Regular exercise participation is an effective intervention to prevent and treat a host of diseases. However, there are instances where exercise is controversial for individuals with certain medical conditions. Debate and understanding about controversial exercise applications for some conditions—such as those with cardiovascular disease, cancer patients undergoing chemotherapy treatment, kidney dialysis patients, and claudicating peripheral artery disease—varies between professional misperception to equivocation. The purpose of this symposium is to highlight both clinical and basic science evidence about the efficacy of exercise applications for muscular dystrophy, chemotherapy patients, kidney dialysis patients, and peripheral vascular disease.

Purpose: To provide an overview of the risks, benefits and special exercise considerations for cancer survivors receiving chemotherapy and describe how to develop a safe exercise prescription during treatment. Methods: Review of literature and current evidence-based practice related to pharmacology of cancer chemotherapy drugs: mechanism of action, cardiotoxicity, neurotoxicity, pulmonary and immunologic toxicities. Results: Provide in depth pathophysiology and pharmacology of chemotherapy drugs and treatment regimens that may cause cardiovascular, pulmonary, neurologic and immunologic complications that will impact exercise prescription. Provide an in-depth review of the special considerations necessary to adapt exercise for the unique needs of these cancer survivors. Drug side effect considerations will be discussed for different common cancers with clear instruction for accommodating exercise to the individual survivor’s needs so they can benefit without risk of injury or illness. Conclusion: Exercise can be safe, effective and beneficial, both physically and psychologically, for cancer survivors receiving chemotherapy if special precautions are taken to safeguard against injury, illness or worsening the side effects of treatment. Exercise prescription needs to take into account the toxicities of chemotherapy drugs, effects of surgery and other comorbidities, which may influence the exercise dose that is well tolerated to promote optimal health and wellness.

Patients with renal failure undergoing chronic hemodialysis (HD) treatment suffer from a variety of co-morbid diseases. Protein energy wasting is common, and this leads to a variety of co-morbid diseases. However, there are instances where exercise is controversial for individuals with certain medical conditions. Debate and understanding about controversial exercise applications for some conditions—such as those with cardiovascular disease, cancer patients undergoing chemotherapy treatment, kidney dialysis patients, and claudicating peripheral artery disease—varies between professional misperception to equivocation. The purpose of this symposium is to highlight both clinical and basic science evidence about the efficacy of exercise applications for muscular dystrophy, chemotherapy patients, kidney dialysis patients, and peripheral vascular disease.
INTRODUCTION: A heat tolerance test (HTT) is a test used to assess an individual’s ability to effectively thermoregulate during exercise in heat. Certain military occupations and commands within the U.S. Navy and Marine Corps require individuals who have experienced a heat injury (i.e., heat stroke) to pass a HTT in order to return to their duties.

METHODS: Individuals have prerequisite fitness to pass a HTT. The development and progression of knee osteoarthritis in this population.

CONCLUSION: Successful gait mechanics are not restored during MTS at 3 and 5 months post-surgery. While range of motion in the surgical limb improves over time, small but significant between limb differences remain at 5 months. Large asymmetries in kFLEXmom at 3 months appear to be resolving by 5 months post-ACLr as the surgical knee increases kFLEXmom. These data suggest that altered sagittal plane mechanical functions are not restricted to the response of gait. Further, these knee loading asymmetries observed during mid to terminal stance are similar in magnitude to those reported during loading response. This is of concern as altered gait mechanics have been attributed to the development and progression of knee osteoarthritis in this population.

RESULTS: The mean ± SD EOT PSI scores for those that passed and failed were 4.0 ± 1.2 and 6.5 ± 0.8, respectively. As expected, PSI scores for those that passed were significantly lower than for those that failed (p < 0.001). Of those that passed, 19% were categorized as no/little strain, 55% were categorized as low strain (PSI 2-3), 24% were categorized as moderate strain (PSI 4-5), and 2% were categorized as high strain (PSI > 5). Of the individuals that failed, 56% were categorized as moderate strain, while 44% were categorized as high strain.

CONCLUSION: Our results suggest that individuals with the thermoregulatory capacity to pass a HTT will exhibit much lower PSI scores than those that fail a HTT. When assessing heat tolerance, it appears that individuals who pass the HTT would be expected to complete the HTT with a PSI score in the low to moderate range, indicating a moderate level of thermal strain.

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Purpose: This study examined biomechanical differences between operative and non-operative limbs during single-leg loading tasks in young athletes after recent ACL reconstruction (ACLR).

Methods: 31 subjects with unilateral ACLR (58% female; aged 15.6 ± 2.0 years; 5-12 months post-surgery) performed single-leg hop and deceleration (reversal from forward to backwards running) tasks. Differences in 3D kinematics and kinetics between operative and contralateral limbs were evaluated using paired t-tests.

Results: In the deceleration task, peak hip adduction was higher in operative limbs (0.5 vs. -3.1°; p=0.02), though no differences were seen in knee frontal plane variables (p=0.48). Operative limbs displayed more plantarflexed ankle positioning (peak dorsiflexion -0.7 vs. -4.6°; p=0.02), but no differences were seen in hip and knee flexion (p=0.18). Approach velocity did not differ between limbs (both 2.2 m/s; p=0.24), but peak ground reaction force (GRF; 16.6 vs. 18.5 N/kg), average external knee flexion moment (0.5 vs. 0.6 Nm/kg), and power absorption at the knee (0.5 vs. 0.6 Nm/kg) were lower in operative limbs (p<0.02).

In the single-leg hop, jump distance was longer on the non-operative limb (1.4 vs. 1.2 m; p<0.04). Peak hip adduction was higher in operative limbs (4.8 vs. 1.2°; p=0.02), but no differences were seen in knee frontal plane variables (p=0.42). Peak GRF was similar between limbs (29.5 vs. 29.2 N/kg; p=0.62), but peak knee flexion (61.1 vs. 66.7°), knee flex-extension range (52.4 vs. 57.2°), average knee flexion moment (0.8 vs. 1.1 Nm/kg), and power absorption at the knee (0.8 vs. 1.2 Nm/kg) were lower in operative limbs (p<0.01).

Conclusions: In both tasks more adducted hip positioning of the operative limb was the only frontal plane asymmetry observed in young athletes post-recent ACLR. Sagittal plane asymmetries included decreased knee moments and power absorption on the operative side which was associated with either decreased GRF or reduced knee flexion. Asymmetries in sagittal plane shock absorption strategies may reflect an attempt to offload the knee during dynamic single leg tasks while frontal plane asymmetries may reflect residual deficits in hip control less than 1 year after surgery. These objective measures may indicate a patient’s readiness, or lack thereof, to return to sport.
Individuals following ACL reconstruction (ACLR) adopt a strategy that shifts mechanical demands away from the knee of the surgical limb. Vertical ground reaction forces (vGRF) asymmetry has been used to characterize a shift in demands to the non-surgical limb in bilateral tasks. However, given the potential for both inter- and intra-limb compensations it is possible that vGRF asymmetry does not accurately reflect knee extensor moment (kEXT) asymmetry.

**PURPOSE:** To determine how well between limb symmetry in vGRF predicts between limb symmetry in kEXT during a squat in individuals following ACLR at 2 time points: 3 and 5 months.

**METHODS:** 11 subjects (7 females, 25.3 ± 10.7 y) performed bilateral squats to self-selected depths (391 ± 11.1 cm) and 5 months (148.8 ± 9.2 cm) post-surgery. 3-D kinematics (250Hz), ground reaction forces (1500 Hz), and anthropometrics were calculated (surgical/ non-surgical limb) for peak vGRFs and kEXT during deceleration; kEXT was calculated using inverse dynamics. Symmetry indices (SI) were used to calculate kEXT moments (inverse dynamics). Symmetry indices (SI) were calculated (surgical/ non-surgical limb) for peak vGRFs and kEXT during deceleration; SI-1 indicates smaller kEXT and vGRF in surgical compared to non-surgical limb. Separate linear regression analyses were used to determine how well vGRF symmetry (SI_vGRF) predicts knee extensor moment symmetry (SI_kEXT) at 3 and 5 months.

**RESULTS:** On average, SI_vGRF and SI_kEXT were 0.86 ± 0.11 and 0.63 ± 0.18 at 3 months, respectively. At 3 months, SI_vGRF predicted SI_kEXT (r²=0.62, p<0.004). On average, SI_vGRF and SI_kEXT were 0.89 ± 0.07 and 0.79 ± 0.12 at 5 months, respectively. At 5 months, SI_vGRF did not predict SI_kEXT (r²=0.28).

**CONCLUSIONS:** The larger asymmetries noted in kEXT versus vGRF indicates that SI_vGRF underestimates SI_kEXT explained 62.4% of the variance in SI_kEXT at 3 months suggesting that the reduction in knee loading is accomplished largely by inter-limb compensations. However, by 5 months post ACLR, reductions in kEXT appear to be accomplished through adjustments made within the limb. Together these data suggest that caution should be taken when relating vGRF symmetry to knee loading during bilateral task.

**G-23 Thematic Poster - Ergonomic Aids**

**Chair:** Mary P. Miles, FACSM.

**Room:** 104

**Board #1**

June 4, 9:00 AM - 11:00 AM

**The Effect Of Ad Libitum Intake Of Different Commercial Beverages And Snack Foods Following Exercise-induced Fluid Loss.**

Nadia Campagnolo¹, Elizaveta Iudakhina¹, Chris Irwin¹, Matthew Schubert², Greg Cox³, Ben Desbrow¹. ¹Griffith University, Gold Coast, Queensland, Australia. ²University of Kansas Medical Center, Kansas City, KS. ³Australian Institute of Sport, Gold Coast, Queensland, Australia. (Sponsor: Louise M Burke, FACSM)

Email: nadia.campagnolo@griffithuni.edu.au

(No relationships reported)

**Purpose:** This study compared the effects of ad libitum consumption of different beverages and foods on fluid restoration and nutrient consumption following exercise. Methods: Ten endurance trained males (VO2max, 62.95±7.20 ml/kg/min) performed four trials employing a randomised, crossover design. Following 60 minutes of standardised exercise (matched for energy expenditure and fluid loss) participants consumed either water (W1 and W2), a sports drink (Powerade (P)) or a milk-based liquid meal supplement (Sustagen Sport (SS)). Additionally, participants had access to snack foods at two time points within the first two hours of recovery. All beverages and food were consumed ad libitum. Total nutrient intake, urine volume, USG, body weight as well as subjective measures of gastrointestinal intolerance and thirst were obtained hourly. Plasma osmolality was measured pre, post, one and four hours after exercise. Results: Total fluid volume ingested from food and beverages in W1 (2.28±0.42 L) and P (2.32±0.80 L) trials was significantly greater than the SS (1.94±0.54 L) trial. No difference was observed between W2 (2.21±0.62 L) and SS. Total urine output was not different between trials (W1 648±202 mL, W2 602±352 mL, P 879±751 mL, SS 466±129 mL). Total energy intake was higher on the P (9695±1974 kJ) and SS (10577±2210 kJ) compared to both water trials (W1 = 7826±888 kJ, W2 = 7578±1112 kJ). Conclusion: Beverages with different nutrient profiles appear equally effective at replacing exercise induced fluid losses when consumed ad libitum with food. Therefore, choosing a post-exercise recovery beverage should consider hydration properties in the context of an individual’s post-exercise energy requirements and overall dietary goals.

**S756 Vol. 48 No. 5 Supplement**
PURPOSE: The aim of this study was to carry out a systematic review and meta-
analysison the effects of caffeine supplementation on physiological responses to
submaximal exercise. METHODS: 28 studies met the inclusion criteria of adopting
double-blind, randomised, crossover designs that included a sustained (5 – 30 minutes)
fixed-intensity bout of submaximal exercise (mean ± standard error of the mean, 65 ± 5%
V̇O2max) or using a standard effective caffeine dose of 3-6 mg·kg⁻¹ administered 30 – 90
minutes prior to exercise. Bouts of exercise longer than 30 minutes were included if
physiological measurements were made within the 5 – 30 minute inclusion window.
Meta-analyses were completed using a random-effects model, and data are presented
as mean ± standard error of the mean. RESULTS: Relative to placebo, caffeine supplementation led to significant increases in
submaximal measurements of minute ventilation (D = +3.36 L·min⁻¹; p < 0.001; n = 191), and blood lactate (D = +0.39 mmol·L⁻¹; p < 0.001; n = 142). In contrast, caffeine supplementation had no significant effect on
ratings of perceived exertion (D = -0.02 ± 0.04; p = 0.01; n = 162). CONCLUSION: The positive effects of
caffeine supplementation on sustained high-intensity exercise performance are widely
accepted, though the mechanisms to explain that response are currently unresolved.
This meta-analysis has revealed clear effects of caffeine on various physiological
responses during submaximal exercise, which may help to explain its ergogenic action.

It has been suggested that the pharmacokinetics of nitrate (NO−3) may differ depending
on the delivery vehicle, although this has not yet been explored in the same group of
study participants. PURPOSE: To compare the changes in blood pressure (BP),
plasma [NO−3], nitrite [NO−2] and total nitroso species ([RXNO] following ingestion of
commercially available beetroot juice (BR) and NO−3 rich chard gels (NG),
matched for NO−3 content. METHODS: ~500 mg nitrate was administered acutely
to nine healthy male adults using two different formulations in a randomised order.
In one arm they ingested two 60 g NG gels and in the other 117 ml of concentrated BR instead. Samples of venous blood were collected and BP was measured prior to ingestion of the supplements and at frequent intervals for 6 hours after ingestion. Blood samples were centrifuged and, following separation of the plasma, [RXNO] was measured using gas-phase chemiluminescence and [NO−3] (peak D ± 308 ± 159 nM, p < 0.001; n = 183). [NO−2] peaked earlier following ingestion of NG (90 min) as compared to BR (210 min), and RXNO increased to a greater extent following BR. The underlying mechanism(s) for these pharmacokinetic differences are unclear, but must relate to the composition of the supplements likely affecting the reduction of NO−3 to NO−2 in the oral cavity and/or the gastrointestinal tract.

