starting point of the ball to facilitate club and ball path for the acquisition trials. The subjects were not made aware of the cues or instructed to use them in any way. The acquisition trial contained five blocks of twenty putts with a three-minute break between each block. Twenty-four hours after the completion of the acquisition trial subjects returned to complete the post-test. Distance from the target was measured as the average sum of horizontal and vertical distance. **RESULTS:** The high anchor group responded with an average of 5.55 inches (9.3±1.96 vs 3.75±1.78, p<0.05) more than the low anchor group. This difference was found to be significant, demonstrating that anchor values may have an influence on estimation. Error was reduced in both the High (50.1±18.07 to 40.84±9.71, p<0.05) and Low (58.72± 18.59 to 35.71±7.99, p<0.05) groups from pre-test to post-test. Differences between groups were not found to be statistically significant (p = 0.262). **CONCLUSION:** Individuals used the provided anchor values to adjust their estimate of predicted performance. Significant differences in putt performance from pre to post test showed improvement in both groups. Improvement between groups were not significant.

1353   Board #161   May 31 9:00 AM - 10:30 AM

Academic Confidence and Grit Predict Mindfulness in Collegiate Student-Athletes

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(No relevant relationships reported)

Mindfulness includes the ability to be attentive and aware of present events and experiences without making judgments based off prior beliefs. There is evidence that mindfulness is related to grit and academic performance but has not been well studied in the collegiate athletic population. **PURPOSE:** The purpose of this study was to determine if grit, academic confidence and demographic factors were predictive of mindfulness in collegiate student-athletes. **METHODS:** 349 (19.6+/-1.23yrs; 191 male, 158 female) varsity student-athletes completed the Mindfulness Attention Awareness Scale, Academic Confidence Scale, and short grit scale as part of the baseline concussion testing protocol. 177 were classified as contact and collision student-athletes (Football, Lacrosse, Soccer), 75 as contact student-athletes (Basketball, Baseball, Softball), and 96 as limited contact student-athletes (Cross-Country, Track and Field, Tennis, Golf, Volleyball). These classifications are used by the NCAA and may influence levels of mindfulness. A stepwise multiple regression was conducted to determine if gender (step 1), age (step 2), sport type (step 3), grit (step 4) and academic confidence (step 5) were predictive of mindfulness. **RESULTS:** Steps 1-3 displayed no significant change in R2(gender, age, and sport type, R2 =0.013, p>0.05) . Steps 4, grit, showed significant change in R2 (R2 change=0.159, p<0.001). In addition, step 5, academic confidence, showed a significant change in R2 (R2 change = 0.013, p<0.05). **CONCLUSION:** Demographic information including age, gender and sport classification do not significantly predict the variance of mindfulness (1.3%) but the addition of Grit and Academic Confidence accounted for 18.5% of the variance in mindfulness. This suggests that the relationship between mindfulness, grit, and academic confidence is important in collegiate student-athletes. Future research should consider how training in mindfulness impacts performance and confidence on and off the field of play.

1354   Board #162   May 31 9:00 AM - 10:30 AM

Psychophysiological And Pacing Strategy Responses To A Sprint Exercise Performed With Different Exercise Expectations.

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(No relevant relationships reported)

Deception is a psychological approach to manipulate the exercise expectation (EE) before or during self-paced exercise(SIE).
PURPOSE: Verify how negative expectations would alter pacing strategy, performance and psychophysiological responses to an all-out sprint interval exercise (SIE).
METHODS: Participated of the study, eleven cyclists (34 ± 6 years old, 173 ± 4.8 cm, 73 ± 5.8 kg, 52.9±8.1 ml/kg/min, 298.4±29.9 Wpeak). After characterize the cyclists with anthropometric measurements, maximal incremental test and familiarization, two all-out SIE were performed: (1) control (CON) composed by a ten all-out sprints, with 0.1 kp.kg-1 body mass workload, interspersed by a 60 s of passive recovery, without manipulating the EE; (2) more demanding exercise expectation (MDEE), with the same exercise configuration as in the CON, but the cyclists were informed that the SIE have a higher demand than in CON, based on the information of they would rest for 50 s between the sprints, however they actually rested for 60 s. Performance as a peak (PPO) and mean (MPO) power output and physiological measurements (heart rate (HR), VO2 and lactate (BLC)) were recorded continuously over the SIE and psychological measurements (RPE, felling scale (FS) and felt arousal scale (FAS)) were collected during each recovery period.
RESULTS: Main effect of EE was not found on performance, however the MDEE session show a higher PPO in the last sprint (p=0.019). EE main effect was also detected for FS (p < 0.001) but not for FAS (p = 0.26) responses. Although we did not detect an effect of EE on performance between experimental sessions (CON x MDEE), affect and pacing performance (MPO) were related. These correlations seems to indicate that either valence or the arousal have better associations either for the CON (r = 0.91, P <0.001; r = - 0.90, P <0.001) than for the MDEE (r = 0.69, P = 0.026; r = - 0.79, P = 0.006), respectively. Additionally, by means of *circumplex* model, the CON affect pre-exercise and sprint 1 values, were in the calmness quadrant, contrary to what is observed is MDEE. Main effect of exercise expectation was also found in HR (p=0.002) but not for VO2 (p=0.067) and BLC (p=0.38).
CONCLUSIONS: The manipulation of pre-EE, it seems to influence psychophysiological but not physiological responses, in two all-out SIE with the same exercise configuration.

1355   Board #163   May 31 9:00 AM - 10:30 AM

Impact Of Music On Athletes' Motivation And Flow State During Competitions

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Flow state (FL) and motivation (M) are among the most studied psychological conditions that may affect athletes' performance. Highly intrinsically motivated players who are fully synchronized and absorbed into their game have greater chances to perform well, to deal positively with stress and pressure associated with competitions, and to maintain a mental balance that allows them to be successful in their personal life as well. Among the strategies that athletes, or their coaches, adopt to prompt a positive mental condition before and after trainings and competition, listening to music has become a widespread trend.
PURPOSE: to determine motivational and flow profiles of athletes based on their use of music before and after trainings and competitions.
METHODS: A sample of 263 athletes participating in the 2017 University Olympics of Mexico filled a questionnaire on music habits and preferences, the Sports Motivation Scale, and the Flow State Scale. Two-step cluster analysis was performed to explore athletes' music-related profiles. RESULTS. The analysis highlighted the presence of two main groups: Music Enthusiasts (ME), athletes who listen to music often in

training and match situations, are characterized by high intrinsic (20.2), low extrinsic motivation (9.3), and null amotivation (7.5); also, they have high levels of flow state (FS > 18); and Music Hesitant (MH), athletes who listen to music seldom or never, have low intrinsic (5.1), high extrinsic motivation (20.4), as well as high amotivation (19.3); although MH's flow profile is similar as ME's in many dimensions, the formers show moderate balance between personal skills and task challenges (12.2), moderate focus on their tasks (13.1), and tend to have low self-awareness (9.9). CONCLUSIONS: Listening to music seems to trigger an optimal mental state before trainings and competitions, as well as it allows athletes to maintain a psychological balance after their performance.

1356   Board #164   May 31 9:00 AM - 10:30 AM

Evaluating The Effectiveness Of Applying Grief-Response Models To Sport Injury In Collegiate Student-Athletes

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(No relevant relationships reported)

For an athlete whose identity is contingent upon their participation in sport, an injury that forces them to cease participation can represent a significant loss. As a result, grief models are often applied to the context of sport injury. However, most models may be outdated, and little empirical research has been done to test their applicability to sport injury. **PURPOSE**: The effectiveness of grief-response models in describing emotional responses to injury was evaluated in collegiate student-athletes. Additionally, the role of social support in determining emotional response was investigated. **METHODS**: 14 collegiate student-athletes (9 female, 5 male) across five Division I sports participated in this study by completing a semi-structured interview regarding the individual's injury experience. **RESULTS**: Athletes most frequently reported feeling upset during the injury diagnosis stage. For those athletes whose injury required surgical intervention, their top reported emotional response during that time was anxiety or fear. Frustration was the most commonly expressed emotion during the rehabilitation stage. Finally, in returning to play, the top emotional response reported among participants was nervousness/anxiety. Regarding social support, participants reported one or both of their parents as their greatest source of social support, while coaches were the primary source that the student-athletes wished they had received more support. **CONCLUSION**: Preliminary findings suggest that grief models should redirect focus from shock and depression and be reworked to account for the prevalence of anxiety and frustration in multiple stages of recovery. Additionally, results identified a need for increased availability of social support resources on campus, as well as, training for coaching staff on how to better meet the expectations and needs of injured athletes.

1357   Board #165   May 31 9:00 AM - 10:30 AM

Indicators Of Burnout In College Athletes: Proportion Comparisons By Sex And Sport Type

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(No relevant relationships reported)

PURPOSE: To describe the proportion of burnout levels in college athletes employing a psychological instrument and compare them by sport type and sex.
METHODS: 236 college athletes from a high performance program (122 from individual sports and 124 from team sports and; 76 women and 160 men) were evaluated. Trained psychologists applied the Sport Burnout Inventory-Reviewed (IBD-R, in Spanish), conformed by 19 items that evaluate 3 Burnout dimensions in athletes: Emotional Exhaustion (EE), Depersonalization (D) and Reduced Personal Realization (RPR); finally, it brings to a Total Burnout Qualification, which let the evaluator know the burnout level in the evaluated subject. The results were classified in four categories: "Low risk" ($\leq$50), "Moderated risk" ($\geq$51 <60), "High risk" ($\geq$61 <70) and "With burnout" (>70). The frequencies and proportions were counted and compared by sport type and sex.
RESULTS: Team sports showed lower proportion of "Low risk" to suffer burnout in the RPR factor than individual sports (p=0.03). As well, a trend for higher proportion of "With burnout" in EE was observed for individual than team sports (p=0.06). Conversely, a trend for higher proportion of "Moderated risk" in RPR was observed for team than individual sports (p=0.06). On the other hand, statistically significant differences were found in three factors between females and males. Males showed higher prevalence of "Low risk" in EE compared to females (p=0.006), also females presented higher proportion of "Moderated risk" to suffer burnout in the EE indicator than males (p=0.02). In the D factor, males reported a higher proportion of "High risk" to suffer burnout than females (p=0.03) (Table 1).
CONCLUSION: The results showed that both individual sports and female athletes presented higher proportions of risk to suffer burnout than team sports and male athletes, respectively. However, a deeper evaluation is suggested to confirm the data and make a Burnout profile in college athletes.

Table 1. Proportion of burnout indicators by sport type and sex.

By sport type

	Team sports (n 124)				Individual sports (n 112)			
	EE	D	RPR	BURN-OUT	EE	D	RPR	BURN-OUT
Low risk	53.2% (n 66)	43.6% (n 54)	54.8% (n 68)[a]	44.4% (n 55)	46.4% (n 52)	48.2% (n 54)	68.8% (n 77)[a]	47.3% (n 53)
Moderate risk	33.9% (n 42)	34.7% (n 43)	31.5% (n 39)[b]	47.6% (n 59)	34.8% (n 39)	29.5% (n 33)	20.5% (n 23)[b]	44.6% (n 50)
High risk	11.3% (n 14)	13.7% (n 17)	8.9% (n 11)	7.3% (n 9)	12.5% (n 14)	14.3% (n 16)	8.9% (n 10)	8.0% (n 9)
With burnout	1.6% (n 2)[b]	8.1% (n 10)	4.8% (n 6)	0.8% (n 1)	6.3% (n 7)[b]	8.0% (n 9)	1.8% (n 2)	0% (n 0)

By sex

	Females (n76)				Males (n 160)			
Low risk	36.8% (n 28)[c]	48.7% (n 37)	65.8% (n 50)	44.7% (n 34)	56.3% (n 90)[c]	44.4% (n 71)	59.4% (n 95)	46.3% (n 74)
Moderate risk	44.7% (n 34)[c]	32.9% (n 25)	27.6% (n 21)	47.4% (n 36)	29.4% (n 47)[c]	31.9% (n 51)	25.6% (n 41)	45.6% (n 73)
High risk	11.8% (n 9)	6.6% (n 5)[c]	5.3% (n 4)	7.9% (n 6)	11.9% (n 19)	17.5% (n 28)[c]	10.6% (n 17)	7.5% (n 12)
With burnout	6.6% (n 5)	11.8% (n 9)	1.3% (n 1)	0% (n 0)	2.5% (n 4)	6.3% (n 10)	4.4% (n 7)	0.6% (n 1)

[a] Significant differences by sport type (p<0.05).
[b] Trend for differences by sport type (p<0.1)
[c] Significant differences by sex (p<0.05).

1358   Board #166   May 31 9:00 AM - 10:30 AM

Differences in Sport Motivation Types in NCAA Division II Athletes over Time

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(No relevant relationships reported)

Few studies have examined motivation types in collegiate athletes over time using the Self-Determination Theory (SDT) continuum. **PURPOSE:** To investigate differences in motivation types in NCAA Division II student-athletes (SAs) over three time points. **METHODS:** Overall, 530 SAs (n_{males} = 355, $n_{females}$ = 175) with an age range of 18 to 23 (M = 19.40, SD = 1.33) from 21 teams voluntarily completed a demographic questionnaire and the 18-item Sport Motivation Scale II used to measure six motivation types: intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), and amotivation (AMR) regulation. Six, one-way, repeated measures Analyses of Variance with Bonferroni post hoc tests were used to analyze SA motivation types over the pre-season (PS), in-season (IS), and off-season (OS). An alpha level of $p \leq .05$ was set for statistical significance. **RESULTS:** Analyses revealed statistically significant differences in IR, INTR, IDR, and AMR types over time. For IR, a difference was seen, $F(2, 710) = 3.66$, $p = .026$, between the PS and IS ($p = .028$) with lower scores in the IS ($M = 16.11$, $SD = 4.21$) versus the PS ($M = 16.67$, $SD = 4.13$). For INTR, differences were seen, $F(1.95, 691.39) = 15.75$, $p < .001$, between both the PS and IS ($p < .001$) and between the PS and OS ($p < .001$) with lower scores in the IS ($M = 16.69$, $SD = 3.69$) and OS ($M = 16.53$, $SD = 4.05$) versus in the PS ($M = 17.58$, $SD = 3.29$). For IDR, a difference was seen, $F(1.92, 680.470) = 5.89$, $p = .003$, between the PS and IS ($p = .004$) with lower scores in the IS ($M = 16.43$, $SD = 4.09$) versus in the PS ($M = 17.12$, $SD = 3.62$). For AMR, differences were seen over time, $F(1.97, 699.89) = 8.21$, $p < .001$, between both the PS and IS ($p < .001$) and between the PS and OS ($p < .001$) with higher scores in the IS ($M = 7.82$, $SD = 4.31$) and OS ($M = 7.78$, $SD = 4.73$) versus lower scores in the PS ($M = 6.93$, $SD = 4.11$). **CONCLUSIONS**: Findings demonstrated that more self-determined motivation (IR, INTR, IDR) was highest in the PS while increasing AMR scores predominated over time extending into the IS and OS. This is consistent with the athlete burnout/SDT literature where motivation extremely low in internalization (i.e., AMR) is positively associated with burnout and motivation extremely high in internalization (i.e., IR) is negatively associated with burnout (Cresswell, 2009; Cresswell & Eklund, 2005a, 2005b).

1359   Board #167   May 31 9:00 AM - 10:30 AM

Quantity Of Deliberate Play And Collegiate Sports: A Comparison Of Two Case Studies.

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(No relevant relationships reported)

The National Collegiate Athletic Association has over 250,000 students competing in Division I (DI) and Division III (DIII) programs. DI colleges comprise 32% of the association while DIII accounts for 40%. Previous studies of individuals within the same collegiate level have uncovered a positive correlation between the hours of deliberate play and athletic skill level. To date, there have been no studies on comparing the two aforementioned divisions. **PURPOSE**: To investigate the quantity of deliberate play that contributes to achieving the DI and DIII statuses. **METHODS**: Using an online interview as proposed by Côté, Ericcson, and Law (2005), all student-athletes from both Rice University (DI) and State University of New York (SUNY) in Plattsburgh (DIII), were recruited via email. Sixty-three participated from DI (track and field, basketball, and football) and 90 from DIII (track and field, basketball, hockey, soccer, softball, and tennis). The response rate was 17% and 29%, respectively. Descriptive statistics and parametric tests were used in the analysis. **RESULTS**: Differences with statistical significance (p<0.05) were found in: (a) height (when younger, 100% DI to 78% DIII were average or taller than peers), (b) participation in early activities of art (17 to 37%), organized games with rules (72 to 86%), and other sport-related activities (48 to 74%), (c) parents being top athletes (24 to 48%), and (d) the current activities of sleeping (25 to 52 hours per week), socializing (9 to 21 h.), school/career (8 to 21 h.), and studying (9 to 15 h.). **CONCLUSIONS**: In both divisions, we further attest to the suggestions of Côté et al. (2003) about participation of youth in multifarious activities. Our results also align with past work from Landers et al. (2011), which has underscored the competitive advantage of athletes with longer levers than their shorter peers. The comparison of current activities indicate that a DIII school may be promoting a more wellness lifestyle (including all its dimensions, such as social, physical, occupational, and mental). Possible limitations of this study are the use of convenience and unequal samples, self-reported data, and of retrospective methods. Future research, comparing more cases of different-division schools, is recommended.

1360   Board #168   May 31 9:00 AM - 10:30 AM

Athletic Coping Skills of Female Division I Volleyball Players

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Reported Relationships: M.P. Casanova: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

A female volleyball athlete's ability to cope within the competitive environment oftentimes determines the outcome of a match. Therefore, possessing a strong coping skill set necessary at this level of competition is essential for optimal performance potential. **PURPOSE:** To quantify the athletic coping skills of Division I female volleyball players. **METHODS:** Following written informed consent, 28 female volleyball players (mean age 19.7 ± 1.5) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR). Data were grouped by athletic rank (top, bottom), present injury status (yes, no), and by academic level (upper class, lower class). **RESULTS:** MANOVAs (Wilks' λ criterion) indicated significant main effects for athletic coping by athletic rank ($F_{13,16} = 5.046$; P = 0.002), but no significant main effects across present injury status ($F_{24,5} = 1.711$; P = 0.161) or academic level ($F_{14,15} = 0.545$; P = 0.791). Post hoc analyses (T scores; T = 50, SD = 10) indicated that top-ranked athletes responded significantly higher in COPE (55 vs 42; p < 0.001), PEAK (53 vs 44; p = 0.001), GOAL (54 vs 44; p = 0.006), and CONC (53 vs 48; p = 0.025), CONF (54 vs 46; p = 0.001), COAC (52, 39; p = 0.001), and PCR (56 vs 41; p < 0.001) than bottom-ranked peers, respectively. There was also a trend for athletes experiencing trauma to respond more positively in COPE, PEAK, GOAL, CONC, FREE, CONF, and PCR than non-injured peers. Of concern, athletic coping skills among this group were below average when compared to normative values across other athletic populations. **CONCLUSION:** Although findings were influenced by limited sample size, results still support the recommendation that volleyball athletes incorporate psychological skills training into their workout routines that specifically target athletic coping skills. Further research is warranted to assess coping skills within a larger volleyball population, to assess coping skills in athletes recovering from injuries, as well as to quantify the efficacy of coping skills interventions on volleyball performance.

1361   Board #169   May 31 9:00 AM - 10:30 AM

Effects of Mental Strength and Mindfulness Training on Exercise Performance

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(No relevant relationships reported)

Internal self-talk has been shown to improve performance and reduce effort, but less is known about how short-term mental strength (MS) and mindfulness (MD) training affect performance and underlying physiological variables.
PURPOSE: To determine how MS (grit, resilience) or MD training affect cycling time trial to exhaustion and to determine the physiological mechanisms underlying these changes.
METHODS: 35 college-aged participants visited the lab on 4 separate days. A VO2max with ventilatory threshold (VT) was performed on day 1. The subsequent visits consisted of time trials to exhaustion (TTE) performed at 10% above VT. Between visit 3 and 4, MS (13 participants) and MD (10 participants) groups watched a video or listened to an audio recording for 15 minutes each day for one week while the control group (C) (12 participants) did no training. Heart rate (HR), rate of perceived exertion (RPE), VAS scores for pain and fatigue, and EMG were recorded during the time trials. CD-Risc, GRIT-S, and the 5-factor mindfulness surveys were also completed before study day 3 and 4. A RM-ANOVA was done to compare group and time differences.
RESULTS: TTE was significantly increased in MS ($8.6\pm13.6\%$, p<0.05) and MD ($4.3\pm5.8\%$, p<0.05) compared to C ($-4.9\pm11.6\%$). There were no changes between MS or MD and C for differences between trial 1 and trial 2 for maximum HR, average HR, maximum RPE, average RPE, or average VAS scores for pain or fatigue (p>0.05). One week of MS or MD training also did not affect the GRIT-S, CD-Risc, or 5-factor mindfulness survey (p>0.05). There was a significant decrease in EMG for MS as compared to both MD (p<0.05) and C (p<0.01), but MD EMG did not change as compared to C (p>0.05).
Conclusions: One week of mental training, whether MS which included grit and resilience training or for MD, has the ability to improve TTE performance. However, current psychological surveys are not sensitive enough to detect changes in mental performance, perhaps because they are not sport/exercise specific. Further, MS may improve performance by reducing EMG input and shifting to a more external focus, allowing a decreased activation of muscle and subsequent reduced fatigue rate.

1362   Board #170   May 31 9:00 AM - 10:30 AM

Fitness Self-perception And Lifestyle In Rugby Players In Colombia

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(No relevant relationships reported)

Background: Self-perception and Lifestyle have a significant influence on athletes´ performance. Research in Rugby had been focused mainly on the assessment of physiological and anthropometrical player´s profiles as well as injuries incidence.
Purpose: The aim of this study was to evaluate the self-perception of Fitness and Lifestyle in Rugby players in Colombia **Methods:** A cross-sectional study was conducted with Rugby players from 37 cities in Colombia aged 18 years and older, with at least one year of sport practice. Fitness self-perception was assessed with the International Fitness Scale (IFIS) and Lifestyle was evaluated with the *FANTASTIC* Questionnaire. Statistical analysis was performed with central tendency measures, standard deviation, t- student and chi-square. **Results:** 479 players were surveyed. 68% were men, 53.7% played at Backs position and 46.3% as Forwards position. The age average was 24.6 (± 4.4) years old and a practice experience of 4.2 (± 3.8) years. Most of the participants classified their Fitness and Its components: Cardiorespiratory endurance, Strength and Speed /Agility as "*Good*" (58%, 47%, 53%, 44% respectively), while Flexibility was categorized between "*Acceptable*" 36% and "*Good*" 34% mainly. Significant differences were found by position on the field (Backs and Forwards) in the Self-perception of the Strength in players (p = 0.000). Regarding to Lifestyle, evaluated with the FANTASTIC Questionnaire, the average of overall score was 75.3 (± 10.2). According to this, the majority of the players, (54.7%, n = 262), reported their lifestyle in the category "*Good*". Significant differences were also found by position on the field in the total scores (p = 0.004). It highlight the difference between Forwards and Backs in the category "*Aggressiveness*" belonging to Personality Type domain (p = 0.04). **Conclusion:** Our results are consistent with the pilot study conducted previously on the same population. The players show a good self-perception of their Fitness and its components as well as a good Lifestyle. The differences found, might be explained according to the characteristics of the player's position on the field. Furthermore studies are necessary.

1363   Board #171   May 31 9:00 AM - 10:30 AM

Muscle Dysmorphic Disorders, Body Dissatisfaction and Eating Disorder in Male Bodybuilders

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Muscle dysmorphic disorders (MDD) have been described as a body image disorder, characterized by a perceived lack of muscularity, and largely affect males. **PURPOSE:** The study aimed to determine the rates and relationships among MDD, body image disturbance and eating disorders in both competitive/professional and non-competitive/recreational male bodybuilders. **METHODS:** The participants consist of 120 bodybuilders (competitive, n=62 (mean age 31.05 ± 10.60 yr) and non-competitive, n=58 (mean age 25.63 ± 6.67 yr) recruited from four bodybuilding gym centers in Ankara, Turkey. Weight, height and body fat percentage were measured with BIA (Tanita, TBF- 300). To assess symptoms of eating disorders, muscle dysmorphia, and body dissatisfaction, the participants were asked to answer four questionnaires, including Eating Attitude Test (EAT)-40, Muscle Dysmorphia Disorder Inventory (MDDI), and Bodybuilder Image Grid (BIG)-Original (BIG-O) and Scale (BIG-S), the instruments to measure the perceptual body images disturbance and perceived attractiveness. A multiple linear regression model was used to identify independent factors associating eating disorders. **RESULTS:** 81 bodybuilders (67.5%) had EAT-40 scores above its cut off point, indicating having eating disorders, and there was no significant difference between competitive and non-competitive bodybuilders (p>0.05). The average scores of BIG-O and BIG-S showed statistically significant differences (p<0.01) in current and ideal body fat and muscle mass scores, indicating the most bodybuilders desire to be leaner (less fat) and muscular than their current body sizes. According to MDDI, 70 bodybuilders (58.3%) had a risk of having MDD. Furthermore, there was a significant positive relationship between EAT-40 and MDDI total scores (r= 0.614, Φ= 0.713, p<0.001) in both competitive and non-competitive bodybuilders. A linear regression analysis predicts that the eating disorder was a relative risk factor for MDDI and muscle-related body dissatisfaction in male bodybuilders. **CONCLUSIONS:** Eating disorder psychopathology is positively related with body dissatisfaction and body dysmorphic disorders. The screening tools, EAT-40, MDDI, and BIG-O and BIG-S may provide early detections of body dissatisfaction and eating disorders in male bodybuilders.

1364   Board #172   May 31 9:00 AM - 10:30 AM

Training Mental Toughness In Sport: A Review And Meta-analysis

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(No relevant relationships reported)

In January 2017, after a week of strenuous, military-style, and anecdotally-based workouts designed to test the level of *mental toughness* (MT), three Pac-12 football players were diagnosed with rhabdomyolysis. In sporting environments, are there any safe and effective, empirically-based MT interventions? To date, there has been no attempt to collate all available empirical evidence in regards to development of MT in Sport.
PURPOSE: To summarize evidence relating to MT training programs in developing MT levels.
METHODS: Cross-sectional designs and pre- and post-test experiments were included. No publication date restriction was imposed. Participants of any age, gender, sport, or level were included. This search was applied to Embase, Scopus, PubMed, and SPORTDiscus. Two reviewers assessed the risk of bias using: (a) for RCTs, the PED*ro* scale, (b) for before-after studies with no control group, the 'Before-After (Pre-Post) Studies With No Control Group', and (c) for single-subject research study, the 'Quality Indicators'. The outcomes of primary interest were the scores of MT, which were translated into standardized variables (SMD). The meta-analysis was completed using a random-effects model.
RESULTS: Nine studies were included in the systematic analysis and seven in the meta-analysis. The methodological quality of those nine studies was not high. Common areas that increased the risk of bias include: (a) RCT's: allocation was not concealed, key outcomes were self-reported, no blinding of all subjects/assessors, and no random allocation of subjects; (b) Before-After Studies With No Control Group: No enrollment of all subjects who meet the inclusion/exclusion criteria, no blinding of assessors, and no reporting of relevant information; and (c) Single-subject design: fewer than three data points per phase without justification. MT scores increased by 0.88 standard deviations (95% CI). The values contained within the confidence interval were at least medium effect sizes and the variance of this estimate was 0.23.
CONCLUSIONS: A strong positive effect was observed. Therefore, the results are promising. Nevertheless, the authors believe that conclusions cannot be drawn due to limited number of reliable results, which creates a high level of uncertainty. However, this finding itself is of value.

1365   Board #173   May 31 9:00 AM - 10:30 AM

Relationships among Perceived Recovery, Vertical Jump And Change In Repeated Sprint Performance

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(No relevant relationships reported)

Recovery may be determined by using a counter movement vertical jump (CMJ). While a CMJ has been shown effective to evaluate recovery, there may be more efficient, less physically taxing alternatives such as the Perceived Recovery Status (PRS) Scale. The PRS is a non-invasive, and accurate psychophysiological tool designed to measure recovery and its correlation to performance. **PURPOSE:** To determine the efficacy of CMJ and PRS as methods for monitoring recovery between repeated sprint efforts. **METHODS:** Eight college-aged individuals (age=23±0.9 years; height=1.65±0.11 meters; weight=67.1±9.3.4 kg; percent body fat=17.5±8.4%) performed repeated sprints. The protocol consisted of three sets of eight 30 meter sprints on a non-motorized treadmill with 45 seconds of rest between each sprint. The sets were separated by 5 minutes of passive rest. Mean power output (MP) was measured during each sprint. RPE (overall) was recorded immediately following each sprint. Immediately before the next set of sprints PRS was recorded and a CMJ was performed on a force plate where maximal height was recorded. **RESULTS:** A 1-way repeated measures ANOVA showed a significant main effect of sprint set on RPE (p=0.04) and PRS (p<0.01). Subsequent pairwise comparisons revealed significant differences for RPE between sprint sets 1 and 2 (p=0.05), and in PRS between sprint sets 1 and 2 (p=0.001), and sprint sets 1 and 3 (p=0.02). Correlations showed the relationship between PRS and delta MP to be moderate, and significant at (R^2=0.32) while the relationship between CMJ and MP was weak (R^2=0.04). **CONCLUSION:** Current results suggest PRS may demonstrate a stronger relationship with change in repeated sprint performance within a session than CMJ. However, neither index of recovery was robust, and may indicate that these measures may be more appropriate for use between day-to-day training sessions (as previously established) and not necessarily to gauge recovery as in the current paradigm.

1366   Board #174   May 31 9:00 AM - 10:30 AM

Cross-cultural Invariance Of The Mental Toughness Inventory Among American And Greek Athletes

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(No relevant relationships reported)

The popularity of the term *mental toughness* (MT) in sporting environments, at least in the U.S., has been established. However, its worldwide cultural relevance remains to be fully uncovered. Recently, Gucciardi et al. (2016), using the Mental Toughness Index (MTI), reported intra-cultural invariance of MT in Australasia. To date, there has been no effort to uncover the extent of the universality of the term between Europe and USA via MTI.
Purpose: To examine the invariance of MT across two different cultural groups of athletes and to further validate MTI. **Method:** The MTI was completed by 99 Greek and 173 US athletes via Qualtrics. The MTI consisted of eight items with a seven-point response scale. Both samples consisted of roughly half male and half female athletes from a number of sports, including American football, basketball, baseball, softball, volleyball, golf, tennis, soccer, track and field, swimming. Judo was only reflected in Greek sample.
Invariance testing was conducted using multiple group confirmatory factor analysis with increasingly restrictive models. We first fitted a unidimensional model within each sample to ensure good model-data fit. Then we estimated configural (equal number of dimensions), metric (configural + equal loadings), and scalar invariance models (metric +equal intercepts). Scalar invariance is the minimum type of invariance to infer cross-cultural equality. To evaluate the model-data fit, we used the comparative fit index (CFI), root mean square error of approximation (RMSEA), and the differences between these indices for increasingly restrictive models.
Results: The model-data fit in both samples was very good (CFI Greek = .995, RMSEA Greek = .046; CFI US = .998, RMSEA US = .032). The scalar invariance model was selected as the best fitting (CFA scalar = .930, RMSEA scalar = .078) but with a slightly different item intercept for one item (Item 4; <.5).

Conclusion: The results of this analysis provide evidence for the partial scalar invariance of the MTI across cultural samples. This implies that the meaning of the MT construct and the levels of the underlying items are equal in both cultures. As a result, the two cultures can be directly compared on their scores in the latent variable.

1367   Board #175   May 31 9:00 AM - 10:30 AM

Athletic Identity does not Predict Reporting Intentions in Intercollegiate Athletes

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(No relevant relationships reported)

In recent years, there has been an increased emphasis on improving athlete recognition of signs and symptoms associated with concussion. Despite these empirical advances, approximately 50% of concussions at the collegiate level are believed to go unreported. In order to understand the motivational aspect of reporting concussions, it is crucial to identify factors contributing to an athletes' intentions to report. Athletes that more strongly identify with their role in their sport may be less likely to report a concussion because they fear losing their athletic identity. **PURPOSE**: To examine the relationship between athletic identity and concussion reporting intentions in student-athletes. **METHODS**: Student-athletes from 3 universities in the state of Georgia were invited to complete a survey via Qualtrics (n=298/498 response rate = 59.7%, male=41.8%). The previously validated survey included questions to assess indirect (8 items) and direct (3 items) concussion reporting intentions and the Athletic Identity Measurement Scale which includes 10 athletic identity (AI) items. All items were answered on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Two separate simple linear regressions were used to determine whether AI predicted intentions (alpha=0.05). A one-way ANOVA was used to compare reporting intentions between athletes with high and low AI. **RESULTS**: Athletic identity did not significantly predict indirect (R^2=.009; $F_{(1,265)}$=0.65; p=0.12,) or direct (R^2=0.002; $F_{(1,256)}$=2.54; p=0.42) concussion reporting intentions. There were no significant differences between groups for indirect (low AI mean= 5.1, high AI mean= 5.8, $F_{(1,256)}$= 3.14, p=0.07, low AI 95% CI [5.41, 6.02], high AI 95% CI [5.12,5.51]) or direct (low AI mean=6.05, high AI mean=6.30, $F_{(1,256)}$= 1.07, p=0.30, low AI 95% CI [5.53, 7.85], high AI 95% CI [5.89, 6.21]) intention to report a concussion. **CONCLUSIONS**: Although AI does play an important role in predicting outcomes following sport-related injuries, it does not seem to significantly predict concussion reporting intentions in the current study. Results of this study suggest the importance of considering the multiple factors that may explain athletes' intentions to report concussions beyond how highly they identify themselves with their sport.

1368   Board #176   May 31 9:00 AM - 10:30 AM

Perceived Behavioral Control is Key for Activity Tracker Usage

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(No relevant relationships reported)

Perceived Behavioral Control is Key for Activity Tracker Usage
Purpose: The Reasoned Action Approach (RAA) has not been previously used to examine activity tracker (AT) beliefs. The purpose of this study was to use the RAA to explore which global constructs (attitude toward the act (AA), perceived norm (PN), and perceived behavioral control (PBC)) would best predict trained-users' intentions to use their activity trackers for the next month. This descriptive study addresses a gap in the literature by examining the AT beliefs of 165 university faculty and staff. **Methods**: A convenience sample was recruited from participants who previously took part in an on-campus physical activity program during 2014-2016. The participants were "trained-users", having been guided for 8 weeks by student coaches and provided with ATs during the program. An online survey was utilized to measure RAA constructs underlying the intention to wear, look at, and make physical activity decisions based on a wearable AT and its corresponding app's information. After data collection, four composite variables were created from 18 close-ended items. Internal consistency and regression analyses were performed for the constructs of intention, AA, PN, and PBC (a construct similar to self-efficacy). **Results**: A standard regression analysis showed that 69.1% of the variance in the intention to use an AT was explained by attitude toward the act (Beta =.317), perceived norm (Beta = .153), and perceived behavioral control (Beta =.488); (R = .831, F [3, 159] = 116.37, p < .0001). PBC was found to be the strongest contributor towards the intention to use an AT. **Conclusion**: This is the first study to examine AT usage using the RAA model. Results of this theory-based research suggest that focusing on perceived behavioral control (the perceived ease or difficulty of AT usage and a person's self-efficacy) may be the most efficacious route to helping individuals become long-term AT users.

1369   Board #177   May 31 9:00 AM - 10:30 AM

Anxiety And Depression Indicators In College Athletes: Proportion Comparisons By Sex And Type of Sport

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(No relevant relationships reported)

PURPOSE: To compare by sex and by type of sport the proportion of college athletes that show the probability of Anxiety and Depression Disorders employing a screening psychological instrument
METHODS: 237 college athletes from a high performance program were evaluated. They were cataloged into two sports modalities, Individual sports (Athletics, Boxing, Fencing, Aerobic Gymnastics, Weightlifting, Wrestling, Taekwondo, Table Tennis, Archery and Triathlon) and Team sports (Basketball, Baseball, Football, Soccer, Handball, Softball, Beach Volleyball and Indoor Volleyball). The instrument used was the Goldberg Anxiety and Depression Scale (a screening test, to evaluate two subscales of Anxiety and Depression). Subsequently, subjects were categorized with "No anxiety" (score <4), "Probable anxiety" (score ≥4 <7), and "Probable severe anxiety" (score ≥7), and with "No depression" (score <2), "Probable depression" (score ≥2 <6), and "Probable severe depression" (score ≥6). Then frequencies and proportions were counted and compared by sex and by type of sport.
RESULTS: We found most of the total sample showed "Probable depression", and in the area of anxiety, most of them showed "No anxiety". Statistically significant differences were found by sex, where women showed higher proportion of "Probable severe depression" than men (p = 0.01). In the area of anxiety, men showed higher "No anxiety" prorportion than women (P = 0.003), and women showed higher proportion of "Probable anxiety" than men (P=0.03). For the comparison between type of sport, no statistically significant differences were found (Table 1).
CONCLUSIONS: The results showed that women had a higher proportion of probable anxiety and depression compared to men. The type of sport was not a significant factor for differences in the presence of anxiety and depression. However, the evaluation was done by a screening instrument, so it is advisable to carry out a thorough assessment to obtain a better diagnosis.