Soccer players experience eccentric exercise-induced muscle damage. An improved
muscle functional recovery from eccentric exercise has been shown with protein
feeding. Since fish oil derived n-3 polyunsaturated fatty acids (n-3PUFA) exhibit
anti-inflammatory properties, combining fish oil with protein may facilitate recovery.
PURPOSE: To assess the influence of 6 wk supplementation with a juice-based
antioxidant-rich drink containing a combination of n-3PUFA, whey protein and
vitamin D on muscle function and soreness, inflammation and soccer performance
during exercise recovery. METHODS: Soccer players (n = 49) were randomised to
either of three conditions. Drink-A contained n-3PUFA (550 mg DHA, 550 mg EPA),
protein (15 g) and vitamin D (3 µg). Drink-B contained whey protein (15 g)
and vitamin D (3.9 µg). Drink-C was an isocaloric CHO control. Eccentric exercise
consisted of 12 sets unilateral knee extension/ flexion contractions on both legs
separately. Statistical analyses included conventional p-value and magnitude-based
inferential approaches. RESULTS: Eccentric exercise impaired maximal force and
increased muscle soreness (p < 0.05). Post supplementation, blood %3PUFA total
PUSA was greater in Drink-A (36 ± 6) vs. Drink-B (24 ± 3, p < 0.05) or Drink-C (23 ±
2, p > 0.05). Maximum force loss during recovery tended to be less in Drink-A
(19 ± 22%) vs. Drink-C (30 ± 19%). Muscle soreness (dominant leg), expressed as
AUC during 72 h recovery, tended to be less in Drink-A (79 ± 549 mmHg × 72 h)
vs. Drink-B (1403 ± 779 mmHg × 72 h, p = 0.08) and Drink-C (1298 ± 621 mmHg × 72 h
p < 0.10). The blood concentration of c-reactive protein tended to be lower in Drink-A
(42 ± 11 mg·L⁻¹) vs. Drink-C (AUC: 83 ± 42 mg·L⁻¹, p < 0.05). Drink-A elicited a very likely (97-98%) beneficial effect on agility t-test
performance vs. Drink-B and Drink-C. CONCLUSION: A juice-based antioxidant-rich
drink, containing n-3PUFA, whey protein and vitamin D, appears to mediate a reduced
feeling of muscle soreness after eccentric exercise and translates into improved muscle
function and soccer-specific performance during acute recovery. Hence, the benefit of
protein ingestion on muscle recovery may be enhanced by the addition of n-3PUFA
and natural antioxidants in competitive soccer players.
Funded by Smartfish Ltd.
post hoc testing showing a 2.49% and 2.48% decrease in RER for 600 and 900 mg/d NZBC, respectively. NZBC had no effect on oxygen consumption (0: 65.9±3.9; 300: 64.6±4.3; 600: 64.8±3.7; 900: 64.4±3.5 %VO2max), heart rate (0: 135±13; 300: 135±14; 600: 135±12; 900: 138±16 beats/min) or cycling economy (0: 11.4±2.1; 300: 11.5±2.0; 600: 11.5±2.0; 900: 11.5±2.1 mL·kg⁻¹·W⁻¹). CONCLUSION: New Zealand blackcurrant extract for 7-days demonstrated a dose-response effect on the respiratory exchange ratio during cycling at ~65% VO2max in endurance-trained athletes with the change suggesting enhanced fat oxidation. Further research is needed to establish whether there is a dose effect of New Zealand blackcurrant on endurance performance. CurrNZ was provided by Health Currency Ltd (UK), Blackcurrants New Zealand Inc (NZ) provided funding for conference attendance.

**PURPOSE**: This study was to examine the effect of four weeks of sweet cassava polysaccharides (SCP) supplementation on oxidative stress and antioxidant enzymes after exhaustive running.

**METHODS**: Sprague-Dawley (SD) rats (n=32, five weeks old, body weight: 180–200 g) were randomly divided into four groups, control (Con), exercise (Ex), two groups with exercise training and SCP supplementation. The dosages in the two SCP supplementation groups were 0.5 g / kg body weight SCP (ExSCP 0.5) and 1.0 g / kg body weight SCP (ExSCP 1.0), respectively. The experimental period was four weeks. For the training part, there were consecutive six days for running training and one-day rest in their cage after a 6-day training. The running speed and duration from the 1st to 4th week were 10-15 m/min for 10min/each time, 15-20 m/min for 20min/each time, 25 m/min for 30min/each time and 25 m/min for 40min/each time, respectively. Concerning SCP supplementation part, the dosage on the basis of rat’s body weight was administrated in the morning and afternoon. The SCP amount at each time point was the half of the dosage (0.25 and 0.5 g / kg body weight for ExSCP 0.5 and ExSCP 1.0 groups, respectively). The blood samples after the completion of exhaustive running (Ex, ExSCP 0.5 and ExSCP 1.0) were collected for thiobarbituric acid reactive substances (TBARS) and super oxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT).

**RESULTS**: Compared with the Con, the three groups showed a significant higher TBARS levels (Ex: 120.8±23.0 uM, ExSCP 0.5: 80.5±16.3 uM, ExSCP 1.0: 75.4±9.7 uM) after exhaustive running (p < 0.05). However, the TBARS levels in the two groups with SCP supplementation were significantly lower than those in the Ex group (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05). With respect to antioxidant enzymes after running, the three antioxidant enzymes were lower in the three running groups (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05) . With respect to antioxidant enzymes after running, the three antioxidant enzymes were lower in the three running groups (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05). With respect to antioxidant enzymes after running, the three antioxidant enzymes were lower in the three running groups (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05). With respect to antioxidant enzymes after running, the three antioxidant enzymes were lower in the three running groups (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05). With respect to antioxidant enzymes after running, the three antioxidant enzymes were lower in the three running groups (ExSCP 0.5: -32%, ExSCP 1.0: -38%, p < 0.05).

**CONCLUSIONS**: SCP supplementation can attenuate an increase in oxidative stress and antioxidant enzymes after exhaustive running.

**PURPOSE**: This study investigated the effects of ecoacupuncture and/or herbal supplementation on skeletal muscle mass and function during 21 days of hindlimb suspension-induced muscle atrophy in rats. METHODS: Thirty female Sprague-Dawley rats were randomly divided into 4 groups: 1) Control (CON), 2) Hindlimb Suspension (HS), 3) H + Herbal supplementation (HH), 4) H + ecoacupuncture (HA), and 5) H + Combination of two treatments (HC) (n=6 each). Huang Qi was orally gavage once a day for 21 days (1 ml mixed with water based on concentration of 368 mg/kg). Ecoacupuncture treatment (2-15 Hz, 2-4 Voltage for 15 mins) was applied 3 times/wk for 21 days. Western blot was used to measure Akt and mTOR. Data was analyzed using one-way ANOVA with LSD post hoc test. RESULTS: Following 21-day hindlimb suspension the gastrocnemius showed significant atrophy in H compared to CON (614.3±27.7 vs. 799.83±19.9 mg; p<0.05). Muscle mass of HA and HC were significantly higher than H (743.00±40.18 and 726.0±23.6 mg; p<0.05). In addition, the protein concentration of Akt and mTOR were similar across treatment groups. CONCLUSION: This study suggests that ecoacupuncture treatment, but not Huang Qi supplementation, may attenuate hindlimb suspension-induced muscle atrophy in rats. However, the protein signaling mechanism responsible for this remains unclear. Thus, ecoacupuncture may be a viable clinical treatment to prevent and/or slow muscle atrophy in certain populations.

**PURPOSE**: Physical inactivity results in atrophy and capillary regression of skeletal muscle. Oxidative stress processes are one of the main background mechanisms present in capillary regression. We found that propolis is natural polyphenol-rich substance that could attenuate capillary regression in atrophied skeletal muscle. The present study was to investigate molecular mechanisms of the preventive effects of propolis on capillary regression.

**METHODS**: Wister rats were assigned randomly either to a control, control with propolis supplementation, hindlimb unloaded (HU) or HU with propolis supplementation group. Propolis was administered orally by a feeding tube twice a day (1,000 mg/kg) for 2 weeks to the rats in the control with propolis supplementation and HU with propolis supplementation groups. The morphological changes of three-dimensional capillary network in soleus muscle were observed using a confocal laser scanning technique. The pro-(VEGF, Flk-1, Flt-1, HIF-1α) and anti-angiogenic (thrombospondin-1) factors, oxidative stress maker, and TUNEL-positive endothelial cells were also determined.

**RESULTS**: Propolis supplementation attenuated the reduction of capillary volume and diameter in atrophied muscle. In addition, the expression levels of thrombospondin-1...
and SOD-1 attenuated in skeletal muscle receiving propolis although these increased in HU group. Furthermore, TUNEL-positive endothelial cells in muscle capillary were also decreased in the propolis group.

CONCLUSIONS: These data suggest that propolis may be effective as a therapeutic strategy for capillary regression of atrophied muscle and prevents capillary regression via inhibiting thrombospondin-1. Supported by Yamada Research Grant.

Dehydroepiandrosterone (DHEA) is converted to testosterone by 3β-hydroxysteroid dehydrogenase (HSD) and 17β-HSD, is converted to 5α-dehydrotestosterone (DHT) by 5α-reductase in peripheral tissues including skeletal muscle. Recent studies showed resistance training- or DHEA administration-induced increase in muscular DHT level were associated with muscle strength and/or muscle mass. However, it is still unclear whether muscular sex steroid hormone can directly contribute to the resistance training-induced muscle hypertrophy.

PURPOSE: The purpose of this study was to investigate whether muscular sex steroid hormone could directly contribute to resistance training-induced skeletal muscle hypertrophy in obese type 2 diabetic rats.

METHODS: Male 20-week-old obese type 2 diabetic rats (OLETF) were randomly divided into 3 groups; sedentary control, resistance training (3 times a week on alternate days for 8 weeks) or resistance training with continuous infusion of 5α-reductase inhibitor groups (n=8 each group).

RESULTS: Resistance training in OLETF significantly increased muscle mass compared with the sedentary control group (p<0.01), whereas the training-induced increase in muscle mass was suppressed by administration of the 5α-reductase inhibitor (p<0.01). Furthermore, resistance training significantly elevated muscular DHEA, testosterone and DHT concentrations (p<0.01) with a concomitant increase in protein expression of androgenic enzymes such as 3β-HSD, 17β-HSD and 5α-reductase (p<0.05). However, training-induced increases in muscular DHT level and 5α-reductase protein expression were significantly suppressed by administration of 5α-reductase inhibitor (p<0.01). Additionally, muscular DHT level was significantly correlated with skeletal muscle mass (r=0.701, p<0.01).

CONCLUSIONS: These results suggest that muscular sex steroid hormone contributes to resistance training-induced muscle hypertrophy in obese type 2 diabetic rats. Supported by Grants-in-Aid for Scientific Research (#26282199, M. Iemitsu)

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Abstracts were prepared by the authors and printed as submitted.

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SATURDAY, JUNE 4, 2016
CONCLUSIONS: The injection of hydrogen peroxide increased significantly the phosphorylation of p70S6K (Thr389) and rpS6 (Ser235/Ser236) at 3 h after the exercise in the both hydrogen peroxide and placebo injected groups. However, there was no difference in the level of either p70S6K (Thr389) or rpS6 (Ser235/Ser236) phosphorylation between groups.

CONCLUSIONS: These results suggest that ROS is one of the activator of mTORC1 signaling in the skeletal muscle, but the exogenous increase in ROS does not further stimulate exercise-induced mTORC1 activation.

RESULTS: The main findings revealed that (a) group A significantly reduced social problems (9.38 vs. 5.31, F=33.30, p<0.01), attention problems (13.44 vs. 9.69, F=41.67, p<0.01), and aggressive behaviors (14.31 vs. 9.69, F=18.75, p<0.01) after the intervention; (b) significantly fewer social problems (6.94 vs. 5.00, t=5.23, p<0.01), attention problems (11.50 vs. 9.56, t=3.42, p<0.01), and aggressive behaviors (7.50 vs. 5.50, t=2.34, p<0.05) were also observed for group B. Changes in dependent variables were examined in relation to treatment, using a two-way ANOVA (group x time) with repeated measured on time (T1 versus T2). Paired t tests were used to examine the treatment effect in group B (T2 versus T3) and potential sustained treatment effect in group A (T2 versus T3). RESULTS: After 12 weeks of intervention (T2), and a third time after another 12 weeks (T3). Changes in dependent variables were examined in relation to treatment, using a two-way ANOVA (group x time) with repeated measured on time (T1 versus T2). Paired t tests were used to examine the treatment effect in group B (T2 versus T3) and potential sustained treatment effect in group A (T2 versus T3).

CONCLUSION: A structured physical exercise training may have clinical relevance in the functional adaption of children with ADHD.

Supported by Taiwan MOST grant 103-2410-H-017-026-MY3.
and strength and agility (69.87 vs. 61.73, F=9.15, p<0.01) as compared with the group B subsequent to the phase I (b) improvements were also observed for group B subsequent to the phase II in total motor composite (56.00 vs. 62.13, t=5.31, p<0.01), fine motor control (49.47 vs. 55.53, t=2.63, p<0.05), and strength and agility (61.73 vs. 68.60, t=5.08, p<0.01), and (c) group A merely maintained the improvements they attained through the intervention during phase I. CONCLUSION: Improvements in motor skill competency could be a critical variable in facilitating participation in sports for children with disabilities.

Supported by Taiwan MOST grant 103-2410-H-017-026-MY3.

3546 Board #3 June 4, 9:00 AM - 11:00 AM Hypothetor Effects on the Autonomic Cardiac Control in Children with Neurological Disorders

Ramona Cabiddu¹, Audrey Borghi Silva¹, Renata Trimer¹, Renata G. Mendes¹, Clara I. Monteiro¹, Marcela C. M. Maniglia¹, Ana M. S. Pereira¹, Gustavo R. das Chagas², Eliane M. Carvalho².¹Universidade Federal de São Carlos, São Carlos, Brazil. ²Universidade Federal de Uberlândia, Uberlândia, Brazil. (No relationships reported)

Hippotherapy (HT) is an exercise therapy that utilizes a horse in an interdisciplinary approach for the rehabilitation of people with physical and/or psychological disabilities. HT therapeutic value is well accepted, especially when applied during critical periods of development in children with neurological conditions known to prevent the acquisition of normal motor skills. Beside positively affecting neuromuscular control, physical therapy can influence the cardiac-autonomic regulation, which is often compromised in these patients. However, to our knowledge, the effects of HT on the cardiac autonomic control in these patients are unknown.