Table 1. Proportion of probable depression and anxiety diagnosis by sex and sport					
	Total sample	By sex		By sport	
		Females	Males	Individual	Team
Depression					
No depression	41.4% (n 98)	31.6% (n 24)	46.0% (n 74)	43.8% (n 49)	39.2% (n 49)
Probable depression	50.6% (n 120)	54.0% (n 41)	49.1% (n 79)	50.9% (n 57)	50.4% (n 63)
Probable severe depression	8.0% (n 19)	14.5% (n 11) *	5.0% (n 8) *	5.4% (n 6)	10.4% (n 13)
Total	100% (n 237)	100% (n 76)	100% (n 161)	100% (n 112)	100% (n 125)
Anxiety					
No anxiety	52.3% (n 124)	38.2% (n 29) *	59.0% (n 95) *	56.3% (n 63)	48.8% (n 61)
Probable anxiety	33.8% (n 80)	43.4% (n 33) *	29.2% (n 47) *	30.4% (n 34)	36.8% (n 46)
Probable severe anxiety	13.9% (n 33)	18.4% (n 14)	11.8% (n 19)	13.4% (n 15)	14.4% (n 18)
Total	100% (n 237)	100% (n 76)	100% (n 161)	100% (n 112)	100% (n 125)
*Significant differences by sex (p<0.05)					

1370   Board #178   May 31 9:00 AM - 10:30 AM

Effect of Watching Professional Baseball on Health Outcomes in Elderly Japanese: A Randomized Controlled Trial

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Reported Relationships: R. Kawakami: *Contracted Research -*

Including Principle Investigator; Seibu Lions Company Limited.

PURPOSE: To investigate the effect that watching professional baseball at a ballpark has on the elderly's health-related outcome indicators.
METHODS: Fifty-eight elderly adults aged 65-85 years were randomized into a spectator group (n = 29) and a waiting-list control group (n = 29). The intervention period was approximately 2 months. During the intervention period, 21 professional baseball games were held. The spectator group was requested to watch professional baseball games at the ballpark freely. Before and after the intervention period, executive functioning (Stroop task), cognitive function (Cognitive Assessment for Dementia, iPad version 2), health-related quality of life (Medical Outcome Study 36-Item Short-Form Health Survey), depression symptoms (Center for Epidemiological Studies Depression Scale (CES-D)), subjective happiness (Subjective Happiness Scale), and physical activity (accelerometer method) were assessed.
RESULTS: The median number of days that the spectator group watched baseball games was 6 (interquartile range (IQR): 4-10 days, range: 1-21 days). Although there were no significant differences, the reverse-Stroop interference rate showed greater improvement in the spectator group (median (IQR): 17.0% (9.2-22.8) to 13.3% (3.1-24.9)) than in the waiting-list group (19.1% (7.4-30.1) to 18.0% (9.2-33.3)) (P = 0.063). The CES-D showed significantly greater improvement in the spectator group (5 (4-12) to 3 (2-7)) than in the waiting-list group (4 (1-8) to 5 (1-8)) (P = 0.016). There were no significant differences between the two groups regarding the other health-related outcome indicators.
CONCLUSIONS: These results suggest that regularly watching professional baseball at a ballpark may positively influence elderly adults' depression symptoms.

1371   Board #179   May 31 9:00 AM - 10:30 AM

Is Short-passing Ability Related To Anxiety And Self-confidence In Division Iii Collegiate Soccer Players?

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(No relevant relationships reported)

Competitive soccer players are required to perform various physiological movements including short passing under the stressful conditions of a match. Individual self-confidence and ability to perform under pressure may impact on a successful match outcome. **Purpose:** The purpose of this cross-sectional study was to examine the relationship between short-passing ability and anxiety and self-confidence among collegiate male and female soccer players. **Methods:** Participants included 17 Division III collegiate soccer players (19. ±1.1 years, 65% female, 35% male) who completed the following questionnaires on a computer to assess competitive anxiety and self-confidence: The Illinois Competitive State Anxiety Inventory-2 (CSAI-2R), Sport Competition Anxiety Test (SCAT), and Trait Sport-Confidence Inventory (TSCI). Soccer skills were then assessed indoors as measured by total time on Loughborough soccer passing test (LSPT), which consisted of 16 short passes completed as fast as possible. Data were analyzed using descriptive statistics and Spearman's *rho* correlations. **Results:** Mean short-pass total time was 55.7±12.03 seconds. We observed positive relationships between SCAT and LSPT total time (r_s =0.51, p = 0.04) and CSAI-2R and LSPT total time (r_s =0.52, p = 0.04): as anxiety increased, so did total time on the passing tests. Additionally a strong negative relationship was found between TSCI and LSPT total time (r_s =-0.68, p= 0.004): as self-confidence increased, total time on the passing test decreased. **Conclusions:** Increased anxiety and decreased confidence lead to poorer short-passing performance in collegiate soccer players. Coaches should consider interventions to decrease anxiety and improve self-confidence in preparation for soccer competition.

1372   Board #180   May 31 9:00 AM - 10:30 AM

Effects of Mental Fatigue Induced Using the Smartphone on Physical & Technical Performance of Footballers

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(No relevant relationships reported)

Mobile devices (i.e., smartphones and tablets) have acquired important functions in both interpersonal and individual spheres. For this reason, they can cause a true dependence for the young people. Moreover, prolonged periods of cognitive activity induce mental fatigue, a psychobiological state which influences the performances in team sports. **PURPOSE:** The purpose of this study was to assess the effects of prolonged use of smartphones on physical and technical performance of young footballers. **METHODS:** In total, 16 young male footballers (15.0 ± 1.1 years) were randomly assigned to two studies, Study 1 (S1, n=8) or Study 2 (S2, n=8), in which the Yo-Yo Intermittent Recovery Test level 1 and the Loughborough Soccer Passing Test were performed, respectively. The soccer-specific physical and technical performance was assessed for S1 and S2. In both studies, the participants underwent to mental fatigue through the use of smartphones (Brain It On App) for 30 minutes, and to control condition (normal activities) after at least 48 hours. A crossover study design

and a paired t-test (p<0.05) were used. **RESULTS:** S1 performed shorter running distances in the state of mental fatigue than under the control condition (1610 ± 135 vs. 1780 ± 249 m, Δ -10.56%, p = 0.046). In addition, mental fatigue significantly increased the performance time in S2 compared with the control condition (51 ± 6 vs. 43 ±2.2 s, Δ +15.7%; p = 0.003). **CONCLUSION:** Our findings suggest that prolonged use of smartphones, which causes mental fatigue, can reduce the physical and technical performance of young footballers. Therefore, it is necessary to educate to the conscientious use of technology.

1373   Board #181   May 31 9:00 AM - 10:30 AM

Effects Of Action Boundary Proximity On Perceptual-motor Judgements: Further Development Of The Pact

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(No relevant relationships reported)

Designed as a more ecological measure of reaction times, the Perception-action Coupling Task (PACT) has shown good reliability and within-subject stability, however, a 5- to 10-minute testing period was required. Perceptual-motor judgements are known to be affected by proximity of the stimulus to the tasks action boundary. **PURPOSE:** To determine the effects of action boundary proximity on PACT performance, and whether redundant levels of stimuli, eliciting similar responses, can be eliminated to shorten the PACT while maintaining reliability, stability, and the intended behavioral responses. **METHODS:** 9 males and 7 females (Age(yrs) = 27.8 ± 3.6) completed 4 testing sessions, separated by at least 6 days. For each, participants performed 3 familiarization cycles and 6 testing cycles of the PACT. The PACT requires participants to make judgements on stimuli, in the form of whether a series of virtual balls presented on a tablet afford "posting" (can fit) through a series of virtual apertures. Eight ratios of aperture to ball size (AR) are presented, ranging from 0.2 to 1.8, with each ratio appearing 12 times per cycle. Response (time from stimulus presentation to first movement), Movement (time from first movement to initiation of ball movement), and Initiation (time from initiation to completion of ball movement) times were calculated. Accuracy was calculated as the percentage of correct judgements. All variables were averaged and plotted by AR. Based on visual inspection of plots, redundant stimuli were eliminated. ICCs (3,1) and coefficients of variation (CV) were calculated for each response variable in an iterative manner to determine the minimum number of testing cycles necessary. **RESULTS:** All variables followed an expected, quadratic trajectory, with performance the lowest near the action boundary (AR = .8 – 1.2). Ratios of .2 and 1.8 were found to elicit redundant responses to .4 and 1.6, and were eliminated. The shortened PACT showed good reliability with 1 (ICCs = .71 - .94) and 2 cycles (ICCs = .81 - .98) of testing. Further, CVs were consistent with the full PACT with 1 (CVs = .8 – 20.0 %) and 2 cycles (CVs = .6 – 14.7 %) of testing. **CONCLUSION:** The main findings support the use of the shortened PACT, limiting the testing period to 3.5 – 8.5 minutes depending on the desired level of reliability and within-subject stability.

C-43   Free Communication/Poster - **Altitude/ Hypoxia**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1374   Board #182   May 31 8:00 AM - 9:30 AM

Separate and Combined Influences of Environmental Heat and Altitude on Self-Paced Aerobic Exercise Performance

Karleigh E. Bradbury, John H. Sellers, Charles S. Fulco, Adam J. Luippold, Katherine M. Mitchell, Robert W. Kenefick, FACSM. *United States Army Research Institute of Environmental Medicine, Natick, MA.* (Sponsor: Nisha Charkoudian, FACSM)
(No relevant relationships reported)

Aerobic exercise performance is degraded when performed in the heat or at altitude; however, it is unknown if the combination of the two environments will lead to a greater decrement in aerobic exercise performance. **PURPOSE:** To determine the impact of the combination of heat and altitude on self-paced aerobic exercise performance. **METHODS**: In order establish a coefficient of variation (CV), 7 subjects (2F, 5M, 27 ± 5 yrs, 174 ± 11 cm, 80 ± 19 kg; SL VO$_2$peak, 42 ± 5 ml·kg^{-1}·min^{-1}) performed 3 familiarization trials consisting of 30 min of steady state (SS) cycling (50% of sea level (SL) VO$_2$peak) followed by a 15 min self-paced cycling time trial (TT) while at sea level and under thermoneutral conditions (SLTN; 250m, 20°C, 30-50% rh). Following familiarization trials, subjects completed the SS and 15 min

self-paced TT under 4 environmental conditions at random: SLTN (SL hot (SLH; 250m, 35°C, 30% rh), altitude thermoneutral (ATN; 3,000m, 20°C, 30-50% rh) and altitude hot (AH; 3,000m, 35°C, 30% rh). Performance was assessed by the total amount of work (kilojoules, kJ) completed during each TT. Heart rate (HR) and rate of perceived exertion (RPE) were recorded during the TTs. **RESULTS**: The CV was 2.6% for familiarization trials. Differences existed in total work completed during the 15 min TT between SLTN vs ATN (167 ± 32 vs 148 ± 28 kJ, P < 0.05), SLTN vs AH (167 ± 32 kJ vs 139 ± 29 kJ, P < 0.05), and SLH vs AH (159 ± 32 kJ vs 139 ± 29 kJ, P < 0.05). No differences existed in mean HR during the TT, or in RPE at the end of exercise (P > 0.05 for both) between any of the conditions. Pacing at 3 min increments was not different between environments (P > 0.05). **CONCLUSION:** Self-paced TT performance was negatively impacted by exposure to altitude, but not heat. The combination of heat and altitude did not lead to a further decrement in exercise performance than caused by either of the two environments alone.
Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1375   Board #183   May 31 8:00 AM - 9:30 AM

Multi-Environmental Exposure does not Alter Plasma Cortisol or Perceived Stress Response to Steady-State Cycle Exercise

John H. Sellers, Michelle A. King, Roy M. Salgado, Karleigh E. Bradbury, Charles S. Fulco, Robert W. Kenefick, FACSM. *USARIEM, Natick, MA.*

(No relevant relationships reported)

Objective and subjective measures of the stress response have been shown to increase in response to exercise in sea-level thermoneutral (SLTN), hot, or altitude environments. However, responses to a combination of these stressors remain unclear. **PURPOSE**: To determine if the responses of objective (serum cortisol [CORT]) and subjective (perceived strain index [PeSI]) stress indices are further increased in a combined environment of heat and altitude. **METHODS**: Six participants (1 F, 5 M) completed 30 min of steady state (SS) exercise on a cycle ergometer at 50% of SL VO_{2peak} in four separate environmental conditions: 1) SLTN (250 m, 20°C, 30-50% RH); 2) Sea-level hot (250 m, 35°C, 30% RH); 3) Altitude thermoneutral (3,000 m, 20°C, 30-50% RH); and 4) Altitude hot (3,000 m, 35°C, 30% RH) in randomized order, separated by ~1 week. Blood samples were drawn via an indwelling venous catheter: upon arrival to the laboratory (baseline, BL); 1 hr upon reaching target environmental condition but before SS (PRE); and immediately following SS exercise (POST). A seated posture was maintained for at least 20 min prior to each draw. PeSI, a product of rating of perceived exertion (RPE) and perceived thermal stress (TS), [5*(TS/16)] + [5*(RPE-6)/14], was calculated PRE and POST SS exercise. **RESULTS**: CORT (ng/ml, mean ± SD) response to SS exercise did not differ among any of the four environmental conditions at any time point (p>0.05), however, there was a main effect of time for CORT levels as shown by an increase between both BL and POST (110 ± 64 vs. 120.32 ± 72 p<0.05) and PRE and POST (113 ± 66 vs 120 ± 72, p<0.05). Similarly, no differences in PeSI (mean ± SD) were observed among any of the environmental conditions (p>0.05), yet there was a main effect of time on PeSI (p<0.05) as demonstrated by an increase from PRE (1.36 ± 0.40) to POST (4.68 ± 1.65) SS exercise. **CONCLUSION**: During SS exercise, the combination of heat and altitude resulted in similar objective and subjective stress responses compared to any singular environmental stressor, suggesting that exercise, and not environmental condition, is responsible for any observed differences.

1376   Board #184   May 31 8:00 AM - 9:30 AM

Exhaled Nitric Oxide Levels during Acclimatization to High Altitude

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(No relevant relationships reported)

Introduction: During ascent to high altitude, inadequate pulmonary acclimatization may lead to high altitude pulmonary edema. One potential mechanism for acclimatization is pulmonary endothelial release of nitric oxide (NO) to reduce pulmonary pressures. **Purpose:** To characterize: 1) the change in exhaled NO concentration (eNO); and 2) the association between systolic pulmonary artery pressure (sPAP), arterial oxygen saturation (SaO_2), and eNO during acclimatization to high altitude. **Methods:** Seventeen healthy, non-smoking, adult lowlanders completed an 8- to 10-day trek to Mount Everest Base Camp (5,150m) in two groups. Group 1 arrived and stayed at base camp for ~30 days (acclimatized, 'ACC'; n=9 (7M/2F); age 38±9yr, ht 174±9cm, wt 69.7±10.1kg) prior to the arrival of group 2 (non-acclimatized, 'Non-ACC'; n=8 (8M/0F); age 36±11yr, ht 181±5cm, wt 85.9±7.8kg). Upon arrival of the Non-ACC group (*Day 1*), eNO (in triplicate via a handheld electrochemical detector), sPAP (via transthoracic echocardiography) and SaO_2 (via pulse-oximetry), were measured in each participant. In addition, eNO was measured in the Non-ACC

group after 5 and 9 days at base camp. **Results:** On Day 1, eNO was greater in the Non-ACC group vs. the ACC group (21.2 ± 8.6 vs. 9.6 ± 5.4 ppb; P = 0.004). In the Non-ACC group, eNO levels fell from Day 1 to Day 9 at high altitude (21.2 ± 8.6 vs. 14.5 ± 5.9 ppb; P = 0.032) such that eNO levels were not different compared to the ACC group by Day 9 (14.5 ± 5.9 vs. 9.6 ± 5.4 ppb; P = 0.095). On Day 1, lower eNO levels were associated with higher sPAP in all participants (r = -0.50, P = 0.042). There was no relationship between eNO and SaO_2. **Conclusion:** During acclimatization to high altitude, eNO levels decrease in healthy lowlanders. Moreover, there is a negative relationship between eNO and systolic pulmonary artery pressure during acclimatization to high altitude. These data suggest that eNO plays a role in pulmonary acclimatization.

1377   Board #185   May 31 8:00 AM - 9:30 AM

The Effects of Fluid Parameters on Performance in a Simulated Altitude Environment

Jessica L. Peacock, PhD.. *Merrimack College, North Andover, MA.* (Sponsor: Vincent Paolone, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of the current research was to clarify approaches to fluid parameters which may improve exercise performance at moderate simulated altitude. The researcher aimed to determine if consuming fluid equal to fluid loss has an impact on acute performance at simulated 3048-m. **METHODS:** Nine trained male cyclists (VO_{2peak} 51.68 ± 6.66 ml^{-1}kg^{-1}min) performed 30 min of cycling at 75-85% of HR attained at VO_{2peak} in four different conditions: control-normoxic (CON-NORM), control-hypoxic (CON-HYP), hypoxic-hydrated (HYP-HYD), and hypoxic-ad libitum (HYP-ADLB). In all conditions, subjects consumed 250 ml of water at baseline. In the HYP-HYD session, subjects consumed 250 ml of water at baseline in addition to the fluid volume equal to 50% of the total fluid lost during the CON-HYP session. After 15 min of cycling, subjects consumed the remaining 50%. In the HYP-ADLB condition subjects were permitted to consume water ad libitum. To simulate altitude (3048 m; 10,000 ft.), an E-Cylinder hypoxic inspirate containing 14.5% O_2 and 85.5% balance N_2 was used. **RESULTS:** As expected, S_aO_2 and average workload (Watts) were significantly reduced with exposure to simulated 3048-m (p < .05). Average workload was significantly (p <.05) lower in the CON-HYP, HYP-HYP and HYP-ADLB conditions ($M_{CON-HYP}$ = 155.00 ± 24.49, $M_{HYP-HYD}$ = 162.59 ± 28.84, $M_{HYP-ADLB}$ = 156.57 ± 22.77) compared to the CON-NORM condition ($M_{CON-NORM}$ = 194.72 ± 31.50). Mean fluid intake was significantly (p<.05) higher in the HYP-HYD condition compared to the HYP-ADLB condition ($M_{HYP-HYD}$ = 668.87 ± 261.23 ml, $M_{HYP-ADLB}$ = 197.00 ± 112.74 ml). **CONCLUSION:** Inadequate fluid replacement and ad libitum fluid consumption degrade exercise performance in an additive manner with that induced by hypoxia, despite maintaining hydration prior to acute performance. Additionally, consuming 50% of fluid loss prior to and during every 15 min appears to reduce the magnitude of performance decrements during an acute bout of high intensity cycling at 3048-m. Optimizing hydration strategies for performance at altitude may always remain indefinite, however, trained athletes that ascend to altitude must be as thorough about their hydration strategies as they are about other performance factors.

1378   Board #186   May 31 8:00 AM - 9:30 AM

Exercise At Simulated Altitude Increases Gastrointestinal Barrier Damage And Promotes Leukocyte Activation

Claire J. Lauterbach, Harrison R. Strag, Zach J. Schall, Ally M. Hamilton, Matthew R. Kuennen. *High Point University, High Point, NC.*

(No relevant relationships reported)

PURPOSE: This study tested whether altitude-associated ischemic stress damages the gastrointestinal barrier, activates leukocytes, and promotes inflammation. **METHODS**: Subjects (N = 5) completed two 60 min bouts of matched-workload treadmill exercise (65% VO_{2max}). One under control conditions (Normoxia, F_iO_2 = 20.9%) and the other at ~4000 m of simulated altitude (Hypoxia, F_iO_2 = 13.5%). Pulse oximetry was used to measure peripheral oxygen saturation (SpO_2) and near-infrared spectroscopy was used to measure absolute tissue saturation (StO_2) at 5 min intervals throughout exercise. Fatty acid-binding protein (I-FABP), markers of leukocyte activation (CD14, ICAM-1, IL-8, MCP-1, MPO), and cytokines (TNFα, IL-1β, IL-6, IL-10, IL-12) were measured in plasma samples that were collected Pre, Post, 1hr-Post, and 4hr-Post exercise. Data were analyzed with 2-Way (Condition x Time) RM ANOVAs with significance set at $p \leq 0.05$. *Post hocs* (Newman-Keuls) were run where appropriate. **RESULTS**: Significant reductions in SpO_2 and StO_2 were shown during exercise at simulated altitude [(SpO_2: Hypoxia = 79 ± 1% *vs* Normoxia = 94 ± 0.5%, p = 0.03) (StO_2: Hypoxia = 61 ± 2 *vs* Normoxia = 69 ± 2, p < 0.01)]. A significant interaction effect was shown for I-FABP (p = 0.05), with *post hoc* analysis indicating I-FABP increased more from Pre to Post in Hypoxia (112%) than in Normoxia (30%). IL-8

Abstracts were prepared by the authors and printed as submitted.

increased more from Pre to Post (60%) and 1hr-Post (83%) in Hypoxia than in Normoxia (33% & 57%, respectively). Significant main effects were also shown for IL-6, ICAM-1, CD14, and MCP-1. All were higher in Hypoxia ($p \leq 0.05$). MPO increased at Post in Normoxia (121%, $p = 0.05$) but did not increase until 1hr-Post in Hypoxia (129%, $p = 0.02$).
CONCLUSIONS: Preliminary data suggest exercise at altitude may increase gastrointestinal barrier damage and leukocyte activation, as indicated by higher levels of I-FABP, IL-8, and MCP-1. Increased CD14 and ICAM-1 suggest TLR4-mediated inflammatory signaling may also be elevated, but the delayed increase in MPO following exercise at altitude warrants further investigation.

1379   Board #187   May 31 8:00 AM - 9:30 AM
Cerebral Blood Flow Velocity and EEG Response during Ergometer Exercise in Normoxia and Hypoxia

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(No relevant relationships reported)

The cerebral blood flow velocity (CBFV) response to acute hypoxia has been known to increase. But, how CBFV might respond to exercise in hypoxic condition and be associated with EEG remains unclear. PURPOSE: To evaluate the effects of exercise in hypoxic condition corresponding to the altitudes of 4000m on cerebral blood flow velocity and EEG. METHODS: In a randomized, double-blind, balanced crossover study, ten healthy volunteers (19.8±0.4yrs) were asked to perform the incremental bicycle ergometer exercise twice in hypoxic and control(sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 125W. Acute normobaric hypoxic condition was maintained for 45 minutes using low oxygen gas mixture. CBFV in middle cerebral artery (MCA) and EEG were measured at rest 5 minutes, rest 15 minutes, immediately after exercise, and 15 minutes recovery using transcranial-Doppler sonography and EEG signal was recorded from 6 scalp sites leading to analysis of alpha and beta wave relative activities. All data were analyzed using two-way ANOVA with repeated measures and Pearson's correlation. RESULTS: CBFV in MCA in hypoxic condition was significantly higher than in control condition at rest 5 minutes (83±9 vs. 69±9 cm/s, p<.01), rest 15 minutes (87±8 vs. 67±7 cm/s, p<.001), immediately after exercise (112±9 vs. 97±9 cm/s, p<.01), and 15 minutes recovery (91±11 vs. 74±7 cm/s, p<.01). However, no significant correlation was found between the changes of CBFV and EEG wave activities. CONCLUSION: These results suggest that hypoxia might amply the changes of CBFV observed during exercise. But, the changes of CBFV might have no association with the changes of EEG wave activities in hypoxia.

1380   Board #188   May 31 8:00 AM - 9:30 AM
Effect of Hypoxia on EEG During and After Cycle Ergometer Exercise

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(No relevant relationships reported)

How hypoxic condition influences the brain cortical activities observed by Electroencephalography (EEG) during exercise has been unknown. **PURPOSE:** To determine the effect of hypoxia on electroencephalographic activity during and after cycle ergometer exercise. **METHODS:** In a randomized, double-blind, crossover study, Eleven healthy volunteers (21.4±0.7yrs) were asked to perform the bicycle ergometer exercise twice in hypoxic condition and control(sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes until 125W, then maintained at 125W for 14 minutes. Acute normobaric hypoxic condition corresponding to the altitudes of 3150m was maintained using low oxygen gas mixture for the whole procedure of 60 minutes. EEG was measured prior to the onset of exercise, immediately after exercise and 20 minutes recovery. EEG signal was recorded from 6 scalp sites (frontal, temporal and occipital lobe of the international 10-20 system) leading to analysis of theta (4-7Hz), alpha (8-13Hz), beta (13-30Hz), and gamma(30-50Hz) relative activities. All data were analyzed using two-way ANOVA with repeated measures. **RESULTS:** Alpha wave activity of frontal lobe in hypoxia group was significantly lower than in control group immediately after exercise (0.24±0.13 vs. 0.41±0.15 μV, p<.05). Beta wave activity of occipital lobe in hypoxia group was significantly higher than in control group immediately after exercise (0.28±0.07 vs. 0.20±0.07 μV, p<.05). Gamma wave activity of frontal lobe in hypoxia group was significantly higher than in control group immediately after exercise (0.25±0.12 vs. 0.12±0.08 μV, p<.05). Theta wave activity of left frontal lobe in hypoxia group was significantly lower than in control group at 20 minutes recovery (0.08±0.05 vs. 0.15±0.05 μV, p<.05). **CONCLUSION:** These results suggest that acute exposure to mild hypoxic condition may amplify the change of EEG activities which has been commonly observed during exercise.

1381   Board #189   May 31 8:00 AM - 9:30 AM
Cardiovascular Adjustments During Steady-state Cycling: Effects Of Heat And Altitude.

Robert W. Kenefick, FACSM, Karleigh E. Bradbury, John H. Sellers, Adam J. Luippold, Katherine M. Mitchell, Charles S. Fulco. *U.S. Army Ressearch Institute of Environmental Medicine, Natick, MA.*
(No relevant relationships reported)

Compared to exercise in a thermo-neutral environment or at sea level (SL), heart rate is elevated to a greater extent during exercise in the heat or at altitude, to compensate for either increased skin blood flow or decreased arterial oxygen saturation (S_aO_2). **PURPOSE**: To determine the compensatory heart rate response [% Δ heart rate (HR)] to steady-state cycling during *combined* heat and altitude exposure. **METHODS**: Seven subjects (2F, 5M, age: 27 ± 5 yrs, height: 175 ± 10 cm, weight: 80 ± 19 kg, SL VO_{2peak}: 42 ± 5 ml·kg⁻¹·min⁻¹) performed 30 min of steady-state cycling at an identical power output (50% of SL VO_2peak) in 4 randomly assigned environmental conditions in a hypobaric chamber: SL thermo-neutral (SLTN; 250m, 20°C, 30-50% rh), SL hot (SLH; 250m, 35°C, 30% rh), altitude thermo-neutral (ATN; 3000m, 20°C, 30-50% rh) and altitude and hot (AH; 3000m, 35°C, 30% rh). There was a minimum of 3-5 rest days between experimental trials. HR and S_aO_2 were measured throughout exercise. %Δ HR and %Δ S_aO_2 were calculated relative to SLTN (control) at the 24th min of exercise. **RESULTS**: %S_aO_2 was reduced (P<0.05) from SLTN for ATN (-12.1 ± 3.3%) and AH (-11.3 ± 2.0%) but not for SLH (-0.7 ± 0.5%). %Δ HR was increased (P<0.05) from SLTN for SLH (10.0 ± 5.2%), ATN (10.5 ± 2.0%), and AH (16.7 ± 5.5%). The %Δ HR for AH also was greater (P<0.05) compared to either SLH or ATN. **CONCLUSION:** Exposure to either heat or altitude resulted in a ~10% Δ HR compensatory response compared to exercise at SL in a thermo-neutral environment. The combination of both environments resulted in a potentiated compensatory %Δ HR of ~17% but was less than the summation of %Δ HR for both environments. These results suggest that the combination of heat and altitude evoked other compensatory adjustments (e.g., increased stroke volume or myocardial contractility; greater splanchnic vasoconstriction, etc.) in order to meet the combined demands of increased skin blood flow for thermoregulation and O_2 delivery during 30 min of moderate intensity, steady-state exercise. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1382   Board #190   May 31 8:00 AM - 9:30 AM
Between Individual Variability in Sleep and Awake Pulse Oximetry During Ascent Of Mt. Kilimanjaro

Stephen R. Muza, FACSM, Robert W. Kenefick, FACSM, Beth A. Beidleman, Charles S. Fulco, Scott W. Hamilton. *US Army Research Institute of Environmental Medicine, Natick, MA.*
(No relevant relationships reported)

Between individual variability in awake arterial pulse oximetry ($aSpO_2$) is well known and has been proposed for field assessment of altitude acclimatization. Sleep SpO_2 ($sSpO_2$) is known to be lower than $aSpO_2$ at high altitude, but the between individual variability in $sSpO_2$ is not as well known. **PURPOSE:** Compare between individual variability and relationship between $sSpO_2$ and $aSpO_2$ during a 6 day ascent of Mt. Kilimanjaro. **METHODS:** In 18 (12 men/6 women), age range 18-62 yr, low-altitude residents over 5 of 6 nights $sSpO_2$ was assessed using a finger sensor recording pulse oximeter and compared to a morning $aSpO_2$ measured for 1 minute while the subject was quietly seated. Each individual's mean SpO_2 was calculated for their sleep and awake measurements. Correlations (Pearson product-moment) between sleep and awake SpO_2 were evaluated. **RESULTS:**

	2280 m	2875 m	3200 m	3850 m	4830 m
$sSpO_2$ (mean±SD)	91 ± 2%	87 ± 3%	83 ± 4%	78 ± 5%	69 ± 4%
$sSpO_2$ (range)	88 – 95%	83 – 91%	78 - 88%	74 – 87%	57 – 76%
$sSpO_2$ (CV)	2.2	3.4	4.8	6.4	5.8
$aSpO_2$ (mean±SD)	94 ± 2%	90 ± 4%	88 ± 4%	83 ± 4%	72 ± 5%
$aSpO_2$ (range)	91 – 99%	86 – 99%	82 – 96%	76 – 91%	62 – 83%
$aSpO_2$ (CV)	2.1	4.4	4.5	4.8	9.7
$sSpO_2$ vs $aSpO_2$ (R)	0.78	0.77	0.71	0.75	0.69

As expected, both $sSpO_2$ and $aSpO_2$ decreased with increasing altitude. The Coefficient of Variation (CV), of both $sSpO_2$ and $aSpO_2$ increased with increasing altitude. Individual $sSpO_2$ and the next morning $aSpO_2$ were strongly correlated at all altitudes. **CONCLUSION:** In low altitude residents climbing to 4830 m over 6 days, sleep and awake SpO_2 have similar between subject variability (dispersion) that more than doubles with increasing altitude indicating a broadening of individual ventilation and pulmonary gas exchange responses to the hypoxic environment. Also, individual

sSpO$_2$ and aSpO$_2$ are highly correlated to each other. Funding: USAMRMC. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

1383   Board #191   May 31 8:00 AM - 9:30 AM

Combined Effects of Heat and Altitude on Sweating Responses during Steady-State Cycling Exercise

Adam J. Luippold, Karleigh E. Bradbury, Katherine M. Mitchell, Beau R. Yurkevicius, John H. Sellers, Robert W. Kenefick, FACSM. *United States Army Research Institute of Environmental Medicine, Natick, MA.* (Sponsor: Robert W. Kenefick, FACSM)
(No relevant relationships reported)

Exposure to high altitude could increase sweating responses as a result of widening the air-to-skin water vapor pressure gradient. Previous laboratory studies have reported both lower and higher sweat losses at altitude. **PURPOSE:** To determine if exposure to altitude in a thermo-neutral environment, and exposure to altitude in the heat will alter the onset time of sweating (OTS) and sweat rate (SR) during 30 minutes of steady state (SS) exercise. **METHODS:** Seven healthy volunteers (2F, 5M, age: 27 ± 5 yrs, height: 175 ± 10 cm, weight: 79.7 ± 18.5 kg, sea level (SL) VO$_{2peak}$: 41.8 ± 4.6 ml·kg^{-1}·min^{-1}) completed 30 minutes of SS cycling exercise (50% SL VO$_{2peak}$) in four randomly assigned conditions: SL thermo-neutral (SLTN; 250m, 20°C, vapor pressure (VP): 5.3-8.8 mmhg), SL hot (SLH; 250m, 35°C, VP: 12.7 mmhg), altitude thermo-neutral (ATN; 3,000m, 20°C, VP: 5.3-8.8 mmhg), altitude hot (AH; 3,000m, 35°C, VP: 12.7 mmhg). Prior to exercise, a ventilated sweat capsule (surface area: 15.9 cm^2, air flow: 2 standard liters/min) was applied to the supinated forearm of the volunteer. Ambient temperature (°C) and relative humidity of the capsule interior were recorded throughout SS exercise. The time at which OTS occurred (minute) and SR (mg·cm^2·min^{-1}) were calculated. **RESULTS:** OTS and SR were not different (P > 0.05) between SLTN vs. ATN conditions (7.58 ± 2.90 vs. 7.43 ± 2.90 min; 0.70 ± 0.32 vs. 0.78 ± 0.33 mg·cm^2·min^{-1}, respectively). Furthermore, in the heat OTS and SR were not different (P > 0.05) between SLH vs. AH conditions (1.28 ± 1.64 vs. 0.83 ± 1.31 min; 1.55 ± 0.25 vs. 1.51 ± 0.20 mg·cm^2·min^{-1}, respectively). **CONCLUSION:** Both exposure to altitude in a thermo-neutral environment and exposure to altitude in the heat did not alter either OTS or SR. This suggests the water vapor pressure gradient at 3,000m was not great enough to have a marked effect on sweating responses. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1384   Board #192   May 31 8:00 AM - 9:30 AM

Heart Rate Variability And Body Composition As A Hypoxia Risk Factor In Military Pilots.

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(No relevant relationships reported)

PURPOSE: To determine if heart rate variability, body composition and hypoxia exposure time could help to identify risk of hypoxia in a group of COLAF aircrew that train in hypobaric Chamber at the Aerospace Medical Center.
METHODS: Previous ethics committee approval and signing of the informed consent, 60 pilots between 20 and 40 years were selected. Body composition was obtained by impedance with a Tanita ® bascule TBA-300A (weight, height, BMI, muscle weight, fat percentage and water percentage). The volunteers attended to a hypoxia physiological training where they were exposed to profile IV-A COLAF (30 minutes denitrogenation with 100% oxygen (DNT), climb to 25,000 feet with exposure to hypoxia and descent to ground level). During this profile heart rate was monitored through the RR record with a Polar ® heart rate monitor RS800 and the minimum percentage of oxygen saturation in hypoxia exercise previous recovery was recorded. Hypoxia permanence time (TH) and power frequency response ANS Low Frequency (LF), High Frequency (HF) and LF / HF were analyzed. For LF and HF, modeling by Fast Fourier Transform (FFT) was implemented. Lilliefors test to verify normality was applied. For the relationship between variables with non-normal distribution Chi square test was applied. And for normal distribution direct correlation was applied.
RESULTS: Direct correlation (p-value <0.05) between TH (4.24 ± 1.74 min) and water percentage (44.46 ± 6.11) was observed. Additionally, a significant difference in LF / H was found among the three moments of the flight profile using the Wilcoxon test was observed in 21 pilots due to loss of signal in the other 39. While in HF there were only significant between moments: DNT - Hypoxia and Hypoxia - descent to ground level.
CONCLUSIONS: Pilots with highest percentage of water and muscular mass tolerated longer exposure to hypoxia at 25000 feet. Also, changes in oxygen partial pressure determine changes on autonomic nervous system, thus hypoxia exposure increase sympathetic modulation over parasympathetic that could be modify by body composition.

1385   Board #193   May 31 8:00 AM - 9:30 AM

Differences of Surface Electromyography during Incremental Cycling Exercise in Hypoxia and Normoxia Using Wavelet Transform Analysis

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(No relevant relationships reported)

Previous studies indicated that there was a difference between hypoxia and normoxia for amplitude parameters of surface electromyography (EMG). However, there are few reports on frequency parameters of EMG because of limitations of traditional analytical methods. **PURPOSE:** The purpose of this study was to investigate the differences of surface electromyography during incremental cycling exercise in hypoxia and normoxia using wavelet transform analysis. **METHODS:** Subjects were fourteen active and healthy men. (mean±SD; age: 21.08 ± 1.50 years; height: 1.69 ± 0.06 m; weight: 60.16 ± 7.77 kg; maximal oxygen consumption: 51.11. ±9.54 ml / min / kg). The subjects performed incremental cycling exercise test to exhaustion in hypoxia (F$_I$O$_2$: 13.4%) and normoxia conditions (F$_I$O$_2$: 20.9%). EMG activities of vastus lateralis (VL), vastus medialis (VM), rectus femoris (RF) and biceps femoris (BF) were recorded during cycling exercise test at a sampling rate of 2000 Hz. Integrated electromyogram (iEMG) and mean power frequency (MPF) for each exercise intensity were calculated from the EMG data. Contentious wavelet analysis was used to calculate MPF, and mother wavelet was set at morlet wavelet. The differences between exercise intensities and F$_I$O$_2$ conditions were compared using a two-way analysis of variance. The significance level was set at $p< 0.05$. **RESULTS:** iEMG of each muscle significantly increased with increasing exercise intensities (all: p < 0.01). However, there were no significant differences between F$_I$O$_2$ conditions for each muscle (VL: p = 0.37; VM: p = 0.49; RF: p = 0.37; BF: p = 0.64). MPF of VL significantly decreased with increasing exercise intensities (p < 0.01), and MPF in hypoxia was higher than that in normoxia (p < 0.01). MPF of VM significantly decreased with increasing exercise intensities (p<0.01), but there were no significant differences between F$_I$O$_2$ conditions (p = 0.37). In addition, there were no significant differences between exercise intensities (RF: p = 0.49; BF: p = 0.57) and F$_I$O$_2$ conditions (RF: p = 0.49; BF: p = 0.19) for RF and BF. **CONCLUSION:** The current results demonstrated that the change in MPF was different for each muscle, and MPF of VL in hypoxia was only higher than that in normoxia, and suggested hypoxia exposure affects neuromuscular activity agonist muscle during exercise.