PURPOSE: To study the effects of a HT session on autonomic cardiac control in children with neurological disorders.

METHODS: Two children (mean±SD = 7.8±2.6 ys) with physical disabilities attributable to neurological disorders, participating in the HT program offered by Instituto Marcos Sahium, Uberlândia, MG, Brazil, underwent a 15-minute HT session. The autonomic function was unobtrusively evaluated by analysis of the heart rate variability (HRV) signal, which was recorded continuously during pre-session rest and during the session itself. For each phase, the mean RR interval and the sample entropy (SE), an index able to characterize a phenomenon complexity, were derived. The t-test was applied to examine differences between the parameters calculated during each condition.

RESULTS: No significant changes were observed for the RR interval mean values calculated during each condition. A significant SE increase (p<0.05) was observed during the HT session (SE=0.56±0.10) when compared with pre-therapy rest (SE=0.40±0.14).

CONCLUSIONS: We observed a significant SE increase during HT, indicative of an HRV complexity increase with respect to baseline values. This increase might be suggestive of a vagal activation and might help explain the qualitative positive effects that patients often report during and after HT. Our patients’ regulation mechanism positively responded to perturbation induced by HT. We conclude that HT might benefit children with disabilities attributable to neurological disorders by eliciting an acute autonomic response during the therapy. The present study was supported by CAPES project n. 88881.062123/2014-01.

3547 Board #4 June 4, 9:00 AM - 11:00 AM Effects of School-based Physical Activity Program on Health In Children with Disabilities

Jooyeon Jin¹, Joonkoo Yun², Stamatis Agiovlasitis, FACSM³.¹University of Wisconsin-La Crosse, La Crosse, WI. ²Oregon State University, Corvallis, OR. ³Mississippi State University, Mississippi State, MS. (Sponsor: Stamatis Agiovlasitis, FACSM) Email: jooyeon.jin13@gmail.com (No relationships reported)

Comprehensive school-based physical activity (PA) program (e.g., recess and physical education) may promote children’s health (Erwin et al., 2014). However, there is a lack of evidence explaining how such program affects health in children with disabilities.

PURPOSE: To explore associations of enjoyment in school-based PA program and the mediation model. METHODS: A total of 241 children with disabilities (age 5-15 years; (b) need special equipment; (c) receive special education). All variables, including 129 boys and 112 girls) were used from the 2012 National Youth Fitness Survey based on the mediation model along with age as a covariate, the interaction effect (PA × gender) on general health was significant (b = .43; p<.01), providing evidence that the mediation effect was moderated by gender (i.e., moderated mediation relationship). CONCLUSION: A comprehensive school-based PA program may promote health in children with disabilities.

3548 Board #5 June 4, 9:00 AM - 11:00 AM Outcomes of a 17 Week Running Program For Youth With Physical Disabilities

Jilda N. Vargus-Adams, Jennifer Schmit, Kathryn Lucas. Cincinnati Children’s Hospital Medical Center, Cincinnati, OH. (Sponsor: Greg Myer PhD, FACSM) (No relationships reported)

PURPOSE: To describe the outcomes of a 17 week running program offered to youth with physical disabilities.

METHODS: 4 youth (age 9-21 years, all male, 2 with cerebral palsy, 1 with a genetic disorder, and 1 with developmental disability) were recruited to participate in a 17 week “Be Well” running program which consisted of thrice weekly group training sessions focused on endurance and speed and culminating in the completion of a 5 kilometer road race. Training included warm-up exercises and runs in a social setting with peer and adult mentors. Duration of running intervals and overall length of run/ walk outings increased gradually over the training period. Evaluations were completed before and after the training program including the 6 Minute Walk Test (6MWT) and Timed Up and Go (TUG).

RESULTS: 6MWT distances increased from 1309.75 feet (SD 307) to 1579.5 feet (SD 329) with mean change of 269.75 feet (SD 446). TUG times decreased from 7.46 seconds (SD 1.14) to 7.34 seconds (SD 3.45) with mean change of -0.12 seconds (SD 4.0). 3 of 4 participants demonstrated improved 6MWT distances that exceeded 450 feet, well above the reported minimal clinically important difference (MCID) of approximately 100 feet. These participants also had TUG times that surpassed the MCID of 0.7 seconds improvement. The remaining participant had a 1.5 second reduction in performance on both measures. All participants successfully completed a 5 kilometer race in a mean of 50:38 (SD 12:14) and all reported satisfaction with the training program.

CONCLUSION: Youth with physical disabilities may experience significant improvement in speed and endurance associated with participation in a running training program. One participant in this program had worse performance on measures afterwards which was possibly related to fatigue from the 5k, but this did not diminish his enthusiasm for the program. Recreation running is feasible and potentially therapeutic for youth with physical disabilities.

3549 Board #6 June 4, 9:00 AM - 11:00 AM Validity Of The Actiheart Monitor For Predicting Physical Activity Energy Expenditure In Lower-limb Amputees.

Peter Ladlow¹, Tom Nightingale¹, M. Polly McGuigan¹, Alexander N. Bennett¹, Russ Coppack², James Bilzon³.¹University of Bath, Bath, United Kingdom. ²Defence Medical Rehabilitation Centre, Epsom, United Kingdom. Email: p.ladlow@bath.ac.uk (No relationships reported)

Human physical activity energy expenditure (PAEE) is inherently difficult to measure in free-living conditions, particularly in populations where movements and movement patterns are atypical, such as prosthetic users following lower-limb loss.

PURPOSE: To assess the validity of using a multi-sensor device, which combines accelerometer and heart rate, to predict PAEE in functional amputees.

METHODS: Ten unilateral (UNI) (31 ± 6 years), nine bilateral (BI) (29 ± 4 years) amputees, and eight non-injured healthy controls (CON) (31 ± 6 years) completed nine activities; resting in a prone position, standing, walking flat (1, 1.5, 2, 2.5, 3 mph) and on a gradient (3 and 5% gradient at 2mph) on a treadmill. An Actiheart™ device was worn on the chest. The relationships between predicted and criterion PAEE (measured using indirect calorimetry) were assessed. Bias and 95% limits of agreement (LoA) were calculated within each group. RESULTS: Predicted PAEE from the Actiheart™ device was significantly (p<0.001) associated with the criterion measure of PAEE in each group. Within the UNI and CON groups there were negligible differences in the strength of relationships and associated error (r ~ .77, SEE = 1.32 kcal·min⁻¹), with strongest relationship reported in the BI group (r ~ .84, SEE = 1.50 kcal·min⁻¹). The BI group reported the widest LoA (0.28 ± 3.98 kcal·min⁻¹) followed by the UNI group.

Abstracts were prepared by the authors and printed as submitted.
Forced exercise training - whether it is conducted active or passive assistive - improves Parkinsonism symptoms such as rigor, dyskinesia, tremor and gait disturbances directly after exercising. The long-term effects, especially for complex movements like walking, are unknown. Furthermore, brain imaging data of healthy adults indicate that active assistive exercise leads to a more prominent brain activation than passive assistive exercise. A comparison of active and passive assistive forced exercise training has not been done. Purpose: To compare active and passive assistive exercise training and to determine its long-term adaptations.

Methods: 24 patients participated in either a passive or an active assistive forced exercise training for 12 weeks. The patients were bilaterally affected by Parkinson’s disease and had a disease classification between ≥ 2.5 ≤ 4.0 on the modified Hoehn & Yahr stage scale. Gait patterns were analyzed before the beginning of the intervention, upon completion of the intervention, and twelve weeks after completion of the intervention.

Results: Both exercise methods led to an accelerated gait velocity (0.5 km/h) and elongated single stride length (6 cm) significantly after the intervention. Furthermore, swing phase (2%) and monopodal stance phase (2%) were significantly increased. Long-term effects were only shown for active assistive forced exercise, because gait velocity was still increased (0.35 km/h) 12 weeks after the intervention in comparison to preexercise levels.

Conclusion: Active assistive forced exercise should be the preferred method for future treatment for patients affected by Parkinson’s disease to improve Parkinson's symptoms long-term.

### Table 1: Results

<table>
<thead>
<tr>
<th></th>
<th>Males (n=103)</th>
<th>Females (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Activity Level (%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HPA</td>
<td>67%</td>
<td>75%</td>
</tr>
<tr>
<td>MPA</td>
<td>22.9%</td>
<td>20.5%</td>
</tr>
<tr>
<td>LPA</td>
<td>10.1%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Meeting MS Guidelines (%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yes</td>
<td>42.2%</td>
<td>34.1%</td>
</tr>
<tr>
<td>No</td>
<td>57.8%</td>
<td>65.9%</td>
</tr>
<tr>
<td>Diagnosed Diseases (%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CVD</td>
<td>5.5%</td>
<td>9.1%</td>
</tr>
<tr>
<td>DM</td>
<td>9.3%</td>
<td>11.6%</td>
</tr>
<tr>
<td>HTN</td>
<td>27.1%</td>
<td>29.5%</td>
</tr>
<tr>
<td>Depression</td>
<td>55.8%</td>
<td>62.8%</td>
</tr>
</tbody>
</table>

G-26 Free Communication/Slide - Emerging Concepts on the Assessment and Treatment of Athletes

**Chair:** Kyle Goerl, Via Christi Hospitals Wichita, Inc., Wichita, KS.

(No relationships reported)

### Single leg hop tests

Single leg hop tests are commonly used in return-to-play decisions after anterior cruciate ligament reconstruction (ACLR). Few studies have examined if trunk or hip strength correlates with improved of hop test performance in these patients.

**Purpose:** To determine the relationship of hip and trunk strength to hop test performance after ACLR.

**Methods:** Participants 6-18 months status post ACLR with no history of other knee injuries completed a series of single leg hop tests consisting of the single leg hop (SLH), 6 meter timed hop (TH), triple hop (TR), and crossover hop (CH). Isometric strength testing with a hand-held dynamometer included hip abduction (HA), hip external rotation (HER), and hip extension (HE). Trunk strength was assessed with the plank (PL) and side plank (SP) tests. Pearson correlations were used to test the relationships of these strength tests to hop test performance.

**Results:** 9 males and 11 females of mean age 22.8 years (SD 8.0) and a mean of 8.2 months post-op (SD 2.0) were tested. Subjects’ mean hip strength were 10.4N (SD 3.4) HER, 29.4N (SD 5.8) HAB, and 19.9N (SD 7.2) HE. Mean times were 101.8s (SD 3.1) for PL and 53.6s (SD 14.5) for SP. Mean hop test performances were 132.1 cm (SD 36.7) SLH, 3.3 s (SD 2.0) TH, 378.9cm (SD 105.4) TR, and 330.7cm (SD 106.6) CH. HER, HAB, and HE significantly correlated to all hop tests (Table 1). Neither the PL nor SP were correlated to performance on any of the hop tests.

**Conclusion:** Hip strength has strong correlations to performance on single leg hop tests in patients post-ACLR. Trunk strength had little benefit to improving hop test performance. Rehabilitation focusing on strengthening the hip may improve hop performance and aid return-to-play following an ACLR.
Table 1: Pearson correlations of strength tests to hop test performance

<table>
<thead>
<tr>
<th></th>
<th>Single Leg</th>
<th>Geter Tired Hop</th>
<th>Tripie Hop</th>
<th>Crossover Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Abduction</td>
<td>0.71**</td>
<td>-0.01</td>
<td>0.71**</td>
<td>0.70**</td>
</tr>
<tr>
<td>Hip External Rotation</td>
<td>0.75**</td>
<td>-0.57**</td>
<td>0.71**</td>
<td>0.76**</td>
</tr>
<tr>
<td>Knee Extension</td>
<td>0.55**</td>
<td>-0.42</td>
<td>0.51**</td>
<td>0.46**</td>
</tr>
<tr>
<td>Plant</td>
<td>0.22</td>
<td>-0.20</td>
<td>0.22</td>
<td>0.19</td>
</tr>
<tr>
<td>SidePlant</td>
<td>0.39</td>
<td>-0.12</td>
<td>0.23</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Biomechanical studies suggest performance on a drop vertical jump (DVJ) can predict anterior cruciate ligament (ACL) injury and should be targeted during rehabilitation after ACL reconstruction. A clinically feasible tool would be advantageous for quantitatively evaluating performance and change in DVJ following therapy. Such a tool should be developed by a panel of experts to establish consensus on the usefulness of the tool, and to verify that essential components are included. PURPOSE: The purpose of the present study was to establish consensus on the content and scoring of a Clinician Rated DVJ Scale for use during rehabilitation after ACL reconstruction. METHODS: Using a Delphi process, 20 experts on the risk factors, prevention, treatment and/or biomechanics of ACL injury, anonymously critiqued the proposed Clinician Rated DVJ Scale, using Likert-scales and written feedback. Three-to-five rounds were planned a priori as termination criteria, with the requirement of 75% agreement on items after the final round.

RESULTS: Nine researchers and eleven clinicians including physical therapists, athletic therapists and orthopaedic surgeons participated. Response rates were 55%, 85% and 70% for rounds two, three and four, respectively. After rounds one and two, the scale was revised to include only the components that ≥ 61% of experts agreed upon. After round three, only two components had ≤ 75% agreement, and these were refined for round four. After round four, ≥ 92% agreement was achieved. Final items on the scale include a rating of knee valgus collapse (No to Extreme), and other undesirable movements including evidence of lateral trunk lean, insufficient trunk flexion, insufficient knee flexion and limb-to-limb asymmetry. A score from 0 (No knee valgus collapse and no undesirable movements) to 9 (Extreme knee valgus collapse ± undesirable movements) is included for each leg to monitor change throughout rehabilitation.