1386   Board #194   May 31 8:00 AM - 9:30 AM

The Effect of Endurance Exercise in Hypoxia on Hepcidin Response in Athletes

Daichi Sumi, Chihiro Kojima, Kazushige Goto. *Ritsumeikan University, Kusatsu, Japan.* (Sponsor: Robert R Kraemer, FACSM)
(No relevant relationships reported)

Training in hypoxia has been widely utilized to improve endurance capacity. On the other hand, the influence of the endurance training in hypoxia on hepcidin (a liver-derived, iron regulating hormone) response remains unclear. This information would be a great help for preventing iron deficiency in endurance athletes.**PURPOSE**: The purpose of the present study was to determine the influence of endurance exercise under hypoxic condition on post-exercise hepcidin levels in endurance athletes. **METHODS**: Nine trained endurance athletes (19.7 ± 0.3 years, 169.8 ± 2.2cm, 57.1 ± 1.1kg, VO$_2$max 62.8 ± 1.6ml·kg·min) completed two different trials on different days, consisting of exercise in under moderate hypoxic (H, FiO$_2$:14.5%) and normoxic (N, FiO$_2$:20.9%) conditions. They performed interval type of endurance exercise (10×3-min running at 95% of VO$_2$max with 60s of active rest at 60% of VO$_2$max) followed by 30-min of continuous running at 85% of VO$_2$max under hypoxic or normoxic conditions. Venous blood samples were collected before the exercise and during 120-min of post-exercise period. **RESULTS**: Running velocities during interval and continuous exercise were significantly lower in the H trial than in the N trial ($P < 0.0001$). Exercise-induced blood lactate elevation was significantly greater in the H trial (5.1 ± 0.5mmol/L) than the N trial (3.2 ± 0.7mmol/L, $P < 0.05$). There were significant increases in plasma interleukin-6, serum iron, and blood glucose levels after exercise, but these responses were not significantly different between the two trials. Serum hepcidin levels increased significantly at 120-min after completing exercise (H: from 10.7 ± 9.4 ng/mL to 15.8 ± 11.2 ng/mL; N: from 7.9 ± 4.7 ng/mL to 13.2 ± 7.9 ng/mL. $P < 0.05$). However, there was no significant difference between the two trials. **CONCLUSIONS**: Endurance exercise under moderate hypoxic conditions resulted in similar exercise-induced serum hepcidin response compared with equivalent exercise under normoxic condition in endurance athletes.

1387   Board #195   May 31 8:00 AM - 9:30 AM

Blood Oxidative Stress Following Exercise Recovery in Normobaric and Hypobaric Hypoxic Environments

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(No relevant relationships reported)

PURPOSE: Hypobaria and hypoxia exert independent effects on exercise-induced oxidative stress in blood, while the hypobaric and hypoxic influences are not well defined. The current study was undertaken to quantify exercise-induced oxidative stress recovery during lab-simulated hypoxic and hypobaric conditions following a common bout of exercise. **METHODS**: At a base elevation of 975m, physically active participants (n=16), ages 18-40, provided informed consent prior to performing 60 minutes of cycle ergometry at 70% watts max. Using a randomized counter-balanced crossover design participants recovered for 4 hours in 3 lab-simulated conditions; 1000m normobaric normoxia (NN, 675mmHg, 18.8%FiO2), 4400m normobaric hypoxia (NH, 675mmHg, 12% FiO2), or 4400m hypobaric hypoxia (HH, 440mmHg, 12% FiO2). O2 saturation was confirmed via pulse oximetry throughout the 3 exercise-recovery trials. Blood samples were collected in heparinized vacutainer tubes at time points Pre, Post, 2 Hours Post, and 4 Hours Post exercise. Blood plasma was analyzed for the quantification of oxidative stress to proteins (protein carbonyls, PC; 3-nitrotyrosines, 3NT), lipid (lipid hydroperoxides, LOOH; 8-isoprostanes, 8-ISO), and antioxidant capacity (ferric reducing ability of plasma, FRAP; trolox equivalent antioxidant capacity, TEAC). **RESULTS**: Plasma TEAC, FRAP, 3NT and PC were unaltered by exercise and recovery environments (p>0.05). Exercise-induced increases in LOOH and 8-ISO were observed, although time-by-trial differences were not present. **CONCLUSIONS**: These data indicate that exercise recovery in simulated conditions of NH and HH do not impact a common panel of blood oxidative stress measures.

1388   Board #196   May 31 8:00 AM - 9:30 AM

Cardiopulmonary Responses, Brain and Muscle Oxygenation during Exercise on Hypoxia as Acclimatization to Hypoxic Training

Jin Uchimaru, Yi-Zhen Yu, Fan Chen, Hidekazu Takemura, Hirohiko Takahashi, Shozo Suzuki. Sendai University, Shibata, Japan.
(No relevant relationships reported)

It is well known that altitude/hypoxic training enhance to exercise performance. But there are individual differences in physiological responses and training effects on hypoxic training. Thus, acclimatize to altitude/hypoxic environment would be also very important factor for successful training. **PURPOSE**: Our study focuses on changes in cardiopulmonary responses, brain and muscle oxygenation on incremental exercise at hypoxia as acclimatization to short periods hypoxic training. **METHODS**: Sixteen male healthy college-age students were divided into a hypoxic training (N, n=8) or a normoxic training group (H, n=8). They completed 5 days training session. All subjects underwent the incremental maximal cycling test at hypoxia on 1st and 5th day and 40-minutes submaximal exercise under 50-70%VO2max on 2nd, 3rd and 4th day at both each environment. We measured cardiopulmonary measurements (VE, VO2, VCO2, HR and SpO2) and blood lactate concentration on incremental exercise. Near-infrared spectroscopy (NIRS) was also used to monitor concentration (μM) changes of oxy- and deoxyhemoglobin (Δ[O2Hb], Δ[HHb]) in left frontal cortex region of the forehead and ipsilateral vastus lateralis muscle. Changes in total Hb and StO2 were calculated and used as index of change in regional blood volume. Paired T-test were performed across treatments. **RESULTS**: VO2max (41.8±4.6 ml/kg/min) and exercise time (911±40 sec) on 5th day of H group were significantly improved from that of 1st day (38.7±3.7 ml/kg/min, 847±62 sec)(p<0.05). VE, VO2 and VCO2 at submaximal exercise (180W) on 5th day of H group were significantly improved from that of 1st day (p<0.05). Also, in H group, SpO2 during submaximal and maximal exercise on 5th day were significantly higher than that of 1st day (p<0.05). There was no significant difference in brain and muscle oxygenation during exercise in both group. **CONCLUSIONS**: We suggest that short period hypoxic training would be improve cardiopulmonary and oxygen-carrying capacity during exercise and exercise capacity under moderate hypoxia. Further study is needed to clarify the mechanism of physiological acclimatization to hypoxia.

C-44   Free Communication/Poster - **Cold/Dive/ Space Physiology**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1389   Board #197   May 31 8:00 AM - 9:30 AM

Precooling With An Ice Vest: Effect On Core Temperature And Heart Rate While Swimming

Brent Alumbaugh, Shelbi Peters, Leah Hendrick, Michael Reeder. Colorado Mesa University, Grand Junction, CO.
(No relevant relationships reported)

Precooling has been shown to improve athletic performance by decreasing core body temperature prior to exercise, thus delaying the onset of core heating and decreasing heart rate at given intensities during training and competition. Previous research has studied the effect of precooling on cyclists and runners, but very little research has observed core temperature (CT) and heart rate (HR) response to precooling in collegiate female swimmers. **PURPOSE**: To observe the effect of precooling on core temperature and heart rate prior to swimming 1600 yards. **METHODS:** Eleven female collegiate swimmers participated in randomized, crossover swimming trials with and without precooling. Trials were separated by one week with each subsequent trial performed at the same time of day. Precooling trials started 45 minutes prior to non-precooling trials and subjects precooled wearing an ice vest with a wet t-shirt prior to the exercise trial. All trials had a 15 minute warm up consisting of a 400yd swim, 200yd kick, and four sets of 50yd drill, followed by a 200yd cool down. Core temperature monitoring was performed during a main set of 1600 yards, swam at 75% of fastest mile pace, broken into eight, 200yd intervals. CT, heart rate (HR), and rating of perceived exertion (RPE) were measured before and after warm-up and at 200yd intervals for the remainder of the trial. **RESULTS:** Group precooling CTs were significantly (p=.02) lower. Group precooling HRs were not significantly different (p=.20), however seven of the subjects did present significantly (p<.05) lower HRs during the precooling trial. **CONCLUSION:** Precooling, using an ice vest 45 minutes prior to exercise, was shown to significantly reduce core temperature during swimming compared to non-precooling. Individual response in HR between subjects was observed, with the majority of subjects (n=7) responding with a significant decrease in HR in the precooling condition.
Keywords: Core Temperature, Precooling, Ice Vest, Core Temperature Pill, Swimming

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1390   Board #198   May 31 8:00 AM - 9:30 AM

Effects Of Cycling In The Cold On Neuromuscular Activation And Fatigue

Brittany N. Followay, Jeremiah A. Vaughan, Savannah R. Hall, Eliott Arroyo, Cody S. Dulaney, Joseph A. Laudato, Ellen L. Glickman, Adam R. Jajtner. Kent State University, Kent, OH.
(Sponsor: Ellen Glickman, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the effects of cold exposure on neuromuscular activation and fatigue during aerobic cycling exercise. **METHODS:** Five apparently healthy males (24.8 ± 2.9 years; 183.1 ± 2.2cm; 80.5 ± 4.4kg; 11.3 ± 2.8%BF; 3.97 ± 0.34 L·min^{-1}) visited the laboratory on three separate occasions. During the first visit, participants performed a VO2max test on a Velotron cycle ergometer. During the two remaining trials, participants performed two, five-second maximal isometric voluntary contractions (MVICs) of the right leg extensors prior to entering the environmental chamber. In the environmental chamber, volunteers cycled for 60 min at 60% of their VO2max in either a low- (5°C / 45%RH; LT), or moderate-temperature (22°C / 45%; MT), in counterbalanced fashion. Electromyography (EMG) of the vastus lateralis was recorded during the 60-minute exercise protocol during the first two minutes, and during the last two minutes of every 10-minute period (0-2min, 8-10min, 18-20min, 28-30min, 38-40min, 48-50min, 58-60min). Root mean square (RMS), mean power frequency (MPF) and median power frequency (MEDPF) were then normalized to the MVIC for each time point. Data were analyzed using a within subjects repeated measures ANOVA. **RESULTS:** No significant differences were observed between conditions (LT and MT) for RMS (F = 0.341; p = 0.591) MPF (F = 0.003; p = 0.959), or MEDPF (F = 1.438; p=0.297). A significant main effect of time was observed for RMS F = 8.187, p<0.001. Specifically, RMS at 8-10Min (26.369 ± 3.542%), 18-20Min (24.782 ± 3.572%), 38-40Min (25.722 ± 3.534%) and 48-50Min (26.070 ± 3.451%) were significantly lower than RMS at 58-60Min (27.091 ± 3.521%). There was also a significant effect of time for MPF (F = 3.049; p = .023), with a significantly higher MPF at 18-20min (85.694 ± 1.467%) and 38-40min (85.942 ± 1.408%) compared to 8-10min (83.165 ± 1.215%). **CONCLUSION:** The increase in RMS observed at the end of exercise suggests an increase in neural drive and motor unit activity, suggestive of an increase in motor unit recruitment and fatigue during aerobic

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cycling exercise at 60% VO₂max. Furthermore, MPF significantly increased from the beginning of exercise, suggesting an increase in action potential conduction velocity. <!--EndFragment-->

1391　Board #199　May 31 8:00 AM - 9:30 AM

Habituation to the Cold Pressor Test

Alyssa Leger, David Bellar. *University of Louisiana at Lafayette, Lafayette, LA.*
(No relevant relationships reported)

During acute cold exposure, a stress response is induced. **PURPOSE**: The purpose of this study was to see if daily, cold water exposure to the dominant hand causes habituation to the stress responses that occur due to cold exposure. **METHODS:** Fourteen seemingly healthy men (age=22± 2 years, height=70± 3cm, body fat %= 17.5± 12.9%) participated in the study. Subjects performed the cold pressor test (CPT) a total of 20 times for 4 weeks (5 times per week). Data was collected during the first and final day of the 20-day habituation period. Blood glucose levels were measured before and immediately after the CPT. Subjects were asked to respond to both pain and thermal sensation scale every 30 seconds during the CPT testing. **RESULTS**: A repeated measures ANOVA showed a significant main effect for time for glucose, day 1 versus the final day (F=5.16; p=.04). A paired T-test also revealed a significant difference between the changes in glucose levels (pre-CPT-post-CPT), day 1 versus the final day (mean difference=11.79; t-ratio=2.27; p=.02). The mean change pre to post CPT in glucose on day one was 12±13 mmol/L, and the mean change in glucose on the final day was .5±18 mmol/L. Repeated measures ANOVA showed a significant main effect for time for pain scale, but there was no significant main effect for time for thermal sensations (pain scale: F=27.39; p=.01) (thermal sensation: F=.68; p=.72). Pain scale responses decreased significantly while thermal sensations remained unaltered. The average pain scale response on day one was 5±5, and on the final day 1±1. **CONCLUSION**: This study found a significantly decreased glucose response after 20 days of cold water exposure to the hand. This demonstrates habituation to the stress response. The perception of pain decreased significantly, but not thermal discomfort. More studies are needed to further the investigation on the physiological processes that habituated due to repeated cold exposure.

1392　Board #200　May 31 8:00 AM - 9:30 AM

Afterdrop Effect during Recovery after Aerobic Exercise in a Cold vs Moderate Temperature Environment

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(No relevant relationships reported)

PURPOSE: To examine the effect of after drop following a bout of aerobic exercise and exposure to a cold compared to moderate temperature during recovery. **METHODS**: Five active men (24.8 ± 2.9 yrs; 183.1 ± 6.2 cm; 80.8 ± 4.5 kg; 11.3 ± 2.8 %; 3.97 ± 0.34 L/min⁻¹) were counterbalanced between a cold (5ºC; CLD) and moderate (22ºC with 45% RH; MOD) temperature trial. Exercise trials consisted of 60min of cycling at 60% of their previously determined VO₂max, 15min of rest, and a time to exhaustion at 90% VO₂max. Rectal temperatures (Tre) were recorded at baseline (BAS), end of 60 min exercise (EX60), 15 min rest (RST), Time Trial (TT), 3 min recovery (Rec3), 10 min recovery (Rec10), 30 min recovery (Rec30), and 60 min recovery (Rec60); while oxygen consumption (VO2) was recorded at 3 min of exercise (Ex3), Ex60, TT, Rec3, 15 min recovery (Rec15), Rec30, and Rec60. The data were analyzed via a two factor within-subjects repeated measures ANOVA. **RESULTS**: A trial x time interaction was observed for VO₂ (F = 6.838, p = 0.001), which was greater in CLD at Rec30 (0.50 60 L·min⁻¹) and Rec60 (0.57 ± 0.10 L·min⁻¹) compared to MOD at Rec30 (0.33 ± 0.03 L/min⁻¹; p = 0.008) and Rec60 (0.37 ± 0.03 L/min⁻¹; p = 0.012). A main effect of time was observed for VO₂ (F = 282.52, p < 0.001), where Ex3 (2.06 ± 0.10 L·min⁻¹) was lower than Ex60 (2.3 ± 0.09 L·min⁻¹; p = 0.027) and TT (3.36 ± 0.18 L·min⁻¹; p = 0.001) and higher than Rec3 (0.5 ± 0.02 L·min⁻¹; p < 0.001), Rec15 (0.43 ± 0.05 L·min⁻¹; p < 0.001), Rec30 (0.42 ± 0.02 L·min⁻¹; p < 0.001) and Rec60 (0.47 ± 0.03 L·min⁻¹; p < 0.001). Ex60 was significantly lower than TT (p = 0.007) and higher than Rec3, Rec15, Rec30 and Rec60 (p < 0.05). TT was higher from Rec3, Rec15, Rec30, and Rec60 (p < 0.05). A trial x time interaction was observed for the change in Tre (F = 7.28, p < 0.001), which changed less than in the CLD at Rec3 (0.37 ± 0.58 ºC;), Rec10 (0.16 ± 0.58 ºC), Rec30 (-0.29 ± 0.67 ºC) and Rec60 (-0.69 ± 0.94 ºC) compared to MOD at Rec3 (0.94 ± 0.35 ºC; p = 0.034), Rec10 (0.85 ± 0.48 ºC; p = 0.024), Rec30 (0.44 ± 0.55 ºC; p = 0.021), and Rec60 (0.002 ± 0.59 ºC; p = 0.045), respectively. There was a main effect of trial (F = 8.078, p = 0.047), where the change in MOD (0.707 ± 0.167 ºC) was greater than the change in CLD (0.275 ± 0.259 ºC; p = 0.047). **CONCLUSION**: Not surprisingly, Tre was significantly reduced in the CLD, with a concomitant increase in VO₂ to maintain homeostasis.

1393　Board #201　May 31 8:00 AM - 9:30 AM

Thermal Responses Associated with Prolonged Cycling in Cold Temperature Cody S. Dulaney, Adam R. Jajtner, Jeremiah A. Vaughan, Brittany N. Followay, Elliot Arroyo, Savannah R. Hall, Joseph A. Laudato, Ellen L. Glickman FASCM Exercise Physiology Department, Kent State University, Kent, OH

cody dulaney. *Kent state university, Kent, OH.* (Sponsor: Ellen G Glickman, FACSM)
(No relevant relationships reported)

PURPOSE: To assess thermal responses to exercise in cold versus moderate temperature. **METHODS:** Recreationally active men (n=5, 23.4 ± 2.2 yrs; 183.1 ± 6.1 cm; 86.9 ± 11.9 kg; 4.44 ± 0.75 L·min⁻¹) completed a cycling protocol in 5°C (LT) and 22ºC (MOD). The protocol consisted of 60-min cycling at 60% VO₂max (CT₆₀), 15-min rest, and a time to exhaustion at 90% VO₂max (TTE). Mean skin (T_{sk}), and core temperature (T_{re}) were evaluated before CT₆₀ (BL) and at 3, 20, 40, and 60 min. Metabolic heat production (M) was assessed at BL, 3, 15, 30, 45, and 60 min. Tissue insulation (I) was assessed at 3, 30, and 60 min T_{sk}, T_{re} and I were measured before (PRE) and after (POST) TTE. M was measured at PRE, at the mid-point (MID), and POST TTE. Changes were analyzed using within-subjects repeated measures ANOVA. **RESULTS:** An interaction was observed for T_{sk} during CT₆₀ (F = 64.00 p < 0.001, η_p^2 = 0.941). T_{sk} was lower in LT versus MT ($p \le$ 0.001) at 3 min (25.5 ± 0.7°C, 30.7 ± 0.6°C, respectively), 20 min (23.0 ± 0.7°C, 30.4 ± 0.8°C, respectively), 40 min (22.4 ± 0.6°C, 30.4 ± 0.8°C, respectively) and 60 min (21.9 ± 1.0°C, 29.9 ± 1.3°C, respectively). No interaction (F = 5.97; p = 0.071; η_p^2 = 0.599) was observed for T_{re}. A time effect was observed for M during the TC₆₀ (F = 25.8, p < 0.001, η_p^2 = 0.866). M increased from 3 min (348.2 ± 36.9 W·m⁻²) at 15 min (375.8 ± 35.6 W·m⁻²; p = 0.006), 30 min (383.6 ± 37.6 W·m⁻²; p < 0.001), 45 min (384.6 ± 35.28 W·m⁻²; p < 0.001) and 60 min (391.2 ± 34.0 W·m⁻²; p = 0.004). An interaction was observed for M during TTE (F= 29.08 p < 0.001, η_p^2 = 0.879), with M lower during LT versus MT at PRE (113.9 ± 28.7 W·m⁻²; 305.2 ± 100.7 W·m⁻², respectively; p = 0.016), MID (154.3 ± 54.3; 529.8 ± 65.3 W·m⁻², respectively; p < 0.001), and POST (176.3 ± 26.6; 577.5 ± 59.6 W·m⁻², respectively; p < 0.001). An interaction was observed for I during TC₆₀ (F= 18.52; p = 0.001; η_p^2 = 0.822). I was greater in LT compared to MT at 3 min (0.034 ± 0.005ºC·m⁻²·W⁻¹, 0.019 ± 0.028ºC·m⁻²·W⁻¹, respectively; p = 0.001), 30 min (0.045 ± 0.006ºC·m⁻²·W⁻¹, 0.019 ± 0.017ºC·m⁻²·W⁻¹, respectively; p = 0.001), and 60 min (0.48 ± 0.008ºC·m⁻²·W⁻¹, 0.022 ± 0.001ºC·m⁻²·W⁻¹, respectively; p = 0.003). **CONCLUSION:** As expected, I increased in 5°C compared to 23°C, while M increase during submaximal exercise. However, M decreased during exhaustive exercise perhaps due to fatigue.

1394　Board #202　May 31 8:00 AM - 9:30 AM

The Impact Of Long Duration Spaceflight On The Function Of Plasma Cells

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(No relevant relationships reported)

Long duration spaceflights have been associated with profound dysregulation of the immune system, which could jeopardize crew safety and mission success. Recent studies have examined the impact of long-duration spaceflight on specific markers of adaptive and innate immunity, but no study to date has characterized humoral immunity and serological markers of B-cell function. **Purpose**: The aim of this study was to characterize acute and chronic changes in polyclonal Free Light Chains (FLC) and in Immunoglobulin class switching, indicative of overall B-cell function, by retrospectively analyzing archived plasma samples collected during long-duration spaceflight studies. **Methods:** Plasma samples were collected before flight, during ("Early flight", "Mid-flight" and "Late flight"), immediately upon return and during a recovery period (R+18, R+33 and R+66) from 23 astronauts and 6 age/gender-matched healthy ground-based controls. Plasma Kappa and Lambda Free Light Chains were measured using commercially available ELISA kits (Abingdon Health, Oxford, UK), and changes in renal function were identified by calculating Cystatin C-derived estimates of Glomerular Filtration Rate (eGFR). Finally, Immunoglobulin isotype switching was assessed by measuring changes in total plasma IgA, IgG and IgM throughout the mission using ELISA kits (eBioscience, San Diego, CA, USA). Maximum likelihood linear mixed models (LMM) were used to determine main effects of time on the concentration of serum FLC, Immunoglobulins and Cystatin C. **Results:** There was no difference in serum Kappa and Lambda FLC between pre-flight samples and either in-flight or recovery samples (p>0.05). Furthermore, serum levels of IgA, IgG and IgM remained unchanged during and after spaceflight, when compared to pre-flight values (p>0.05). Finally, there was no difference in eGFR (p>0.05) between before, during and after flight, suggesting that kidney function was not affected by spaceflight. **Conclusion:** These preliminary findings indicate that free light chains

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Abstracts were prepared by the authors and printed as submitted.

and whole immunoglobulin output from plasma cells are unaffected by long-duration spaceflight, indicating that plasma cell immune competency is maintained in microgravity and risk of infection does not appear to be magnified.

1395   Board #203   May 31 8:00 AM - 9:30 AM

Power But Not Fatigue Is Influenced By Hot And Cold Immersion Prior To Vigorous Cycling

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(No relevant relationships reported)

PURPOSE: The impact of hot and cold immersion upon vigorous physical activity is not fully understood. Increased body temperature has been linked to improved performance during vigorous activities, whereas lower body temperature has been noted as detrimental during maximal exercise. A deeper understanding of the effect of hot and cold immersion on fatigue characteristics during the Wingate Anaerobic Test (WAnT) may lead to better understanding on how to best construct training and rehabilitation programs. The purpose of this study was to explore the effects of hot and cold immersion on measures of power and fatigue while completing a maximal bout of anaerobic cycling.
METHODS: Thirty apparently healthy and physically active women (23.00 ± 2.67 yr, 165.77 ± 5.95 cm, 61.97 ± 10.56 kg) completed this study. Participants visited the laboratory on three occasions. Using a counterbalanced design, each completed the WAnT following three immersion protocols: HOT, COLD, and no immersion (CON). Each then rode an electronically-braked cycle ergometer at maximal intensity for 30 seconds. Conditions were controlled and measured by computer. Indices of peak power (PP), mean power (MP), and fatigue index (FI) were calculated using 5-second time periods. Repeated measures ANOVA were used for statistical analysis. Statistical significance was set at the $p \le .05$ level.
RESULTS: Significant differences were found between conditions for PP $[F_{(2,28)}=3.918, p\le 0.032)]$ and MP $[F_{(2,28)}=101.71, p\le 0.000)]$, respectively. Pairwise comparisons using the Bonferroni correction indicated that PP ($p\le 0.024$) was significantly different between HOT and COLD conditions, and MP ($p \le 0.001$) was significantly different between HOT, COLD, and CON conditions. Non-significant differences were found between the warm-up conditions for FI $[F_{(2,28)}=.032, p\le 0.968)]$.
CONCLUSIONS: The measures for PP and MP were improved following heat immersion. These findings suggest heat immersion had a stimulatory effect upon performance in this study. Conversely, no differences were found between conditions regarding FI. This element suggests that the types of immersion therapy used in this study were essentially neutral in affecting staying power during maximal cycling.

1396   Board #204   May 31 8:00 AM - 9:30 AM

Central Chemosensitivity is Augmented during Thermoneutral Head Out Water Immersion in Healthy Adults

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(No relevant relationships reported)

Carbon dioxide (CO_2) retention occurs during water immersion and increases the risk of CO_2 toxicity. The central chemoreceptors primarily mediate the rise in ventilation during hypercapnia. However, it is unknown if central chemosensitivity is altered throughout two hours of head out water immersion (HOWI) in healthy adults. **Purpose:** We tested the hypothesis that central chemosensitivity is blunted throughout two hours of HOWI in healthy adults. **Methods:** We assessed central chemosensitivity in 17 subjects (age: 22 ± 1 y, BMI: 25 ± 2 kg/m², 7 women) during a thermoneutral ($35\pm0°C$) HOWI trial and a time-control dry trial at baseline, 10 min, 60 min, 90 min, 120 min, and post. The partial pressure of end tidal CO_2 ($PETCO_2$; capnograph) and minute ventilation (pneumotachometer) were recorded continuously. Central chemosensitivity was evaluated via a rebreathing test. Subjects rebreathed 7% CO_2 and 93% O_2 from a 10 L bag for 3.5 min. Central chemosensitivity was calculated as the slope of the linear regression line of minute ventilation vs. $PETCO_2$ every 30 s throughout the test. Data are reported as a change from baseline (mean $\pm$ SD). **Results:** $PETCO_2$ increased from baseline during HOWI at 10 min ($+1\pm2$ mmHg), 60 min ($+2\pm2$ mmHg), 90 min ($+2\pm2$ mmHg), and 120 min ($+2\pm2$ mmHg) (all $p<0.01$). The change in $PETCO_2$ was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all $p<0.01$). The change in minute ventilation did not differ over time ($p=0.50$) or between conditions ($p=0.09$). Central chemosensitivity increased from baseline during HOWI at 10 min ($+0.68\pm0.51$ L/min/mmHg), 60 min ($+0.70\pm0.69$ L/min/mmHg), 90 min ($+0.73\pm0.92$ L/min/mmHg), 120 min ($+0.85\pm1.09$ L/min/mmHg), and post ($+0.39\pm0.72$ L/min/mmHg) (all $p<0.01$). Central chemosensitivity also

increased from baseline during control at 120 min ($+0.36\pm0.52$ L/min/mmHg, $p=0.04$). The change in central chemosensitivity was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all $p<0.01$). **Conclusion:** These findings indicate that central chemosensitivity is augmented during two hours of thermoneutral HOWI. Thus, it is unlikely that changes in central chemosensitivity contribute to CO_2 retention during water immersion.

1397   Board #205   May 31 8:00 AM - 9:30 AM

The Role of Diver Hydration Status on Performance Following Head Out Water Immersion

Hayden Hess[1], David R. Pendergast[1], Zachary J. Schlader[1], Lindsey N. Russo[1], Brian M. Clemency[1], Mary G. Carey[2], David Hostler, FACSM[1]. [1]*University at Buffalo, BUFFALO, NY.* [2]*University of Rochester, Rochester, NY.* (Sponsor: Dave Hostler, FACSM)
(No relevant relationships reported)

Water immersion results in a diuresis, which could potentially limit exercise performance after egress to land. **PURPOSE**: We examined the effect of three rehydration strategies on an endurance run to exhaustion, cardiovascular stability, and overnight recovery following a four-hour head out water immersion (HOWI) in thermoneutral water.
METHODS: Twelve male subjects (22.7 ± 1.8 y) completed a crossover design consisting of three rehydration strategies: no rehydration (NH), hourly replacement of fluid loss during immersion (RD), and replacement of fluid after the immersion period (RA). Following immersion, subjects ran to exhaustion at ~80% maximum heart rate. After completing the run, each subject submitted to a head up tilt test (HUTT). Vital signs and ECG were monitored overnight.
RESULTS: HOWI resulted in a transient diuresis in NH and RA protocols, while it was sustained throughout immersion in the RD protocol resulting in greater total urine volume (l) output (1.27 ± 0.48 (NH), 2.32 ± 0.77 (RD), and 1.18 ± 0.43 (RA); p < 0.001). Body mass change (%) from fluid loss was greater in NH than RD, but not RA (-1.58 ± 0.56 (NH), -0.66 ± 0.47 (RD), and -0.92 ± 0.76 (RA)). Run time was 17% and 13% shorter in NH than RD and RA, respectively, but were not statistically different. Time to orthostasis, heart rate, and blood pressure during the HUTT did not differ by condition. Overnight heart rate variability and mean arterial pressure were not different between rehydration strategies.
CONCLUSIONS: Loss of body water during thermoneutral HOWI was modest and rehydration strategies minimally affected aerobic performance, cardiovascular stability, and overnight recovery in young, healthy males. Rehydration during water immersion resulted in a large, sustained diuresis without improving performance or recovery after exiting the water.

1398   Board #206   May 31 8:00 AM - 9:30 AM

Effects Of Concurrent Exercise During Simulated Microgravity On Soleus Muscle Fiber Myonuclear Content

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(No relevant relationships reported)

Introduction: Exercise countermeasures administered on the International Space Station are time-consuming and use large/expensive equipment. Aerobic exercise has shown to maintain oxidative capacity of muscle fibers, while resistance exercise preserves muscle mass in Astronauts. Recently, Cotter et al. (2015) determined that concurrent exercise (combining aerobic and resistance exercises; CE) was effective at mitigating de-conditioning during ULLS (unilateral lower limb suspension, simulated microgravity) but resulted in differences in fiber-type responses (i.e., fast-twitch *vs* slow-twitch). This current study provides additional analyses of muscle samples used in Cotter et al. (2015), investigating soleus muscle (mostly slow-twitch) myonuclei. Modulations in fiber size and myonuclear domain (MND; the area each myonuclei controls) may provide mechanisms for preventing unloading decrements. **Purpose:** Our aim was to determine 1) if simulated microgravity affects soleus muscle fiber size and MND size and 2) if CE training mitigates these changes. Sixteen subjects were separated into two groups, 10-day ULLS and 10-day ULLS + CE. **Methods:** Muscle biopsies were taken pre- and post- intervention, which were isolated into individual fibers (muscle cells), stained for myonuclei, three-dimensionally imaged, and analyzed for fiber size and MND size. 2x2 ANOVAs determined potential differences in fiber size and MND size between groups, before and after ULLS. **Results**: No significant differences in fiber size or MND size after 10 days of ULLS were observed. These findings suggest that, while 10 days of ULLS may cause a decline in muscle function (as seen in Cotter et al., 2015), it may not significantly affect soleus muscle fiber size or MND size. However, individual variability occurred, suggesting that some people may be responders (or non-responders) to ULLS and ULLS+CE. **Conclusion:**

The results of this study suggest a need for additional analyses to help develop "personalized" exercise countermeasures for those undergoing significant periods of unloading (e.g., people in bed rest or Astronauts). <!--EndFragment-->

1399   Board #207   May 31 8:00 AM - 9:30 AM
Reliability of the Portable Metabolic Gas Analysis System used on the International Space Station

Alan D. Moore, FACSM[1], Meghan E. Downs[2], Shannon L. Jordan[1], Alan H. Feiveson[3], Jamie R. Guined[4], Stuart MC Lee[2]. *[1]Lamar University, Beaumont, TX. [2]KBRwyle, Houston, TX. [3]NASA-Johnson Space Center, Houston, TX. [4]University of Houston, Houston, TX.*
(No relevant relationships reported)

Metabolic gas analysis is utilized for both research and medical operations purposes on the International Space Station (ISS). Data regarding reliability of metabolic gas analysis system used on board the ISS, the Portable Pulmonary Function System (PPFS – Danish Aerospace Corporation, Odense, DK), has not been reported. **PURPOSE:** To determine the reliability and intra-subject repeatability of metabolic gas analysis data collected by the PPFS. **METHODS:** Subjects (n=8: 5M, 3F) performed 3 peak cycle tests, consisting of three 5-min stages designed to elicit 25%, 50%, and 75% peak oxygen consumption (VO_{2peak}) followed by stepwise increases of 25 W/min until reaching volitional exhaustion. Metabolic gas analysis was performed using the PPFS during these tests. Intraclass correlation coefficients (ICC), within-subject standard deviations (WS SD), and coefficients of variation (CV %) were calculated. **RESULTS**: The ICC, WS SD and CV % for peak exercise are contained in the table below. Across all exercise stages, the ICC values for oxygen consumption (VO_2), carbon dioxide production (VCO_2), and ventilation (V_E) ranged from 0.79 to 0.99; however, the ICC for respiratory exchange ratio (RER) indicated poorer agreement between trials (ICC=0.11 to 0.51). The CV values for all dependent variables ranged from 2.6% to 6.6%, which are consistent with reported values obtained using other metabolic gas analysis devices.

Variable	ICC	WS SD	CV (%)
VO_{2peak} (L/min)	0.98	0.11	3.6
VO_{2peak} (ml/kg/min)	0.92	1.91	4.6
VCO_{2peak} (L/min)	0.94	0.18	5.4
RER_{peak}	0.51	0.05	4.0
V_{Epeak} (L/min)	0.94	6.34	5.6
Peak Watts	0.96	10.32	3.7

CONCLUSIONS: The PPFS appears to yield reliable metabolic gas analysis data. Lower reliability of RER measurements are reported in the literature using other devices and is not likely a function of the PPFS. The PPFS should provide accurate and reliable data for research and monitoring of human adaptation to spaceflight.

C-45   Free Communication/Poster - **Heat/Hydration**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1400   Board #208   May 31 8:00 AM - 9:30 AM
Physiological Response in Time to Exhaustion Trial Across Varied Environmental Conditions

Savannah R. Hall, Ellen L. Glickman, FACSM, Jeremiah A. Vaughan, Brittany N. Followay, Elliott Arroyo, Cody S. Dulaney, Joseph A. Laudato, Adam R. Jajtner. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Purpose: To examine different environmental conditions on the physiological response to aerobic exercise preformed to exhaustion. **Methods:** Recreationally active men (n=5, 24.2 ± 2.6yr., 183.6 ± 5.57cm, 79.95± 3.99 kg, 11.72 ± 2.48 %BF, VO_2 =3.89 ± 0.31 L·min⁻¹) completed four trials. VO₂max was tested on the first trial, and trials were counterbalanced into: 5°C (LT), 23°C (MT), 34°C (HT). Participants cycled 60 minutes at 60% of their previously determined VO₂max, prior to a time to exhaustion (TTE) trial at 90% of VO₂max. Duration, metabolic (VO_2, VCO_2, V_E, & HR), and electromyography (EMG) of the right leg (RMS, MPF, MEDPF) were collected during TTE. Metabolic and EMG variables were assessed over the initial (PRE), middle (MID) and last (POST) 30s periods. EMG data were normalized to a 2-min reference bout in a thermoneutral condition. Data were analyzed using a within subjects repeated measures ANOVA. **Results:** A condition effect (F =5.37; *p*=0.033; η_p^2 = 0.573) during TTE, indicated MT (326.4 ± 231.1s) was longer than HT (143.2 ± 52.6s; *p*=0.034), with no differences in LT(281.6± 259.5s; *p* >0.05). No interactions

were observed for metabolic or EMG analyses. A time effect (F=145.23, *p* <0.001, η_p^2 = 0.973) was observed for VO₂. VO₂ was lower (*p*<0.001) at PRE (1.78 ± 0.52 L·min⁻¹) than MID (2.97 ±0.48 L·min⁻¹) and POST (3.15 ± 0.53 L·min⁻¹). A time effect (F= 222.182, *p*<0.001, η_p^2=0.982) was observed for VCO₂. VCO₂ was lower (*p*<0.001) at PRE (1.40± 0.37 L·min⁻¹) than MID (2.97 ± 0.72 L·min⁻¹) and POST (3.49± 0.48 L·min⁻¹), while MID was lower than POST. A time effect on V_E (F= 87.523, *p* <0.001, η_p^2=0.956) indicated increases (p<0.05) from PRE (37.44±6.95 L·min⁻¹) to MID (67.70 ±21.72 L·min⁻¹) to POST (86.12 ± 18.23 L·min⁻¹). A time effect (F= 45.382, *p* = 0.002, η_p^2= 0.002) for HR indicated increases (p<0.05) from PRE (150.80 ± 29.0 bpm) to MID (180.3 ± 19.7 bpm) to POST (189.3 ± 15.8 bpm). A time effect (F= 4.503, *p*= 0.049, η_p^2=0.530) for RMS indicated decrease (*p*=0.043) from PRE (135.1±25.04%) to MID (124.6±28.2%). A time effect (F= 4.720, *p*=0.044, η_p^2=0.541) of MPF indicated no differences across time points. **Conclusions:** LT had no effects on TTE endurance. Endurance in MT may be better compared to HT, though metabolic and EMG variables are likely not responsible for this difference.

1401   Board #209   May 31 8:00 AM - 9:30 AM
Thermoregulatory Responses To Moderate-intensity And High-intensity Cycling In The Heat

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(No relevant relationships reported)

PURPOSE: To examine the thermoregulatory responses to moderate- and high-intensity cycling in the heat. **METHODS:** Recreationally active Caucasian men (n=5, 24.2 ± 2.9 yrs; 183.6 ± 6.2 cm; 83.6 ± 8.1 kg; 11.7 ± 2.8%BF; 48.9 ± 6.2 ml·kg⁻¹·min⁻¹) completed an exercise protocol under two conditions: high temperature (HT; 35°C) and moderate temperature (MT; 22°C). The protocol consisted of 60 minutes of cycling at 60% VO₂max (CT_{60}), a 15-minute rest period, and a time to exhaustion trial at 90% VO₂max (TTE). Mean skin temperature (T_{sk}; °C), core temperature (T_{re}; °C), and thermal sensation (TS) were evaluated before CT_{60} (BL) and at minutes 3, 20, 40, and 60. Metabolic heat production (M; W·m⁻²) was evaluated at BL and at minutes 3, 15, 30, 45, and 60. Tissue insulation (I; °C·m²·W⁻¹) and physiological strain index (PSI) were evaluated at minutes 3, 30, and 60 of CT_{60}. T_{sk}, T_{re}, TS, PSI, and I were measured before (PRE_{TTE}) and after ($POST_{TTE}$) TTE. M was measured at PRE_{TTE}, during TTE (MID_{TTE}), and $POST_{TTE}$. Changes were analyzed using a two factor (time x trial) within-subjects repeated measures ANOVA. **RESULTS:** For MT, T_{sk} was lower at all timepoints relative to BL (*p*'s = 0.014–0.028). For HT, T_{sk} was higher at all timepoints relative to BL (*p*'s = 0.003–0.005). T_{sk} was significantly higher in HT compared to MT at minutes 3, 20, 40, and 60 (*p*'s = 0.001–0.033). T_{sk} decreased from PRE_{TTE}–$POST_{TTE}$ (*p* = 0.002) and was significantly higher during HT compared to MT (*p* < 0.001). T_{re} was higher at all timepoints relative to BL (*p* < 0.001–0.001) during CT_{60}, and was significantly higher during HT compared to MT (*p* = 0.003). In HT, T_{re} decreased from PRE_{TTE}–$POST_{TTE}$ (*p* = 0.032). T_{re} was significantly higher during HT compared to MT at PRE_{TTE} (*p* = 0.009) and $POST_{TTE}$ (*p* = 0.033). M was higher at minutes 15, 30, 45, and 60 relative to 3 min (*p*'s = 0.001–0.047) and increased at MID_{TTE} and $POST_{TTE}$ (*p*'s < 0.001) relative to PRE_{TTE}. I was significantly lower during HT compared to MT at minutes 3, 30, and 60 (*p*'s < 0.001–0.001). I was lower at $POST_{TTE}$ relative to PRE_{TTE} (*p* = 0.001). TS was higher during HT compared to MT at minutes 20, 40, and 60 (*p* < 0.001–0.009). PSI was significantly higher during HT compared to MT at PRE_{TTE} (*p* = 0.047). **CONCLUSION:** As expected, tissue insulation is decreased, and physiological strain index is increased during exercise in the heat.

1402   Board #210   May 31 8:00 AM - 9:30 AM
Effects Of Wrist Cooling On Balance And Cognitive Performance In The Heat

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(No relevant relationships reported)

Many cooling modalities exist in the literature claiming to improve performance in the heat; however, there's a paucity of literature regarding wrist cooling's effects on balance and cognitive performance after a bout of exercise in the heat. **PURPOSE:** To examine if wrist cooling influences balance and cognitive performance after a bout of cycling exercise in the heat. **METHODS:** Fourteen male participants (age, 22±4 years; height, 182±7 cm; body mass, 75.4±8.7 kg; body fat %, 10.7±3.4%) were analyzed. In an environmental heat chamber (39.5±0.9°C, 38.6±5.2% RH) participants underwent three randomized 135-minute cycling trials, which included: one wrist cooling device (W1), two wrist cooling devices (W2), and no wrist cooling device (W0) during exercise. Cognitive measures (Balance Error Scoring System [BESS], Letter Digit Substitution Test [LDST], Trail Making Test [TM]) were conducted immediately post-exercise, and delta scores were calculated from a baseline familiarization session. Rectal temperature (T_{REC}) was taken every 15 minutes during exercise. A group x time

repeated measures ANOVA was conducted to determine group differences, and paired samples t-tests were used to determine mean differences. **RESULTS:** No statistical difference between groups W1 and W2 occurred, therefore their data were pooled (W_P). No statistically significant difference was observed in T_{REC} between W0 and W_P (n=28; p=0.69). Additionally, no significant differences were observed in the LDST (n=27, p=0.21) and TM (n=26, p=0.64) delta scores between W0 and W_P. Significant differences were noted in BESS delta scores between W0 and W_P specifically for the single leg foam stance (0±2 vs. 1±2, respectively; p=0.002). **CONCLUSION:** Wrist cooling during exercise in the heat did not have an effect on T_{REC}, LDST, and TM scores; however, it did significantly improve single leg foam stance of the BESS testing post-exercise. Further research is warranted to investigate the potential link of body cooling and balance performance, as well as the effectiveness of wrist cooling on cognitive measures after exercising in the heat.

1403   Board #211   May 31 8:00 AM - 9:30 AM

Game-to-Game Increases in Core TemperatureDuring Rugby 7's World Series Tournaments

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(No relevant relationships reported)

PURPOSE: Characterize player core temperature (Tc) across two separate World Rugby 7's Series (WRSS) tournaments in temperate and warm environments. **METHODS:** Continuous Tc (ingestible e-Celsius™ capsule) was collected in seventeen separate playing members of one men's team (Singapore; n = 12, London; n = 11, with n = 6 competing in both tournaments) competing at the Singapore (warm) and London (temperate) WRSS tournaments. Symptoms of exertional heat illnesses (EHI), cooling strategy use, playing minutes and wet blub globe temperature (WBGT) were collected. Linear mixed models were used and a magnitude-based inference network was used to describe differences in delta Tc between all periods (baseline, pre-warm-up, warm-up, pre-game, game and post-game) within and between competitions. **RESULTS:** There were substantial game-to-game Tc increases relative to baseline, particularly within second and third games, on all match-days. Despite high peak Tc values (Singapore 39.9°C; London 39.6°C); (1) no signs and symptoms of EHI were reported by players; (2) voluntary post-game CWI usage was low; and (3) other pre-, during- and post-game cooling maneuverers were not implemented. Magnitude of Tc response was associated with playing minutes [excluding London Day 2 (Effect size; ES = 0.87–1.46)] and WBGT [excluding Singapore Day 1 (ES = 0.54–0.60)]. **CONCLUSION:** Tc demonstrated game-to-game increase with peak temperatures approaching thresholds associated with EHI (>40°C) and exceeding those demonstrated to decrement repeated sprint performance (>39°C), despite the short game duration. Practitioners may consider the use of acclimation/acclimatization programs (preferentially) and practice compatible cooling strategies to minimize Tc increase and maximize recovery and preparedness for games within and between match-days. Supported by Aspire Zone Foundation (AZF; Doha, Qatar) funding.

1404   Board #212   May 31 8:00 AM - 9:30 AM

Effect of Thermal Stress on Cycling and Plasma Volume Shifts, Body Weight and Water Intake

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(No relevant relationships reported)

PURPOSE: To examine the effects of environmental stress while cycling, and its influence on hydration status. **METHODS:** Recreationally active men (n=5, 24.2 ± 2.6 years; 183.6 ± 5.6 cm; 80.0 ± 4.0 kg; 11.7 ± 2.5 %BF; 3.9 ± 0.3 L·min⁻¹) completed 4 trials, with the first consisting of a VO_2 max test, and the remaining 3 trials involving cycling at 5°C (LT), 23°C (MT), and 34°C (HT) in a counterbalanced manner. Each trial consisted of 60 min of cycling at 60% VO_2 max, 15-min rest, and a time to exhaustion (TTE) at 90% VO_2 max. Blood was drawn prior to (PRE), immediately following (60), after TTE and 1-hr post-trial (REC). An automated hematology analyzer examined whole blood, in which plasma volume shifts (PVS) were calculated using the formula established by Dill & Costill (1974). Body weight (BW) and water intake (WATER) was assessed at each time point, while urine specific gravity (USG) was assessed at PRE and REC. All data were analyzed using within-subjects repeated measures ANOVA. **RESULTS:** A trial x time interaction was observed for PVS (F= 5.71; p=0.041; η_p^2= 0.655). Post Hoc analysis indicated that at REC, PVS were greatest in LT (-14.75 ± 2.33%), compared to HT (-9.33 ± 1.77%; p=0.039), and MT (-3.5 ± 2.25%; p=0.015), while PVS at HT was significantly greater than MT (p=0.009). Furthermore, in MT, PVS were significantly greater at 60 (-18.06 ± 4.47%) and TTE (-16.34 ± 4.55%) than REC (-6.64 ± 7.29%; p=0.008, p=0.047 respectively). In HT,

PVS was significantly greater at 60 (-17.63 ± 2.52%) and TTE (-19.45 ± 2.58%) than REC (-9.33 ± 1.77%; p=0.024, p=0.001 respectively). No change was observed in LT (p=0.090). There was no trial x time interaction (F= 0.515; p= 0.435; η_p^2=0.203), nor a main effect of time (F=0.655; p=0.595; η_p^2=0.141), or trial (F=0.515; p=0.616; η_p^2 =0.114) in BW. A main effect of trial was observed in WATER (F= 29.156; p=<0.001; η_p^2=0.879). WATER was lower in LT (399.2 ± 186.9 ml) than MT (903.9 ± 302.6 ml; p=<0.001) and HT (1386.0 ± 216.8 ml; p=0.021), and greater in HT than MT (p=0.033). There was no trial x time interaction nor main effect of time or trial in USG. **CONCLUSIONS:** Cycling resulted in a greater PVS at REC for LT, compared to HT and MT. For MT and HT, PVS were reduced at REC when compared to 60 and TTE, revealing a resolution of plasma volume post-trial. As expected, water intake increased as trial temperature increased.

1405   Board #213   May 31 8:00 AM - 9:30 AM

World Championship Heat Stress Preparation: A Comparison Of IAAF And UCi Athletes

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(No relevant relationships reported)

PURPOSE: To compare exertional heat illness (EHI) history and preparedness to compete in the heat at the Beijing, China 2015 IAAF (athletics) and Doha, Qatar 2016 UCI (road cycling) World Championships. **METHODS:** Responses to a pre-competition questionnaire evaluating EHI history, heat countermeasure strategies and recovery approaches were compared in 307 IAAF and 69 UCI respondents (32% and 7% participation rate, respectively). The IAAF event was held in ~29ºC and ~58% RH conditions, and the UCI event in ~37ºC and ~25% RH. A *Chi-square* test of independence was employed to compare sports. **RESULTS:** Both the IAAF (48%) and UCI (57%) athletes had previously experienced EHI symptoms, with 9% and 17% having been diagnosed with EHI, respectively (P<0.001). Only 15% of IAAF athletes trained in the heat (5-30 days) before the championships, in contrast to 32% of the cyclists (P<0.001). Half of the IAAF athletes (52%) had a precooling strategy compared with 96% of the cyclists (P<0.001). Ice slurry ingestion was the most prevalent strategy in athletics and wearing an ice-vest during the warm-up was most common for cyclists. Almost all IAAF (96%) and all UCI athletes (100%) had a fluid consumption strategy (P<0.001), which differed based on event category (field, sprints and distance events; time trials and road race). The volume of fluids planned on being consumed also differed between event categories within each sport, although water was the fluid most commonly consumed. Most IAAF athletes (89%) planned on using at least one recovery strategy with the most frequently employed being massage, active recovery, stretching and cold-water immersion. The majority of cyclists (92%) planned on using one or more recovery strategies with massage, stretching and active recovery the most prevalent. **CONCLUSION:** Athletes competing at the 2015 IAAF and 2016 UCI World Championships reported a similar history of heat illness. Along with most athletes competing throughout the northern hemisphere summer months, 15% of IAAF athletes surveyed prepared specifically for the event by training in the heat, whereas 32% of the cyclists reported undertaking some form of heat training. Approximately half of the IAAF athletes and almost all the UCI athletes had a precooling strategy. Most athletes in each sport had a fluid consumption and recovery strategy.

1406   Board #214   May 31 8:00 AM - 9:30 AM

Gastrointestinal Telemetric Pills Used as Rectal Probes Provide Inaccurate Measurements of Absolute Rectal Temperatures

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(No relevant relationships reported)

Continuous measurement of rectal temperature (RT) using a wired rectal probe (WRP) comes with obvious technical difficulties and practical limitations. Measurement of RT using a telemetric pill (TP) inserted as a suppository to act as a rectal probe would circumvent some of those problems. **PURPOSE:** Validate the use of a commercially available gastrointestinal TP (HQ Inc.) for the continuous measurement of RT during slow and rapid increase and decrease in core temperature induced by periods of passive cooling, passive heating, active heating and active cooling. **METHODS:** Nine (8 men, 1 woman) physically active participants (30 ± 9 yrs; 175 ± 7 cm; 75 ± 9 kg) underwent a research protocol where they completed, while wearing a WRP (YSI 401) linked to a TP: 1) a 30 min sitting period (23°C) followed by 2) a 45 min sitting period inside a head-out environmental chamber (40-42 °C); 3) a 45 min sitting period (23°C) while ingesting, over the first 30 min, 7.5 g of shaved-ice (-1°C)/kg body weight; 4) a running exercise period (38 °C, 20-30% RH) at 68% VO_{2max} until a WRP temperature of 39.5°C and; 5) a cold-water (10°C) immersion period until a WRP decrease in temperature of 1.5°C. The WRP and each TP were calibrated before experiments. A

bias ± random error contained within ± 0.35°C (daily variation in RT of ± 0.25°C + sensors measurement error of ± 0.1°C) around the zero line was deemed acceptable between sensors. **RESULTS:** The rate of change in WRP and TP temperatures during phases 1, 2, 3, 4 and 5 was respectively of -0.008 ± 0.007°C/min and -0.006 ± 0.004°C/min, 0.003 ± 0.005°C/min and 0.002 ± 0.004°C/min, -0.011 ± 0.004°C/min and -0.011 ± 0.002°C/min, 0.057 ± 0.010°C/min and 0.054 ± 0.008°C/min and -0.141 ± 0.124°C/min and -0.091 ± 0.065°C/min. Mean biases (WRP - TP) and random errors during phases 1, 2, 3, 4 and 5 were of 0.12°C/± 0.30°C, 0.15°C/± 0.22°C, 0.12°C/± 0.26°C, 0.21°C/± 0.34°C and 0.24°C/± 0.66°C, respectively **CONCLUSION:** The use of TPs (HQ Inc.) as suppositories tracked slow and rapid increases in RT and slow decreases in RT as measured by WRP, but did not detect the rapid decrease in RT. In all instances, however, the absolute difference between WRP and TP exceeded +/- 0.35°C. Therefore, we conclude that a TP inserted as a suppository to act as a rectal probe does not provide acceptable absolute measure of RT.

1407   Board #215   May 31 8:00 AM - 9:30 AM

Gastrointestinal Heat Sink: Impact on Ingestible Telemetric Pill and Rectal Probe Temperature Measurements Following Exercise

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(No relevant relationships reported)

Measurement of core temperature at the gastrointestinal level with an ingestible telemetric pill (ITP) is increasingly used in research. But, unlike core temperature measured at the rectum *via* a rectal probe (RP), data contamination due to water or food ingestion remains a limitation of ITP. Rapid creation of a heat sink at the stomach and upper-intestinal level (duodenum to ileum), as can be obtained, for example, following shaved-ice ingestion, could potentially differently impact ITP and RP temperature measurements. In fact, the closer proximity of ITP to the heat sink than RP could result in a more important and faster rate of energy loss for ITP than RP. **PURPOSE:** To examine the impact of shaved-ice ingestion following exercise-induced increase in core body temperature on the degree of agreement between ITP and RP temperature measurements. **METHODS:** 8 healthy young men (33 ± 8 yrs, 75 ± 6 kg, 176 ± 5 cm) underwent a passive sitting period of 20 min at 20°C, after which they completed 2 exercise periods (cycling or running) at 75% of estimated maximal heart rate in a hot-dry environment (31.1 ± 1.1°C, 32% RH) with the goal of increasing rectal temperature by 1°C over baseline level. Following each exercise period, subjects passively seated in a 20°C ambient temperature for 45 min while ingesting, over the first 30 min, either 7.5 g of water provided at rectal temperature/kg body mass (after the first exercise) or 7.5 g of shaved-ice provided at -1°C/kg body mass (after the second exercise). Rectal (YSI 401) and gastrointestinal temperatures (HQ Inc.) were measured continuously during the experiments. ITPs were ingested 10 h prior to arrival time at the laboratory. **RESULTS:** The rate of decrease in RP and ITP temperatures during water ingestion was respectively of 0.017 ± 0.004°C/min and 0.018 ± 0.008°C/min, compared to 0.025 ± 0.006°C/min and 0.026 ± 0.006°C/min for shaved-ice ingestion. Mean biases (RP - ITP) and 95% limits of agreement during the passive sitting period, first exercise period, water ingestion period, second exercise period and shaved-ice ingestion period were respectively of 0.10°C/± 0.35°C, 0.09°C/± 0.31°C, 0.17°C/± 0.66°C, 0.12°C/± 0.38°C and 0.16°C/± 0.64°C. **CONCLUSION:** The present results indicate that the creation of a heat sink at the stomach and upper-intestinal level does not alter the degree of agreement between RP and ITP.

1408   Board #216   May 31 8:00 AM - 9:30 AM

Evidence for Seasonal Acclimatization of Behavioral Thermoregulation in Resting Humans

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(No relevant relationships reported)

Environmental temperatures perceived as comfortable in the summer season are often perceived as uncomfortably warm during the winter, and vice versa. During rest, behavioral thermoregulation is driven by thermal discomfort, which is largely mediated by changes in skin temperature. Thus, it is likely that seasonal acclimatization shifts the skin temperature thresholds that elicit behavioral thermoregulation. However, this is unknown.
Purpose: Test the hypothesis that skin temperatures upon the decision to behaviorally thermoregulate differ between the winter and summer.
Methods: Seven healthy adults (age: 26 ± 3 y, 2 females) wearing shorts and a t-shirt underwent a 90 min behavioral test while seated in which they passively moved between a warm (40 ± 0°C, RH: 20 ± 0%) and a cool (19 ± 1°C. RH: 37 ± 14%) room when they felt 'too warm' or 'too cool'. Testing was completed during both the summer (S; average high/low: 26 ± 4°C / 18 ± 3°C) and winter (W; 0 ± 8°C / -7 ± 5°C) months in Buffalo, NY. Weighted mean skin (6 sites) and intestinal temperatures were measured continually and are reported as a 30 s average immediately prior to moving from cool to warm (C-to-W) and warm to cool (W-to-C). Thermal sensation (7 point

scale: 1 = cold, 7 = hot) and thermal discomfort (4 point scale: 1 = comfortable, 4 = very uncomfortable) were measured at C-to-W and W-to-C. Data were averaged across behaviors for a given subject.
Results: The time prior to moving from C-to-W (S: 9.4 ± 3.4 min, W: 10.5 ± 3.9 min, P=0.46) and W-to-C (S: 15.1 ± 4.5 min, W: 14.1± 4.2 min, P=0.51) did not differ between seasons. Intestinal temperature at C-to-W (S: 36.8 ± 0.2°C, W: 37.1 ± 0.2°C, P<0.01) and W-to-C (S: 36.7 ± 0.2°C, W: 36.8 ± 0.3°C, P=0.05) was higher in the winter. However, mean skin temperature at C-to-W (S: 33.2 ± 0.4°C, W: 31.9 ± 0.8°C, P<0.01) and W-to-C (S: 35.9 ± 0.5°C, W: 34.4 ± 0.6°C, P<0.01) was lower in the winter. Thermal sensation at C-to-W (S: 2.5 ± 0.4, W: 2.7 ± 0.3, P=0.22) and W-to-C (S: 5.5 ± 0.6, W: 5.3 ± 0.4, P=0.49) did not differ between seasons. Thermal discomfort at C-to-W (S: 1.9 ± 0.4, W: 2.0 ± 0.1, P=0.58) and W-to-C (S: 1.9 ± 0.6, W: 2.0 ± 0.2, P=0.57) also did not differ between seasons.
Conclusion: Compared to the summer, skin temperatures upon the initiation of thermoregulatory behavior are shifted to lower temperatures in the winter.

1409   Board #217   May 31 8:00 AM - 9:30 AM

Thermoregulation And Perception Among Lean/obese And Fit/unfit Girls Cycling In The Heat

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(No relevant relationships reported)

Heat stress may be an extra concern to obese and unfit adolescents while exercising. Besides the higher rate of body temperature (T_{body}) increase, it is believed that heat stress aggravates perceived exertion (RPE), irritability and thermal sensations. However, no study has compared thermoregulatory and perceptual responses of obese and unfit girls in relation to their lean and fit peers under similar heat stress and metabolic heat production. **PURPOSE:** To verify thermoregulatory and perceptual responses of obese and lean girls, either fit or unfit, exercising in the heat at a similar metabolic heat production per unit of body mass (Hp). **METHODS:** 34 pubescent (Tanner 2 to 4) girls divided in four groups participated in the study. 21 were obese (12 fit and 9 unfit; 13.2±1.4yrs, 60.8±13.7kg, 158±0.1cm, 40.5±5.8% fat (DXA), VO_{2peak} 76.0±8.1 and 56.6±5.8 ml kg^{-1} muscle mass^{-1} min^{-1}), and 13 lean (5 fit and 8 unfit; 13.1±1.6yrs, 44.1±6.5kg, 156±0.1cm, 24.0±4.8% fat, VO_{2peak} 74.5±2.9 and 56.2±5.0 ml kg^{-1} muscle mass^{-1} min^{-1}). They cycled 2×25 min bouts, with a 10-min rest, at ~5.4 W kg^{-1} (5.2±1.2 and 5.7±1.0 W kg^{-1} obese and lean) in the heat (36°C and 40% RH). Rectal (T_{re}) and skin (T_{sk}) temperatures and heart rate (HR) were measured every 5 min. Additionally, RPE, irritability, thermal sensation, and thermal comfort were collected throughout the exercise. Sweat losses were replenished with spring water during rest period. **RESULTS:** Initial T_{re} and HR were similar between obese and lean girls (37.5±0.3 and 37.2±0.3°C and 101±13.6 and 98.8±11.9 bpm). No difference was observed among the 4 groups (obese fit, obese unfit, lean fit and lean unfit) throughout the exercise for T_{re}: 37.6±0.2, 37.5±0.3, 37.5±0.3 and 37.4±0.3 °C; T_{sk}: 34.8±0.8 ; 35.1±1.0 ; 34.4±0.9 e 35.2±0.9°C; T_{body}: 37.0±0.2, 37.0±0.4, 36.8±0.3 and 36.9±0.3°C; HR: 128±18; 118±12, 130±16 and 119±16 bpm. Also, no differences were observed in the perceptual responses (RPE:11±2, 12±2, 11±2 and 11±2, irritability: 3±0.5, 2±0.3, 3±0.8 and 2±0.3, thermal sensation: 7±0.4, 7±0.5, 7±0.7, 6±0.7 and thermal comfort: 3±0.4, 3±0.5, 3±0,7 and 3±0.5). **CONCLUSION**: Regardless of the adiposity or aerobic fitness level, pubescent girls had similar thermoregulatory and perceptual responses while cycling under heat stress during 50 min at a mild (~5,4 W kg^{-1}) intensity level.

1410   Board #218   May 31 8:00 AM - 9:30 AM

Effect Of Dehydration On Cognitive Functions: A Meta-analysis

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(No relevant relationships reported)

Dehydration (DEH) is believed to impair cognitive functions but which processes (e.g., from executive control to simple reaction time) are affected and at what magnitude of body mass loss (BML) remains unclear. **PURPOSE:** To systematically review the literature and examine factors influencing the effect size (ES) of DEH on cognitive functions via meta-analysis. **METHODS**: Human studies were identified through databases (PubMed, Psych Info, Sport Discus, Scopus, ISI Web of Science, Medline, ProQuest Dissertation & Theses). Thirty-one studies were identified, providing 256 ES estimates from 388 subjects with the magnitude of DEH ranging from 1 to 6% BML. Outcome variables (accuracy, reaction time), cognitive domains, and methods to induce DEH (exercise and/or heat stress and/or fluid restriction) varied. ES were calculated using standardized mean differences and a meta-analysis completed using a random-effects model. **RESULTS**: Impairment on overall cognitive performance (all domains/outcomes) with DEH was small (ES = −0.24; 95% CI [−0.38, −0.10]) but significant (p = 0.002) and due primarily to outcomes based on accuracy (ES = −0.24; [−0.39, −0.10]) versus reaction time (ES = −0.16; [− 0.34, 0.02]), although these two ES were not different (p = 0.47). Indicators of heterogeneity (τ^2 = 0.19, I^2 = 69.9%) reflected moderate to large variation across studies. Cognitive impairment

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following DEH was greater (p = 0.02) for executive functions (ES = −0.38; 95% CI: [−0.60, −0.17]) compared to simple/choice reaction times (ES = −0.02; [−0.16, 0.11]). Based on meta-regression, the magnitude of BML was not associated with impairment of executive functions (slope = −0.03, r^2= 0.002, p = 0.68). Sub-group estimates of cognitive impairment when %BML was ≤ 2% (ES= −0.20; [−0.40, −0.002]) versus > 2% (ES= −0.30; [−0.50, −0.10]) were not different (p = 0.38) based upon 134 and 122 outcomes, respectively. **CONCLUSIONS**: Despite variability among studies, the adverse effect of DEH on human cognition appears to be small to moderate. Tasks requiring executive functions appear more vulnerable to DEH compared to tasks utilizing lower-order cognitive domains, but lacking a dose-response relationship. A minimum threshold of DEH that impairs human cognition was also not evident.

1411   Board #219   May 31 8:00 AM - 9:30 AM

Dehydration is How You Define It: Comparison of 318 Blood and Urine Spot Checks

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(No relevant relationships reported)

Clinical medicine defines dehydration using blood markers which confirm hypertonicity (serum sodium concentration/[Na$^+$] >145mmol/L) and intracellular dehydration. Sports medicine equates dehydration with a concentrated urine as defined by any urine osmolality (UOsm) ≥700mOsmol/kgH$_2$O or urine specific gravity (USG) ≥1.020. **PURPOSE**: To compare blood versus urine indices of dehydration in a cohort of athletes undergoing routine screenings. **METHODS**: 318 collegiate athletes (193 female) provided blood and urine samples and asked to rate how thirsty they were on a 10-point visual analogue scale. Serum was analyzed for serum [Na$^+$] while urine osmolality was measured using an osmometer. USG was measured using a Chemstrip. Data were categorized into Dehydrated versus Hydrated groupings based upon the above-mentioned UOsm and USG thresholds. **RESULTS**: Athletes from seven sports teams were represented (combined: height 1.75±0.1m; weight 71.9±13.5kg; body mass index 23.2±2.5kg/m^2). Overall, female athletes had lower USG vs. male athletes (1.014±0.006 vs. 1.015±0.006;p=0.03). Using the UOsm ≥700mOsmol/kgH$_2$O threshold to define dehydration, 55% of athletes were classified as dehydrated. Using any USG ≥1.020 to define dehydration, 27% of these same athletes were classified as dehydrated. No athlete met the clinical definition for dehydration (hypertonicity; serum [Na$^+$] >145mmol/L). Normonatremia (serum [Na$^+$] between 135-145mmol/L) was maintained in 99.7% of athletes (mean serum [Na$^+$] 139.9±2.1; range 134-145mmol/L) despite wide variation in UOsms (mean 682.7±302; range 110-1298mOsmol/kgH$_2$O). A significant correlation was confirmed between serum [Na$^+$] versus UOsm (r=0.18; p=0.001). However, urine concentration at the extreme ranges of dehydration did not reflect clinical abnormalities in serum markers or thirst rating (mean rating 4.4±1.8; range 0-10). **CONCLUSION**: Urine concentration thresholds (commonly used by sports medicine) classified 27-55% of collegiate athletes as dehydrated, while no athlete was dehydrated according to serum [Na$^+$] measurement. Practitioners should caution against using urine indices, as isolated measurements, to diagnose or monitor dehydration because urinary output is largely a response rather than a reflection of physiologically regulated blood tonicity.

1412   Board #220   May 31 8:00 AM - 9:30 AM

Thirst Perception and Fluid Intake are not Affected by Knowledge of Water Losses During Exercise

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(Sponsor: Luis Fernando Aragon-Vargas, FACSM)
(No relevant relationships reported)

Thirst perception has been studied as an indicator of acute dehydration during exercise, however, as a perception, it could be affected by the information received about water (sweat) losses. **Purpose:** To identify if thirst perception (TP) can be affected by knowledge of water losses during exercise. **Methods:** 11 males exercised intermittently in the heat on two occasions (30 min bicycle-30 min treadmill, at 70-80%HRmax), to a dehydration of 3.9±0.4% and 3.8±0.4% body mass (BM). TP and heat sensation were measured every 30 minutes during exercise. During session one (S1) they received real information about their water losses; in session two (S2), they received false information about their water losses (60% of their real losses). Information was given every 30 minutes; the order of the sessions was randomly assigned. After finishing the exercise, they ingested water *ad libitum* for 30 minutes. Urine osmolality was measured preexercise, postexercise and at the end of each trial. Data were analyzed using Student's *t* and analysis of variance, as appropriate. **Results:** Preexercise conditions were not statistically different between sessions (Table).

Variable	Real Information (S1)	False Information (S2)	t	p
Body Mass (kg)	76.7±5.2	76.8±5.2	-0.389	0.706
USG (a.u)	1.019±0.07	1.018±0.07	0.135	0.895
Uosm	699.6±256.8	673.5±255.3	0.279	0.786
Thirst perception (mm)	15.09±9.6	22±15.7	-1.38	0.199
WBGT (°C)	28.8±0.1	28.9±0.3	-0.814	0.461

Exercise time was the same (115±22.3 and 110±24.4 min, t=-1.27; p=0.232). Thirst perception between sessions was also similar (48.26±2.11 and 51.2±3.81, for S1 and S2, respectively; f=0.661; p=0.447). Thirst perception changed significantly over time in both sessions (f=44.6; p= 0.001), but no interaction (f=0.382; p=0.559). Power analysis for TP was 79%. Heat sensation showed no differences between sessions (8.14±2.18 and 6.00±0.23, for S1 and S2; f=0.982; p=0.360) or over time (f=2.88;p=0.140). Uosm was not different between sessions 659.94±80.59 and 636.09±79.76, for S1 and S2; f=0.134; p=0.722). Water ingestion was the same between sessions (1220.4±248.6 mL and 1228±421.8 mL; t=-0.66, p=0.949). **Conclusion**: these results suggest that thirst perception is not affected by knowledge of water losses during exercise.

1413   Board #221   May 31 8:00 AM - 9:30 AM

Fluid Intake Pattern, Dehydration, And Performance In Young Athletes During A Triathlon In Tropical Climate

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(No relevant relationships reported)

Mild dehydration is associated with increased core temperature and reduced performance during endurance events in adult athletes. Little is known about hydration practices, hyperthermia, and the effects of insufficient fluid replacement on performance in young athletes during real-life competitions. **PURPOSE:** Examine voluntary fluid intake, the relation between dehydration and performance, and core temperature in adolescents during a triathlon competition in tropical climate. **METHODS:** 15 junior (14-15 yr) and 21 senior (16-18 yr) athletes competed in a triathlon (750 m swim, 18 km cycle and 4 km run) in a hot and humid environment (WBGT=27.9°C; water temp=29.0°C), in July, between 7:30 to 9:30 am. Urine specific gravity (U$_{SG}$) was measured upon waking the day of competition. Water and sports drinks were carried in bottles on the bike, and available for each athlete in a fluid station during the run. Sweat loss was calculated from change in body weight [BW] (corrected for urine output) and fluid intake. Dehydration was calculated as % change in BW. Core temperature was measured in two athletes pre-competition, and at the end of the swim, cycle, and run portions, using ingestible sensors. **RESULTS:** Mean U$_{SG}$ (1.025 ± 0.001 g/mL) indicated that athletes were not in an adequate state of hydration upon waking. Fluid intake (juniors=471.8 ± 161.4 and seniors=551.3 ± 263.2 ml) replaced 46% of the sweat loss and was higher during run (juniors=10.2 ± 3.5 and seniors=12.3 ± 8.2 ml/min) compared to cycle (juniors=6.1 ± 2.5 and seniors=8.0 ± 3.4 ml/min), P < 0.05. At the end of the competition, 26% of juniors and 52% of seniors had dehydrated ≥ 1.5%. Dehydration was associated with finishing time in senior boys (r= -0.70; P= 0.01) who also showed the highest sweat rate (1.3 ± 0.8 L/h) and faster times. Core temperature rose to 40.1°C in the girl who placed 2nd, and to 39.6°C in the boy who placed 3rd. No athletes showed symptoms of heat illness. **CONCLUSIONS:** Young athletes participating in a triathlon in tropical climate show mild to moderate levels of dehydration. Higher dehydration in senior athletes may be due to higher sweat rates and faster racing. Competition organizers should be aware that young, dehydrated athletes may become hyperthermic during triathlons in tropical climate, and should be prepared for medical interventions if needed.

1414   Board #222   May 31 8:00 AM - 9:30 AM

Effects of Hypohydration on Markers of Catabolism in Females Following Resistance Exercise

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(No relevant relationships reported)

BACKGROUND: Cortisol is elevated in times of stress and works as an inhibitor of muscle protein synthesis through binding to its glucocorticoid receptor (GR). This GR is expressed throughout the body and regulates the expression of glucocorticoid responsive genes that are involved in catabolic pathways. **PURPOSE:** The purpose of this study was to determine the effects of previous night dehydration on markers of catabolism in resistance-trained females following resistance exercise. **METHODS:** Ten healthy, resistance trained females (age 22.0 ± 2.1 years; height 164.5 ± 5.0 cm; mass 61.9 ± 19.0 kg; body fat 26.7 ± 2.9%) completed two bouts of resistance exercise,

either dehydrated (~3% body weight) (DT) or heat exposed with fluid replacement (HT). Each exercise bout consisted of one rep maximum (1RM) followed by 5 sets to failure of 75% of 1RM for bench press and leg press. Muscle and blood samples were obtained prior to and 1hr following exercise. Blood samples were obtained to examine cortisol. From each muscle sample, glucocorticoid receptor-DNA (GR-DNA) binding and mRNA expression were determined. Data was analyzed with separate 2 (trial) x 2 (time) analysis of variance (ANOVA). Significant interactions were further analyzed with paired t-tests. **RESULTS:** There were no significant interactions between session and time for any markers of mRNA expression. There was no significant interaction or main effects for session and time for serum cortisol. There was a significant main effect for session for GR- DNA binding (p = .043). GR-DNA binding was significantly elevated post exercise for DT (p = .016). **CONCLUSION:** Hypohydration appears to have little effect on proteolytic gene expression even though GR-DNA binding was increased. It is possible that gene expression was suppressed due to participants being resistance-trained. Further research is needed to determine if hypohydration affects proteolytic gene expression in untrained individuals. Theoretically, if an individual were to be chronically hypohydrated, a reduction in resistance training volume and increase in GR-DNA binding could diminish the anabolic response to resistance exercise and potentially lead to muscle atrophy. This study was supported by a doctoral research grant from the National Strength and Conditioning Association.