CONCLUSIONS: The Delphi process resulted in adequate agreement on the content and scoring of the Clinician Rated DVJ Scale to support its preliminary use as a measurement tool for functional testing throughout rehabilitation following ACL injury and/or reconstruction. A Beta version of the scale will be subsequently piloted.
and increase in errors following exercise without a diagnosed concussion. Further investigation is warranted to determine if K-D performance naturally fluctuates with exercise in larger samples. Supported by FSU’s Institute of Sports Sciences and Medicine.

3559  
June 4, 10:30 AM - 10:45 AM  
The Incidence of Osteochondritis Dissecans in Adolescents Complaining of Chronic Anterior Knee Pain  
James MacKenzie1, Michael Shradler1, Carla Boan1, Jeffrey Vaughn1  
1University of Arizona Medical School, Phoenix, AZ. 2University of Mississippi Medical Center, Jackson, MS. 3Phoenix Children’s Hospital, Phoenix, AZ.  

(No relationships reported)
Monitoring the effects of maximum strength training programs conducted at various times in the periodized training cycle has been well documented in adult athletes, however, research on adolescent athletes is scarce.

**PURPOSE:** The purpose of this study was to examine the effects of strength training at different periods in the annual training cycle on body composition, muscle morphology and neuromuscular performance in adolescent athletes.

**METHODS:** Fourteen young male athletes (age 16.5 ± 1.1 y, height 171 ± 6.3 cm, body mass 65.0 ± 11.2 kg) performed a battery of tests before and after two specific strength training blocks; in-season and preparatory period. Tests included a DEXA whole-body scan, ultrasound of the vastus lateralis (VL), countermovement jump (CMJ), drop jump (DJ), isometric mid-thigh pull (IMTP), 20 m sprint and 3RM back squat. Meaningful differences following each training period were assessed using a magnitude-based inferences approach (effect sizes [ES]) with qualitative descriptors of change also calculated.

**RESULTS:** Body composition showed trivial changes throughout both study periods. VL muscle thickness increased during the preparatory period (7.5% ± 3.3%). The CMJ variables showed no positive effects during the in-season period; however increases were seen in several of these variables during the preparatory period (e.g., jump height = 4.9% ± 3.1%; peak concentric power 5.3% ± 5.9%). Most DJ variables decreased during both training periods whilst IMTP measures showed improvements during the in-season period but remained stable during the preparatory period. Most 20 m sprint variables showed positive effects (e.g., 5 m split = 5.0% ± 4.7%) following the in-season period but no clear changes during the preparatory period. 3RM back squat showed a small increase following in-season training (7.5% ± 4.5%) and an even greater increase during the preparatory period (16.9% ± 5.2%).

**CONCLUSION:** This study showed that in adolescent athletes a specific preparatory period strength program will likely result in greater improvements in dynamic lower body strength/power measures compared to one conducted in-season. In-season strength training may however have a more beneficial impact on sport specific physical performance variables such as sprint speed.
Thirty-six adolescents volunteered to participate in the study (15 females and 21 males, 13.3±0.8 years of age, BMI = 21.2±4.8kg/m²). Body fat (BF) and FFM were calculated by anthropometric-derived equation. Maturation status was assessed following Mirwald method and then individuals were classified as prepubertal or postpubertal according to years from peak height velocity. Hydration of FFM was determined as TBW/FFM. General linear model was carried out to analyze the main effects (TBW, TBW/FFM and body hydration (%TBW)) and interactions with sex and maturation change (from M1 to M3). RESULTS: All variables increased from M1 to M3 except for BF (23.6±11.4% and 20.6±7.6%, p<0.05). TBW increased from 31.3±7.4kg in M1 to 35.9±0.9kg in M2 and 38.2±8.6 kg in M3 for the overall group (p<0.001). For boys, TBW increased from 33.7±8.0kg to 42.0±9.2kg (p<0.001) and from 28.0±8.8 to 33.0±3.6 kg for girls (p<0.001). TBW/FFM decreased from M1 to M2 (-1.42, 0.93SE, p<0.05), and increased in M3 respect to M2 (2.46, 0.76SE, p<0.08). The repeated measures analysis revealed a significant TBW x sex interaction for the M2-M1 change (p<0.05) and TBW x maturation for the M3-M2 change (p=0.018). Different results were found for TBW/FFM, where interaction was only present within subjects (p=0.004). No significant interaction for the other variables. CONCLUSION: In accordance with other studies, TBW/FFM decreases with age in overall sample. Nevertheless, in our study TBW/FFM increased from M2 of age at 15 to M3 at age of 17 for both gender groups being the values higher for girls than for boys. These results could have important implications for body composition estimations.

Body mass index (BMI) is commonly used to categorize individuals’ health and obesity status; although it is often criticized for misclassifying individuals when considering percent body fat (%fat). Misclassification of obesity status could result in lack of risk reduction behaviors that are important to prevent chronic disease. PURPOSE: To examine sensitivity and specificity of BMI and students’ perceptions of weight in determining obesity status based on %fat. METHODS: Ninety traditional-aged (18-25 yr) college students were asked to describe their weight status as slightly overweight (UW), about the right weight (ARW), slightly overweight (SOW), or very overweight (VOW). Height (cm), weight (kg), and body composition (%fat, iDXA, Lunar) were measured. The subjects were divided into categories by the measured BMI categories and then by how they identified their weight status. Sensitivity and specificity rates were calculated for BMI and students’ perceptions based on %fat. A %fat >22% in men and >32% in women was defined as overweight. RESULTS: Students that were classified as UW based on BMI or perception were not included in the analysis. In men, BMI classified 26 subjects as healthy-weight (HW) and 18 subjects as overweight or obese (OWOB). The sensitivity of BMI on obesity status was 64% and the specificity was 82%. Eighty men were under-classified as HW and 4 men were over-classified as OWOB. In women, BMI classified 27 subjects as HW and 16 subjects as OWOB. The sensitivity of BMI on obesity status was 58% and the specificity was 95%. Nine women were under-classified as HW and 1 was over-classified as OWOB. Twenty men identified themselves as ARW and 19 men identified as SOW or VOW. The sensitivity for their perception of their obesity status was 52% and the specificity was 90%.

The High-intensity circuit training (HICT) using body weight as resistance could help decrease body fat, improve aerobic capacity, and muscular fitness in previous study. However, the effects of HICT on metabolic syndromes in middle aged male was still unknown. PURPOSE: To investigate the effects of HICT on body composition, aerobic fitness and metabolic syndrome markers in middle aged male over 12 weeks. METHODS: Twenty three overweight middle aged male participants were randomly assigned to HICT group (age: 45.7±4.0 yrs, height: 172.1±5.1 cm, weight: 76.6±10.2 kg, N = 13) or control group (age: 47.8±4.8 yrs, height: 173.5±4.8 cm, weight: 76.6±8.5 kg, N = 10). Pre and post intervention, participants were measured by body fat and muscle mass from InBody, fitness level of the 3-Minute Step Test and metabolic syndrome markers (waist circumference, rest blood pressure, fast blood sugar, total cholesterol, HDL, LDL and triglyceride). HICT group performed HICT (maximal effort to complete 12 exercises for 30 seconds with 15 seconds rest between exercises) 6 times a week for 12 weeks. Control group were asked to keep their daily activity. Using the ANCOVA to compare variables between groups. The significant level was set as α = .05. RESULTS: After 72 times HICT over 12 weeks, HICT group significant improved all variables (p < .05) besides muscle mass, total cholesterol, and triglyceride. Compare to control group, HICT group only improved body fat% (25.1±5.1% vs. 23.2±4.1%), fat mass (19.5±5.7 kg vs. 17.5±4.4 kg) and fitness level (63.9±14.1 vs. 72.4±16.9) however there was no difference in other variables between groups. CONCLUSIONS: Around 60 minutes one week HICT over 12 weeks could improve body composition and aerobic capacity but has limit effects on metabolic syndrome markers in overweight middle aged male.

FITNESSGRAM® has established criterion standards for aerobic capacity (AC) to assess cardiorespiratory function. Standards for body composition and body mass index (BMI) have also been established. Waist-to-Height ratio (WHRR) has been shown to be a strong indicator of aerobic fitness in youth. PURPOSE: The purpose of this study was to determine the association between WHRR and FITNESSGRAM® AC classification in sixth-grade children. METHODS: Subjects were 528 sixth-grade boys and girls, ages 11-13, who completed each of the FITNESSGRAM® test components as a part of their yearly physical education assessment. AC was determined from one-mile run/walk (1MRW) times, age, gender and BMI. In addition to height and weight, subjects were also measured for waist circumference. The percent of these students classified within the Healthy Fitness Zone (HFZ) were 46% for BMI, and 52% for AC. The percent of these students classified as High Risk were 43% for BMI, and 31% for AC. RESULTS: The correlation between WHRR and 1MRW was .41, and the correlation between BMI and 1MRW was .42. The correlation between WHRR and AC was .83, and the correlation between BMI and AC was .91. Receiver Operating Characteristic (ROC) analysis indicated that a WHRR of 0.45 represents the best cut-off score for classifying girls within the HFZ for AC, with 89% classified correctly, and AUC ~ 94. Also, a WHRR of 0.48 represents the best cut-off score for classifying boys within the HFZ for AC, with 93% classified correctly, and AUC ~ 96. For determining High Risk classification for AC, a WHRR of 0.51 represents the best cut-off score for classifying girls as High Risk for AC, with 91% classified correctly, and AUC ~ 98. Also, a WHRR
of 0.55 represents the best cut-off score for classifying boys as High Risk for AC, with 92% classified correctly, and AUC = .97.

CONCLUSIONS: As with BMI, WHR is strongly associated with classification according to FITNESSGRAM® AC standards in sixth-grade children. These data suggest that a WHR of .45 for girls and .48 for boys are the best criteria for the HFR classification for FITNESSGRAM® AC. Also, a WHR of .51 for girls and .55 for boys are the best criteria for High Risk classification for FITNESSGRAM® AC. Intervention strategies for reducing WHR are important since children in the High Risk category are most likely to develop health problems as adults.

3569 Board #8
June 4, 8:00 AM - 9:30 AM
Body Composition in Team Sports: Comparisons of Fat and Muscle Percentages in Female Players

(Please select and/or add your own abstract if provided.)

PURPOSE: To assess differences by sport in the percentages of fat mass and muscle mass in female athletes of five team sports. METHODS: Body composition was evaluated by anthropometry in 223 players of Basketball, Handball, Field Hockey, Rugby and Volleyball (Age = 22.7 ± 3.6 years, BMI = 22.7 ± 1.9 kglm²; mean ± SD). Anthropometry was performed following the protocol described by Ross and Marfell-Jones (1991). Body density was assessed using the simple regression equation proposed by Withers et al. (1987) based on the sum of triceps, subscapular, suprailiac and calf skinfold thicknesses; Siri formula (1961) was applied to calculate the percentage of fat mass (%FM). The percentage of muscle mass (%MM) was estimated from the model of Lee et al. (2000) that includes main limb circumferences and skinfold thicknesses. Differences in %FM and %MM among the sports were tested through one-way ANOVAs. Post-hoc multiple comparisons were made using Tukey-Kramer tests. Linear associations of %FM and %MM with Age were also inspected by computing Pearson correlation coefficients. Statistical significance was determined at p < 0.05. RESULTS: ANOVA showed statistically significant differences among the sports for %FM and %MM values (respectively: F = 7.2, p < 0.001; F = 8.2, p < 0.001). In %FM, multiple comparisons among the means showed three homogeneous subsets: Field Hockey (19.3), Rugby (20.4) and Volleyball (21.0); Rugby (20.4), Volleyball (21.0) and Basketball (21.9); and Basketball (21.9) and Handball (23.6). In %MM, multiple comparisons among the means also showed three homogeneous subsets: Handball (34.2), Basketball (34.6) and Volleyball (35.1); Volleyball (35.1) and Field Hockey (36.4); and Field Hockey (36.4) and Rugby (37.5). Very low correlations were found between Age and %FM and between Age and %MM (respectively: r = -0.17, p = 0.01; r = 0.09, p = 0.05). CONCLUSIONS: The comparisons between sports that reached statistical significance evidenced differences over 2 points in %FM. Similar tendency was observed in %MM, except for the comparison between Field Hockey and Basketball. Age was poorly correlated to %FM and %MM.

3570 Board #9
June 4, 8:00 AM - 9:30 AM
Validity and Reliability of Estimates of Body Composition Using Circumferences Measured Photographically and Manually.
Elizabeth Z. MacDonald, Nicole Brown, Jami Hamblin, Pat Vehrs, FACSIM. Brigham Young University, Provo, UT. (Sponsor: Pat Vehrs, FACSIM)

Email: Elizabeth.zorah@gmail.com

(Please select and/or add your own abstract if provided.)

The LeanScreenTM app (LS) uses photographs to estimate circumferences of the human body and body composition using the Department of Defense (DOD) regression equations.

PURPOSE: This study evaluated the validity and reliability of body composition estimates in adult men and women using photographically and manually measured circumferences (CIRC) compared to DEXA as the criterion method.

METHODS: Height and weight was measured on 80 males and 63 females between 18 and 50 years of age. Circumferences of the neck, abdomen, waist, and hips, and front- and side-view photographs using the LeanScreenTM app (LS) were collected twice on each subject by two administrators. The DOD equations were used to estimate percent body fat (%BF) from CIRC and photographic measurements of circumferences using LS. Each administrator used LS to evaluate their own photographs of each subject on the same day and a day later and the photograph taken of the same subject by the other administrator. A DEXA scan was performed on each subject once. Estimates of %BF from LS and CIRC were compared to DEXA. Intrarater and interrater reliability were determined for the estimates of %BF from LS and CIRC.

RESULTS: A mixed model ANOVA indicated that the use of CIRC and the LS significantly (p = 0.001) underestimated DEXA %BF by an average of 3.9 %BF and 3.4 %BF, respectively. When the %BF determined from CIRC and LS were regressed against DEXA, both methods of estimating %BF had similar R2 values (0.86 and 0.84) and Root MSE values (3.3 and 3.6 %BF), respectively. Estimating %BF using CIRC and LS resulted in high intrarater (0.99) and interrater (0.99) reliability.