1415   Board #223   May 31 8:00 AM - 9:30 AM

Factors Influencing Hydration Status during a NCAA Division 1 Soccer Preseason

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(No relevant relationships reported)

PURPOSE: To investigate the role that training and environmental conditions has on fluid balance during a collegiate men's soccer preseason. **METHODS:** Twenty-eight male collegiate soccer players (mean±SE; age, 20±0y; body mass (BM), 79.9±7.6kg; height, 180.9±7.0cm; VO_{2max}, 50.8±4.4ml·kg^{-1}·min^{-1}) participated in this study, which took place during the preseason period of the 2016 NCAA soccer season. Prior to each practice and game (PRE), BM and urine sample were collected to assess hydration status and then donned a heart rate and GPS enabled chest strap to measure training volume and intensity, including session time, total distance (TD), training load score, distance·session time[-1], average heart rate, and average speed. Players consumed 500mL of water prior to and following each practice with ad libitum access to water during practice as team customized hydration strategy. Participants provided a post-session (POST) BM to assess percent body mass loss (%BML). Average ambient temperature (T_{AMB}) and relative humidity (RH) were collected using an online environmental-based serve. Stepwise linear regression was used to identify which hydration, training, and environmental variables were predictive of %BML. Repeated measures ANOVA was used to assess changes in PRE-BM, POST-BM, and %BML across the 17-day preseason period. Significance was set a-priori p<0.05. **RESULTS:** TD predicted %BML during preseason training sessions (r²=0.252, p<0.001). When T_{AMB} and RH were added to the model these factors significantly predicted %BML (r²=0.301, p<0.001). PRE-BM, POST-BM, %BML were significantly different over the course of the study (p<0.05). However, %BML never exceeded 2% of BM during any one session and daily variations in BM were <1% from baseline measures. **CONCLUSION:** TD, T_{AMB} and RH were able to predict %BML during the preseason of a collegiate soccer season. The team customized hydration strategy utilized was successful at preventing fluid losses exceeding 2% of BM, which may adversely affect athletic performance. Future work is needed to assess 24-h fluid balance in this population to develop improved hydration strategies.

1416   Board #224   May 31 8:00 AM - 9:30 AM

Pregame Hydration Status of Collegiate Basketball Players on Consecutive Days of Play

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(No relevant relationships reported)

Collegiate basketball teams typically compete on non-consecutive days, allowing players ample time to recover from fluid loss incurred during a game and return to a euhydrated state before the next contest. However, some NCAA conferences, tournaments and invitationals require play on consecutive days, possibly leading to greater occurrences of hypohydration, which could impair performance and/or increase injury risk. **PURPOSE:** To evaluate pregame hydration status of collegiate basketball players on consecutive days of competition and determine if these measures are associated with game performance. **METHODS:** Twenty-five collegiate basketball players (14 men, 11 women) from a NCAA Division II university participated in this study. Players' urine specific gravity (USG) and body weight (BW) were assessed 1-2 hours prior to the start of 8 pairs of regular season conference games (16 games

total) played on consecutive days (Fri & Sat). Upon arrival to the locker room, each athlete was weighed on a digital scale, wearing similar clothing each time, and provided a urine sample. USG was assessed using a hand-held clinical refractometer. Box score data were used to calculate player efficiency (PE) ratings as measures of in-game statistical performance. **RESULTS:** On Sat, 61.8% of players had a BW deficit (-0.60 ± 0.42 kg) compared to Fri, with 20.2% presenting with a BW deficit ≥ 1%; however, Fri vs. Sat BW differences were not significant (P = 0.693). Overall, 25.2% of players had USG values 1.020-1.024 and 27.0% of players had USG values ≥ 1.025 before their games. Players had USG values ≥ 1.020 more often on Fri (56.2%) than Sat (48.2%), though this difference did not reach statistical significance (P = 0.834). Neither changes in BW (P = 0.659) nor USG (P = 0.854) from Fri to Sat were significantly associated with PE on Sat. **CONCLUSION:** Approximately 50% of players were mildly to severely hypohydrated before the start of each game; yet hypohydration rates were similar before games played on consecutive days. Still, the majority of players had modest BW deficits before games played on the second day, indicating insufficient rehydration from the prior game. Although collegiate basketball players were consistently hypohydrated before their games, hydration status was not associated with statistical performance in these contests.

1417   Board #225   May 31 8:00 AM - 9:30 AM

Bilateral Differences in Muscle Activation Associated with Cycling in Varying Environmental Conditions

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(No relevant relationships reported)

PURPOSE: To examine the influence of ambient temperature on bilateral differences (DIF) in muscle activation. **METHODS**: Five recreationally active men (24.2 ± 2.9 yrs; 1.84 ± 0.06m; 80.0 ± 4.47 kg; 11.7 ± 2.8 %BF, 3.89 ± 0.34 L·min^{-1}) completed four experimental visits: a VO_2max test, and cycling in 5°C (LT), 23°C (MT) and 34°C (HT) in a counterbalanced fashion. Cycling consisted of 60 minutes at 60% of their previously determined VO_2max (TC_{60}), and a time to exhaustion trial at 90% of their VO_2max (TTE). Electromyography (EMG) was monitored on the vastus lateralis of both legs from 0-2min, 8-10min, 18-20min, 28-30min, 38-40min, 48-50min, and 58-60min during TC_{60}, as well as at the initial (PRE), middle (MID) and last (POST) 30-second periods during the TTE. Rectified EMG (RMS) and power spectra analysis (MPF and MedPF) were normalized to a standard 2-min cycling bout at 60% of VO_2max in a thermoneutral condition. DIF between legs were calculated (dominant - non-dominant), and data analyzed via a within-subjects repeated measures ANOVA. **RESULTS**: During CT_{60} a main effect of trial (F = 5.34; $p = 0.034$; $\eta_p^2 = 0.572$) was observed with differences from LT (4.29 ± 6.28%) to MT (-3.79 ± 6.98%; $p = 0.033$) and HT (-7.36 ± 10.76%; $p = 0.033$). During CT_{60}, no interaction was observed for MPF (F = 1.755; $p = 0.227$; $\eta_p^2 = 0.305$). An interaction (F = 2.883; $p = 0.033$; $\eta_p^2 = 0.419$) was observed for MedPF during CT_{60}. No differences were observed across time in LT ($p = 0.597$) or MT ($p = 0.287$), though in HT 48-50min (10.17 ± 7.79%) was different ($p < 0.05$) from 8-10min (-1.91 ± 3.77%), 18-20min (2.40 ± 4.63%), and 28-30min (4.12 ± 2.97%). Additionally, at 8-10min, HT was different from MT (10.61 ± 5.14%; $p = 0.004$). During TTE, no interactions were observed for RMS (F = 0.660; $p = 0.629$; $\eta_p^2 = 0.142$) or MPF (F = 0.840; $p = 0.520$; $\eta_p^2 = 0.174$). An interaction was observed for MedPF (F = 3.808; $p = 0.023$; $\eta_p^2 = 0.488$) during TTE. Post hoc analysis indicated that during the LT trial, DIF was different at MID (-2.63 ± 8.34%) compared to PRE (3.12 ± 8.51%; $p = 0.004$) and POST (2.54 ± 7.77%; $p = 0.004$). **CONCLUSIONS**: During prolonged exercise in cold conditions, there appears to be a greater propensity to activate muscle from the dominant limb. Similarly, as an individual fatigues in a hot condition, it appears the rate of action potential depolarization may increase more in the dominant limb.

1418   Board #226   May 31 8:00 AM - 9:30 AM
Hydration Biomarker and Plasma Copeptin Variability in Response to Partial Rehydration After Exercise-Induced Dehydration

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(No relevant relationships reported)

Changes in plasma osmolality (P_{osm}) and arginine vasopressin (AVP)-mediated signaling regulate thirst and drinking behavior. Copeptin is a peptide derivative of the AVP preprohormone and thought to be more stable and measureable than AVP as a biomarker of the hydration process. PURPOSE: This investigation aimed to evaluate hydration biomarkers, including copeptin, responses to exercise-induced dehydration and partial rehydration. METHODS: Fifty-two registrants (mean age: 52y, range: 21-72) in a 161km cycling event under warm and humid environmental conditions (mean = 26°C, 76%RH; maximum = 30°C, 93%RH) participated. P_{osm}, urine specific gravity (U_{sg}), urine color (U_{col}), thirst, and plasma copeptin were measured at 3 time points: before (PRE) and shortly after (POST) the ride, and one hour following a 650mL water bolus at ambient temperature consumed in 6 increments within 3min ($POST_{1h}$). Subjects consumed their typical diet during, but were not permitted to eat or drink between ride completion and the 1h post period. RESULTS: Subjects lost 2.2 ± 1.1% body mass at POST, and all variables significantly increased from PRE to POST (P_{osm} = 295.8 ± 3.9 to 299.1 ± 5.6 mOsm·kg⁻¹; U_{sg} = 1.017 ± 0.005 to 1.021 ± 0.006; U_{col} = 3 ± 1 to 5 ± 2; copeptin = 7.50 ± 4.9 to 42.23 ± 35.74 pmol·L⁻¹; thirst = 3 ± 1 to 5 ± 2; all p < 0.05). At $POST_{1h}$ (body mass = -2.0 ± 1.1%) P_{osm} returned to PRE (294.4 ± 5.7 mOsm·kg⁻¹), while U_{sg} (1.021 ± 0.006), U_{col} (5 ± 2), and thirst (5 ± 2) remained elevated compared to PRE (all p < 0.05). Copeptin remained elevated at $POST_{1h}$ vs. PRE (p < 0.0001) but decreased from POST to $POST_{1h}$ ($POST_{1h}$ = 27.87 ± 28.57 pmol·L⁻¹; p < 0.0001). CONCLUSION: Well-studied hydration biomarkers and the more recent biomarker copeptin tracked exercise-induced dehydration (PRE vs. POST), but differed in response to partial rehydration with a 650mL bolus ($POST_{1h}$): copeptin tracked with partial rehydration, while P_{osm} would indicate adequate and urine markers inadequate fluid replacement occurred. Ongoing work includes analyses of the relationship between food intake during the ride and hydration biomarkers to determine factors that may contribute to change magnitude at POST and differences in biomarker responses at $POST_{1h}$. Grant Funding: University of Hartford faculty grant; University of Connecticut ONSF, faculty start-up funds, and OUR

1419   Board #227   May 31 8:00 AM - 9:30 AM
Fast Rehydration Rate Helps To Keep Positive Body Fluid Balance Longer Time: A Pilot Study

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(No relevant relationships reported)

PURPOSE: To compare the effects of three different post exercise rehydration rates after exercise derived dehydration on body fluid balance and subjective feelings of thirstiness and bloating.
METHODS: We evaluated five male college soccer players. They were weighted before performing a treadmill run to induce a ≈2% body weight loss by sweating. After the dehydration, subjects were rehydrated with 150% of their body weight loss with a carbohydrate electrolyte solution (5% CHO, 30 Na mEq/L). Subjects were assigned to one of three postexercise rehydration rates in a randomized, counterbalanced and crossover design. The postexercise rehydration rates consisted on drinking the whole fluid volume the first 30 minutes in 3 equal doses (H30), or the first 60 minutes in 5 equal doses (H60), or the first 120 minutes in 9 equal doses (H120) after dehydration. Subjects were weighted without clothes (after voiding their bladders and drying the skin with towels) each 30 minutes during a 240 minutes lapse. At the same time they answered a visual analogue scale to answer how thirsty and how bloated they felt at that moment. Results are presented as mean. A two-way repeated measures ANOVA was performed.
RESULTS: Positive fluid balance in H30 was significantly higher than H60 and H120 at minute 30. H30 and H60 were higher than H120 at minute 60. H60 was higher than H120 at minute 90, but H30 was not different vs H60 nor H120. H30 kept a positive

fluid balance for 2 hours, H60 for 1 hour, and H120 for 0.5 hours. Thirstiness was significantly lower in H30 than H120, but not to H60 at minute 30, no other difference was found. Bloating was significantly higher in H30 than H120, but not to H60 at minute 30, no other significant difference was found (Table 1).
CONCLUSIONS: The H30 rehydration rate was effective to keep positive fluid balance for a longer period and to rapidly achieve positive fluid balance and decrease thirstiness acutely, however bloating may be a concern employing this rehydration rate.

Table 1. Body fluid balance and subjective feelings of thirstiness and bloating by rehydration rate								
Minute	0	30	60	90	120	150	180	210	240
Body fluid balance (%)								
H30	-1.90ᵃ	0.79ᵃ	0.77ᵃ	0.58ᵃᵇ	0.30ᵃ	0.17ᵃ	-0.17ᵃ	-0.24ᵃ	-0.51ᵃ
H60	-1.80ᵃ	-0.25ᵇ	0.76ᵃ	0.71ᵃ	0.23ᵃ	-0.06ᵃ	-0.15ᵃ	-0.21ᵃ	-0.57ᵃ
H120	-1.86ᵃ	-0.99ᶜ	-0.41ᵇ	0.12ᵇ	0.43ᵃ	0.00ᵃ	-0.22ᵃ	-0.45ᵃ	-0.75ᵃ
Thirstiness (mm)								
H30	65.4ᵃ	9.7ᵃ	17.3ᵃ	22.5ᵃ	23.5ᵃ	27.5ᵃ	38.3ᵃ	46.3ᵃ	51.5ᵃ
H60	62.1ᵃ	37.1ᵃᵇ	23.7ᵃ	25.9ᵃ	28.0ᵃ	30.6ᵃ	23.3ᵃ	26.6ᵃ	24.6ᵃ
H120	67.6ᵃ	50.7ᵇ	43.1ᵃ	39.2ᵃ	31.8ᵃ	37.6ᵃ	42.7ᵃ	46.4ᵃ	51.3ᵃ
Bloating (mm)								
H30	20.0ᵃ	76.3ᵃ	58.2ᵃ	47.8ᵃ	41.1ᵃ	33.7ᵃ	21.6ᵃ	14.6ᵃ	6.6ᵃ
H60	11.3ᵃ	53.0ᵃᵇ	64.7ᵃ	53.3ᵃ	43.5ᵃ	29.9ᵃ	18.4ᵃ	11.8ᵃ	6.8ᵃ
H120	29.1ᵃ	31.3ᵇ	37.8ᵃ	39.6ᵃ	45.1ᵃ	36.0ᵃ	27.7ᵃ	17.1ᵃ	8.1ᵃ
Different lowercase letters denotes significant differences (p<0.05) between rehydration rates at the same minute								

1420   Board #228   May 31 8:00 AM - 9:30 AM
Error Analysis of a Commercial Water Planning Tool for Road Race Event Organizers

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Reported Relationships: K.J. Sollanek: *Intellectual Property; Dr. Cheuvront is owner of the intellectual property and copyright related to the Road Race Water Planner app.. Ownership Interest (Stocks, Bonds); Dr. Cheuvront is owner of Sports Science Synergy, LLC and has commercial interests related to sale of RRWP on the AppStore.*

Water planning is an important logistical and risk management concern for event organizers of road races. Until now event organizers have relied upon experience to estimate water needs on race day.
PURPOSE: To compare estimated water needs using a commercial water planning tool against both 1) empirical group water losses of runners and 2) documented event water usage.
METHODS: Group sweating rates (L/h) from 14 published studies were compared to a weighted composite average using the Road Race Water Planner© app (RRWP). Estimated water (gallons) and cup (#) needs were compared to documented usage at a large marathon event. RRWP inputs were air temperature (ºC), race distance (km), numbers of runners and numbers of water stations; outputs were gallons of water, numbers of cups, and both gallons and cups per fluid station. An *a priori* constant error (y-intercept) of less than ± 0.250 L/h per runner was used as an acceptance threshold and evaluated using Deming Regression.
RESULTS: Published studies provided 14 group mean sweating rates from 321 runners for comparison to composite RRWP estimates. Air temperatures ranged from 13.4 to 28.5ºC and running distance from 11.7 to 42.2 km. Constant error was 0.203 L/h with one outlier and 0.053 L/h with outlier removed. The 2017 Boston marathon hosted 27,222 runners on a day averaging 21.5ºC. Water and cup usage was 31,740 gallons and 1,036,003 cups (51.8 cases), respectively. RRWP estimates were 33,505 gallons and 1,072,160 cups (53.6 cases), respectively. The difference in gallons expressed as liters was 0.246 L per person. For a ~4 h marathon, the difference as a rate was 0.062 L/h. The difference in cups was 1.8 cases (3.5% error).
CONCLUSIONS: The results of the RRWP analysis indicate acceptably small error, thus RRWP provides event organizers with a quantitative way to narrow the uncertainties of water planning related to changes in weather, participant numbers, and race distance.
Travel support for Dr. Sollanek provided by Sports Science Synergy, LLC.

1421   Board #229   May 31 8:00 AM - 9:30 AM

A Comparison of Environmental Heat Stress Response in Professional and Amateur Sports Car Racing Drivers

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(No relevant relationships reported)

It is hypothesized that heat stress in a race car can impair driving performance. Yet there is little published research on the physiological demands of driving a racing car. **PURPOSE**: The purpose of this investigation was to compare the physiological responses to racing in veteran professional drivers and amateur drivers. **METHODS**: Four male sports car drivers, two professionals (PRO) and two amateurs (AM) participated in seven nationally sanctioned sports car races in the IMSA series. Rate of perceived exertion (RPE) was collected on the Borg scale (scale of 6-20) after their driving stint. Blood lactate was measured both before and after their driving stint. Pre and post nude body weights were collected as a measure of flood loss. **RESULTS**: Over the course of the seven races, there was no significant difference in RPE between the professionals and amateurs. However, there was a significant difference in blood lactate following a driving stint (PRO 4.82mmol/dl ±0.95; AM 5.2 ±0.98 mmol·dl-1 ; P<0.05). There was also significant difference (P=0.03) in fluid loss with the PRO losing 3.05 ±.78 lbs of sweat while the AM lost 4.09 ±0.78 lbs. **CONCLUSIONS**:These findings suggest that the level of racing experience plays a critical role for a driver in the amount of work done in a race car and the associated fluid loss. These factors indicate that AM could become fatigued faster and result in a decrease in driving performance.

1422   Board #230   May 31 8:00 AM - 9:30 AM

Effect of Fatigue and Active Hyperthermia on Proprioception

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(No relevant relationships reported)

PURPOSE: Proprioception is of paramount importance for motor control, with any alterations likely to alter sport performance and injury risk. Passive hyperthermia impairs proprioceptive acuity, but the effect of exercise-induced fatigue and active hyperthermia remain unclear. This study sought to determine the effect of a 30-min running time-trial in temperate and hot environments on proprioception. **METHODS:** Post familiarization, 11 trained runners (maximal aerobic velocity range 18 - 21.3 km.h-1) completed two 30-min running time-trials (TT) in temperate (CON, 22ºC) and hot (HOT, 39ºC) conditions on separate days in a counterbalanced manner. Proprioception was evaluated immediately pre- and post-TT by Active Movement Extent Discrimination Apparatus (AMEDA). Thermoregulatory [rectal (Tr) and skin temperature (Tsk)], physiological [heart rate (HR)] and perceptual [thermal comfort (TC)] responses were recorded. Data were compared via a two-way ANOVA for repeated measures. **RESULTS:** Tr, Tsk, HR and TC increased with exercise but reached higher values in HOT compared to CON (see Table 1, p<0.05). The average error for active movement discrimination displayed an interaction effect (p=0.029) with post-hoc analyses revealing that proprioception was impaired by running in HOT (p=0.028) but not in CON (p=0.547). **CONCLUSION:** Exercise-induced fatigue in HOT (but not CON) impaired proprioception and thus active hyperthermia may influence performance and injury risk during dynamic tasks requiring proprioceptive acuity.

Table 1. Thermoregulatory, physiological and perceptual responses				
	COOL	HOT		
	Pre	Post	Pre	Post
Rectal temperature (°C)	37.3 (±0.4)	39.3*(±0.4)	37.4 (±0.3)	39.9*(±0.3)
Skin temperature (°C)	32.2 (±1.1)	33.1*(±1.1)	34.3 (±0.5)	36.1*(±1.0)
HR (bpm)	62.0 (±9.3)	136.2*(±13.7)	64.2 (±13.1)	150.1*(±17.7)
Thermal comfort (/7)	2.6 (±0.9)	4.0*(±0.9)	3.9 (±1.2)	5.6*(±0.8)
Average error (degrees)	0.63 (±0.2)	0.60 (±0.2)	0.57 (±0.1)	0.64*(±0.2)

1423   Board #231   May 31 8:00 AM - 9:30 AM

Whole-body Sweating Rate And Percentage Of Weight Lost By Dehydration In Two Different Volleyball Trainings

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(No relevant relationships reported)

PURPOSE: To compare the whole-body sweating rate and percentage of weight lost by dehydration in two different types of indoor training in male college volleyball players.
METHODS: 8 male college volleyball players were evaluated from February to March 2017. We calculated the whole-body sweating rate and the percentage of weight lost by dehydration in two different training session [Volleyball training (VO) and Volleyball training plus resistance training (VR)]. To evaluate the whole-body sweating rate, body and sport bottle were weighted before and after training to calculate changes in body mass and fluid intake (subjects were allowed to drink ad libitum during trainings). Subjects had to wear minimal clothing, to dry their skin with towels and to void their bladders before being weighed. Active time of each training was evaluated employing a stopwatch. Results are shown in median, minimum and maximum.
RESULTS: The active time for VO were 117 min (72 - 135); on the other hand, for VR were 107 min (97 - 126) (p= 0.96). A higher whole-body sweating rate was found from VO (11.8 ml/min, 5.7 - 13.3) than VR (10.1 ml/min, 7.0 - 12.3) but were not significantly different (p= 0.42). Conversely, a lower percentage of weight lost by dehydration was found from VO (0.7, 0.3 - 1.4 %) than VR (0.8, 0.2 - 1.3 %), but again were not significantly different (p=0.69).
CONCLUSIONS: In this study we found the sweating rate and body weight loss by dehydration were similar despite the training sessions were different. Maybe this happened because the active time was the same. However, it is known that intensity also plays a role in sweating rate, but it wasn't measured here, and therefore, the differences in training intensity may soft the differences in sweating rate and body weight loss despite there were the same active time.

1424   Board #232   May 31 8:00 AM - 9:30 AM

Effects of Aerobic Cycling Exercise in the Heat on Neuromuscular Activation and Fatigue

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(No relevant relationships reported)

Purpose: To examine the effects of heat on neuromuscular activation and fatigue during aerobic cycling exercise. **Methods:** Five recreationally active men (24.8 ± 2.9 years; 183.1 ± 2.2cm; 80.5 ± 4.4kg; 11.3 ± 2.8%BF; 3.97 ± 0.34 L·min-1) visited the laboratory on three separate occasions. Participants completed a VO₂max test on a Velotron cycle ergometer and underwent skinfold assessment. The remaining two visits consisted of cycling for 60 min at 60% of their previously determined VO₂max in either a high-temperature (35°C / 45%RH) (HT), or a moderate-temperature (22°C / 45%) (MT) in a counterbalanced fashion. Electromyography (EMG) of the vastus lateralis of the right leg was recorded during the 60-min exercise protocol during the first two min, and during the last two min of every 10-min period (0-2 min, 8-10 min, 18-20 min, 28-30 min, 38-40 min, 48-50 min, 58-60 min). Raw EMG recordings were normalized to maximal voluntary isometric contractions (MVICs), and analyzed for root mean square (RMS), mean power frequency (MPF) and median power frequency (MEDPF). Data were analyzed using a within-subjects repeated measures ANOVA. **Results:** No significant interaction (F = 0.519; $p = 0.788$) or main effects (Time: F = 2.069; $p = 0.095$; Condition: F = 2.742; $p = 0.173$) were observed for RMS. Additionally, no interaction was observed for MPF (F = 1.310; $p = 0.291$), however, a significant main effect of condition was observed for MPF (F = 15.325; p = 0.017), with a significantly higher MPF in HT (91.27 ± 3.03%) compared to MT ($p = 0.017$; 85.00 ± 3.07%). A significant main effect of time was also observed for MPF (F = 3.282; $p = 0.017$), with a significantly higher MPF at 58-60 min (89.30 ± 2.86%) compared to 8-10 min ($p = 0.039$; 86.34 ± 2.34%). No significant interaction was observed for MEDPF (F = 1.214; $p = 0.333$), though a significant main effect of time was observed (F = 2.841; $p = 0.031$). Pairwise comparisons indicate this difference occurred between 0-2min (82.469 ± 3.098%) and 28-30min ($p = 0.023$; 85.834 ± 2.638%). **Conclusion:** Exercise in the heat resulted in a significantly higher MPF, with an increased MPF towards the end of exercise. These data suggest that heat exposure, as well as continuous aerobic exercise, may elicit an increase in action potential conduction velocity over the vastus lateralis. <!--EndFragment-->

1425 Board #233 May 31 8:00 AM - 9:30 AM

Predicting The Onset Of Sweat During Cycling In Simulated Environments

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(No relevant relationships reported)

E-bikes have become a growing alternative to traditional bikes. E- bikes are often used for transportation to and from the workplace, thus, in the initiative to promote adoption, advanced features such as appropriate assistance to eliminate the onset of sweat would be appealing to most users. **PURPOSE:** To provide a starting point for the development of a regression equation that can predict sweat onset. **METHODS:** Ten participants volunteered for this study. Participants committed to 5 experimental cycling sessions that varied by workload and climate. Participants cycled on an indoor bike trainer at 2 power outputs (25W and 75W) and 2 climatic conditions (25ºC @ 60% RH and 30ºC @ 60% RH) until sweating commenced. Physiological measures included: electromyography, heart rate, skin temperature, core temperature, galvanic skin response, and VO_2. **RESULTS:** The average subjective sweat onset time for the 75W condition was less effected by the climatic condition than the 25W condition. The subjective sweat onset times for the 75W condition was 8.53 ± 2.19 minutes and 5.83 ± 1.44 minutes for the low and high temperatures, respectively. The subjective sweat onset times for the 25W condition was 23.52 ± 7.40 minutes and 12.49 ± 7.08 minutes for the low and high temperatures, respectively. A regression equation was developed and is able to predict subjective sweat onset with 61.5% of the variance explained with two measured variables. Workload alone explained 41.5% of the variance for sweat onset determination. When the regression was designed with workload as the outcome instead of sweat onset time, subjective sweat onset time was able to predict wattage with 40.1% of the variance explained. **CONCLUSION:** For the conditions simulated in this study, external temperature had less of an influence on sweat onset times than cycling workload. Sweat onset can be predicted with 61.5% of the variance explained using only two input variables. Heart rate was a poor indicator of sweat onset and simply using power output would be a better starting point. Overall, workload proved to be the most influential variable for predicting sweat onset.

This project was funded by the Natural Sciences and Engineering Research Council Engage Grant

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1426 Board #234 May 31 8:00 AM - 9:30 AM

Folic Acid Improves Vascular Function, But Not Skin Blood Flow, In Heart Failure Patients

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(No relevant relationships reported)

PURPOSE: Heart failure (HF) patients' are limited in their ability to manage a thermal load during exercise secondary to impaired skin blood flow (SkBF). Folic acid has been shown to improve vascular function and accompanying changes in SkBF in healthy older individuals and in those with metabolic and cardiovascular disease. Therefore, we examined the effect of folic acid on vascular function, and SkBF responses during exercise in 10 HF patients and 10 age-matched healthy controls (CON) similar in body size during exercise at a fixed rate of metabolic heat production (Hprod) in a 30°C environment. **METHODS**: Rectal temperature (T_{rec}) and cutaneous vascular conductance (CVC) were measured during 60min of cycle ergometry before (pre) and after (post) a 6 week intervention period where participants ingested 5mg of folic acid, once daily. At these time points (pre- and post-folic acid), vascular function was assessed using flow-mediated dilation (FMD). **RESULTS**: H_{prod} was maintained at the same level for HF (pre: 332 ± 46; post: 337 ± 51W, p=0.84) and CON (pre: 323 ± 31; post: 317 ± 40W, p=0.72), and no differences were observed between groups in both exercise trials (p>0.05). T_{rec} increased to a similar extent for HF (pre: $0.76\pm0.22°C$; post: $0.70\pm0.11°C$, p=0.63) and CON (pre: 0.55 ± 0.27; post: $0.45\pm0.25°C$, p=0.84); however, the rise in T_{rec} was consistently higher in HF during both exercise trials (p<0.05). Similarly, CVC increased to a similar extent for HF (pre: 0.89 ± 0.43; post: 0.83 ± 0.45au/mmHg, p=0.80) and CON (pre: 2.01 ± 0.79; post: 2.03 ± 0.72au/mmHg, p=0.73), but the rise in CVC was consistently lower in HF during both exercise trials (p<0.05). Furthermore, folic acid improved FMD in HF (pre: 3.72 ± 1.16; post: 5.88 ± 1.29, p<0.01); however, no difference was observed in CON (pre-: 5.47 ± 1.98; post: $6.50\pm2.49\%$, p=0.20). **CONCLUSIONS**: Collectively, these findings demonstrate that folic acid supplementation does not serve to enhance SkBF responses and attenuate the rise in core temperature during exercise at a fixed H_{prod} in HF patients. However, folic acid improved vascular function to a greater extent in HF than CON.

1427 Board #235 May 31 8:00 AM - 9:30 AM

Combined Heat Treatment and Exercise Prevents Skeletal Muscle Insulin Resistance in Wistar Rats Fed a High-Fat Diet

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(No relevant relationships reported)

PURPOSE: Insulin resistance (IR) is associated with many related health complications. Previous studies demonstrate that heat and exercise independently reduce IR. The purpose of this study was to test the hypothesis that combined exercise and heating is even more favorable in reducing IR.
METHODS: Male Wistar rats were randomly divided into five groups: exercise (NE; n=10), heated (HC; n=10), exercise and heated (HE; n=10), sedentary (NC; n=10), and normal diet plus sedentary (CC; n=10). All but the latter group was fed a high-fat diet (60% calories from fat) for 10 weeks while receiving heat and/or exercise exposure for latter 8 weeks. Following this regimen, protein expression from the soleus and extensor digitorum longus muscles, serum, and brown fat were analyzed using Western blotting.
RESULTS: Exercise combined with heating shifted the metabolic characteristics of rats on a high-fat diet toward that observed in the rats on a standard diet. Specifically, eight weeks of combined heat and endurance exercise increased PGC-1α, CnA, CaMKIV and p38 MAPK protein expression in the soleus (P < 0.05), insulin protein expression in the serum (P < 0.05), and UCP1 protein expression in the brown fat (P < 0.05), when compared to the high fat fed sedentary group. There were some significant differences in responses (i.e., body weight and Leptin & Adiponectin concentrations) between the combined exercise and heat group relative to the exercise alone group.
CONCLUSIONS: Exercise combined with heat exposure mitigates the development of IR, presumably from the Irisin pathway. The study provides potential non-pharmaceutical methods for therapeutic treatment of IR.
KEY WORDS: Insulin resistance (IR); Exercise; Heat; Irisin
This work was supported by The National Natural Science Foundation of China (31371195).

1428 Board #236 May 31 8:00 AM - 9:30 AM

The Effect of Mild Hypohydration on Performance and Thermoregulation in Male Cyclists: A Blinded Study

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(No relevant relationships reported)

PURPOSE: The aim of the present study was to examine the effect of mild dehydration on thermoregulation and exercise performance with subjects blinded to their hydration status via intravenous infusion (I.V.).
METHODS: Eleven male cyclists (weight 75.8 ± 6.4 kg, VO_{2peak}: 64.9 ± 5.6 mL·kg·min^{-1}, body fat: $12.0\pm5.8\%$, Power$_{max}$: 409 ± 40 W) performed three sets of criterium-like cycling, consisting of 20 min of steady state cycling at 50% peak power output, each followed by a 5-km time-trial at 3% grade. Subjects completed the protocol, in counter-balanced fashion, on two separate occasions in dry heat (30 °C, 30% rh) either hypohydrated (HYP) or euhydrated (EUH). In both trials, subjects ingested 25 mL every 5 min during the steady-state and 25 mL every 1-km during the 5-km time-trials. In the EUH trial, sweat losses were fully replaced via intravenous infusion of isotonic saline, while in the HYP trial, a sham I.V. was instrumented.
RESULTS: Following the exercise protocol, the subjects dehydrated by $-0.1\pm0.1\%$ and $-1.8\pm0.2\%$ of their body weight for the EUH and HYP trial, respectively. During the second and third time-trials, subjects displayed faster cycling speed in the EUH trial (27.5 ± 3.0 and 27.2 ± 3.1 km·h^{-1}) compared to the HYP trial (26.2 ± 2.9 and 25.5 ± 3.3 km·h^{-1}; both P<0.05). Core temperature (T_{re}) was higher in the HYP trial throughout the third steady-state (P<0.05) and continued to be higher throughout the third 5-km time-trial (P<0.05). Final T_{re} of the third time-trial for HYP and EUH was 39.1 ± 0.3 vs. 38.6 ± 0.6 °C (P<0.05).
CONCLUSIONS: These data suggest that full fluid replacement, even in a blinded manner, provided a performance advantage of faster cycling speeds. This benefit seems to be associated with concomitant decreased thermoregulatory strain.

1429   Board #237   May 31 8:00 AM - 9:30 AM

Thermal Behavior During Recovery From Exercise

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(No relevant relationships reported)

During exercise recovery, autonomic thermoeffectors return to pre-exercise levels despite elevations in core temperature. It is unknown if thermal behavior follows a similar trajectory or compensates for elevated core temperature in lieu of autonomic thermoeffector withdrawal. **PURPOSE:** To test the hypothesis that thermal behavior during recovery remains engaged despite autonomic thermoeffector withdrawal. **METHODS:** In a $24 \pm 1°C$, $45 \pm 10\%$ RH environment, 10 subjects (6 females, 22 ± 1 y) cycled for 60 min (225 ± 46 W metabolic heat production), followed by 60 min passive recovery. Weighted mean skin (10 site) and intestinal temperatures, skin blood flow (forearm; laser Doppler), average local sweat rate (upper arm, trunk; ventilated capsule), and weighted mean skin wetness (4 site) were measured continually. Subjects controlled the temperature of their dorsal neck to their perceived thermal comfort using a custom-made fluid filled tubing device. Device temperature provided an index of thermal behavior. Mean body temperature, calculated as the unweighted average of mean skin and intestinal temperatures, provided an index of the stimulus for thermal behavior. To directly determine the effect of prior exercise, post-exercise data were analyzed the minute mean body temperature recovered to pre-exercise levels within a subject. **RESULTS:** Mean body temperature returned to pre-exercise levels 28 ± 20 min into recovery (Pre: 33.5 ± 0.2, Post: $33.5 \pm 0.2°C$, P=0.20). At this point, mean skin temperature had recovered (Pre: 29.6 ± 0.4, Post: $29.5 \pm 0.5°C$, P=0.20), yet intestinal temperature (Pre: 37.3 ± 0.2, Post: $37.5 \pm 0.3°C$, P=0.01) and skin wetness (Pre: 0.2 ± 0.1, Post: 0.3 ± 0.0 a.u., P=0.02) were elevated. Post-exercise, skin blood flow (Pre: 59 ± 78, Post: 26 ± 25 PU, P=0.10) and local sweat rate (Pre: 0.05 ± 0.25, Post: 0.13 ± 0.14 mg/cm^2·min^{-1}, P=0.09) returned to pre-exercise levels, while neck device temperature was depressed (Pre: 27.4 ± 1.1, Post: $21.6 \pm 7.4°C$, P=0.03). **CONCLUSIONS:** Mean body temperature and autonomic thermoeffectors returned to pre-exercise levels, yet thermal behavior was active during recovery. Thermal behavior may compensate for autonomic thermoeffector withdrawal in the presence of elevated intestinal temperature and mean skin wetness post-exercise.

C-46   Free Communication/Poster - **Exercise Immunology**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1430   Board #238   May 31 8:00 AM - 9:30 AM

Erk1/2 And Ccr2 Expression In Fit And Unfit Males

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(No relevant relationships reported)

C-C chemokine receptor 2 (CCR2) is required for monocyte chemotaxis to inflamed areas. Monocytes undergo diapedesis and differentiate into inflammatory M1 or anti-inflammatory M2 macrophages. Skewing of M1/M2 balance toward M1 may lead to sustained inflammation and disease development, including cardiovascular disease (CVD). CCR2 activation increases phosphorylation of extra-cellular regulated kinase 1 and 2 (pERK) which is necessary for M2 polarization but not M1. **PURPOSE:** To evaluate the differences and time course of CCR2 and pERK in fit (FIT) and unfit (UF) males following acute exercise. **METHODS:** 5 FIT (VO2$_{peak}$ ≥45ml O$_2$/kg/min) and 5 UF (VO2$_{peak}$ <40ml O$_2$/kg/min) males performed 30 minutes of cycling. Intensity was adjusted to maintain an average blood lactate concentration of 8mM/L. Blood samples were taken pre-exercise, immediately (POST), 1 hour (1H), and 2 hours (2H) post. Cells were fixed and stained using antibodies against CD14, CD16, CCR2, and pERK. Monocytes were defined by CD14 and CD16 using flow cytometry. **RESULTS:** A main effect for pERK (p=0.017) suggested a difference between groups. pERK increased POST in FIT (3113 [PRE] vs. 4116 [POST], p = 0.031). CCR2 was not significantly altered within groups. However, CCR2 was significantly different between groups at POST (12316 [FIT] vs. 3253 [UNFIT], p=0.001) and CCR2 was positively correlated with pERK at POST (R=0.77, p<0.02) and at 1H (R=0.94, p<0.001) with all subjects. **CONCLUSION:** Higher pERK in FIT males may increase monocyte recruitment and differentiation to the M2 macrophage phenotype. This likely helps maintain M1/M2 macrophage balance which may decrease the incidence of CVD.