CONCLUSIONS: The results of this study show for the first time, that use of the LeanScreenTM app was highly reliable but underestimated DEXA %BF. The LeanScreenTM app is a portable, and cost and time effective method to assess %BF in adults.

3571 Board #10
June 4, 8:00 AM - 9:30 AM
Field Position Influence on Maladaptive Effect in Morphological And Body Composition

Luisa Malas1, Tomas Malys1, Frantisek Zahalka1, Lee Cabell1. Charles University, FFES, Prague, Czech Republic. 2Seton Hall University, New Jersey, NJ.

Email: tommalys@yahoo.com

(Please select and/or add your own abstract if provided.)

Soccer players are divided into six field positions, and players in side positions (fullbacks, wide midfielders) often demonstrate distinct kicking leg preference in actions such as crossing and long distance passing. These preferences can lead to strength and morphological asymmetries (MA) which can result in large changes in myodynamic characteristics of the muscles, particularly in the preferred (kicking) leg.

PURPOSE: To compare anthropometric parameters and body composition (BC), and to identify MAs in relation to field position (FP) in elite soccer players.

METHODS: The monitored players (n = 104, age 18.2 ± 0.6 yrs) of the highest Czech league (U19) were divided according to FP into: goalkeepers (GK), fullbacks (FB), central defenders (CD), wide midfielders (WM), central midfielders (CM), and attackers (AT), and were tested using Bioelectrical Impedance Analysis. The following parameters were measured: Body Height (BH), Body Mass (BM), Lean Body Mass (LBM), relative Lean Body Mass (LBMR), percentage of Fat Mass (FM), the ratio Extra to Body Cell Mass (ECM/BCM), as well as segmental proportion of muscle mass in upper extremities, trunk, lower extremities and percentage differences between the upper extremities (AUE) and lower extremities (ALE).

RESULTS: Multilevel analysis of variance revealed significant differences in means of the selected variables between the FPs (F<sub>2, 96</sub> = 2.06, λ = .26, p < .01, r<sub>.23</sub>). The criterion of “field position” had a significant effect on all screened variables apart from ECM/BCM, FM, LBMR, and AUE (p > .05). FBs and WMs are significantly smaller and lighter in comparison to other FPs (p < .01). We detected significant differences in ALE with respect to FPs (F<sub>5, 96</sub> = 6.53, p = .01, r<sub>.25</sub>). Significant differences were also found in FBs (3.54 ± 1.20 %) and WMs (3.58 ± 1.39 %) in comparison to CDs (2.19 ± 1.11 %), ATs (2.04 ± 1.62 %) and Gs (1.14 ± .96 %).

CONCLUSION: Research has shown differences between anthropometric indicators and body composition parameters in players on the basis of division according to their FPs. Maladaptive effects in terms of different segmental muscle mass proportion between the preferred and non-preferred leg may represent a potential risk of a player’s injury, especially for FBs and Gs. Supported by PRVOK P38.

3572 Board #11
June 4, 8:00 AM - 9:30 AM
Reliability and Validity of 3D Body Scanning for Anthropometric Profiling
Fabrizio Forchino1, Stuart DR Galloway2, Andrew Douglass3, Anthony Hazeldine1, Christopher Brandner3, Pierre C. Bourdon2.
1Aspetar – Qatar Orthopaedic and Sports Medicine Hospital, Doha, Qatar. 2University of Stirling, Stirling, United Kingdom. 3Aspire Academy, Doha, Qatar. 4The University of South Australia, Adelaide, Australia.

Email: Fabrizio.Forchino@aspetar.com

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Recently, 3D body scanning has emerged as a promising alternative to traditional anthropometry. However, various steps in the 3D data collection process and analysis can potentially introduce error.

PURPOSE: To assess the reliability and validity of the 3D body scanning (3D) technology for use in the assessment of anthropometric variables.

METHODS: Physical measurements (PM) were collected using both traditional ISAK protocols and 3D body scans on 30 highly trained young male athletes (age 15.8 ± 1.7 y, body mass 62.9 ± 15.1 kg, height 174.0 ± 7.9 cm). Digital data analyses of the 3D scans were carried out in duplicate by 3 trained technicians. Interclass correlation coefficients (ICC) and relative technical error of measurements (%TEM) were calculated to assess the reliability of the 3D analyses between technicians, and also between the 3D and PM data. Pearson correlation and a paired sample t test (p < 0.05) were also conducted.

Abstracts were prepared by the authors and printed as submitted.
PURPOSE: In recent years, there has been increasing attention focused on new factors strongly related to arteriosclerosis such as the ratio of high-density lipoprotein cholesterol (HDL-C) to low-density lipoprotein cholesterol (LDL-C), or the “L/H ratio,” and adiponectin. Therefore, this study compared the relationships between body fat percentage, visceral fat mass and subcutaneous fat mass with arteriosclerosis risk factors in obese and non-obese children.

METHODS: Subjects comprised 112 children (age: 7.5 - 12.6 years) who consented to participate in this study. They were divided into an obese group (68 children, age: 9.7±1.5 years) and a non-obese group (44 children, age: 9.6±1.4 years) with an obesity index score of 20% or higher the cutoff for determining obesity. The Bod Pod system (Life Measure, Inc., CA) was used to measure body density and body fat percentage was then calculated. MRI with a 0.27 magnet field strength was used to calculate visceral fat and subcutaneous fat cross-sectional areas in the horizontal plane between lumbar vertebrae 4 and 5. Venous blood collection was performed during fasting in the early morning. TC, LDL-C, HDL-C, triglycerides, blood glucose level, insulin, HOMA index and adiponectin were analyzed, and L/H ratio and the homocysteine model assessment (HOMA) index were calculated. Systolic and diastolic blood pressure was measured three times and the lowest values for each were used as data.

RESULTS: Comparison of the correlation coefficients of test items with body fat percentage, subcutaneous fat area/height and visceral fat area/height in obese children indicated that the correlation coefficient of visceral fat area/height for LDL-C, triglycerides, systolic blood pressure and adiponectin was significantly higher than for the other two indices. Comparison of the correlation coefficients with visceral fat area/height between the obese and non-obese groups indicated that the correlation coefficient was significantly higher for the obese group with regards to TC, LDL-C, insulin, HOMA index, systolic blood pressure and adiponectin.

CONCLUSIONS: Results demonstrated that obese children tend to exhibit subcutaneous fat obesity, visceral fat is more strongly related to arteriosclerosis risk factors than body fat percentage and subcutaneous fat.

RESISTANCE: 5.5% resistance setting produced the lowest PPO (1038.3 ± 82.3 Watts) and fatigue index (15.29 ± 3.66 W/S). The 7.5% resistance setting had the highest PPO (1413.10 ±125.64 Watts) and fatigue index (25.97 ± 5.27 W/S). At the 6.5% resistance setting, data were between the two other groups and different from the other groups.

CONCLUSION: In conclusion, excessive body weight individuals should perform the standard resistance of 7.5% on the Wingate test instead of lower resistances to obtain a true peak power output and fatigue index.
Complex training takes advantage of the phenomenon known as postactivation potentiation (PAP), which is an acute enhancement of jump performance following the heavy resistance exercise (HRE). Numerous of researchers have shown fatigue mask the PAP effect in the early stage of recovery and the PAP is an individualized phenomenon. Creatine (Cr) supplementation plays an important role in short term energy metabolism of skeletal muscle. PURPOSE: To examine the effects of Cr supplementation on athletic performance and body composition after 4 weeks of complex training with optimal individual PAP time. METHOD: Thirty two explosive athletes conducted the tests of body composition, counter movement jump (CMJ), 30 m sprint and 1-repetition maximal (1 RM) half squat strength. A matched pair design was used to assign the subjects into creative group (Cr gr) or placebo group (Pla gr) by their maximal muscular strength. Subjects consumed 5 g of Cr or methyl cellulose (Pla gr) plus 5 g of glucose 4 times per day for 6 days. The 1 RM half squat strength was assessed again after the supplementation to calculate the weight of HRE in complex training. Meanwhile, subjects ingested 2 g of Cr (or methyl cellulose) plus 2 g of glucose per day till the end of study. Thereafter, complex training (6 sets, 5 RM of half squat and 8 jumps, with optimal individual PAP time for rest) was executed 3 times per week for 4 weeks. Body composition and athletic performance were tested after the training periods. RESULTS: After 4 weeks of training, for 30 m sprint (Cr gr.: 4.31 ± 0.20 vs. 4.13 ± 0.17 Δp; Pla gr: 4.62 ± 0.20 vs. 4.18 ± 0.15 Δp), and 1 RM half squat strength (Cr gr.: 128.43 ± 13.75 vs. 180.31 ± 17.83; Pla gr: 127.18 ± 17.50 vs. 165.31 ± 14.97 Δp) were significantly improved in both groups. And the strength in Cr gr. was significantly higher than in Pla gr. There were no significant difference in height and peak power seen in the assessment of BC. A secondary purpose was to determine the appropriate number of trials required of each assessment in order to gain a reliable BC measure. METHODS: This measurement study included 38 participants who had been assessed on two different occasions (in the same week) and on each of four different BC field methods: percent body fat (PBF) by skinfold technique (SF), waist circumference (WC), body mass index (BMI), and PBF by handheld bioelectrical impedance (HBI). Two different G-theory designs were used in this research. First, a two facet crossed design (G-study) and decision study (D-study) were conducted. Three different software packages were used to ensure consistent and valid results (GENOVA, SPSS macro, and SAS GLM). RESULTS: The completely random design showed the largest variance component for persons (p) (57.8%). Variance components for both trials (t) and BC method (m) were negligible. However, the interaction between persons and method (p×m) was substantial (38.6%). D-study results indicated reliable BC scores for measurement designs administered once using three different methods (G=303). The mixed design, averaging over BC method, showed majority of variance due to persons (98.5%) and each of the four BC methods showed reliable scores with a single trial (G<945). CONCLUSIONS: Results from this G-theory study indicate that the measurement equivalence of commonly administered BC assessments may be inadequate. Although different BC assessments individually are reliable, for dependable BC trait generalization to the universe, a minimum of three different methods administered once may be required.

Various body composition analysis techniques are commonly available for use in most Exercise Physiology Laboratories. Our lab uses an Air Displacement Plethysmography (Bod Pod) device and we recently purchased a Direct Segmental Multi-frequency Bioelectrical Impedance (Bsm-BIA). The Bsm-BIA appears to be a more efficient method for estimating body composition, especially when testing large numbers of students in a class setting or athletic teams on our campus. Since we have been using the Bod Pod for a number of years, we wanted to assess the accuracy of the Bsm-BIA as a potential replacement for the Bod Pod. PURPOSE: To determine the accuracy of the Bsm-BIA compared against the Bod Pod in our laboratory. METHODLOGY: Sixty-six university students volunteered for the study (age=23.73±5.75yrs; WT=69.51±12.82kg; HT=172.13±9.50cm). Volunteers reported to the lab and were...
randomly assigned to test first in either the BSM-BIA or Bod Pod. Once the initial test was completed, subjects were then tested in the other device. Subjects were asked to refrain from exercising and eating/drinking two hours prior to testing. Each subject completed with the manufacturer’s recommendation for attire prior to each test. RESULTS: Results indicate that the BSM-BIA is an accurate estimation of body composition when compared with the Bod Pod in this group. BSM-BIA percent fat was 19.58±9.03 compared to Bod Pod percent fat at 19.73±9.41 (p = .91). BSM-BIA fat mass was 13.5±6.82kg compared with Bod Pod fat mass at 13.6±7.08kg (p = .93). BSM-BIA lean mass was 56.14±13.02kg compared with Bod Pod lean mass at 55.84±12.76kg (p = .94). CONCLUSION: These results demonstrate that the BSM-BIA is an accurate method to assess body composition in our laboratory when compared with the Bod Pod.

3582 Board #21 June 4, 8:00 AM - 9:30 AM Changes In Predicting PACER From BMI During Middle School Period: Boys Versus Girls

Wenhao Liu, FACSM, Traci D. Zillifro, Randall A. Nichols. Slippery Rock University, Slippery Rock, PA.

Email: wenhao.liu@sr.edu

(no relationships reported)

PURPOSE: This study examined how prediction of PACER from body mass index (BMI) would change differently for boys and girls during three-year middle school period of puberty. METHODS: Measures of BMI, body fat percent (%BF), and 20-meter Progressive Aerobic Cardiovascular Endurance Run (PACER) were administered to 56 boys and 73 girls at the beginning (pretest) and the end (posttest) of their middle school period (a three-year interval). Linear regression analysis was used to evaluate the prediction of PACER laps from BMI, and the prediction/correlation strengths at the two assessment points were compared. Further, measures of BMI, %BF, and PACER between the two test points were compared with paired-samples t-test. RESULTS: The during-three-year interval, PACER performance increased significantly (p < .001) for boys (28.57±13.99 vs. 47.36±23.93) and girls (21.08±4.74 vs. 32.33±5.47). As for %BF, however, a different pattern appeared. While girls’ %BF increased significantly (p < .001, 24.40±6.70 to 26.38±8.07), boys’ %BF decreased considerably (p = .06, 25.18±21.72 to 20.72±11.13). Accordingly, compared with the pretest, prediction/correlation strength between BMI and PACER increased for girls at the posttest with a larger absolute value of r (-.37 vs. -.43), larger r² (.14 vs. .19), larger slope and F value, and more significant p value in the regression equation: y = 40.15 -.88BMI, 95% CI (-1.40, -.36), F = 11.44, p < .005 vs. y = 54.35 -1.14BMI, 95% CI (-1.71, -.57), F = 15.97, p < .001. In contrast, the changes in the corresponding strength for boys were in the opposite direction (became weaker): -54.3 vs. -.30 in r value, .29 vs. .09 in r², and y = 45.78 ±1.23BMI, 95% CI (-1.76, -.70), F = 21.61, p < .001 vs. y = 71.60 ±1.07BMI, 95% CI (-2.01, -1.3), F = 5.18, p < .05. CONCLUSION: Middle school children are in puberty in which boys tend to gain less (even lose) fat but gain more muscle compared with girls. Due to this disparity, predicting PACER from BMI during middle school period becomes stronger for girls but becomes weaker for boys.

3583 Board #22 Abstract Withdrawn

3584 Board #23 June 4, 8:00 AM - 9:30 AM Vo2 Max And Body Composition Had No Influence In Hdl-c Levels In Brazilian Adolescents

Jose Marinho Dias Neto,1 Eduardo Martinez,2 Marcos Fortes,2 Maria Aparecida Nascimento,2 Cristiane Barcellos,2 1UNIRIO - UERJ - UNIGRANRIO, Rio de Janeiro, Brazil, 2IPCFex - Brazilian Army, Rio de Janeiro, Brazil, 3UNIRIO, Rio de Janeiro, Brazil. (No relationships reported)

The increase in HDL-C levels is commonly observed following aerobic training, depending on the exercise intensity, frequency and duration. Besides, dyslipidemia is strongly associated to overweight in adults. Aerobic capacity and body composition are components of physical fitness. The relationship between physical fitness and metabolic markers in adolescents are not as understandable as in adults due to establish the real contribution of physical activities to health in youth. PURPOSE: To compare maximum oxygen uptake (VO2 max) and body fat percentage between dyslipidemic and normolipidemic Brazilian adolescents. METHODS: Twenty-one Brazilian adolescents (17.2±0.85 years, 58.7±7.2 kg, 164.7±9.3 cm) were evaluated and divided in 2 groups. Ten were considered normolipidemic and eleven were dyslipidemic according to The International Diabetes Federation (IDF) criterion. Blood samples were collected to measure the HDL-C, egospirometry was used to determine the VO2 max and Dual energy x-ray absorptiometry (DEXA) was selected to estimate body fat percentage. Shapiro Wilk test was used to test the normality of data. Independent Student t-test was used for the statistical comparison. RESULTS: In dyslipidemic group, VO2 max and body fat percentage were respectively 36.3±10.2 ml/kg/min and 32.4±12.2%. In the normolipidemic group the VO2 max was 41.9±7.7 ml/kg/min and body fat was 26.8±9.3%. No statistical differences were found between these two groups in both comparisons (p = 0.08 for VO2 max and p = 0.13 for body fat percentage). CONCLUSIONS: To this sample, there was no difference between groups. However, the sample was composed of only 21 subjects and the diet intake was not controlled.

3585 Board #24 June 4, 8:00 AM - 9:30 AM BMD In Figure Skating: Retrospective Analysis With Event, Gender, Leg Dominance, And Vitamin D Status

Kristina Comer1, Margaret Harris2, Peter Zapalo2, Jennifer Burke2,1, Peter Zapalo2, Jennifer Burke2

1University of Colorado, Colorado Springs, Colorado Springs, CO. 2U.S. Figure Skating, Colorado Springs, CO.

Email: kristinacomer@gmail.com

(no relationships reported)

PURPOSE: To assess if bone mineral density (BMD) is different in male and female competitive skaters as well as skaters divided by leg dominance (LD). This study hypothesized that BMD would be lower in competitors with female skaters being more significantly affected. METHODS: Skaters were tested pre and post at the training camp and all were female. Skaters were divided into 2 groups. Ten were considered normolipidemic and eleven were dyslipidemic according to The International Diabetes Federation (IDF) criterion.

CONCLUSIONS: Data were collected during CC in 2011, 2012, and 2013, with athletes’ (n=28) consents was obtained at the 2014 training camp. BMD (whole body, lumbar spine, proximal femur) and body composition were assessed by DXA (GE Lunar, i-DXA, Madison, WI). 25-OH Vitamin D levels were measured using an HPLC assay and MS by questionnaire which were verified by pre-participation physicals. Cross-sectional comparisons were conducted with 1-way ANCOVA (with age and lean body mass, LBM, covariates). RESULTS: In the studied groups, no statistical differences were found in BMD by gender or event. However, significant differences were found between groups by leg (p = 0.034). CONCLUSIONS: In the future, leg dominance should be considered when designing future studies. In addition, future studies should include all gender as there were no differences seen in the studied groups.
Body composition (BC) is a frequently assessed component of health-related fitness. Many different field methods are used to measure BC including bioelectrical impedance analysis and skinfolds. Recently, a portable computer based ultrasound (US) system has become commercially available for estimating BC. PURPOSE: The purpose of this study was to determine the validity of a portable computer based US system and skinfolds (SKF) for estimating percent body fat (%fat) in collegiate baseball players. METHODS: Participants’ %fat was estimated using US (3 site) and SKF (3 site) and then compared to dual-energy X-ray absorptiometry (DXA), which served as the criterion estimate. Participants were 35 male collegiate baseball players [age 20.1 (1.7) yrs., height 1.84 (0.06) m., body mass 89.2 (11.0) kg, and BMI 26.5 (2.9) kg/m²]. All participants were tested in the hydrated state [1.016 (0.012), Urine Specific Gravity]. The validity of the US and SKF %fat estimates was based on the evaluation of each method versus the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r²), and standard error of estimate (SEE) from linear regression analysis. To assess the average deviation of individual scores from the line of identity, total error (TE) was calculated for each field method. Paired sample t-tests determined pair-wise differences between measurements using an alpha level of 0.05. RESULTS: The mean %fat results were as follows: US = 14.4 (3.3), SKF = 13.8 (5.9) and the DXA = 21.4 (6.3). Mean differences were observed with US (-6.9%, p<0.001) and SKF (-7.5%, p<0.001) when compared to DXA. The r² values were 0.605 for US and 0.875 for SKF; SEE values were 4.0 %fat for US and 2.2 %fat for SKF; and total error (TE) values were 8.12 %fat for US and 7.86 %fat for SKF. CONCLUSIONS: In this study neither the US nor SKF estimates provided a valid assessment of body composition. When compared to the criterion (DXA), each of these methods underestimated %fat. Neither the US nor SKF method can be recommended for estimating %fat in this population based on this preliminary analysis.
Body fat percentage (BF%) prediction models based on anthropometric measurements have been widely used because of their practicality and moderate accuracy; however, most of the prediction models rely on complex equations that may be impractical for everyday use. PURPOSE: To develop a user-friendly model to estimate BF% using decision tree (DT) analysis from a national representative sample of adults.

METHODS: Data (age≥18 years; n=7,161; male=3,109) from the 2009 Korean National Health and Nutrition Examination Survey (KNHANES) were divided into 80% training and 20% testing splits using a simple random sampling method. BF% was measured by dual-energy x-ray absorptiometry (DEXA), a criterion measure of BF%. Fifteen anthropometrics and demographics related variables were considered as predictors. Multiple DTs were constructed using chi-squared automatic interaction detection (CHAID) and classification and regression trees (CART) methods using data from training split. A parsimony DT with the lowest risk estimate was selected. The chosen DT was further validated using data from testing split. The accuracy of the DT was evaluated by R² and root mean square error (RMSE) against BF% measured by DEXA. RESULTS: Average age, body mass index (BMI), and BF% were 44.78±.38 years, 23.62±.05 kg/m², and 27.05±.16 %, respectively. The best model for estimation of BF% was a DT from CART method, consisting of 5 levels and 4 predictors (risk estimate: r²=0.139; # of terminal nodes=21). The first level was sex. The second and third levels were waist circumference (WC) and BMI for males and females, respectively. The fourth and fifth levels were combinations of WC, BMI, and age. BMI% estimated by the DT accounted for 73% of the variation in criterion-measured BF% with a RMSE of 4.03% in the data from testing split. CONCLUSION: The new model using DT analysis to estimate BF% had moderate R² and small RMSE in a national representative sample of Korean adults. In addition, BF% can be estimated much faster by following the DT map (i.e., flow chart) compared with other equation models. This new algorithm can be a useful and practical method for estimating BF% with reasonable accuracy for Korean adults.

To minimize the isothermal effects of clothing and hair, it is recommended that clients using the Bod Pod wear minimal, tight-fitting clothing and a swim cap to compress the hair. Despite these recommendations, few studies have examined the effect that wearing improper clothing has on percent body fat (%BF) measurements determined by this technology. PURPOSE: To examine the effect of wearing improper clothing on %BF determined by the Bod Pod in women. METHODS: Twenty-four women (mean ± SD: age = 19.7±1.0 years) participated in this investigation. During one testing session, subjects were asked to enter the Bod Pod four times in counterbalanced order: (a) Proper 1 trial – wearing recommended attire to examine normal testing variability; (c) Improper trial – wearing typical sports bra and shorts/sport bra; (b) Proper 2 trial – again wearing recommended attire to examine normal testing variability. These data confirm that wearing improper clothing (i.e., yoga pants, no cap) in the Bod Pod reduces the BV measurement leading to a significant %BF underestimation (mean difference: Improper = 4.2%, No cap = 9.9%). Given the magnitude of the %BF reduction observed in this study, we highly recommend that all individuals adhere to the manufacturer’s recommended clothing guidelines.

The relationship between in-season changes in aerobic fitness and body composition in collegiate athletes is poorly defined.

**Purpose:** To evaluate in-season changes in aerobic fitness among collegiate athletes, and how these are influenced by gender, sport and body composition.

**Methods:** 50 NCAA Division I athletes (23 female [11 hockey, 12 soccer], 27 male [11 hockey, 16 soccer]) completed testing immediately before and after their competitive seasons for determination of lean body mass (LBM) and percentage body fat (BF%) by dual-energy x-ray absorptiometry (DXA) and maximal treadmill testing for maximal aerobic capacity (VO₂max), time to exhaustion (Tₚₓ), and ventilatory threshold (VT). Pre- and post-season fitness and body composition values were compared using paired t-tests. Multivariable regression analysis was used to identify independent predictors of in-season change in body composition using gender and sport as covariates, as well as in-season changes in fitness measures using sport, gender and body composition as covariates.

**Results:** Compared to pre-season, post-season values for the entire group were lower for VO₂max (4.30±0.088 v 4.08±0.086 L/min, p<0.002), and unchanged for Tₚₓ. In Tmax, change in VO₂max was not related to VO₂max and VT, whereas in-season changes in Tₚₓ were independently predicted by changes in both LBM and VO₂max. In-season changes in aerobic fitness and body composition do not differ across sport or gender. This suggests that efforts to influence body composition during the competitive season can significantly impact aerobic fitness in intermittent sport athletes.

**Conclusion:** In the current study, BMI was shown to misclassify football players as overweight and obese when compared to measured %BF. This is similar to previous studies and typical in sports where size can be used for effectiveness. BMI should not be solely used as a measure of categorization for risk factors in these athletes.
expressed absolutely (5.01±0.59 vs 3.54±0.39 L/min, p<0.001), in terms of body mass (63.4±6.2 v 53.4±5.7 mg/kg/min, p<0.001) and LE LB1 (212.8±26.5 v 198.6±23.0 mg/kgLBM/min). However, the differences in VO2max were no longer significant (78.8±7.0 v 75.4±8.7 mg/kgLBM/min, p=0.088).

Males showed higher VT when expressed absolutely (3.63±0.0 v 2.43±0.44 L/min), and additionally when normalized for body mass (45.9±6.9 v 36.4±5.8, p<0.001), LB1 (57.1±8.4 v 51.6±9.2 mg/kg/min, p=0.018), and LE LB1 (145.6±6.6 v 126.6±10.6 mg/kgLBM/min, p=0.018).

Conclusions: Gender differences in VO2max are no longer significant when normalized by LB1, while gender differences in VT between persist. This data supports normalizing maximal aerobic capacity in terms of LB1 rather than by body mass to compare levels of aerobic fitness in collegiate athletes.

Previous research has shown that competitive cyclists tend to ride at cadences higher than what have been found to be the most efficient for them. Several studies have been conducted with the hope of finding what factors determine cadence efficiency in competitive cyclists. To date, there has been limited LBM in investigation conducted on the relationship between body composition and cadence. PURPOSE: The primary aim of this investigation was to determine the relationship between body composition and cadence efficiency in competitive cyclists.

METHODS: In 23 subjects (M=15, F=8, age=32.1 (11.1) yrs) body fat: 18.1 (7.6)%; body mass: 72.9 (7.6) kg; lean mass: 59.7 (9.3) kg; thigh circumference: 50.0 (3.1) cm; VO2max: 57.1 (9.0) ml/kg/min; and preferred cadence: 89 (4.1) rpm were measured. Efficiency was assessed during two cadence sessions where 3, 5-minute intervals, followed by 5 minutes of rest at a freely chosen cadence were performed on their personal racing bike. The intervals were set at an intensity of 70% of the power output reached at VO2max. During the interval sessions the participants were instructed to maintain cadences of 80-8590rpm and 95-100-105rpm for the first and second sessions, respectively. Statistical analysis was run using repeated measures ANOVA and correlations.

RESULTS: Lean mass, body fat %, thigh circumference, and body mass were not significantly associated with cadence efficiency. Body composition was correlated with lean mass (r=−0.465, p=0.045), thigh circumference (r=−0.630, p=0.004), and body mass (r=−0.604, p=0.006). In agreement with previous studies, cyclists were most efficient at 80 rpm (23.7 (1.8)%), and least efficient at 105 rpm (22.2 (1.9)%)(p=0.000).

CONCLUSIONS: In conclusion, the body composition measurements were not significantly associated with cadence efficiency. However, preferred cadences was found to have a negative correlation with lean mass, thigh circumference, and body mass. While cyclists were found to be most efficient at 80 rpm, they train and race at faster cadences. Therefore, additional research is needed to determine what factors contribute to a competitive cyclists cadence selection.

Assessing fitness in obese youth is challenging. Normalizing the common fitness metric, peak VO2, in children of different sizes is confounded by metabolically inactive adipose tissue. When lean body mass (LB1) is used, differences in peak VO2 metrics of fitness in obese compared with normal weight children are diminished or eliminated. Very little is known about the relationship between circulating lipids and fitness when muscle mass, the biological driver of gas exchange during exercise, is accounted for.