1431   Board #239   May 31 8:00 AM - 9:30 AM

Alleles Associated with Voluntary Physical Activity are Predicted to be Older Than Anatomically Modern Humans

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(No relevant relationships reported)

Voluntary physical activity (VPA) has repeatedly been shown to be partially driven by genetics. Understanding the genetic age of the specific genetic mutations associated with VPA control can help facilitate understanding of potential mechanisms underlying genetic control of physical activity level. **PURPOSE:** To determine the estimated allelic age of SNPs associated with VPA in humans. **METHODS:** All human registered SNPs (rs#) found to be associated with VPA to date were cross-referenced with the NHLBI GO ESP's Exome Variant Server to find estimated African-American (AA) and European-American (EA) allelic origin. Allelic origin predictions were published by Fu et al. (Nature, 2012) with estimates based on the Out-of-African model that characterized a bottleneck of non-African populations approximately 51 Kyrs ago and a second bottleneck for European populations 23 Kyrs ago, with accelerated population growth 5.1 Kyrs ago. The VPA-associated SNPs were located in the Fu database and the estimated age of allelic variation represented by that SNP was calculated. **RESULTS:** Only 4 of the 64 SNPs associated with various measurements of physical activity were exonnally-located missense variants. The exon-located SNPs were in the IFNAR2, PPARGC1A, PML, and APOE genes. APOE age was not estimated in the initial allelic origin predictions and thus could not be determined. For the remaining SNPs, average AA estimated allelic age was 584.7 ± 355.1 kyrs and average EA estimated allelic age was 607.6 ± 397.2 kyrs. **CONCLUSIONS:** Exon-located VPA candidate SNPs are older than the hypothesized emergence of anatomically modern humans. The predicted allelic age of these particular SNPs suggests the control of VPA in humans has been conserved throughout modern human evolution.

1432   Board #240   May 31 8:00 AM - 9:30 AM

Aerobic Training Status and Fatty Acid-Induced hTERT mRNA Expression Following Maximal Exercise

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(No relevant relationships reported)

PURPOSE: Telomeres protect the ends of cellular chromosomes from degradation. Although telomere length within immune cells shorten naturally with age, increasing risk of disease and all-cause mortality, physical activity preserves telomere length by increasing mRNA expression of the telomerase component, telomerase reverse transcriptase (hTERT). Therefore, this study examined the influence of aerobic training status on the capacity of peripheral blood mononuclear cells (PBMCs) to express hTERT mRNA following palmitate stimulation.
METHODS: PBMCs were isolated from 12 trained (T) and 11 untrained (UT) subjects pre- and post-maximal exercise, and stimulated with or without palmitate (4 hours) to examine changes in hTERT mRNA expression.
RESULTS: hTERT mRNA expression remained unaltered following palmitate stimulation in T subjects at rest and in response to maximal exercise. To the contrary, palmitate-induced hTERT mRNA expression was elevated at rest relative to unstimulated PBMCs in UT subjects and following maximal exercise was suppressed relative to unstimulated PBMCs and pre-exercise expression levels ($F_{[1, 81]} = 7.874$, $p = 0.006$). In addition, cardiorespiratory fitness (VO$_{2max}$) was negatively associated with the percent change in hTERT mRNA expression in unstimulated PBMCs (r = -0.496, $p = 0.022$) and positively associated with the percent change in hTERT mRNA expression following palmitate stimulation (r = 0.468, $p = 0.032$).
CONCLUSION: This data suggests that aerobic training may preserve the capacity of immune cells to protect against inflammatory-induced telomere shortening following acute physiological stress.

1433 Board #241 May 31 8:00 AM - 9:30 AM

Association Between Actn3 R577x Polymorphism And Weight-lifting Performance In Japanese And Italian Atheltes.

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(No relevant relationships reported)

α-actinin-3 (ACTN3) R577X polymorphism is associated with various aspects of muscular strength and power. **PURPOSE**: To investigate the association between ACTN3 R577X polymorphisms and athletic performance in Japanese and Italian weight-lifting athletes.
METHODS: 128 weight-lifting atheletes (n=114 Japanese; n=14 Italians) and 1323 controls (n=1227 Japanese; n=96 Italians) were included in the analysis. The data were the best crean & jerk and snatch performances obtained by athletes during official competitions. Genotyping results were analyzed using the TaqMan approach for the *ACTN3* (rs1815739) polymorphism.
RESULTS: The genotype frequencies in Japanese and Italian controls were 21%, 48%, 31% and 30%, 58%, 12% for RR, RX, and XX, respectively. There were no significant differences in the ACTN3 R577X genotype frequency distribution between athletes and controls in either Japanese and Italian cohorts. Athletes with RR genotype showed higher records of snatch and crean & jerk than athletes with XX genotype in both Japanese and Italian groups.
CONCLUSIONS: In conclusion, our data indicates an association between that *ACTN3* R577X polymorphism and weight-lifting performance, with carriers of the RR and RX genotypesthat showed higher records in crean & jerk and snatch performance than athletes with XX genotypes in both Japanese and Italian cohorts. Further studies in large cohort are required to confirm the association between genetics and weight-lifting performance

1434 Board #242 May 31 8:00 AM - 9:30 AM

The Interplay between Genes and Psychosocial Home Environment on Leisure-time Physical Activity: a Twin Study

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(No relevant relationships reported)

PURPOSE Both genetic and environmental factors contribute to individual differences in physical activity. However, it remains uncertain whether the home environment can modify the effects of genetic factors on physical activity. We examined to what extent the psychosocial home environment in childhood and adolescence modifies the genetic influences on leisure-time physical activity in young adulthood by using Finnish twin data. **METHODS** Families with twins born between 1983 and 1987 took part in the population-based FinnTwin12 study. The psychosocial home environment was assessed by twins at ages 12, 14 and 17, as well as by their parents when the twins were age 12 using an 8-item questionnaire. At age 24, twins assessed their leisure-time physical activity based on a series of structured questions, which were used to calculate leisure-time MET hours per day. Data of 3,305 twins were analyzed using a gene-environment interaction model with OpenMx software. **RESULTS** Parental ratings of positive home atmosphere as well as the twins' ratings of both positive home atmosphere at age 14 and lower relational tensions at ages 12 and 14 predicted higher leisure-time physical activity levels in young adulthood (regression coefficients 0.33-0.64). Parental perceptions as well as the twins' perceptions of positive home atmosphere at ages 14 and 17 increased the additive genetic variation (moderation effects 0.60, 95% CI 0.26-1.05; 0.55, 95% CI 0.29-0.80 and 0.52, 95% CI 0.19-0.87, respectively). The twins' ratings of positive home atmosphere at age 12 and lower relational tensions at ages 12 and 14 increased the unique environmental variation of their subsequent physical activity (moderation effects 0.46, 95% CI 0.19-0.60; 0.48, 95% CI 0.29-0.64 and 0.85, 95% CI 0.12-0.95, respectively). **CONCLUSION** A warm and supportive psychosocial home environment in childhood and adolescence not only increases the level of leisure-time physical activity in young adulthood, but also modifies the variation of genetic and environmental influences on leisure-time physical activity. In terms of clinical implications, it would be important to find ways to help parents create a home environment that is both warm and supportive for their children because it can go a long way toward developing their offspring's interest in physical activity.

1435 Board #243 May 31 8:00 AM - 9:30 AM

The Effect Of Exercise Mode On The Hypothalamic Expression Of Kiss-1and Gpr54 Genes Mrna In Dietinduced Obesity Rats

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(No relevant relationships reported)

Kisspeptin, a hypothalamic peptide coded by the KiSS1 gene, is a neuromodulator that controls GnRH secretion and is now recognized as a crucial regulator of the onset of puberty.**PURPOSE**: To explore the difference roles of moderate-intensity treadmill training (MIT) and high intensity interval treadmill training (HIIT) in modulating the hypothalamic expression of KiSS-1and the G-protein coupled receptor (GPR) 54 mRNA in the diet induced obesity male rats.
METHODS: After 8 weeks high fat feeding, 24 obesity 11-weeks SD rats were randomly assigned to sedentary (FS, n=8), MIT (n=8) , and HIIT (n=8) groups, 8 normal diet 11-weeks SD rats were assigned as sedentary (SS, n=8) groups. During the following 8 weeks, obesity rats were continued expose to high-fat-diet. MITgroup did the 60%-70%V(•)O$_2$max treadmill training (5 days/week, 1 hour/day). HIIT group did the HIIT training (5 days/week, 1 hour/day),which included 7 minutes warmup (70% V(•)O$_2$max), 6groups formal training(90% V(•)O$_2$max*3min+ 50% V(•)O$_2$max*3min) and 7 minutes recobery (70% V(•)O$_2$max) The V(•)O$_2$ max of exercise groups were remeasured every two weeks. The hypothalamic expression of KiSS-1 and GPR54 mRNA were tested in each group. **RESULTS**: After the first 8-weeks high fat feeding, the obesity rats were heavier than normal diet group (491.74±26.19g vs. 410.05±45.77g, p<0.01). After 8-weeks training, FS group was still heavier than SS group (681±52.56g vs. 574.27±52.43g, p<0.01), and had more hypothalamic expression of KiSS-1 mRNA(1.51±0.66 vs 0.75±0.27, p<0.05) and GPR54 mRNA (2.45±0.38 vs 0.61±0.15, p<0.01). Both MIT and HIIT groups weighted less than FS group, HIIT group had the lightest bodyweight (590.23±35.74g, 558.1±29.57g vs 681±52.56g). Compared with FS group, although both MIT and HIIT groups had lower hypothalamic expression of KiSS-1 mRNA and GPR54 mRNA, HIIT group had the lowest hypothalamic expression of KiSS-1 mRNA (0.47±0.13 vs 0.69±0.13, p<0.01) and GPR54 mRNA(0.58±0.10 vs 0.23±0.06, p<0.01).
CONCLUSIONS: Both MIT and HIIT could reduce the stimulating effect of high-fat diet induced obesity on bodywight and hypothalamic expression of KiSS-1and GPR54 mRNA, and HIIT could play a better role.

C-47 Free Communication/Poster - **Musculoskeletal**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1436 Board #244 May 31 8:00 AM - 9:30 AM

Retrocalcaneal Approach Of Ultrasound Guided Tibial Nerve Block: A Preliminary Study

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(No relevant relationships reported)

PURPOSE: Ultrasound guided tibial nerve block has emerged as a valuable tool for various situations related to chronic heel pain. With conventional method the needle is advanced oblique angle from antero-medial side to the Achilles tendon into tarsal tunnel. However, the entire shaft of the needle is difficult to visualize. Besides, as the needle is inserted from the proximal side of posterior tibial artery, extraordinary precaution is required to avoid damage to the artery. In order to complement such shortcomings, a new tibial nerve block method was designed. The purpose of this study was to introduce, and assess the effectiveness and safety of this new approach.
METHODS: The study subjects were patients with chronic plantar heel pain. The needle was inserted from the lateral side of retrocalcaneal space, advancing medially toward tarsal tunnel space beneath the Achilles tendon. This method allowed the transducer to be nearly parallel to the needle axis, making the entire needle to be visualized. After the needle tip was positioned in the tarsal tunnel adjacent to the tibial nerve, anesthetic was injected. Revised Foot Function Index (FFI-R) was used to assess the effectiveness of the nerve block. The FFI-R questionnaire was conducted two times; before and 2 weeks after the procedure. Higher score indicated greater impairment. The safety was assessed by the presence or absence of bleeding, swelling, and inflammation after the procedure. **RESULTS**: Two patients suffering from prolonged plantar fasciitis underwent the retrocalcaneal posterior tibial nerve block. The first patient who had plantar fasciitis showed some improvement after the nerve block; FFI-R score changed from 36 to 27. The second patient who had excessively severe foot pain and activity limitation initially with FFI-R score of 55 showed dramatic improvement after the nerve block; the FFI-R score declined to 36. There were no complications such as bleeding, swelling, or inflammation in both subjects.

CONCLUSIONS: This study has introduced retrocalcaneal approach of ultrasound guided posterior tibial nerve block. It can be as effective as, and even safer than the conventional method because visualization of the entire needle is possible and the needle is advanced from the opposite direction to the posterior tibial artery.

1437   Board #245   May 31 8:00 AM - 9:30 AM

Dynamic Quadriceps Strength are Associated with Self-Reported Disability Following ACL Reconstruction

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(No relevant relationships reported)

PURPOSE: Quadriceps dysfunction following ACL reconstruction contributes to the development of knee osteoarthritis. Individuals with ACLR express long-term disability that is attributed to quadriceps weakness. The purpose of this study was to (1) compare quadriceps function between individuals with and without ACLR, and (2) determine the relationship between indices of quadriceps function and self-reported disability. **METHODS**: Isometric peak torque (PT; Nm/kg) and rate of torque development (RTD; Nm/kg/s) and isokinetic (180°/sec) quadriceps PT (Nm/kg) were assessed in 46 individuals with ACLR (74% female; age=22.1±2.8 years; height=1.70±0.09m; mass=71.6±15.7kg) and 38 control participants (74% female; age=21.9±1.2 years; height=1.69±0.09m; mass=66.2±11.7kg). Self-reported disability was assessed using the International Knee Documentation Committee (IKDC) instrument. Dependent variables were compared between the involved and uninvolved limbs using paired t-tests, and involved and uninvolved limbs were compared to control limbs using independent t-tests (adjusted α=0.017). Pearson correlation was used to determine the relationship between indices of quadriceps function and IKDC (*a priori* α =0.05). **RESULTS**: Involved limbs had lower isometric PT (2.27±0.55 vs. 2.57±0.73 Nm/kg, p=0.016), RTD (11.7±5.9 vs. 15.3±6.9 Nm/kg/sec, p<0.01) and PT at 180°/s (1.72±0.48 vs. 1.91±0.47 Nm/kg, p<0.01) compared to control limbs. Uninvolved limbs had lower PT (2.29±0.53 vs. 2.57±0.73 Nm/kg, p=0.02), RTD (10.7±5.1 vs. 15.3±6.9 Nm/kg/sec, p<0.001) and PT at 180°/s (1.66±0.41 vs. 1.91±0.47 Nm/kg, p<0.01) compared to control limbs. No differences were found between involved and uninvolved limbs in PT (p=0.43), RTD (p=0.07), or PT at 180°/sec (p=0.16). Greater PT at 180°/sec (r=0.33, p=0.02), and greater RTD100 (r=0.28, p=0.03) were associated with higher IKDC score. Isometric PT was not associated with IKDC (r=0.15, p=0.31). **CONCLUSION**: Bilateral quadriceps weakness was found compared to control participants. Greater isokinetic PT and RTD were associated with higher levels of self-perceived knee joint function while maximal isometric strength was not. Assessment of maximal isometric strength following ACLR may not comprehensively evaluate quadriceps impairment after ACLR.

1438   Board #246   May 31 8:00 AM - 9:30 AM

Response Of Muscle Damage Markers After Acute Heavy Exercise In Different Ovarian Hormone Secretion

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(No relevant relationships reported)

PURPOSE To evaluate the response of muscle damage markers to acute heavy resistance exercise in female athletes with different ovarian hormone levels.
METHODS Eleven female college athletes were enrolled. They were divided into 2 groups according to the variations in their ovarian hormone levels: the ovarian-suppression group (OVS) and the cyclic menstruation group (CYC). Measurements were taken under 2 conditions (rest and exercise) over a 3-week period. Measurements in CYC were started after the start of menstruation (week 1). The exercise involved 6 sets of 5 squats at 90% 1-RM with a 3-min rest between each set. During rest, the athletes remained quiet and sat for 30 min. Blood chemicals including serum creatine kinase (CK) and lactate dehydrogenase (LD), Profile of Mood State 2 (POMS2) TMD scores, and muscle soreness evaluated using the 100-mm Visual Analog Scale were measured before, immediately after, 30 min after, 60 min after, and 24 h after each condition.
RESULTS In CYC, week-2 estradiol (E2) levels during exercise were significantly higher than those of weeks 1 and 3 (336.7±104.6 vs 69.5±44.2 and 109.8±28.7 pg/mL). During rest, week-1 E2 levels were significantly lower than those of weeks 2 and 3 (63.2±36.9 vs 116.2±18.1 and 198.8±19.7 pg/mL). In OVS, E2 levels did not differ significantly at any point in the study (weeks 1, 2, and 3: 45±12.1, 66.2±8.8, 59.8±14.2 pg/mL during exercise and 52.2±23.2, 52.0±18.1, 43.0±20.1 pg/mL during rest). CK was significantly higher in week 2 in OVS than in CYC before both conditions (163±12.1 vs 196.1±11.0, 158.4±10.4 vs 201.3±11.4 U/L). LD and TMD scores were significantly higher in OVS than in CYC during rest and before exercise. CK in CYC increased significantly immediately after exercise when compared with its level before

exercise in week 1 (178.3±12.8 vs 218.2±39.7 U/L) and 3 (189.7±8.1 vs 207.0±7.6 U/L). CK in OVS significantly increased immediately and 30 min after exercise when compared with its level before exercise in every week (week 1: before exercise 191.1±114.0 vs immediately after 256.4±11.2 vs 30 min after 239.4±11.5; week 2: 196.3±11.0 vs 244.0±8.1 vs 239.4±13.1; week 3: 199.9±8.8 vs 240.6±5.4 vs 234.0±4.9 U/L).
CONCLUSION Ovarian suppression in athletes may lead to severer muscle damage because of lack of muscle protection by estradiol.

1439   Board #247   May 31 8:00 AM - 9:30 AM

Within-Day Intra- And Interrater Reliability Of Ultrasonographic Measurements Of Acromion-Greater Tuberosity Distance Performed By Novice Testers

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(No relevant relationships reported)

Introduction: The use of musculoskeletal ultrasonographic (US) measurements in Physical Therapy (PT) has recently increased and been reported to assist in the diagnosis of supraspinatus impingement syndrome (SIS). It has been proposed that the acromion-greater tuberosity distance (AGT) measurements with US may be used to determine the efficacy of PT interventions aimed at increasing AGT in patients with SIS. Limited data has been reported on the intrarater and interrater reliability of AGT measurements when performed by novice (limited US training) individuals. **Purpose:** The purpose of this study is to establish the intrarater and interrater reliability of ultrasonographic measurements of the AGT in healthy individuals when performed by novice testers. **Methods:** Participants were 7 males and 13 females (26 years; 21-38 years) with an average BMI of 24.4 (18.9-32). Two PT students took measurements with a portable ultrasound device in brightness mode (B-mode) with an 8-13 MHz linear transducer. Ultrasound images (3) were taken with participants placed in standardized position with transducer placed on lateral surface of the right shoulder aligned with long axis of humerus. AGT was measured using on-screen calipers from the inferolateral edge of the acromion to the nearest margin of the superior aspect of the greater tuberosity. Each participant was then instructed to move out of the standardized position and 3 more images were taken. A second rater repeated the process. The average of the 3 measurements were used for data analysis. Intra- and interrater reliability of measuring AGT was determined by calculating intraclass correlation coefficients (ICC$_{2,3}$) with 95% confidence intervals. **Results:** Intrarater reliability for Rater A: .872 (CI: .683-.949) with AGT distance of 2.17 cm (1.68-2.59 cm). Intrarater reliability for Rater B: .804 (CI: .503-.923) with AGT distance of 2.27 cm (1.94-2.91 cm). Interrater reliability for both raters was .741 (CI: .349-.897). **Conclusions:** This study demonstrates that intrarater and interrater measurements of AGT are very reliable in healthy individuals when performed by novice testers.

1440   Board #248   May 31 8:00 AM - 9:30 AM

Effect Of Cryotherapy To A Muscle Versus A Joint On Functional Performance

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(No relevant relationships reported)

Cryotherapy is a common intervention used to treat acute and chronic injuries, and it can be used to facilitate rehabilitation exercises. A common practice in athletic training is allowing a patient to return to activity after the application of some type of cryotherapy. However, the effect of applying cryotherapy to a muscle or a joint on functional performance is unclear. **PURPOSE:** To investigate if cooling a muscle compared to cooling a joint affects functional performance in healthy, active individuals. **Methods:** Forty-five healthy, college student volunteers (21 males; 24 females) with ages ranging from 18 to 23 years (M = 20.67; SD = 1.09) were randomly assigned to muscle (low leg) cryotherapy, joint (ankle) cryotherapy, or control (no cryotherapy) intervention for 20 minutes. After a 10 minute warm-up, subjects performed practice trials of a shuttle run and single leg vertical jump (SLVJ). Subjects performed three trials of a shuttle run (4 – 6.1 m sprints) for time, and performed three trials of a SLVJ for height measured prior to and immediately following the intervention. A mixed model ANOVA with a Bonferroni Correction was used to determine significant interactions between intervention groups and times with an alpha level of .05 for statistical significance. **RESULTS:** For the SLVJ, there was a significant interaction between the intervention groups and time; F(2,42)=3.349, p=0.045; however, group differences were unable to be determined. The muscle intervention group had a significant decrease in jump height between pre- (M=12.24, SD=3.61) and post-test (M=10.89, SD=3.21); p=0.01. For the shuttle run test, there were no significant interactions between group and time; F(2,42)=0.747, p=0.480. The joint (pre-M=7.43, SD=0.77; post-M=7.56, SD=0.70); p=0.036, and muscle (pre-M=7.63, SD=0.71; post-M=7.79, SD=0.78); p=0.013 intervention groups had a significant increase in run times between pre- and post-test. **CONCLUSIONS:** Cryotherapy application for 20 minutes to a muscle significantly decreased SLVJ

Abstracts were prepared by the authors and printed as submitted.

height and increased shuttle run time, while, cryotherapy application for 20 minutes to a joint significantly increased shuttle run time pre-to post-test. If cryotherapy application is utilized prior to performance, a warm-up should be initiated to prevent a decrease in functional performance.

1441   **Board #249**   **May 31 8:00 AM - 9:30 AM**

VO₂max Differs Between Those with Chronic Ankle Instability and Healthy Matched Controls

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(No relevant relationships reported)

Previous research has reported decreased physical activity levels in those with Chronic Ankle Instability (CAI). The impact of this decrease in physical activity is known in CAI subjects. **PURPOSE**: To measure VO_2max in those with CAI compared to healthy matched controls. **METHODS**: Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4±2.8 yr and 22.3±3.0 yr, respectively), height (165.3±8.5 cm and 167.8±8.2 cm), weight (68.5±8.2 kg and 65.5±8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. After the preliminary measurements, the subjects performed a treadmill maximal exercise test. Heart rate was monitored by ECG, while oxygen consumption and carbon dioxide production were monitored using standard techniques. Every minute of the test the subjects rated their effort of exertion using the Borg RPE scale (a 6 to 20 scale). For the treadmill test we used a two-minute progressive test until volitional exertion was attained. **RESULTS**: No differences were observed between groups for age (p=0.93), height (p=0.56), and weight (p=0.48). VO_2max (ml/kg.min) was significantly different between Injured and Control groups (p=0.0005; 32.5±5.1 and 50.5±10.0, respectively). Time to maximal exercise test completion (p=0.26), maximal RER (p=0.57), and VEmax (p=0.44) were not different between groups. Although maximal HR (p=0.30) and peak RPE (p=0.13) were not different between groups, resting HR was observed to be different between the Injured and Control groups (p=0.0078; 75.2±11.7bpm and 58.9±7.5bpm, respectively). FAAM (p<0.0001), FAAM Sport (p<0.0001) and NASA (p<0.0001) were all observed to indicate differing activity levels between the groups. **CONCLUSIONS**: These findings suggest one's physical fitness level, as assessed by VO_2max, and resting HR differs in college-aged subjects with CAI, suggesting the reoccurrence of this musculoskeletal injury at a young age is serious enough to reduce physical activity levels and result in decreased fitness levels.

1442   **Board #250**   **May 31 8:00 AM - 9:30 AM**

Reliability of a Smartphone Compass App and Goniometer for Assessing Tibial Rotation Range of Motion

Justin Stanek. *Illinois State University, Normal, IL.* (Sponsor: Kristen Lagally, FACSM)

(No relevant relationships reported)

Rotational motion at the tibia is important for both knee and ankle function. Normative values for tibial rotation vary greatly and the ability to accurately assess this motion lacks reliability and clinical applicability. Increasingly, clinicians are using smartphone apps for assessing ROM. **PURPOSE**: To assess the reliability of a smartphone compass app and goniometer for measuring tibial rotation ROM. Secondarily, to compare average values for the two devices. **METHODS**: Two evaluators used a test-retest study design. Seventeen (11 male, 6 female), healthy subjects (21.0±1.3yrs, 177.2±10.8cm, 82.0±23.3kg) volunteered with a total sample of 31 qualifying limbs. Maximum internal (IR) and external rotation (ER) ROM was assessed in a seated position simultaneously using a smartphone compass app secured to the shank using an armband and with a goniometer secured to the floor. Participants sat on an adjustable stool with the limb in neutral and knee flexed to 90°. Evaluators separately recorded 3 trials of IR and ER from the goniometer and compass app. The average of 3 trials was used for analysis. Interclass correlation coefficients (ICC) were used to assess reliability. Two MANOVAs (2 devices x 2 raters x 2 times) were used to compare IR and ER ROM. **RESULTS**: ICC values from the app ranged from 0.78-0.84 and 0.78-0.88 for the goniometer. No significant differences for rater or time were found for either IR or ER. Significant differences in both IR (p=0.001) and ER (p=0.001) ROM were found between devices. Tibial IR and ER were significantly lower for the smartphone (IR=12.7±5.4°, ER=25.1±8.2°) than the goniometer (IR=39.7±8.4°, ER=43.6±7.7°). **CONCLUSIONS**: While both devices demonstrated excellent reliability, some of the differences in normative values may be attributed to the device used and/or measurement techniques. Reliability values for the smartphone app compared similarly to a previously published study using the Myrin Goniometer®, an expensive, needle-based goniometer that is no longer manufactured or sold. Assessing tibial motion using a compass app is a reliable and efficient way to assess a patient's tibial rotation,

although values will vary compared to traditional goniometers. Clinicians must ensure they utilize the same measurement technique and device to accurately track this motion.

1443   **Board #251**   **May 31 8:00 AM - 9:30 AM**

Breast Injuries In Female Collegiate Athletes: Prevalence, Type, And Impact On Sport Participation

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(No relevant relationships reported)

In 2015-2016, over 214,000 female athletes competed at the collegiate level in the U.S. The NCAA collects injury data; however, breast related injuries do not have a specific reporting category. The exact sequelae of breast injury is unknown; however, a relationship between breast injury and fat necrosis, which mimics breast carcinoma, is documented outside of sport participation. Breast injuries related to motor vehicle collisions, seatbelt trauma, and blunt trauma have been reported. For these reasons, it is important to investigate female breast injuries in collegiate sports. **PURPOSE:** The objectives of this study are to report the prevalence of self-reported breast injuries in female collegiate athletes, explore injury type and treatment, and investigate breast injury reporting and impact on sports participation. **METHODS:** A cross-sectional study of female collegiate athletes at four U.S. Universities participating in basketball, soccer, softball, or volleyball. The main outcome measure was a questionnaire regarding breast injuries during sport participation. **RESULTS:** Almost half of the 194 participants (47.9%) reported a breast injury during their collegiate career, less than 10% reported their injury to health personnel with 2.1% receiving treatment. Breast injuries reported by sport include softball (59.5%), basketball (48.8%), soccer (46.7%), and volleyball (34.6%). **CONCLUSION:** The long-term effects and sequelae of breast injuries reported by female collegiate athletes during sport play is unknown. Nearly 50% of participants had a breast injury during sport. Although 18.2% indicated that breast injury affected sport participation, only 9.6% of the injuries were reported to medical personnel with 2.1% receiving treatment. From a clinical perspective, this information can be used to heighten the awareness related to female breast injuries and encourage health professionals to create an environment that encourages disclosure of injures that may be perceived as personal or embarrassing to discuss.

1

1444   **Board #252**   **May 31 8:00 AM - 9:30 AM**

Medical Utilisationat a Major Sporting Event- A Descriptive and Epidemiological Analysis.

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(No relevant relationships reported)

Objectives

We aimed to measure resource utilisation at the largest international aquatic sporting event in the hemisphere. We also aimed to measure epidemiological data including the type, location, sporting discipline and outcomes of medical contacts during the event.

Methods

This was a prospective observational study conducted under the auspices of the organising committee of the XXX Confederation Centroamericana y del Caribe de Natacion (CCCAN) championships held in Trinidad & Tobago. Anonymised data was collected from event medical contact records, screening and voluntarily reported contacts by team medical staff (for individuals who did not visit event medical staff). We excluded contacts by spectators. Data was collected over a 12 day competition period. Injury incidence rate (IR; number of injuries per 1000 athlete-days) and injury incidence proportion (IP; injuries per 100 athletes) were calculated.

Conclusions

There were 110 medical contacts for the event, with 80 occurring in athletes (72.7%). A significant number of non-sport related contacts was observed (60%) with a high number of complaints related to exhaustion and inadequate hydration. This was independent of country of origin. Acute gastroenteritis, ear and sinus infections were within expected frequencies. No EMS usage was necessary, and hospital transfers were for diagnostics in all cases. There were a total of 54 sport related contacts in 3956 athlete days (IR 13.65 injuries per 1000 athlete-days with an injury incidence

proportion, IP; of 6.5 per 100 athletes). Planning for aquatic events must take into consideration non-sport as well as competition related complaints. This study gives important information on medical utilisation for future event planning.

1445   Board #253   May 31 8:00 AM - 9:30 AM

Injury Reporting in Collegiate Runners

Kristyne Wiegand, Julia Freedman Silvernail. *University of Nevada, Las Vegas, Las Vegas, NV.* (Sponsor: John Mercer, FACSM)

(No relevant relationships reported)

PURPOSE: It is well-known that runners are commonly injured, yet rates of running injuries reported in the literature vary widely, ranging from 19% to 92%. This discrepancy in reported injury rates may be due to several factors, including injury definition, the timeline used when reporting injuries, and whether the reporting method is self-report or reported by medical professionals. Therefore, the purpose of this study was to compare self-reported injury rates to medically-reported injury rates in a group of Division-I cross country runners. **METHODS**: Questionnaires regarding pain, injury, and training status were completed at the beginning and end of the 2015 and 2016 seasons. Additionally, injury reports were obtained from the team's certified athletic trainer (ATC). Data were coded as 1) self-reported only; 2) ATC-reported only; 3) self-reported and ATC-reported. Only injuries that occurred within the past year were considered in the analysis. **RESULTS**: In 2015, 12 athletes participated, with 38 reported injuries. Of those, 26 were self-reported (68.4%), 6 were ATC-reported (15.8%), and 6 were both self-reported and ATC-reported (15.8%). In 2016, 9 athletes participated, with 22 reported injuries. Of those, 13 were self-reported (59.1%), 8 were ATC-reported (36.4%), and 1 was both self-reported and ATC-reported (4.5%). Additionally, about half of the reported injuries (47% in 2015; 55% in 2016) led to missed or modified training. Of those injuries that led to missed or modified training, the majority (88% in 2015 and 91% in 2016) were self-reported only. **CONCLUSIONS**: The results indicate a marked difference in self-reported injury rates compared with medically-reported injury rates. This demonstrates that the method of reporting injuries may be a contributing factor to the wide range of reported injuries in the literature. Thus, caution should be taken when considering injury rates reported in the literature, as the method of reporting injuries may be influential.

1446   Board #254   May 31 8:00 AM - 9:30 AM

Determining Orthopedic Knee Surgeons' Preference in using Hamstring or Patellar Tendon ACL Grafts

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(No relevant relationships reported)

The decision of which graft to choose for anterior cruciate ligament (ACL) injuries is a current a topic for debate. **PURPOSE:** To determine if athlete status or patient gender influence orthopedic surgeons' graft preference to perform ACL reconstruction (ACLR) surgery. **METHODS:** Human resource representatives of orthopedic hospitals and centers from various locations in the United States were contacted via faxes and emails to distribute access to an electronic survey. Approximately 500 orthopedic knee surgeons were invited to participate in this study through their human resource representative. A total of 31 surgeons completed the survey. Surveys were administered through Qualtircs. The survey included questions regarding preference of graft choice (i.e., Hamstring, Patellar Tendon, Other) for different demographics of patients (i.e., athlete/non-athlete, age, gender) **RESULTS:** Analysis were conducted using IBM SPSS V.23 statistical software. When combining survey responses regarding ACLR graft preference for all age groups (N=614), a one way chi-squared test determined a significant association between the type of group (i.e., Athlete (n=309) and Non-athlete (n=305)) and preference of the graft choice (Hamstring (n=408), Patellar Tendon (n=114), Other (n=92)) for orthopedic surgeons $\chi^2(2) = 261.7, p < .001$. For all age groups combined, orthopedic surgeons strongly preferred Hamstring ACLR for non-athletes (97%, Yes=297). Orthopedic preference of ACLR for athletes was similar between Patellar Tendon (37%, Yes=114) and Hamstring (36%, Yes=111). Another chi-squared analysis concluded no significant association in orthopedic surgeons' preference with type of graft choice for ACLR and patient gender $\chi^2(2) = .013, p= .993$. **CONCLUSION:** Orthopedic Surgeons appear to strongly prefer Hamstring graft ACLR for non-athletes while graft preference for athletes is similar between Patellar Tendon and Hamstring ACLR. Also, patient gender does not appear to play a role when deciding graft preference for ACLR. Future research may identify why these preferences exist between athletes and non-athletes and if surgeon demographics play a role.

1447   Board #255   May 31 8:00 AM - 9:30 AM

Percent Body Fat Differs between those with Chronic Ankle Instability and Healthy Matched Controls

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(No relevant relationships reported)

Ankle sprains remain one of the most common orthopedic injuries, with a significant percentage of patients developing chronic ankle instability (CAI). The impact CAI has on overall health is unknown. **PURPOSE:** To measure body composition in those with CAI compared to healthy matched controls. **METHODS:** Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4±2.8 yr and 22.3±3.0 yr, respectively), height (165.3±8.5 cm and 167.8±8.2 cm), weight (68.5±8.2 kg and 65.5±8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. Body composition was measures with DEXA. Subjects laid on the DEXA table supine, arms placed down by their side and fully clothed for approximately 15 minutes while the machine conducted a whole body scan. The following measurements were obtained: lean tissue mass (muscle), total/regional body fat, and bone mineral density. Bone mineral density in the form of AP Spine (5th lumbar vertebrae) and Dual Femoral (left and right pelvic joints). **RESULTS:** No differences were observed between groups for age (p=0.93), height (p=0.56), weight (p=0.48). Percent fat was different between Injured and Control groups (p=0.016; 35.5±6.1% and 25.5±8.3%, respectively). Fat mass was significantly different (p=0.024) while lean mass was found to be similar (p=0.89) between groups. Android:Gynoid was not different (p=0.58), suggestive of no differences in regional fat deposition between groups in college-aged subjects. Total BMD was not significantly different between the Injured and Control groups (p=0.055; 1.23±0.08 and 1.32±0.10, respectively). FAAM (p<0.0001), FAAM Sport (p<0.0001) and NASA (p<0.0001) were all observed to indicate differing activity/functional levels between the groups. **CONCULSIONS:** These findings suggest CAI results in decreased physical activity levels in college-aged subjects that appears to be resulting in increased adiposity, a trend towards altered total bone mineral density, and no changes in lean body mass.

1448   Board #256   May 31 8:00 AM - 9:30 AM

Effects of Instrument Assisted Soft Tissue Mobilization on Biceps Femoris Muscle Architecture

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(No relevant relationships reported)

Instrument assisted soft tissue mobilization (IASTM) is a popular therapeutic modality that is often used to treat skeletal muscle restriction and injury. The efficacy and mechanism by which IASTM elicits a therapeutic effect is not fully understood. This study was designed to explore if any reported benefits of IASTM stem from changes in skeletal muscle architecture. **PURPOSE:** Examine the effects of IASTM on biceps femoris (BF) ultrasonography (US) baseline measurements of cross sectional area (CSA) and echo intensity (EI) as well as pennation angle (PA) at three different joint positions. Joint positions included 90°, mid- (Mid$_{ROM}$), and end-range of motion (ROM) (End$_{ROM}$). **METHODS:** Seventeen female participants (mean±SD: age=21.12±0.78 years) participated in this study. Participants were placed in a prone position for the IASTM treatment and for CSA and EI measures of the BF. Participants were also placed in a supine position, with the right hip and knee joints at 90° of flexion against a horizontal support for PA measurements. PA measurements were recorded at 90°, Mid$_{ROM,}$ and the End$_{ROM}$ joint positions. US settings were enhanced to improve image quality, including gain (50dB), depth (8cm), and frequency (12MHz). For the IASTM protocol, the BF received 3 sets of 7 strokes in both proximal and distal directions at a treatment angle of 45°. Paired samples t-tests [Time (Pre vs Post)] were used to analyze CSA and EI US data. A two-way repeated measures ANOVA [Joint position (90° vs Mid$_{ROM}$ vs End$_{ROM}$) × Time (Pre vs Post)] was used to analyze PA data. An alpha value of $P \leq 0.05$ was considered statistically significant for all comparisons. **RESULTS:** No significant difference was observed across time for CSA (p=0.220) or EI (p=0.515). Additionally, there was no significant joint position × time interaction (p=0.851) for PA. However, a significant main effect (p=0.001) for joint position was observed. Pairwise comparison revealed significant decreases in PA between 90° and Mid$_{ROM}$ (p=0.038), 90° and End$_{ROM}$ (p=0.001) and Mid$_{ROM}$ and End$_{ROM}$ (p=0.001). **CONCLUSION:** Although PA was altered with the corresponding changes in joint position, this was not a result of IASTM. These results indicate that a single bout of IASTM may not evoke architectural change in the hamstrings as measured by ultrasonography.