Purpose: To determine the relationship between peak VO2 normalized to LB1 and blood lipids in healthy children and adolescents. METHODS: 165 children (8-17 y/o, 80 boys, 58 BMI≤ 85 percentile) performed ramp-type progressive cycle ergometer exercise test until exhaustion. Gas exchange was measured breath-by-breath. Body composition was assessed using DXA. Fasting blood lipids were measured with standard techniques. Peak VO2 was normalized to body weight (BW) and LB1.

Correlation matrices with linear regression curves were obtained for total cholesterol, triglycerides, HDL, and LDL using SAS software. Results: Peak VO2/BW was inversely correlated with LDL (r=−0.31, p<0.0001) and TG (r=−0.42, p<0.0001), and positively correlated with HDL (r=0.23, p=0.003). In contrast, peak VO2/LBM was only significantly inversely correlated with LDL (r=−0.31, p<0.0001). When we looked separately at those participants whose BMI≥ 85 percentile, we found a similar significant inverse correlation between VO2 peak/LBM and TG (r=−0.34, p<0.0004), and no significant correlations between VO2 peak/LBM and TG. No significant inverse correlations were observed between the VO2 peak/LBM and the lipids in the normal weight children.

Conclusion: By expressing fitness in terms of the metabolically active LB1, most of the correlations between circulating lipids and fitness were eliminated. However, the inverse correlation persisted with LDL. LDL is known to directly impair mitochondrial respiration and there is evidence that gas exchange may also be impaired in obese youth. The data suggest that there may be some threshold of obesity above which oxygen transport is truly impaired. Targeting those children may be an optimal use of health care resources. Supported by NIH Grant PO1HD-048721.

In sports performance assessments, body composition can often be over emphasized by coaches and peers. Currently, there are limited data examining the relationship between athletic performance and body composition in collegiate softball players. Purpose: This study examined the relationships between body composition and athlete performance metrics from a single competitive season in collegiate softball players. METHODS: Female student athletes from Division I collegiate softball teams (n = 13, Age 20.1±1.1 years, Height 169.7±5.3 cm, Body Mass 74.9±10.9 kg, Body Fat %, 27.2±7.3, Fat Free Mass, 53.5±4.6 kg) were analyzed for body composition utilizing a Bod Pod (COSMED USA, INC., Concord, CA). The relationships among measures of body composition (fat free mass percentage (FFM%), body fat percentage (BF%), and body mass (BM)) and the athlete’s off-season performance metrics from the 2015 season were examined using Pearson product-moment correlation coefficients (p ≤ 0.05). Offensive performance metrics examined included slugging percentage (SLG%), batting average (BA), on base percentage (OBP), number of hits (H), number

Abstracts were prepared by the authors and printed as submitted.
of homers (HR), runs hitting in (RBI), and total bases (TB). Results: There were no statistically significant (p > 0.05) relationships among the body composition measures and offensive performance metrics. The strongest relationships were between FFM% and H (r = 0.47); BM and AVG (r = -0.42); BM and H (r = -0.48); BF% and H (r = -0.51); BF% and TB (r = -0.41). Conclusions: In this sample of collegiate softball players, body composition was not significantly related to offensive performance metrics. Although increased body composition measurements in BM and BF% were shown to have a negative relationship with offensive performance metrics, none of these relationships were statistically significant. Future research should examine this trend beyond one season of offensive performance metrics. It would also be beneficial to examine the body composition relationships and changes based on the athlete’s position and track changes in body composition throughout the athlete’s collegiate career to examine how these changes may affect in-season performance metrics.

### RESULTS

One-way repeated measures ANOVA indicated a significant difference (p < 0.001). Trial 2 (13.34%) vs. Trial 3 (13.71%) was not significant (p > 0.001). Trial 2 (13.34%) vs. Trial 4 (15.88%) resulted in a 2.54% difference (p < 0.001). Trial 3 (13.71%) vs. Trial 4 (15.88%) resulted in a 2.17% difference (p < 0.001). CONCLUSION: The presence of body hair and cranial hair significantly decreased body composition results. These conclusions presume that variations in results are derived from possible isothermal air trapped inside exposed hair follicles. It is suggested that exposed body hair is an influencing factor in lowering body fat percentage measurement using air displacement plethysmography.

### An Exploratory Study of Infant Physical Activity in Relation to Obesity

Danae Dinkel, Jung-Min Lee, Kailey Snyder. University of Nebraska at Omaha, Omaha, NE.

Email: dmdinkel@unomaha.edu

(No relationships reported)

Historically, society has thought that infants (0 to 1 year of age) are “active enough” and not in need of efforts to promote physical activity (PA). However, approximately 10% of infants in the U.S. are obese. While research has shown low PA is one of the risk factors for obesity in toddlers minimal. However, little research has been done to systematically compare PA level between normal weight infant and obese/overweight infant in the first year of life. PURPOSE: The purpose of this study was to determine the level of PA in healthy weight and overweight infants. METHODS: Eighteen normal weight infants (age = 3.0 ± 0.4 month, weight = 94 ± 9.4 kg, height = 66.7 ± 1.4 cm) and six overweight/obese (age = 3.0 ± 0.4 month, weight = 94 ± 9.4 kg, height = 66.7 ± 1.4 cm) were recruited to participate in the study. Anthropometric measurements (e.g., height, weight, skinfold thickness) were taken at three different time points to determine infant size: 3-months of age, the onset of sitting, and one month post onset of sitting. Additionally, infant PA was assessed using Actigraph Link accelerometers at each time point. Infants wore two accelerometers on the left wrist and ankle for 4 consecutive days (2 weekdays, 2 weekends). Caregivers were asked to complete a time activity diary every day the accelerometer was worn to document infant activity (e.g., sleeping, eating, quiet/active play) and infant playtime. Combined average minute count (VMC) values were used as PA indicator. Statistical analyses were performed using two factor repeated measures (group x time) ANOVA between normal weight and overweight/obese infant. RESULTS: VMC values for the visits were: 1st visit=10509140, 2nd visit=11205462, and 3rd visit=11618064 for normal weight infants and 1st visit=10842518, 2nd visit=12286147, and 3rd visit=9961017 for overweight infants. There was no significant main effect of weight (F(1,28)=4.04, p=.052), body composition (F(1,28)=1.00), FFM% were shown to have a positive relationship with offensive performance metrics, none of these relationships were statistically significant. Future research should examine this trend beyond one season of offensive performance metrics. It would also be beneficial to examine the body composition relationships and changes based on the athlete’s position and track changes in body composition throughout the athlete’s collegiate career to examine how these changes may affect in-season performance metrics.

### The Effect of Marathon Training on Fitness and Body Composition in College-Aged Recreational Runners

Austin Miller. University of Minnesota, Minneapolis, MN.

Email: mill5824@umn.edu

(No relationships reported)

Eighty-one college-aged runners (21 ± 1.5 years; 65 females, 16 males) performed two mile time trial (2TT) before and after completing a 5-month marathon training program. PURPOSE: To assess the changes in body composition and VO\(_2\text{Max}\) of individuals before and after the completion of a 5-month marathon training program.

Methods: Eighty-one college-aged runners (21 ± 1.5 years; 65 females, 16 males) completed a 2-mile time trial (2TT), hydrostatic weighing for percent body fat (BF), and a VO\(_2\text{Max}\) test (in that order) before and after completing a 5-month marathon-training program as part of a university marathon-training course. The 2TT was conducted on an indoor 200-meter track. Hydrostatic weighing was repeated 3 to 6 times, and BF was calculated using the Brozek equation. The VO\(_2\text{Max}\) test was administered on a treadmill using a graduated protocol. Paired sample t-tests were used to assess changes. Changes in variables were calculated as a percentage and Pearson’s r was used to assess relationships between the variables.

Results: Female participants experienced a 1.06 ± 2.92% (p<0.005) decrease in BF, no change in VO\(_2\text{Max}\), and a 1.17 ± 99 minute (p<0.001) decrease in 2TT. Males experienced a similar drop in 2TT (1.41 ± 6.85 minutes; p<0.001), but no change in BF, and a non-significant increase (1.37 ± 3.77 ml/kg/min; r=0.166) in VO\(_2\text{Max}\). Change in BF is inversely related to change in VO\(_2\text{Max}\) (men r=-0.34, women r=0.49) and 2TT (men r=-0.16, women r=0.62) post training.

Conclusion: Based on the results we conclude that both men and women will experience a decrease in 2TT with training. However, there may be sex differences in physiological adaptations following the completion of a 5-month marathon-training program with women decreasing body fat percentage and men possibly increasing VO\(_2\text{Max}\).

### The Effects of Exposed Body Hair on Air Displacement Plethysmography Body Composition Measurement

David A. Fritz, Joel D. Reece. Brigham Young University Hawaii, Laie, HI. (Sponsor: Eli Lankford, FACSFM)

Email: davidfritz@gmail.com

(No relationships reported)

Air displacement plethysmography is considered by some as the ‘Gold Standard’ of body fat percentage estimation. Despite specific testing guidelines to help control for clothing and body positioning/guidelines related to exposed body hair. PURPOSE: To determine the effects of exposed body hair (i.e., chest, back, arms, legs, and cranial hair) on body fat percentage measurements using air displacement plethysmography. METHODS: A total of 18 men volunteered after being asked to participate based on visual observation of body hair. Body composition of each subject was recorded while wearing compression shorts in four back-to-back trials. Trial 1: Exposed cranial and body hair. Trial 2: Head cap and exposed body hair (criterion method). Trial 3: Exposed cranial hair and shaved body hair. Trial 4: Head cap and shaved body hair. RESULTS: One-way repeated measures ANOVA indicated a significant difference between trials, Wilks’ F(5,17) = 19.57, p=.001, –.85. Follow-up Pairwise Comparison tests showed Trial 1 (11.18%) vs. Trial 4 (15.88%) resulted in a 4.71% difference (p<.001).

### Monitoring Strength And Body Composition During A Season: What Happens In The Middle?

Julio Morales, Daniel Chilek. Lamar University, Beaumont, TX.

Email: jmoralesa@lamar.edu

(No relationships reported)

Body composition and strength are common variables used as important indicators of performance related fitness of athletic teams. They are usually measured following a pre-post model and commonly show a decline at the end of the season. However little is known about the effects of the season activities on these measures. PURPOSE: The purpose of this study was to examine the changes in strength and body composition of female volleyball players during a season of competition comparing the traditional pre-post model to a three measure model incorporating a midseason measure. METHODS: Twenty one (21) females ranging in age from 18 to 22 years (Mean height 176.56 cm ± 6.01, mass 71.25 kg ± 5.78) members of a Division I NCAA team over a period of four years were the subjects of this study. The subjects were measured at the start (PRE) of training for the season, halfway (MID) and at the end (END) of the season. Testing was done at 5-6 week intervals during the season as part of training. Variables were: 1) RM Bench Press (BP), Back Squat (BS) and percent fat estimated from skinfold measures. Dependent groups t-tests and One-way ANOVA with repeated measures were used to examine the changes in the variables over the course of the season (PRE, MID and END) with significance level for all tests set at 0.05. RESULTS: Results of the pre-post t-tests revealed significant improvement for the BS, PRE (M). The three measure model showed significant improvement in BP (Wilks’ Lambda: 0.329 F(2,32) = 32.59 and BS (Wilks’ Lambda: 0.324 F(2,21) = 11.47). CONCLUSION: The discrepancy in the results of the two analyses, point to the need of using appropriate models for understanding what happens during a competitive sport season. Finally, we can conclude that the modulation of the physical training during the season was successful in preventing the strength decreases seen in much of the literature.
Within competitive athletics, the incorporation of core stabilization exercises to improve performance is commonplace. However, within a dance population, the effects of utilizing such exercises is largely unknown.

**PURPOSE:** To determine the impact of core stabilization exercises on novice collegiate ballet dancers.

**METHODS:** Dancers (n=28) were recruited from a collegiate introductory ballet course. The dancers participated in a 6-week core stabilization training intervention consisting of two days per week for approximately 10 minutes during each dance class. The exercise program consisted of supine (dead bugs), prone (bird dogs and planks), and lateral (side bridges) core stabilization exercises that increased in difficulty each week. All dancers were assessed both pre and post intervention with timed tests to exhaustion in the passé balance position, prone plank position, and a modified side bridge mimicking the passé arm and foot positions.

**RESULTS:** Wilcoxon signed-rank tests were performed to compare the pre- and post-assessments. Of the 28 dancers, 19 improved on both the plank and passé, with 15 improving on the side bridge. However, there was only a statistically significant median increase in prone plank time from pre to post (32.6 sec vs. 48.7 sec, Z = 2.21, p = .027, r = .42). Non-significant pre-post median increases were observed in both the side bridge (22.4 sec vs. 24.2 sec, Z = 1.89, p = .059) and passáile balance (1.85 sec vs. 2.09 sec, Z = .82, p = .412).

**CONCLUSIONS:** The results of this study found that 6 weeks of core stabilization training increased core endurance in a static ground based prone plank position, but failed to do so in the modified passé side bridge or improve subsequent dance performance via the passé balance position. The results of this study call into question the ability of ground-based static core stabilization exercises that require a dancer to stabilize with the upper body to positively impact the vertical positions and dynamic stabilization patterns specific to ballet.
The overall profile of the U.S. high school football player is as follows:

**Physical Characteristics**

- Height: 177.4 cm (5’10”)
- Weight: 83.5 kg (184 lbs)
- 40-yard dash: 4.75 ± 0.36 sec
- Vertical jump: 27.3 in
- Kneeling Med Ball Throw: 29.6 in

**Anthropometric and Performance Characteristics Among High School Football Players: Results From the 2015 Nike Combines**

Jocelyn Eisenmann, Michigan State University, East Lansing, MI.

(Sponsor: Greg Welk, FACSM)

Email: jce@msu.edu

(No relationships reported)

**Validation of the Integrative Body Composition Method for Assessing Fat Mass with Dual-energy X-Ray Absorptiometry**

Thomas S. Lyons1, Battogtokh Zagdsuren1, John C. Jackson2, James M. Green3, FACSM.

1Western Kentucky University, Bowling Green, KY.
2University of Alabama, Tuscaloosa, AL.
3University of North Alabama, Florence, AL.