1449   Board #257   May 31 8:00 AM - 9:30 AM

Analysis of USAWR Wheelmill VO$_2$ Max Testing Between Classes

Brandon Kane[1], Ellie Moore[1], Kerri Morgan[2], James Rimmer[1]. [1]Lakeshore Foundation, Birmingham, AL. [2]Washington University, St. Louis, MO.
(No relevant relationships reported)

PURPOSE: Little is known about how elite level training can affect the Maximum Aerobic Capacity (Max VO$_2$) testing for all functional classifications of national wheelchair rugby athletes. The primary purpose of this study was to review existing Max VO$_2$ data between Higher Classification (HC) and Lower Classification (LC) players on the USA Wheelchair Rugby Team (USAWR). **METHODS:** Data was collected during the April training camp (camp1) and August training camp (camp2) at Lakeshore Foundation during the 2017 season. All athletes followed an individualized high intensity workout plan between camp1 and camp2. Athletes (n = 12) had to perform a graded VO$_2$ max test on a unique Wheelmill ergometer during both camps to be included. Variables tested for significance included absolute VO$_2$ (aVO$_2$), relative VO$_2$ (rVO$_2$), Respiratory Exchange Ratio (RER), Heart Rate (HR), Ventilatory Equivalent (VE), and Rate of Perceived Exertion (RPE). International Wheelchair Rugby Federation classifications are set by functional ability starting at 0.5 and progress up in 0.5 increments to a max level of 3.5. For this study, classifications were grouped into those whose roles were primarily as a blocker (Class 0.5 – 1.5) and those whose roles were primarily ball handlers (class 2.0 – 3.5). **RESULTS:** Means for the whole team were tested for significant change between camp1 and camp2, and then between HC and LC using 2-tailed T-test (95% confidence interval). Despite whole team mean aVO$_2$ and mean rVO$_2$ was not significantly changed, whole team mean VE significantly increased from camp1 to camp2 (64.92 L/min $\pm$ 9.5601, p=0.0146), as did RER (1.0750 $\pm$ 0.0636, p=0.0387). Significant rVO$_2$ Max changes occurred among LC athletes (17.9300 mL/kg/min $\pm$ 1.1172, p=0.0246) and with aVO$_2$ Max (1.5000 L/min + 0.0990, p=0.0346), but no significant changes occurred among HC group. **CONCLUSION:** Analysis results showed significant improvements in maximum achieved VE and RER variables between camp1 and camp2 in elite wheelchair rugby athletes. When separated into LC and HC groups, only LC showed significant improvements in rVO$_2$ and aVO$_2$. This could indicate that elite USAWR training methods are more effectively improving performance in athletes with lower classifications than in their higher classification counterparts.

C-48   Free Communication/Poster - Cardiac and Pulmonary Rehabilitation

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1450   Board #258   May 31 9:00 AM - 10:30 AM

Predictors of Health-Related Quality of Life in Patients with Symptomatic Peripheral Arterial Disease

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(No relevant relationships reported)

Purpose: To identify predictors of baseline measures of health-related quality of life (HRQoL) in symptomatic patients with peripheral artery disease (PAD) from objective markers of severity of PAD, clinical and demographic characteristics, comorbid conditions, cardiovascular risk factors, objectively measured physical activity, and patient-based measures of physical function. **Methods:** HRQoL measurements of 216 symptomatic men and women with PAD were assessed with the Medical Outcomes Study Short-Form 36 survey. Patients were further characterized on demographic variables, comorbid conditions, cardiovascular risk factors, ankle/brachial index, peak walking time (PWT) during a maximal treadmill test, 6-minute walk distance (6MWD), gait speed, ambulatory activity monitored during one week, activities of daily living (ADL), mini-mental state examination questionnaire, and walking impairment questionnaire (WIQ). **Results:** For the physical function HRQoL subscale, the significant predictors included WIQ speed score (p < 0.001), a history of stumbling (p < 0.001), WIQ stair climbing score (p < 0.001), the ADL associated with bathing (p = 0.001), 6MWD (p = 0.004), and daily walking cadence (p = 0.043). For the role emotional function HRQoL subscale, the significant predictors included a history of stumbling (p < 0.001), the ADL associated with transferring from a bed to a chair (p < 0.001), and the WIQ distance score (p = 0.022). **Conclusions:** Physical and mental subscales of HRQoL in symptomatic patients with PAD are primarily predicted by patient-based physical function, rather than by more specific markers of PAD severity and comorbid conditions. The clinical significance is that interventions designed to improve HRQoL should focus on improving the quality of executing functional tasks

such as walking more steadily without stumbling, completing ADL's that are not specific to walking, such as bathing and transferring, and improving patient-based ability to walk various distances, speeds, and to climb stairs.

1451   Board #259   May 31 9:00 AM - 10:30 AM

Impact of Cardiovascular Disease Diagnosis on All-Cause Mortality Reductions after Cardiac Rehabilitation.

Martijn Maessen[1], Thijs Eijsvogels[1], Esmée Bakker[1], Esther Meindersma[1], Niels van Gorp[2], Nicole Pijnenburg[2], Maria Hopman, FACSM[1]. [1]Radboudumc, Nijmegen, Netherlands. [2]Coöperatie VGZ UA, Arnhem, Netherlands. (Sponsor: Maria Hopman, FACSM)
(No relevant relationships reported)

Cardiac rehabilitation (CR) is known to reduce the risk for all-cause mortality. However, little is known whether the health benefits of CR differ across different types of cardiac patients.
PURPOSE. To compare the impact of CR participation on all-cause mortality between cardiac patients that were diagnosed with ST elevated MI (STEMI), non-STEMI, unstable angina pectoris (AP), stable AP, chronic heart failure (CHF), and among patients that underwent revascularisations.
METHODS. A Dutch population-based cohort study was performed using insurance claim data from 4 million individuals. Cardiac patients eligible for the study were those with STEMI (n 9,071), non-STEMI (n 11,611), unstable AP (n 12,182), stable AP (n 20,594), CHF (n 5824), and revascularisation (n 1569). Adjusted proportional hazards models (hazard ratio, HR [95%-CI]) were used to assess the efficacy of CR against all-cause mortality. All HR were adjusted for confounding factors, such as age, sex, medication use, and cardio-thoracic surgical intervention.
RESULTS. Among the 60,581 (67±12 yrs; 61.6% males) included patients, 16,598 (64±10 yrs; 71.9 %males) participated in CR. After an average follow-up time of 4 years, 533 CR participants (3.2%) and 4728 non-CR patients (10.8%) died (P<.05). CR patients had a 42% lower all-cause mortality risk compared to non-CR patients (HR$_{adjusted}$ [95%-CI]: 0.52 [0.47-0.57]). We observed similar findings for each type of diagnosis (STEMI, HR: 0.55 [0.44-0.68]; non STEMI, HR: 0.52 [0.44-0.62]; unstable AP, HR: 0.60 [0.47-0.75]; stable AP, HR: 0.63 [0.49-0.80]; CHF, HR: 0.40 [0.26-0.60]; and revascularisation, HR: 0.62 [0.41-0.94]).
CONCLUSION. Participation in cardiac rehabilitation programs lowers the risk of all-cause mortality irrespectively of the initial cardiovascular diagnosis. These findings support the need for improved referral and participation rates of cardiac patients in CR programs.

1452   Board #260   May 31 9:00 AM - 10:30 AM

Mobile phone-based Cardiac Rehabilitation Program Improves Exercise Capacity and Clinical Outcomes in Chinese Revascularized Patients

Jing Ma[1], cheng Ge[1], yajun shi[1], yong xu[1], Chenghui Zhao[1], Chunxue Liu[1], ling Gao[1], Sidney C. Smith[2], Yundai Chen[1]. [1]department of Cardiology, beijing, China. [2]heart and vascular center, Chapel Hill, NC.
(No relevant relationships reported)

Previous studies have documented a favorable effect of cardiac rehabilitation (CR) on patients undergoing percutaneous coronary intervention (PCI). However, participation in CR is sub-optimal, especially in China. Innovative models of CR are needed to improve participation. **Purpose:** The present study assessed the effect of a mobile phone-based CR (MBCR) program on exercise capacity and clinical outcomes in patients undergoing PCI. **Methods:** Totally 212 patients following PCI referred to the CR clinic of Chinese PLA General Hospital, between Jul, 2015 and Apr, 2016, were divided into 2 groups, to participate in MBCR (n=107) or usual care program (control, n=105). Individualized exercise prescription and educational materials were sent to the participants in the MBCR group by the App named "Heartguard" regularly. Cardiopulmonary exercise testing and questionnarires were measured in 12 months. **Results:** Compared with those in the control group, participants in the MBCR group showed a greater increase in peak exercise capacity (+0.74 vs +0.08 METs,+16.4% vs +4.5%, p=0.000), VO$_2$ at anaerobic threshold , and dVO$_2$/dWR, with a greater decrease in VE/VCO$_2$ slope in 12 months. Range of blood pressure lowering, angina symptoms and life quality in both groups were similar, but the proportion of smoking participants in the MBCR group was lower (1.0% vs 6.3%, p=0.048). More significant lowering of low density lipoprotein, uric acid, as well as homocysteine was also showed in the MBCR group. During a median follow-up of 18 months, a lower incidence of unscheduled target vessel revascularizations , rehospitalizations , worsening angina, and combined endpoint (9/107 vs 23/105, p=0.005), was also found in the MBCR group. Multivariable Cox regression analysis of correlation showed participation in MBCR was associated with a toward decreased clinical events (HR=0.32, p=0.0064) after adjustment for many factors. Subgroup analysis demonstrated that patients with a history of smoking are more likely to benefit from the MBCR program. **Conclusions:**

THURSDAY, MAY 31, 2018

The MBCR program we studied is associated with better exercise capacity, better control of risk factors, and less adverse cardiovascular events. These findings add support to the application of mobile phone-based CR programs in patients following PCI.

1453   Board #261   May 31 9:00 AM - 10:30 AM

Relationships Between Short Physical performance Battery And Clinical and Laboratory Factors For Cardiovascular Disease Inpatients

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(No relevant relationships reported)

A progression of muscle atrophy (secondary sarcopenia, etc.) in lower extremity function in cardiovascular disease (CVD) inpatients leads to a high need for medical and nursing care. Previous study reported that the Short Physical Performance Battery (SPPB) may be an effective assessment tool for strength and lower extremity morphological evaluation for CVD patients (mixed inpatients and outpatients). However, it is unclear the SPPB can be used to evaluate mobility capability for only CVD inpatients, although which require special attention to nutrition status and body composition. **PURPOSE**: The purpose of this study was to examine if the SPPB can validated assessment tool for strength and lower extremity morphological evaluation and the relationships between the SPPB and clinical and laboratory factors for CVD inpatients. **METHODS**: CVD male (n=318) and female (n=172) inpatients were recruited. A stepwise multiple-regression analysis was performed to predict total SPPB scores and assess variable factors (physical characteristics, functional and morphological assessments, etc.). **RESULTS**: There were significant correlations between knee extensor strength and total SPPB scores for CVD male and female inpatients (both p<0.001). There were significant correlations between mid-thigh MTH and total SPPB scores for CVD male and female inpatients (both p<0.001). To predict total SPPB scores, the predicted handgrip, Controlling Nutritional Status score, % body fat, anterior mid-thigh muscle thickness (MTH), standing height and systolic blood pressure were calculated for males and anterior mid-thigh MTH, BMI, knee extension and fat mass were calculated for females. **CONCLUSIONS**: Total SPPB scores are an effective assessment tool for the functional and morphological evaluation for CVD male and female inpatients. Notably, quadriceps femoris MTH may play an important role in high SPPB scores in CVD in patients regardless of gender.

1454   Board #262   May 31 9:00 AM - 10:30 AM

Knowledge and Perceived Physician Encouragement Toward Exercise in Congenital Heart Disease Patients and Their Sphere

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(No relevant relationships reported)

Background: Congenital heart disease (CHD) affects approximately 1 in 100 babies. Patients with CHD may be dissuaded or discouraged from activities, for reasons including fear of sudden cardiac arrest. **Purpose:** The primary purpose of this study was to examine exercise-related knowledge among patients and the patient's perception of physician encouragement toward exercise. A secondary purpose was to gauge these same variables among the sphere of influence (family and friends). **Methods:** Eligibility was limited to CHD patients and their sphere. Exercise-related knowledge and disease-specific knowledge (Leuven Knowledge Questionnaire) were assessed by questionnaire. **Results:** There were 71 volunteers (age 18-66, 38.7±12.0 yrs). **Patient Focus:** Of the sample, 42 identified as CHD patients (females=36; males=6). For treatment, surgery (n=37) and medication (n=26) were common, but only 10 patients had ever been prescribed a physical intervention. Overall, 38 patients believed that regular aerobic activity would improve heart health and 35 viewed regular weight training as a means to maintain or increase muscular strength. Also, 37 patients believed that regular activity provides a great sense of accomplishment. When asked about physician influence on exercise habits, only 23 patients "agreed" they had been positively influenced, while 12 disagreed. **Sphere Focus:** Of the sample, 29 identified as sphere (female=28; male=1). All 29 believed that regular aerobic activity would improve heart health and 24 viewed regular weight training as a means to maintain or increase muscular strength. Also, 26 of the sphere believed that regular activity provides a great sense of accomplishment. When asked about physician influence on exercise habits, only 16 of the sphere "agreed" that they had been positively influenced, while 1 disagreed. **Discussion:** Certainly, cardiovascular and musculoskeletal health are necessary for all individuals. In particular, support for safe exercise is critical for CHD patients. From our findings, patients and their sphere seem to have a favorable view of exercise and physician encouragement could be improved. **Conclusions:** It would be prudent for educational efforts to become an intentional focus for physicians who are in an authoritative position in patient-care interactions.

1455   Board #263   May 31 9:00 AM - 10:30 AM

Submaximal Oxygen Uptake Efficiency Slope as a Predictor of VO₂max in Men with Cardiovascular Disease

Clare M. McDermott, Ciara M. McCormack, Sarah M. Kelly, Andrew McCarren, Kieran M. Moran, Niall M. Moyna. *Dublin City University, Dublin, Ireland.*
(No relevant relationships reported)

Title: Submaximal Oxygen Uptake Efficiency Slope as a Predictor of VO_2max in Men with Cardiovascular Disease

Purpose: Although VO_2max is considered the gold standard measure of cardiorespiratory fitness, it can be difficult to attain in patients with cardiovascular disease (CVD). The submaximal oxygen uptake efficiency slope (OUES) integrates cardiovascular, musculoskeletal and respiratory function during incremental exercise into a single index and has been proposed as an alternative and effort independent measure of cardiopulmonary reserve (Baba et al., 1996). The purpose of this study was to examine the relation between VO_2 peak and both submaximal absolute OUES and relative OUES (OUES/kg).

Methods: A total of 42 men ((mean ± SD) age, 59.9 ± 8.7 yr; VO_2peak, 1.9 ± 0.5 L/min and 22.3 ± 6.1 mL/kg/min) were recruited during induction to a community based exercise referral program following completion of a phase 2 cardiac rehabilitation. Participants performed a graded exercise test on a cycle ergometer with breath-by-breath open circuit spirometry and a 12- lead ECG. Absolute OUES and OUES/kg were calculated by plotting VO_2 in mL/min on the x-axis, and the log transformed VE on the y-axis ($VO_2 = a \log_{10} VE + b$). Exercise data up to the ventilatory anaerobic threshold (VAT) was included in the analysis.

Results: The $\%VO_2$ max corresponding to the VAT was 56.0 ± 10.3. Absolute OUES and OUES/kg were 2114 ± 515 and 24.5 ± 5.48, respectively. There was a significant positive correlation between VO_2max (L/min) and OUES (r= 0.78; p<0.001) and between VO_2max (mL/kg/min) and OUES/kg (r= 0.80; p<0.001).

Conclusion: Determination of VO_2max is not often feasible in individuals with CVD where maximal exercise testing is contraindicated or when performance may be impaired by pain, dyspnea or angina. The findings from the present study indicate that the OUES and OUES/kg are significantly related to absolute and relative VO_2max, respectively and may be used as a valid submaximal effort independent measure of CRF.

Baba, R. (1996). Oxygen Uptake Efficiency Slope : A New Index of Cardiorespiratory ., Functional Reserve Derived From the Relation Between Oxygen Uptake and Minute Ventilation During Incremental Exercise. *Measurement*, (6).

1456   Board #264   May 31 9:00 AM - 10:30 AM

Unstable Surface Training Is More Effective For Improving Stability Than Walking Training In Stroke Survivors

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(No relevant relationships reported)

BACKGROUND: Falls are of great concern in the post-stroke population. Balance and gait deficits are major risk factors but may be improved through rehabilitation. However, little research has been done comparing the efficacy of different types of rehabilitation training programs. **PURPOSE:** The purpose of this study was to determine if unstable surface training is more effective than conventional walking training for improving stability among stroke survivors. **METHODS:** Twenty male chronic stroke patients were randomly assigned into two groups, the unstable surface training group (UST; n=10, 53.9 ± 8.3 yrs) and conventional walking training group (CON; n=10, 58.3 ± 12.1 yrs). Participants trained 3 d/wk for 60 min/d for 12 weeks with BOSU half ball (UST) or treadmill (CON). Stability was evaluated using the Biodex balance system. Anterior/Posterior (Sagittal Plane), Medial/Lateral (frontal plane), and overall scores were analyses using ANCOVA. Zones and quadrants were reported with individual data. **RESULTS:** The UST group showed a significant improvement in Anterior/Posterior (1.63 ± 0.42 vs 1.15 ± 0.56, $F(1, 17) = 12.62$, p=.002), Medial/Lateral (1.3 ± 0.80 vs 0.64 ± 0.30, $F(1, 17) = 31.38$, p<.001), and overall (2.26 ± 0.81 vs 1.41 ± 0.66, $F(1, 17) = 21.25$, p<.001) scores whereas the CON group showed no significant improvements. **CONCLUSION:** The unstable surface training of 12-week was effective in significantly improving stability in chronic stroke survivors.

1457   Board #265   May 31 9:00 AM - 10:30 AM

The Role of Ethnicity in Developing Cardiovascular Disease in At-Risk Populations

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(No relevant relationships reported)

In the U.S., cardiovascular disease (CVD) is responsible for 1 in 4 deaths. There are known predictors (e.g., obesity, hypertension, and dyslipidemia) that increase the odds of developing CVD; however, risk is not proportionate among all ethnicities. While Hispanic Americans often display markers of elevated risk, they have longer life expectancies than their non-Hispanic counterparts. Further exploration of this phenomenon is necessary to elucidate how risk engenders disease in different ethnic groups. **PURPOSE:** To evaluate CVD risk factors and the incidence of adverse cardiovascular events among at-risk Hispanic and non-Hispanic adults. **METHODS:** We enrolled 10 Hispanic and 41 non-Hispanic men and women with Type 2 diabetes in a 10-week exercise program. Prior to initiating exercise, we documented demographic data, collected a health history, conducted 7 tests of physical functioning, and measured cardiometabolic variables, including body mass index (BMI), body fat percent (BF%), blood pressure, heart rate, and HBA1C. We repeated all assessments following the intervention. Differences between ethnic groups in baseline values and exercise responses were evaluated with independent-samples t-tests and chi-squared tests. **RESULTS:** Hispanic subjects had fewer diagnoses of hypertension ($p=0.002$) and no history of heart attack, compared to 25% incidence among non-Hispanics ($p=0.077$). Hispanic subjects were 8.1 years younger ($p=0.032$), 40% of them smoked (compared to 0%; $p<0.001$), and they had better body compositions as measured by BMI ($p=0.038$), BF% ($p=0.021$), and categorical obesity ($p=0.030$). Physical functioning was slightly better among Hispanic subjects as measured by the 6-minute walk ($p=0.010$) and functional reach ($p=0.029$). Participants who completed the exercise program experienced improvement in all assessments but grip strength; there were no differences in improvement between ethnic groups. **CONCLUSION:** We found exercise to benefit Hispanic and non-Hispanic subjects similarly. Hispanic adults with diabetes had a lower incidence of heart attacks. This may be attributable to observed anthropometric differences; however, if nutritional or behavior customs confercardio-protective effects in this population, it is important for future researchers to identify those variables.

1458   Board #266   May 31 9:00 AM - 10:30 AM

Sex Influences Changes Over Time In Exercise Ventilatory Dynamics In Patients With Cystic Fibrosis

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(No relevant relationships reported)

Exercise capacity (VO$_2$ peak), an independent predictor of mortality, declines at a substantial rate in patients with cystic fibrosis (CF). Despite a similar rate of decline in VO$_2$ peak between sexes, female patients with CF experience greater mortality compared with their male counterparts. Ventilatory dynamics (VD) during exercise provide important prognostic information in several clinical populations; however, changes over time in exercise VD in CF are not well understood. Moreover, little is known about the influence that sex may have on changes over time in exercise VD in patients with CF. **PURPOSE**: This study sought to test the hypothesis that females with CF have more pronounced decrements in VD over time compared with male patients. **METHODS**: 20 patients with CF (10 female, 10 male) were tested on two visits (V1 and V2) which were separated by a minimum of six months. On each visit, lung function (FEV$_1$, % predicted), exercise capacity (VO$_2$ peak), and VD during exercise (V$_E$/VO$_2$ max, V$_E$/VCO$_2$ max, and V$_E$/VCO$_2$ slope) were determined in all patients. Repeated-measures ANOVA were used to test the influence of sex while controlling for the time between visits and lung function as an index of disease severity. **RESULTS**: Age (15 ± 7 vs. 20 ± 11 y), FEV$_1$ (85.4 ± 16.2 vs. 96.1 ± 20.8 % predicted), VO$_2$ peak (9.4 ± 6.0 vs. 34.1 ± 6.2 ml/min/kg), and the mean time between visits (43 ± 10 vs. 35 ± 20 months) were all similar between female and male patients (all p>0.05), respectively. Significant sex by time interactions were observed such that at V2, female patients exhibited greater increases from V1 in V$_E$/VO$_2$ max (15.4 ± 2.8 vs. 4.5 ± 8.1, p=0.005), V$_E$/VCO$_2$ max (7.6 ± 3.1 vs. 2.1 ± 3.7, p=0.014), and V$_E$/VCO$_2$ slope (4.0 ± 3.4 vs. -0.2 ± 4.1, p=0.036) versus males, respectively. Changes in both VO$_2$ peak (-1.9 ± 3.8 vs. -1.9 ± 5.6 ml/min/kg, p=0.973) and FEV$_1$ (-7.8 ± 8.3 vs. -10.5 ± 9.1 % predicted, p=0.208) between visits were similar between females and males. **CONCLUSIONS**: These data suggest that females with CF have a greater decline in exercise VD over time compared with male patients, albeit similar changes in VO$_2$ peak or lung function over time. Future studies are warranted to examine the potential utility of exercise VD as a prognostic marker in CF.

1459   Board #267   May 31 9:00 AM - 10:30 AM

Antioxidant Supplementation Improves Skeletal Muscle Metabolism During Maximal Exercise In Patients With Cystis Fibrosis

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(No relevant relationships reported)

INTRODUCTION: Patients with cystic fibrosis (CF) exhibit high levels of oxidative stress that contribute to multiple systemic dysfunctions, including exercise intolerance. Antioxidant supplementation has been shown to mitigate oxidative stress and improve exercise intolerance in other populations. Recently, our group has described that patients with CF exhibit impairments in skeletal muscle metabolism that may contribute to exercise intolerance. Whether or not antioxidants can impact muscle metabolism during exercise in patients with CF, however, has yet to be elucidated. **PURPOSE**: This study sought to test the hypothesis that 4 weeks of oral antioxidant supplementation will improve skeletal muscle metabolism during maximal exercise in patients with CF. **METHODS**: Eight patients with CF (25 ± 11 yrs.) completed an incremental exercise test on a cycle ergometer before (Pre) and after 4 weeks of oral supplementation with an antioxidant cocktail (AOC: vitamin C, vitamin E and α- lipoic). Skeletal muscle metabolism was evaluated at rest and during maximal exercise (max) through: (I) O$_2$ extraction (O$_2$Ex) calculated using a derivation of the Fick equation, (II) muscle O$_2$ utilization (HHb), using near-infrared spectroscopy and (III) exercise factor (EF), as the relative contribution of O$_2$ supply to O$_2$ consumption. **RESULTS**: A significant ($p=0.039$) increase in O$_2$EXmax was observed after 4 weeks of AOC when compared to baseline (Pre: 57 ± 8%, AOC: 64 ± 7%). In addition, HHbmax was significantly ($p=0.046$) greater (Pre: 0.97 ± 3.4 μM, AOC: 5.9 ± 2.9 μM) and EFmax was significantly ($p=0.048$) reduced (Pre: 7.1 ± 1.4 AU; AOC: 6.3 ± 1.3 AU) after completing the AOC treatment. No changes in resting skeletal muscle metabolism ($p≥0.446$) were observed following 4 weeks of supplementation. **CONCLUSIONS**:
For the first time, we have documented that four weeks of AOC supplementation improves skeletal muscle metabolism during maximal exercise in patients with CF. These findings suggest that oxidative stress may be partially involved in the reduced O$_2$ extraction and muscle O$_2$ utilization during exercise observed in patients with CF. Future studies are warranted to investigate the long term effects of antioxidants on muscle metabolism and exercise tolerance in CF. Supported in part by CFFT HARRIS14A0 (RAH).

1460   Board #268   May 31 9:00 AM - 10:30 AM

Qigong exercise for Chronic Obstructive Pulmonary Disease Rehabilitation A Randomized Controlled Trial

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(No relevant relationships reported)

Purpose: To compare the effects for chronic obstructive pulmonary disease (COPD) between Qigong exercise and the aerobics exercise using cycle ergometer. **Methods**: Twenty-six participants (21 males and 5 females) with COPD were recruited and randomly assigned to either the Qigong group (N=13) or the cycle ergometer group (N=13). Both interventions lasted 12 weeks and comprised of 24 supervised training sessions with 30 min for each session and twice a week. All outcome measures were recorded at baseline and at the end of the study period. The primary outcome was the endurance capacity measured by six minute walk test. The secondary outcome was the St. George's Hospital Respiratory Questionnaire (SGRQ). Paired t-tests were utilized to analyze for within-group comparisons between baseline and after three months. **Results**: The data of ten participants in each group were analyzed due to 3 participants of losing follow up in each group. The six minute walk distance (6MWD) in Qigong group was 530±75.4m at baseline, and 560.9±60.9m after intervention. The 6MWD in cycle ergometer group was 520.6±35.6 and 549.6±26.9 after intervention. The result showed that there were significant differences between before and after intervention in each group (Qigong group t= -2.520, $p <0.05$, cycle ergometer group t= -3.747, $p <0.05$), and was no significant difference between two groups after interventions. The SGRQ score in Qigong group was 27.8±11.8 at baseline and 22.5±8.9 after intervention. The SGRQ score in cycle ergometer group was 34.4±13 at baseline and 23.4±10.4 after intervention. The cycle ergometer group has significant difference between before and after intervention in (t = 2.601, $p <0.05$), but no significant

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difference between two groups after interventions. **Conclusions**: Both Qigong and cycle ergometer should improve the endurance capacity and quality of life of COPD patients through a 12 weeks training.

C-49   Free Communication/Poster - **Cardiorespiratory Fitness**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1461   Board #269   May 31 9:00 AM - 10:30 AM

The Association of Combined Peak Oxygen Consumption and Ventilatory Efficiency with Survival in Hypertrophic Obstructive Cardiomyopathy

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(No relevant relationships reported)

Introduction: Hypertrophic obstructive cardiomyopathy (HOCM) patients have impaired left ventricular outflow compromising peak oxygen uptake (VO_2). HOCM patients also exhibit reduced ventilatory efficiency (i.e. greater ventilation to carbon dioxide production (V_E/VCO_2) slope). Reduced peak VO_2 and elevated V_E/VCO_2 slope have independently been associated with mortality in these patients; however, it unknown if combining these prognostic indicators will their prognostic value. **Purpose:** To determine if peak VO_2 combined with V_E/VCO_2 slope was associated with survival in HOCM patients. **Methods:** We included all consecutive patients with the diagnosis of HOCM who underwent CPET between the years 1995 to 2016. We created Cox regression models to test the association between VO_2 and V_E/VCO_2 slope with survival and the prognostic value of exercise capacity (EC) defined by the median [peak (VO_2) in mL/Kg/min] to define high and low EC. The V_E/VCO_2 slope cutpoint was defined as ≥ 34. Models were adjusted for factors known to affect both peak VO_2 and survival. **Results:** We included 926 patients (age: 53.4 ±14.1 years, 41% women) over a median follow-up of 5.1 years with 107 patient deaths. Peak VO_2 and V_E/VCO_2 slope predicted survival in HOCM patients (AUC: 0.63, p<0.001 and AUC: 0.66, p<0.001, respectively). Combining peak VO_2 and V_E/VCO_2 improved the prognostic value for survival (AUC: 0.69, p<0.001) beyond that of peak VO_2 and V_E/VCO_2 separately. HOCM patients with a low peak VO_2 and high V_E/VCO_2 slope had a greater risk of death than those with a higher VO_2 and low V_E/VCO_2 slope (HR: 5.51, 95%CI: 2.51-13.93, p<0.001). This relationship remained consistently strong after adjusting for age, sex, body mass index, New York Heart Association Functional Class, hypertension, diabetes, coronary artery disease, and smoking (adjusted HR: 3.73, 95%CI: 1.52-10.18, p=0.007). **Conclusion:** These findings demonstrate that combining peak VO_2 and ventilatory efficiency accurately predicts survival in HOCM patients even after adjustment for traditional risk factors. These results highlight the importance of CPET in HOCM patients.

1462   Board #270   May 31 9:00 AM - 10:30 AM

Does Estimated Cardiorespiratory Fitness Accurately Predict Directly Measured Vo_{2peak} In Breast Cancer Survivors?

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(No relevant relationships reported)

The ACSM walking equation used to estimate maximal aerobic capacity (VO_{2peak}) was developed nearly 4 decades ago and based on relatively few (<100), young (19 to 26 years old) participants. The validity of estimated VO_{2peak} in clinical populations remains uncertain. **PURPOSE:** To compare estimated VO_{2peak} with actual VO_{2peak} derived from maximal treadmill testing in breast cancer survivors. **METHODS:** In the context of a randomized controlled trial, 115 survivors (mean age, 59 ± 7 yr) performed an incremental walking treadmill test to volitional fatigue with gas exchange to determine VO_{2peak}. Estimated VO_{2peak} was calculated using the ACSM walking equation and compared with actual VO_{2peak} by examining the constant error (CE) and correlation coefficient (r). . **RESULTS:** The ACSM equation significantly overestimated VO_{2peak} (CE: 6.3 ± 5.0 ml/kg/min, p<0.001; r: 0.65, p<0.001) . **CONCLUSION:** Alternative estimated VO_{2peak} models should be considered given that low $VO2_{peak}$ is associated with a higher prevalence of acute and chronic treatment-related toxicities, higher symptom burden, and increased risk of all-cause and cancer-specific mortality. Supported by National Institutes of Health (CA-142566)

1463   Board #271   May 31 9:00 AM - 10:30 AM

Abnormal Submaximal Cardiopulmonary Exercise Parameters Predicts Impaired Peak Exercise Performance In Sickle Cell Anemia Patients

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(No relevant relationships reported)

Purpose: We recently demonstrated that impaired functional capacity is associated with diastolic dysfunction in sickle cell anemia (SCA) patients. While impaired functional capacity on maximal effort testing is well described in SCA patients, less is known regarding submaximal exercise parameters. Additionally there have been no published studies investigating associations between submaximal exercise parameters and diastolic dysfunction.
Methods: A prospective longitudinal pilot study was performed in SCA patients. All patients had a resting cardiac MRI (cMRI), cardiopulmonary exercise test (CPET) with cycle ergometry using a ramp protocol and an exercise echocardiogram. Exercise data were compared to age, gender and size-matched normal controls.
Results: Compared to normal controls, the SCA group (n=19) had lower peak oxygen consumption (VO2; 1378±412 ml/min vs 2266±638.9, p<0.01), predicted peak oxygen pulse (67±15.9% vs 97±5.3%, p<0.01) and worse ventilatory efficiency (VE/VCO2 slope; 31.7±7 vs 27±4.3, p=0.03). When evaluating the submaximal exercise parameters, there was lower VO2 at the anaerobic threshold (AT; 950±311.7 vs 1497±526.8, p<0.01), oxygen uptake efficiency slope (OUES) at AT (1512±426.2 vs 2140±402.7, p<0.01) and higher VE/VCO2 slope at AT (24±6.6 vs 21±2.8, p=0.04). With the VO2 at respiratory exchange ratio 1.0, 12/19 patients were < -2 standard deviations below the mean with all 12 having a peak VO2 less than 70%. The VO2 at AT correlated with hematocrit (r=0.77, p<0.05). The OUES positively correlated with left ventricular ejection fraction (r=0.55, p=0.01) and left ventricle cardiac output by cMRI (r=0.51, p=0.02), hematocrit (r=0.52, p=0.02), and lateral E/e' (r=-0.54, p=0.01). The VO2 at respiratory exchange ratio 1.0 correlated with right ventricular (r=0.5, p=0.03) and left ventricular cardiac output by cMRI (r=0.47, p=0.04), and lateral E/e' (r=-0.51, p=0.02).
Conclusions: SCA patients have abnormal submaximal exercise measures compared to controls. The degree of submaximal abnormality correlates with the degree of diastolic dysfunction by echocardiography. These data further reinforce the scope of functional cardiovascular abnormalities in SCA.

1464   Board #272   May 31 9:00 AM - 10:30 AM

Considering Cardiorespiratory Fitness Relative to Lean Body Mass in HIV+ compared with HIV- Hispanic Women

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(No relevant relationships reported)

Cardiorespiratory fitness (CRF = VO_2max) is known to significantly influence the risk of morbidity and mortality from chronic diseases. Comparing CRF relative to body weight in different population groups is common. However, CRF relative to lean body mass (LBM) could be more informative due to its energy demanding characteristic; a relevant aspect in people living with debilitating chronic diseases associated with muscle wasting such as HIV infection. **PURPOSE:** To compare absolute VO_2max, and VO_2max relative to body weight and relative to LBM among community dwelling HIV+ and HIV- Hispanic women; and determine the percent VO_2max variance explained by body weight vs. LBM. **METHODS:** Measures of total mass, LBM, fat, and percent fat were conducted with DEXA scanning in a group of 32 HIV+ and 15 HIV- Hispanic women. VO_2max was measured on a cycle ergometer using increments of 25 W every 2-min until volitional fatigue. Independent t-tests were conducted to detect between group differences, and linear regressions to determine the percent variance in CRF explained by body weight and LBM. **RESULTS:** No between group differences were observed for the following variables, age (45.1±10.4 vs. 41.1±14.2 yrs), weight (73.6±15.2 vs. 72.0±12.3 kg), BMI (28.8±5.9 vs. 28.0±6.3 kg/m²), DEXA fat (41.1±7.2 vs. 43.3±4.8 %), DEXA LBM (41.6±5.7 vs. 39.6±6.7 kg), absolute VO_2max (1.40±0.34 vs. 1.53±0.34 L/min), VO_2max relative to body weight (19.3±3.6 vs. 21.4±4.2 ml·kg⁻¹·min⁻¹). However, a lower VO_2max relative to LBM was observed among HIV+ compared with HIV- women (33.4±5.3 vs. 38.6±6.3 ml·kg⁻¹·min⁻¹, P=0.006). Body weight explained 38%, and LBM explained 50% of the variance in CRF. **CONCLUSION:** These results suggest that VO_2max relative to LBM should be considered as the standard for VO_2max comparison, particularly among HIV+ women at risk of experiencing reduced muscle mass. Supported by NIMHD S21MD001830, R21MH095524, U54MD007587-04, R25MD007607.

Abstracts were prepared by the authors and printed as submitted.

1465   Board #273   May 31 9:00 AM - 10:30 AM

Impact of Primary Disease Status on Six-Minute Walking Distance.

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(No relevant relationships reported)

PURPOSE: The 6-minute walk distance (6MWD) is one the most commonly used outcome assessments of physical function in exercise research. The 6MWD is predictive of health outcomes across many chronic health diseases, however, the impact of health conditions on 6MWD remains unclear; limiting its use as a clinical tool. The purpose of this study was to assess the differences in 6MWD across multiple chronic health conditions in older adults.
METHODS: We assessed the 6MWD in 337 community dwelling older adults (mean age 65 years, 225 males, 158 African American, BMI=29.4), following ATS guidelines. We separated groups by primary disease status [type 2 diabetes only (DM, n=117), moderate/severe chronic obstructive pulmonary disease (COPD, n=119), chronic kidney disease (CKD, n=40), peripheral artery disease (PAD, n=16), and moderate chronic heart failure (HF, n=45)].
RESULTS: The mean 6MWD across groups was 389 (103) meters. By disease, the mean 6MWD was 222 (78) m for HF, 364 (25) m for PAD, 425 (108) m for COPD, 458 (110) m for CKD, 477 (104) m for DM. Normative values of older adults are commonly considered to be 514 meters with the 10th percentile reported at approximately 334-361 meters. Our finding of a mean 6MWD of 389 m suggests low physical functioning status across older adults with chronic disease. Only the HF group met criteria for being in the 10th percentile although the PAD group also showed significant decline in physical function. A 6MWD of less than the 25 percentile (<470 m) is considered low functioning status. Our mean 6MWD was substantially lower than the 25th percentile in all groups except for the DM group.
CONCLUSIONS: We found that the mean 6MWD is lower in patients with HF and PAD, placing these patients at a high risk for loss of ability to conduct activities of daily living and eventually loss of independence, however all groups exhibited reduced physical function. This study highlights the importance of interpreting the 6MWD based on individual health conditions and that generalization based on 6MWD cannot be made without taking individual health conditions into account. Establishing a data register would capture data based on health conditions and enable the 6MWD to be used across disease states in a clinical setting and when prescribing exercise therapy for older adults with chronic disease.

1466   Board #274   May 31 9:00 AM - 10:30 AM

Cardiorespiratory Fitness Is Inversely Associated With Metabolic Syndrome And Clustering Of Metabolic Risk Factors: The Ball State University Adult Physical Fitness Study

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(No relevant relationships reported)

The metabolic syndrome (MetSyn) is a high-risk phenotype characterized by the clustering of cardio-metabolic risk factors (RF), including obesity, elevated triglycerides, high density lipoproteins, hypertension, and impaired fasting glucose. Cardiorespiratory fitness (CRF) has been associated with metabolic RF clustering and the presence of MetSyn. Most studies assessing this relationship have estimated CRF, which is associated with estimation error up to 40%, with only few studies using directly measured CRF assessed from cardiopulmonary exercise testing (CPX). However, these studies were small in size and predominately assessed men; therefore more information from studies using CPX derived CRF in both sexes may aid in the risk assessment for MetSyn and guide clinical decisions. **Purpose:** To assess the association between directly measured CRF and MetSyn RF clustering. **Methods**: A retrospective cross-sectional analysis was performed on 3,636 self-referred men and women who completed a health assessment including a CPX between 1969-2017. Inclusion criteria consisted of being ≥ 18 years of age, attainment of a respiratory exchange ratio ≥1.0 during CPX, and complete data on MetSyn RFs. Sequential regression models were run to assess the relationship between CRF and MetSyn and a univariate analysis of variance was performed to assess differences between number of MetSyn RF present and CRF. **Results**: Individuals with MetSyn (n=953) had a mean CRF 8.8 ml/kg/min lower than those without the syndrome (n=2683). Number of RFs was inversely related to CRF; CRF was significantly lower (p<0.05) with each additional RF. There was also a negative relationship (p<0.001) between CRF quartile and the likelihood of having MetSyn. Each quartile increment was associated with a 50% relative reduction in likelihood of MetSyn (p<0.001). **Conclusion**: These findings with CPX measured CRF suggest that higher levels may confer resistance to developing metabolic RFs, which could prevent MetSyn, and ultimately decrease cardiovascular disease risk. Further, the inverse, graded relationship between CRF and

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number of MetSyn RFs has public health importance, as adoption of an endurance training program may increase CRF, and therefore should be promoted as an approach to improve health and decrease MetSyn risk.

1467   Board #275   May 31 9:00 AM - 10:30 AM

Physical Activity Patterns And Cardiorespiratory Fitness In Men With Cardiovascular Disease

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(No relevant relationships reported)

PURPOSE: Cardiorespiratory fitness (CRF) is generally regarded as an objective and reproducible measure of recent habitual physical activity (PA). Considering that the majority of daily PA is performed at light intensity, it is likely that CRF benefits will be detected at submaximal rather than maximal exercise. The purpose of this study was to evaluate daily minutes of light (LIPA), moderate (MIPA) and vigorous (VIPA) intensity physical activity among men with cardiovascular disease (CVD), and to determine the relation between PA and submaximal (oxygen uptake efficiency slope (OUES)) and maximal (VO$_2$ peak) indices of CRF.
METHODS: A total 32 male participants (mean (± SD): age of 60.0 ± 8.7 yr, VO$_2$ peak, 2.0 ± 0.45 L/min and 23.3 ± 5.7 mL/kg/min) were recruited during an induction to a community based exercise referral program following completion of phase 2 cardiac rehabilitation. Participants underwent a graded exercise test on a cycle ergometer with breath by breath open circuit spirometry after which they wore a wrist worn accelerometer (Actigraph) for 7 d. Absolute and relative submaximal OUES were calculated by plotting VO$_2$ in mL/min on the x axis, and the log transformed VE on the y axis (VO$_2$ = a log $_{10}$ VE + b). Exercise data up to the ventilatory anaerobic threshold was included in the analysis.
RESULTS: Participants performed 589.05 ± 69.41 min of daily LIPA, 161.38 ± 66.16 min of MIPA and no daily min of VIPA. There was no significant relation between peak VO$_2$ and either LIPA or MIPA. There was a significant correlation between submaximal OUES (r=0.44; p<0.01) and LIPA. The relation between submaximal OUES/kg and LIPA min almost reached statistical significance (r=0.33; p<0.07). There was no significant relation between MIPA and OUES or OUES/kg.
CONCLUSIONS: Men with CVD spend the majority (78%) of their day performing LIPA. OUES, a submaximal measure of CRF was related to LIPA whereas no relation was found between VO$_2$ peak and LIPA.

1468   Board #276   May 31 9:00 AM - 10:30 AM

Firefighters and Physical Function: Should There Be Annual Testing?

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(No relevant relationships reported)

There are more than a million actively employed firefighters in the United States. To qualify as a firefighter, one must pass the Candidate Physical Ability Test (CPAT), a vigorous assessment of strength and endurance. Following the CPAT, there is no national or state mandate to evaluate fitness or uphold a standard of minimum physical competency. Although strength, endurance, and mobility are critical to job performance, data concerning the preservation of function throughout a firefighter's career are scarce. **PURPOSE:** To evaluate the physical functioning of firefighters.
METHODS: We enrolled 35 firefighters in California, collected demographic data, and performed a battery of tests, which included anthropometric assessments, grip strength, sit-and-reach, shoulder flexibility, vertical jump, push-ups, curl-ups, and VO$_2$ max. We compared mean data to normative data and used multiple linear regression to test the effect of age on physical functioning, holding potential confounders constant.
RESULTS: On average, firefighters were 33.5 ± 11.8 years of age and performed 23.9 ± 3.1 curl-ups, 32.2 ± 12.3 push-ups, had a vertical jump of 59.6 ± 10.4 cm, mean L/R grip strength of 66.0 ± 12.9 kg, sit-and-reach of 5.2 ± 9.1 cm, shoulder flexibility of 20.2 ± 6.8 cm, and VO$_2$ max of 40.1 ± 10.8 ml/kg/min. Compared to normative data, the mean firefighter had excellent grip strength, excellent push-ups, above average vertical jump, average shoulder flexibility, below average curl-ups, poor sit-and-reach, and poor VO$_2$ max; 94.1% of firefighters were classified as poor in sit-and-reach and 58.1% were classified as poor or very poor in VO$_2$ max. Linear regression did not find age to be a significant predictor of sit-and-reach (p=0.167) or VO$_2$ max (p=0.319) holding other significant predictors constant. **CONCLUSION:** In general, firefighters performed competently in assessments of strength, but poorly in flexibility and aerobic capacity. Age was not a significant predictor of performance in either assessment; the implication is that duration spent as a firefighter is not related to functional decline. There may not be a need for firefighters to complete periodic CPAT assessments, but they should be encouraged to improve capacities of endurance and flexibility.

1469   **Board #277**   **May 31 9:00 AM - 10:30 AM**

Comparison of Six-minute Walk Test VO$_{2peak}$ Prediction Equations in Cardiac Rehabilitation Patients

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(No relevant relationships reported)

The six-minute walk test (6MWT) is a popular submaximal exercise test used in cardiac rehabilitation (CR) programs. Patients in CR characteristically have several cardiovascular risk factors present; therefore, the selection of the 6MWT over maximal treadmill testing reduces the likelihood of adverse events. Several established prediction equations exist for predicting VO$_{2peak}$ from six-minute walk speed (6MWS) and/or distance (6MWD). **PURPOSE:** To compare the predicted VO$_{2peak}$ values, calculated from 6MWS, obtained from CR patients using established equations. **METHODS:** Seventeen volunteers (age = 64 ± 16 yr) completed a pre- and post-6MWT prior to a High-intensity Interval Training (n = 6) or moderate intensity continuous exercise (n = 11) program. The Burr et al. (2011), Cahalin et al. (1996), and Ross et al. (2010) VO$_{2peak}$ prediction equations were examined for validity and reliability. A repeated measures analysis of variance (ANOVA), with subsequent paired sample t-tests, was conducted to compare differences within and between 6MWT the VO$_{2peak}$ prediction equations. A 3 x 2 mixed-design ANOVA was performed to examine the effects across VO$_{2peak}$ and time (pre- and post-). **RESULTS:** The repeated measures ANOVA revealed statistical significance within pre- [$F(2,32) = 121.40, p \leq (0.001)$] and post-program VO$_{2peak}$ values [$F(2,32) = 78.24, p \leq (0.001)$]. Sequential paired sample t-tests showed a significant difference between the three equations for both pre- and post-program VO$_{2peak}$ values (df = 16, $p \leq 0.001$). The 3 x 2 mixed-design ANOVA observed no significant differences in VO$_{2peak}$ values across the two time points. **CONCLUSION:** The three prediction equations demonstrated reliability pre- and post-programming. However, insufficient literature exists comparing the validity and reliability of VO$_{2peak}$ prediction equations. Future research should increase the sample size and consider the use of criterion measurement system (i.e., wearable metabolic system which can measure gas exchange).

1470   **Board #278**   **May 31 9:00 AM - 10:30 AM**

Fat Mass, and Not Heart Rate Recovery is Associated With Cardiorespiratory Fitness in Young, Sedentary Adults

J. Matthew Thomas, Julie S. Pendergast, W. Scott Black, Philip A. Kern, Jody L. Clasey, FACSM. *University of Kentucky, Lexington, KY.* (Sponsor: Jody L. Clasey, FACSM)
(No relevant relationships reported)

Peak oxygen uptake resulting from maximal graded exercise testing is considered a measure of cardiorespiratory fitness. Post-exercise heart rate recovery (HRRec) measures have been used as a clinical indicator of health and mortality in older adults. However, the relationship between HRRec and cardiorespiratory fitness in young, sedentary adults has not been fully elucidated. **PURPOSE:** To examine the association between peak oxygen uptake (VO$_2$; ml·kg^{-1}·min^{-1}) and HRRec responses following a progressive maximal graded exercise test (MaxGXT; treadmill); and body composition measures in young, sedentary adults. **METHODS:** We examined peak VO$_2$ and absolute (AbsHRRec; beats·min^{-1}) and relative (RelHRRec; %) HRRec measures at 1, 3, and 5 mins post MaxGXT in 27 young (mean ± SD, age = 26.4 ± 5.7) adults (16 females). All subjects were sedentary (< 2hrs weekly structured exercise), non-smokers, free of known cardiovascular disease risk and medications. Body composition measures including fat mass (kg), fat-free mass (FFM; kg), mineral-free lean mass (MFLM; kg), and percentage body fat (%Fat; %) were determined by total body DXA scans. Pearson's correlation analysis was used to determine if significant (p < 0.05) correlations were observed between peak VO$_2$, AbsHRRec and RelHRRec, and body composition measures. **RESULTS:** No significant correlations were observed between peak VO$_2$ (36.4 ± 9.0) and AbsHRRec at 1 min (30.4 ± 7.8; r = 0.29), 3 mins (62.6 ± 8.6; r = -0.06) or 5 mins (71.1 ± 9.8; r = -0.07). Similarly, there were no significant correlations between peak VO2 and RelHRRec at 1 min (84.1 ± 4.3; r = -0.18), 3 min (67.3 ± 4.9; r = 0.20) or 5 min (62.9 ± 5.3; r = 0.21). Peak VO$_2$ was significantly correlated with %Fat (35.1 ± 9.3; r = -0.82; p<.001) and fat mass (27.8 ± 11.9; r = -0.66; p<.001), but not significantly correlated with FFM (49.7 ± 14.0; r = 0.22) or MFLM (47.0 ± 13.4; r = 0.22). **CONCLUSION:** Although heart rate recovery measures have been used as a clinical indicator of health and mortality in older adults, it may not be a valid measure of cardiorespiratory fitness in sedentary, young adults.

1471   **Board #279**   **May 31 9:00 AM - 10:30 AM**

Aerobic Exercise Capacity In Mild-to-moderate Chronic Kidney Disease Is Maintained Over A 5 Year-period

Helena Wallin[1], Anette Rickenlund[1], Maria E. Eriksson[2], Eva Jansson[1], Carin Wallquist[2], Britta Hylander Rössner[2], Stefan Jacobsson[3]. *[1]Karolinska Institutet, Huddinge, Sweden. [2]Karolinska Institutet, Stockholm, Sweden. [3]Karolinska Institutet, Danderyd, Sweden.*
(No relevant relationships reported)

PURPOSE: A reduced aerobic exercise capacity is a known feature of chronic kidney disease (CKD) and is associated with increased morbidity and mortality. Peak heart rate (peak HR) and hemoglobin level are known determinants of exercise capacity in CKD. Less is known about the change in exercise capacity over time. The purpose was to study the change in aerobic exercise capacity, peakHR and hemoglobin over a 5 year-period in mild-to moderate CKD (CKD 2-3).
METHODS: 34 patients (11 females and 23 males, 24-62 years at baseline) with CKD 2-3 and 34 age- and gender-matched healthy controls were examined at baseline and after 5 years. Peak workload, as a measure of aerobic exercise capacity, and heart rate response were measured during a maximal exercise test on a cycle ergometer. Hemoglobin was assessed in both groups and glomerular filtration rate (GFR) was measured by iohexol clearance in CKD only.
RESULTS: GFR in CKD 2-3 decreased from 60±5.2 to 47±15 mL/min/1.73 m^2 over 5 years, (p<0.001). Peak workload, peakHR and hemoglobin level were significantly reduced (p<0.05) in CKD 2-3 compared to controls both at baseline and at 5 years-follow-up. The changes in these parameters over 5 years did not reach significance in either group. CKD at baseline vs 5 years-follow-up: peak workload 209±62 vs. 200±60 W; peakHR 161±22 vs. 158±21 beats per minute; hemoglobin 13.5±1.3 vs. 13.9±1.1 g/dL. Controls at baseline vs 5 years-follow-up: peak workload 247±65 vs. 244±73 W; peak HR 178±11 vs. 173±12 beats per minute; hemoglobin 14.2±1.0 vs. 14.7±1.0 g/dL. The change in peakHR was positively correlated (r=0.57, p<0.05) to the change in peak workload in CKD, but not in controls. No such correlation to the change in peak workload was found for the change in hemoglobin level or GFR.
CONCLUSION: Aerobic exercise capacity and its determinants peakHR and hemoglobin were maintained over a 5 year-period in mild-to-moderate CKD, despite a mean decline of 22 % in kidney function. Change in peak heart rate over a 5 year-period is an important determinant of the change in exercise capacity in CKD 2-3.

C-50   Exercise is Medicine®/Poster - **EIM: Counseling and On-Campus**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1472   **Board #280**   **May 31 9:00 AM - 10:30 AM**

Bridging The Gap Between Campaigns And Programs. The Country-based Public Health Policy Issue: "Move It For Heath"

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(No relevant relationships reported)

Cardiovascular disease and risks factors are worldwide concerning problems leading to public health policies and strategies to avoid high costs and low outcomes to populations. Physical inactivity is a major risk factor and play an important role that should lead to global public health strategy for its cost-efficiency and cost-effectiveness. The main issues are the specific country-based public health policies, wich continuously leads to campaign to avoid sedentary behavior and physical inactivity, and not population-based exercise programs policies. **Purpose:** The purpose of our study was to share data from a community-based exercise program ("Move it") contextualized on the Brazilian public health policy (SUS) for the last 20 years. **Mehods and Results:** The program "Move it" is a multidisciplinary program that runs on primary care facilities of a inner state city of São Paulo (Botucatu), Brazil, that has been implemented 25 years ago. So far, 2% of the city population has been involved (2800 participants; 55±9 years, 74% females and 68,7% under 60 years of age), participating on protocols that runs on city's facilities (parks, public gyms and squares), involving diagnosis, fitness analysis and exercise program (80 minutes, 3 times a week). Metabolic Syndrome (ATP criteria) prevalence is 35%, with a succesfull response to the program of 20% after 10 weeks. VO$_2$ max (Balke

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protocol) improvement is 30% and muscular strength (25%). Blood Pressure (BP) normalization occurs after 20 weeks, returning to basal levels (High BP) when detrain occurs (Hollydays). Health Eating Index (HEI) and sedentary behavior (IPAQ and Baecke questionnaires) improves after 8 weeks. Figure 1. "Move-it": Flow-chart and interactions with the national public health policy (SUS): **Conclusion:** Cardiorrespiratory fitness, healthy eating index, lipid profile, insulin sensitivity and body composition were improved. Since the primary care system in Brazil is based on active search ("Estratégia Saúde da Família - agentes comunitários"), the adhesion, acceptance and effectiveness of this model should be encourage for nation wide application. Strategies leading transition from campaigns to programs should be encourage world wide.

1473   Board #281   May 31 9:00 AM - 10:30 AM
Scientific Abstract

Victor Andrews. *Kansas State University, Manhattan, KS.*
(No relevant relationships reported)

PERCEIVED PHYSICAL LITERACY IN COLLEGE AGED STUDENTS

Victor Andrews, Kansas State University, Manhattan, Kansas
Individuals who fail to acquire adequate competencies in regards to physical activity may develop barriers that limit physical activity later in life. Physical literacy(PL) is a descriptive that is used to measure one's competence, confidence, and motivation in regards to physical activity. The goal of PL is to have all youth to be considered competent by 12 years of age in order to allow them to be physical active throughout their life-course. **PURPOSE:** To investigate the perceived physical literacy levels of college aged students. **METHODS:** The Physical Literacy Self-Assessment was distributed to college aged students to measure perceived PL through e-mail and social media. **RESULTS:** 94 college students responded (21 ± 3 years, 38 male, 56 female). SPSS vs 24 was used for frequency analysis and two independent samples t-test. Perceived PL scores were then divided into 4 graded categories: Very Low, Low, High, Very High. 49% of respondents were placed in the "Very High" category, 47% of respondents were categorized at "High", 3% of respondents were categorized as "Low", 1% of responded was categorized as "Very Low". The results indicate that there is no statistically significant difference between the PL score for male and females (t= 1.881, p= 0.63). **CONCLUSION:** The goal of PL is to have all individuals meet the criteria to be considered "Very High". Individuals graded into categories other than "Very High" are considered in need of further education and support until they are perceived to be competent in all elements of PL. PL is still a new concept within the USA. Further research is needed to better understand PL within the USA population and relationships with current physical education levels in college aged populations.

1474   Board #282   May 31 9:00 AM - 10:30 AM
Prenatal Healthcare Provider Physical Activity And Nutrition Discussions According To BMI

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(No relevant relationships reported)

Research suggests healthcare providers (HCP) do not regularly discuss physical activity (PA) and nutrition during patient interactions, particularly when patients are considered overweight/obese by body mass index (BMI). It is unknown if this trend extends to obstetric HCPs. **PURPOSE:** To investigate the differences in 1) patient value of prenatal HCP advice, and 2) the likelihood of prenatal HCP discussion/recommendation of PA/nutrition behaviors according to BMI. **METHODS:** Participants (n=46) included pregnant women enrolled in a PA/nutrition behavioral intervention. A survey assessed 1) demographics, 2) pre-pregnancy height and weight, 3) the degree (1=do not value to 5=highly value) participants valued their prenatal HCP's opinions, and 4) whether the patient's prenatal HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice. Means(SD) and percentages were calculated. Participants were categorized into BMI categories of normal weight (<25 kg/m²) and overweight/obese (≥25 kg/m²). An independent samples t-test and chi-square analyses were utilized to assess differences in the value of HCP's opinions, and whether or not the patient's HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice according to BMI category. **RESULTS:** Most participants were Caucasian (82%), married (70%), and college graduates (59%). Participants were 28.3(4.4) years of age, had a pre-pregnancy BMI of 28.0(9.7)kg/m² and valued their HCP's opinions 4.6(0.6). Most participants discussed current PA habits (61%), received a PA recommendation (57%), and received nutritional advice (59%) from their prenatal HCP. Normal (45.6%) and overweight/obese (54.4%) participants valued their HCP's advice similarly: 4.6(0.60) and 4.6(0.64), respectively (p=0.71). Although not statistically significant, more normal weight participants discussed PA and received a PA and nutrition recommendation than overweight/obese participants (p=0.10-0.50). **CONCLUSION:** Our sample highly valued prenatal HCP opinions. HCPs discussed/recommended PA/nutrition behaviors to women across BMI categories, yet many participants received no PA/nutrition advice. Future research should explore ways to consistently incorporate PA/nutrition discussions in obstetric appointments.

1475   Board #283   May 31 9:00 AM - 10:30 AM
Physical Activity Counselling and Exercise Prescription Practices of Physiotherapists in Nova Scotia

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(No relevant relationships reported)

PURPOSE: Physiotherapists (PTs) have education and scope of practice to promote the benefits of physical activity (PA) and prescribe exercise in their clinical interactions with patients. As such, they provide an avenue to increase the reach of Exercise is Medicine, to improve the PA levels of the Canadian population. However, no study has assessed Canadian physiotherapists' perceptions and practices surrounding physical activity counselling and exercise prescription (PAE). **METHODS:** PTs working in Nova Scotia (n=146) completed an online self-reflection survey regarding their current practices, confidence, barriers, and facilitators in providing PAE to their patients. **RESULTS:** Overall confidence for PAE was high (most scores >80%) except for in helping patients maintain PA (72.8±25%) and in patients following through on PAE recommendations (66.3±22.5%). PTs include PAE in 85±23% of appointments and prescribe written exercise in 80±20% of appointments, but only refer to other exercise professionals or facilities in 27±27% of appointments. The most salient barriers to providing PAE were patient's interest in PA, and patients' preference for medication management over lifestyle intervention (2.36±0.68 and 2.11±0.66 respectively, out of 4), exceeding the typically cited barrier of lack of provider time. The most helpful facilitator was PTs' perceived patients' readiness to do PAE (3.5±0.7, out of 4). PTs are most comfortable providing PAE advice to those with arthritis and musculoskeletal issues (81%) and least comfortable to those with cancer (49%), insulin requiring diabetes (33%), respiratory disease (32%) and mental health concerns (28%). **CONCLUSION:** The primary barriers for PTs in providing PAE are patient-focused and PTs may benefit from avenues that allow greater referral access to other exercise professionals and a collaborative treatment approach to help patients maintain a physically active lifestyle, especially in those with other chronic disease beyond musculo-skeletal disorders. Exercise is Medicine networks should consider greater collaborations between allied health and exercise professionals to support multi-disciplinary approaches to patient exercise management across the continuum of health care.

1476   Board #284   May 31 9:00 AM - 10:30 AM
Participation in an Exercise Education Rotation affects Medical Students Opinions Towards a Physician's Role in Physical Activity Recommendations

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(No relevant relationships reported)

Physical activity is key for prevention of most chronic disease. In response, a global initiative called *Exercise is Medicine* was launched to encourage physicians to treat physical activity participation as a vital sign. However, medical students may not receive the necessary training which may inhibit the future physician's likeliness to assess or recommend physical activity participation. **Purpose**: To determine if a five day exercise education rotation affects medical student's opinion regarding a physician's role in recommending physical activity. **Methods:** Third year medical students (n=169) completed a mandatory exercise education rotation as part of general primary care clerkship. This rotation included included basic fitness assessment and consultation, one-hour observation of a clinical supervised exercise program, exercise prescription education for special populations, explanation of the *Exercise is Medicine* Initiative and mandatory attendance to five group exercise classes. All exercise activities were led by an ACSM certified exercise physiologist at a University based fitness facility. The medical students completed an 8-item Likert scale pre-post survey (1 to 4, strongly disagree, disagree, agree, strongly agree, respectively) to assess their level of agreement with statements about a physician's role in exercise prescription and personal fitness (Table 1). A paired t-test was used to compare the pre and post scores for each individual item. Significance was set at p < .05. Results: Table 1.

Item	Pre	Post	Mean Diff	p value
1. It is a physician's responsibility to discuss exercise with their patients.	3.67	3.76	.09	.059
2. Physicians are qualified to accurately prescribe exercise.	2.93	3.08	.15	.051
3. A physician's personal fitness affects the credibility of their advice.	3.28	3.30	.02	.805
4. Physicians should assess a patient's physical activity levels just like other vitals signs.	3.33	3.54	.21	.001*
5. A physician who can prescribe exercise is a better overall physician.	3.49	3.59	.10	.123
6. Exercise prescription coursework should be mandatory in medical school.	3.36	3.41	.04	.580
7. A physician should be judged based on their personal fitness.	2.36	2.58	.22	.007*
8. A physician should serve as a role model with regards to their nutrition/fitness.	3.28	3.37	.09	.201
Total Survey Score	25.66	26.57	.92	.009*

*p < .05

Conclusion: The findings demonstrate that a five-day exercise education rotation favorably impacts medical student's opinion regarding a physician's role in exercise consultation with patients. More importantly, the most significant increase in agreement was observed in the students' agreement that a physician should consider physical activity levels as a vital sign, consistent with the Exercise is Medicine initiative.

1477   Board #285   May 31 9:00 AM - 10:30 AM

Primary Care Students' Perceptions of Using Physical Activity Counseling as a Medical Intervention

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(No relevant relationships reported)

Chronic diseases are among the most common and costly health problems in the U.S. Physical activity (PA) has been shown to be effective in treating and preventing many chronic diseases. The Exercise is Medicine initiative aims to promote PA counseling among healthcare providers. However, little is known about the education and perceptions of medical providers related to PA counseling. **PURPOSE:** To learn about the knowledge and perceptions that students in primary health care professions have related to using PA counseling. **METHODS:** Students currently enrolled in a DO or MD medical school, physician assistant, or nurse practitioner program were recruited to take an online survey. Incorporating two previously validated surveys, subjects were asked about their own PA counseling training they have received, the importance of various PA counseling tasks, and their competency to do each task. Data analyses were performed on each Likert scale question. Open ended questions were analyzed thematically. **RESULTS:** Of the participants who completed the survey (n=72), 6.8% were MD, 52.3% were DO, 21.6% were physician assistant, and 18.2% were nurse practitioner students. Primary care students rated many aspects of PA as being important (59.4-76.7% agreed/strongly agreed). but reported low confidence in their education and abilities to do them (19.7-51.3% agreed/strongly agreed). The most common barriers to PA counseling were patient motivation/compliance, lack of education, time, support system for patients, and cost/billing. The most common solutions they proposed to overcome these barriers were more education for primary care professionals, being able to refer patients to specialist, and help with psychological aspects of counseling. There was strong interest in taking an elective course, attending a CME/continuing education course, and having a certified fitness and/or nutrition professional in the office. **CONCLUSION:** There is a clear disconnect between what primary care students find important and what they feel competent to do in the field. There is a need for improving medical education related to PA counseling. There are many opportunities for PA professionals to work with primary care providers on PA counseling. Educating our healthcare professionals is essential in making them confident in PA counseling.

1478   Board #286   May 31 9:00 AM - 10:30 AM

Resistance Exercise Does Not Improve Habitual Physical Activity Despite Pain Relief: Implications for Patient Counseling

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(No relevant relationships reported)

Osteoarthritis (OA) of the knee leads to physical disability and avoidance of activity. Resistance exercise can reduce pain and increase leg strength, but it is not yet clear how resistance exercise (RX) impacts habitual physical activity levels. **PURPOSE:** To determine whether resistance-exercise induced changes in physical function and pain relief are related to increased walking related function and habitual physical activity in older adults with knee OA. **METHODS:** Older adults (N=60; 69.0 ± 6.9 yr; 64% women) were randomized to a 4-month total body RX program or not. Knee pain was estimated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscore. One repetition maximum of leg strength (knee extension and leg press) and walking performance measures (walking speed, walking endurance during progressive treadmill test, 6-minute walk test distance) were collected pre and post-training. Daily step count and intensity of ambulatory activity was determined by a 7-day tracking of ambulation using a StepWatch©. **RESULTS:** Knee pain severity decreased by 27% in the RX group and increased by 13% by month 4. Leg extension and leg press strength increased from 17% to 22% and decreased by 4% in the control group (p<.05). Walking speed did not differ between the two groups from pre to post-training. Walking endurance treadmill time increased from 12.5 to 13.3 min in control and from 10.1 to 11.2 min in the RX group but these changes were not different between groups. Six-minute walk distance increased by 1.0-4.2% in the RX and control groups (p=.08). Pre-training average daily step counts were 5002 ± 2125 and 3601 ± 1181 in the CON and RX groups, respectively, and decreased by 614 and 356 steps a day by month 4. **CONCLUSIONS:** Despite pain reduction and strength gains with RX, walking-related functional indices and habitual activity levels were not impacted. Patients should be counseled that RX does not replace daily physical activity, but should be added to ambulatory activity. The importance of combining ambulatory activity and strengthening exercise to maximize possible functional improvements should be discussed.

1479   Board #287   May 31 9:00 AM - 10:30 AM

"If We Knew That Exercise Could Be Our Medicine": Perceptions of Latinas in Low-Income Clinics

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(No relevant relationships reported)

PURPOSE: There is scarcity of research regarding the leveraging of the healthcare setting to promote PA among Latinas specifically, though they are one of the largest and most inactive ethnic minority groups in the US. This study aimed to conduct qualitative research to understand how low-income community clinics could be capitalized on as settings for the promotion of PA among Latina women. **METHODS**: In-depth individual interviews were conducted with 24 Latina patients in two low-income community clinics in San Diego, California. Data were collected in English and Spanish, transcribed, translated to English, and analyzed using structural coding procedures, under a Thematic Analysis framework. Two investigators jointly coded each interview using a codebook. Codes were then compared and grouped into themes. **RESULTS**: While other themes were identified, this presentation will mainly focus on participants' perceptions regarding the role of clinics and health professionals in the promotion of PA. The majority of participants reported receiving PA advice at their doctor's office, although only some of them found this advice facilitated their participation in PA. A few participants stressed the importance of personal responsibility, rather than physicians' responsibility, for their PA. Nevertheless, most participants had expectations regarding doctors' role in the promotion of PA. Specifically, participants wanted doctors to motivate people, for example by becoming role models and by providing more specific information of places and exercises they can do. **CONCLUSIONS**: The results of this qualitative study support the need to leverage the role of healthcare professionals and clinics in the promotion of PA among Latinas, as participants expressed a desire for health professionals' involvement and provided suggestions regarding how they may motivate patients to be active. Future research might benefit from including some of these suggestions for the promotion of PA among Latina women in the healthcare setting. The results of this study also highlight the importance of initiatives like ACSM's Exercise is Medicine to better equip future healthcare professionals to address the PA promotion needs and expectations of their patients.

1480　Board #288　May 31 9:00 AM - 10:30 AM

Exercise Is Medicine On Campus 2017: Increasing Off-campus Outreach And Community Collaboration

Zack Papalia, Melissa Bopp, FACSM, Michele Duffey, Lori Gravish-Hurtack, Christopher M. Bopp, Nancy Williams, FACSM, Alexandra Telech, Britni De Castro. *Pennsylvania State University, University Park, PA.* (Sponsor: Melissa Bopp, FACSM)

(No relevant relationships reported)

PURPOSE: Exercise is Medicine on Campus (EIMOC) is an initiative promoting physical activity (PA) on college campuses. Pennsylvania State University, promoting EIMOC since 2010, has held an annual EIMOC Week since 2012. A focus of the EIMOC committee in 2017 was to expand its off-campus reach and community collaboration throughout the commonwealth of Pennsylvania and beyond. The purpose of this study is to analyze and describe the logistical challenges and lessons learned from expanding an EIMOC initiative to off-campus and out of town locations.
METHODS: During fall 2017, EIMOC events were expanded from one, on-campus week, to a month of activities including a day of coordinated events with off-campus local businesses, travel to commonwealth campuses, and a week of collaboration with alumni-led organizations nationwide. The logistical challenges of coordinating remote events were documented and evaluated. Observational data from each event assessed popular activities and feedback from participating partners regarding the planning and execution of events was gathered.
RESULTS: Analysis addressed three new initiatives. Partnership with local, off-campuses businesses, known as "EIM Off Campus Day," involved local fitness centers offering no-cost access to students, faculty, and staff for one day, promoted via social media and our website. Reach was assessed through social media analytics (i.e. likes, retweets), website visits and unique page views. Traveling events to commonwealth campuses occurred during "Mobile EIM Week" and were assessed based on the type of activities included, number of partners involved, and number of participants engaged, as well as feedback regarding the perceived success of each event and suggestions to improve future collaborations. Finally, a week-long initiative engaged alumni nationwide (EIM Everywhere Week) relying on email campaigns and social media to spread the word and gauge participation.
CONCLUSIONS: The current study offered insights on the challenges and successes in leveraging an existing EIMOC program to spread the message into the community, including timing of advertising and better communication. Despite this, the new initiatives proved both popular and successful, and improving their execution will significantly benefit the future impact of EIMOC.

1481　Board #289　May 31 9:00 AM - 10:30 AM

Preliminary Results Of An In-depth Investigation Of Exercise Is Medicine On Campus

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(No relevant relationships reported)

Widespread implementation of Exercise is Medicine on Campus (EIM-OC) has potential to address college student physical inactivity, however, limited research has comprehensively assessed how EIM-OC is operationalized at campuses. **PURPOSE:** To assess EIM-OC implementation, development, and outcomes at various academic institutions. **METHODS:** A survey was developed in consultation with key EIM-OC stakeholders and administered online among EIM-OC representatives. Data collected included: institutional information; promotion, education, and healthcare system integration; partnerships; challenges; and goals. **RESULTS:** Initial responses (*n*=24) were received from a diverse group of academic institutions ranging in size (<10,000 to >50,000 students) and type (public, private). Campus health and recreation were considered the most important EIM-OC partners, which was attributed to these partners providing the most opportunities for and having the most interactions with students. A lack of time and wanting to focus on existing relationships were cited as reasons for not yet establishing working relationships with other partners. Multiple respondents cited lack of time, awareness, funding, and/or resources as the biggest challenges faced by their program. Bureaucracy surrounding the collaboration between university departments was also a cited as a major challenge. Implementing the physical activity vital sign emerged as a common issue, with many institutions having no protocol in place for arranging a follow-up between students and physical fitness professionals after referral acceptances (*n*=5), and no protocol existing for referral declinations (*n*=9). Despite a stated desire for greater collaboration with other universities, particularly sharing of information and ideas (*n*=9), most respondents (83%) had not collaborated with other programs. Social media was under-utilized, with over a third (*n*=9) of respondents not utilizing any social media platforms. **CONCLUSION:** EIM-OC programs at various institutions experienced similar challenges. This research will serve to inform and improve upon the implementation, development, and outcomes of EIM-OC programs and ultimately contribute to helping academic institutions increase the physical activity of students and their local communities.

1482　Board #290　May 31 9:00 AM - 10:30 AM

Referred Students' Motivators And Barriers To Participate In An EIMOC Program

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to describe referred students' motives and barriers to participating in an Exercise is Medicine on Campus (EIMOC) training program at Illinois State University.
METHODS: Referrals are initiated by Student Health or Counseling Services, and referred students complete an intake session with the School of Kinesiology and Recreation's (KNR) Exercise is Medicine on Campus staff. Student Health and Student Counseling services indicated a need for physical activity (PA) programming for students with certain conditions (e.g. social anxiety, body image concerns, obesity, depression, anxiety, and eating disorders) that would benefit from increased physical activity performed in a private setting. Students are referred to the School of KNR EIMOC program, which is informed and implemented by graduate students and Exercise Science faculty with expertise in the areas of exercise physiology, biomechanics, and exercise psychology. Specific diagnoses are not currently provided by Student Health or Counseling services to EIMOC staff.
RESULTS: Since the initiation of the referral system in 2016, 40 students (Women = 30, Men = 10) have been referred to the EIMOC program - 30 from Health Services and 10 from Counseling Services. Approximately half of these were already performing some activity, but were either not meeting recommended levels of PA or needed assistance with their exercise program. At the time of submission, ten of the 40 students had completed full intake questionnaires and consent forms. Descriptive statistics were calculated on data from these ten subjects to identify reasons for pursuing participation in the EIMOC program and clients' current motivations for and barriers to PA. All subjects cited "improving energy levels" as an important motivator for PA. The top three reported barriers for PA were Lack of Willpower (M±SD = 6.1±2.9), Lack of Energy (M±SD = 4.4±2.4) and Social Influence (M±SD = 4.0±1.8). Privacy of the exercise sessions (90%), expertise of the staff (90%), and physician referral (70%) were selected as strong motivators for pursuing the EIMOC program.
CONCLUSIONS: These preliminary data suggest that students referred to Illinois State University's EIMOC program pursue it due to an interest in increasing PA levels in a private, supervised setting.