(Sponsor: James Matthew Green, FACSM)

Email: scott.lyons@wk.edu

(No relationships reported)

**PURPOSE:** To examine the correlation between body composition, waist size, total cholesterol (TC), blood glucose (BG), and high-density lipoprotein cholesterol (HDL) among Hispanic college-age females.

**METHODS:** Thirty-five female subjects (age− 23.2 ± 2.8) volunteered to partake in this study. Each subject read and signed the informed consent prior to participation in this study. Subjects visited the lab two times. On the first visit, height, weight, and three circumference measurements were taken [waist at umbilicus (BELLY), waist at narrowest point (XIPHOPID), and hip at widest point (HIP)]. On the second visit, subjects returned to the lab following at least 8-hour fasting and blood sample was used to measure TC, HDL, BG; TC:HDL ratio and non-HDL were also calculated. After blood samples were taken via finger prick, air-displacement plethysmography was used to determine percent body fat (BF).

**RESULTS:** BF and BMI were significantly correlated with HDL (r= −0.342, p< 0.05 & r= −0.409, p< 0.02), BG (r= −0.410, p< 0.02 & r= 0.481, p< 0.04), and TC:HDL ratio (r= −0.401, p< 0.02 & r= 0.421, p< 0.02), respectively. HIP was significantly correlated with HDL cholesterol (r= −0.369, p< 0.03) and BG (r= 0.418, p< 0.01). XIPHOPID was significantly correlated with TC:HDL ratio (r= 0.337, p< 0.05) and BG (r= 0.433, p< 0.01). BELLY was significantly correlated only with BG (r= 0.374, p< 0.03). Age was only significantly correlated with non-HDL (r= 0.370, p< 0.03) and BG (r= 0.594, p< 0.01).

**CONCLUSION:** The findings suggest that both BF and BMI show moderate to strong correlation with cholesterol levels and BG. One important findings of the study highlights the importance of waist measurement site, indicating hip measurement could be a better site to determine negative risk factor, but XIPHOID for positive risk factors regarding cholesterol. Findings also suggest that any of the waist and hip circumference sites can be selected to screen for possible health risks regarding BG in Hispanic young female students.
CONCLUSIONS: Consistent with previous research identifying IBC as a valid measure when compared to HW and ADP, these data support IBC as a valid BC assessment technique when also compared to DXA. However, it should be noted that the standard deviations in these data were fairly large, and that these data as well as previously collected data on IBC are limited to correlative values. Additional analyses of these data should be conducted to determine the magnitude of agreement between these assessment methods.

RESULTS: Whole trunk T1(M = 680 ± 169 cm², 212 ± 102 cm² and 141 ± 79 cm², respectively). Trunk T1 and SF were 89 ± 12 cm and 4 ± 1.7 cm, respectively. Predicted trunk SAT (r = 0.90, P < 0.0001) and VAT (r = 0.88, P < 0.0001) were 64 ± 166 cm² and 16 ± 84 cm², respectively. When SF was used to predict MRI thickness values (r = 0.87, P < 0.0001) and abdominal circumferences to predict constant ratio between VAT and internal organs (r = 0.57, P < 0.0001), SAT predicted CSA and VAT predicted CSA were 161 ± 69cm² (r = 0.73, P < 0.0001) and 146 ± 77cm² (r = 0.61, P < 0.0001), respectively.

CONCLUSION: The present study demonstrated that abdominal and waist circumferences and trunk skinfold thickness can be used effectively to predict SAT and VAT CSAs in persons with chronic motor complete SCI.

PURPOSE: Manual segmentation using dual energy X-ray absorptiometry (DXA) is a valid method for quantifying contralateral tissue asymmetries of the body but has not been used to quantify body composition in the ipsilateral upper leg compartments. The purpose of this study was to examine the reliability and validity of DXA to quantify fat and lean composition in the anterior and posterior compartments of the upper leg.

METHODS: Twenty-one (10 male/11 female) college athletes (Age= 20±1y) were assessed for total and regional body composition. Segmentation of the anterior and posterior thigh compartments was accomplished by scanning participants lying on their right and left side. Each scan was manually segmented and analyzed by 3 technicians using custom regions of interest (ROIs) created from bony landmarks on the femur. Caudal and distal borders of the ROI were made at the level of the greater trochanter and lateral epicondyle. A line was drawn down the middle of the femur to create an anterior and posterior ROI to quantify tissue composition between compartments. To validate this new segmentation method, lateral scan measures were compared with total body frontal scan measures of upper leg compartments for fat, lean and total tissue masses. Independent t-tests assessed these compositional comparisons. Intraclass correlation coefficients (ICC) and coefficients of variation (CV) were calculated to assess reliability.

RESULTS: All comparisons of total, lean and fat tissue masses between the frontal and lateral DXA scans were non-significant (p-value: 0.14 to 0.64). ICCs were high for all comparison measures between- and within-testers, ranging from 0.983 to 0.999 and ≤3.8% and compartmental composition were ≤2.7%.

CONCLUSIONS: This study demonstrated that DXA measures using custom ROIs to assess anterior and posterior upper leg fat, lean, and total tissue mass are valid and reliable. Future studies are needed to determine the clinical usefulness of these measures with regard to prevention or rehabilitation of sports-related injury.

Funded by University of Minnesota CTRS Mini Pilot Funding Program

PURPOSE: To examine the relationships between several body composition techniques at baseline and in detecting changes following eight weeks of high-load strength training.

METHODS: Lower body strength, leg lean mass assessed by DXA, 50% quadriceps muscle thickness assessed by ultrasound, four thigh skinfolds, and thigh circumference (TC) were performed on 28 women prior to and following eight weeks of strength training. Thigh cross-sectional area (CSA) was calculated from the TC and skinfolds using the method of Moritani and deVries (M&D) and the Hough multiple regression equation (HMR). Relationships between lower body strength, leg lean mass (LM), thigh muscle thickness (MT), HMR estimated CSA (HMR) and M&D estimated CSA (M&D) along with relationships between leg fat mass (FM), thigh fat thickness (FT), and the sum of the four thigh skinfolds (4S) were examined with Pearson’s correlation coefficients both at baseline and as change values from pre to post training.

RESULTS: When baseline muscle-related values were examined, strength (183 ± 38 kg) was correlated with MT (8.6 ± 1.0 cm) only (r = 0.597; p < 0.001) and LM (13.7 ± 2 cm); r = 0.499; p = 0.003), and MT (8.6 ± 1.0 cm; r = 0.382; p = 0.026). Changes in LM (3.8 ± 5.9 kg) were correlated to changes in M&D only (4.6 ± 20.8 cm²; r = 0.532; p = 0.034) and M&D changes were correlated with HMR changes (1.9 ± 8.6 cm²; r = 0.488; p = 0.004). When baseline fat-related values were examined, FT (4.5 ± 1.5 cm), 4S (138.3 ± 29.4), and FM (10.5 ± 3.9 kg) were all correlated with each other (FT = 0.488; p = 0.004) and coefficients of variation (CV) were calculated to assess reliability.

CONCLUSIONS: These data suggest that relationships between these assessments vary. Further, techniques that provide values at baseline may not track changes similarly. This lack of similarity could be due to the sensitivity of the technique, the location of the measurement (i.e. one site vs. whole leg) or other factors. These data imply that results will vary based on technique used and thus these techniques cannot be used interchangeably.

PURPOSE: To examine the relationships among various body composition techniques for lower limb muscle and fat assessment.

METHODS: Magnetic resonance imaging was captured in a multi-axial fashion to measure VAT and internal organs (r = 0.57, p < 0.0001), SAT predicted CSA and VAT predicted CSA were 161 ± 69cm² (r = 0.73, p < 0.0001) and 146 ± 77cm² (r = 0.61, p < 0.0001), respectively.

CONCLUSIONS: The present study demonstrated that abdominal and waist circumferences and trunk skinfold thickness can be used effectively to predict SAT and VAT CSAs in persons with chronic motor complete SCI.
METHODS: Physically inactive (<30 min. physical activity/wk), men (n=33) and women (n=27), 18-43 years of age, completed the study (25 ± 7 yr, 79.1 ± 16.8 kg, 171.0 ± 9.0 cm, BMI 26.8 ± 4.1). Body fat percentage (%Fat) was assessed using BV-based 2C models (DXA-BV, ADP, HW) and 4C models that included bone mineral content, BV, and total body water using deuterium oxide. DXA-BV, ADP, and HW BV values were also compared in addition to DXA-derived %Fat (DXA-%Fat).

RESULTS: For men, DXA-BV estimations (84.3 ± 15.1%) were no different than ADP (84.2 ± 15.0%) or HW (83.2 ± 15.4%). Fat % for both 2C and 4C models were no different between DXA-BV (2C: 26.6 ± 9.6, 4C: 28.6 ± 9.0), ADP (2C: 26.2 ± 7.2, 4C: 28.4 ± 7.0), and HW (2C: 26.2 ± 6.4, 4C: 28.4 ± 6.6) (p > 0.4). However, significant differences were found between DXA-%Fat (31.0 ± 7.3%) and HW, and ADP, and DXA-BV and 4C models (p < 0.01). For women, significant differences (p < 0.01) were observed for DXA-BV estimations (68.1 ± 12.1%) compared to ADP (67.5 ± 11.9%) and HW (67.6 ± 12.1%). Percent Fat values for both 2C and 4C models were also significantly different between DXA-BV (2C: 35.2 ± 5.6, 4C: 37.0 ± 5.0), ADP (2C: 31.7 ± 3.8, 4C: 34.9 ± 3.9), and HW (2C: 31.7 ± 3.8, 4C: 34.9 ± 4.1) (p < 0.01). Significant differences were also found between DXA-%Fat (38.2 ± 4.5) and HW, ADP, and DXA-BV 2C and 4C models (p < 0.01).

CONCLUSIONS: For both men and women the DXA-BV 2C and 4C %Fat values improved on the DXA-%Fat values. However, for women the DXA-BV 2C and 4C %Fat values were significantly higher than ADP and HW 2C and 4C models. For men DXA-BV appears to be an alternative method for calculating BV compared to ADP and HW models, although further research is warranted.

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PURPOSE: This study evaluated the validity and reliability of body composition estimates in adult men and women using LS and OMRON compared to DXA as the criterion method.

METHODS: Height and weight were measured on 80 males and 63 females between 18 and 50 years of age. Two administrators took front- and side-view photographs of each subject twice using LS. Each administrator used the LS to measure circumferences of the neck, abdomen, waist, and hips of each subject from their own photographs on the same day and on a different day and the photographs taken by the other administrator. Each administrator also used the OMRON to estimate body composition of each subject twice. A DEXA scan was performed on each subject once. Estimates of %BF from OMRON and LS were compared to DEXA. Intrarater and interrater reliability was determined for OMRON and LS estimates of %BF.

RESULTS: A mixed model ANOVA indicated that the OMRON and the LS significantly (p < 0.001) underestimated DEXA %BF by an average of 8.6 %BF and 3.4 %BF, respectively. When the %BF determined from OMRON and LS were regressed against DEXA, both methods of estimating %BF had similar R2 values (0.85 and 0.84) and Root MSE values (3.4 and 3.5 %BF), respectively. Nevertheless, the intercepts and slopes of the regression lines demonstrated greater bias when using the OMRON (intercept = 6.76 %BF; slope = 1.09) compared to the LS (intercept = 3.87 %BF; slope = 0.96). Use of the OMRON and LS to estimate %BF resulted in high intrarater (0.99) and interrater (0.99) reliability.

CONCLUSIONS: The results of this study show for the first time, that the LeanScreenTM app, although highly reliable, significantly underestimated DEXA %BF. The OMRON, although highly reliable, resulted in greater underestimates of DEXA %BF.

Studies have shown that the vertical jump is an accurate measure of lower extremity power quantification. Many studies have focused on lower limb power and the relationship to athletic performance. While this is warranted, college-aged students comprise a larger demographic population who tend to have a more sedentary lifestyle. PURPOSE: The purpose of this study was to investigate the effects of anthropometric measures on lower limb power in college-aged students. METHODS: 189 normal-weight (BMI = 24.2 ± 4.7) college (19.1 ± 1.7 years) men (n=119) and women (n=70) were randomly recruited during a physical fitness evaluation at Eastern Kentucky University. Body composition was collected with Bioimpedence analysis (Tanita, SC-3315) and lower limb power was calculated from a countermovement (CMJ) vertical jump using validated power calculations. Subjects were given a proper warm-up and instructions on how to perform a countermovement jump. Subjects performed 1 practice and 2 measured jumps. Statistical analysis was performed using one-way ANOVA (body composition) and Pearson correlations to predict relationships, significance set at p < 0.05. RESULTS: Body composition was significantly different between gender for height (H), weight (W), fat mass (FM), and muscle (MM), (p < .001). For all subjects H (r = .68), W (r = .76), MM (r = .89) and FM (r = .35) revealed significant correlations (p < .05). All subjects' anthropometric measures revealed significant positive (W & MM) and negative correlations (FM) with lower limb power. For males W (r = .76), MM (r = .89), & FM (r = .51) and females W (r = .83), MM (r = .81), & FM (r = .71) yielded similar results. Gender analysis revealed strong/ moderate positive correlations (W, MM, FM) for both genders. For body composition the lean subjects W (r = .76), MM (r = .76), FM (r = .26) — the average weight W (r = .86), MM (r = .90), FM (r = .77) — overweight subjects W (r = .86), MM (r = .87) also yielded similar results. The lean, average, and overweight subjects also displayed significant positive (W, MM) and negative (FM) correlations with lower limb power. CONCLUSION: Body composition measures of weight and muscle mass displayed the strongest relationship with lower limb power suggesting that certain anthropometric measures have a higher correlation with lower limb power.
Background: Bone mineral density (BMD), fat free soft tissue mass (FFSTM) and fat mass (FM) have all been observed as altered in individuals with hemiplegic cerebral palsy (CP), compared to healthy able-bodied controls. These alterations include lower BMD and FFSTM and higher FM on the affected side of these individuals. These findings have similarity in BMD between sides as well as the FM symmetry lends insight into the residual effects of CP in these individuals. These findings have important consequences for rehabilitation as they indicate the potential for positive physiological adaptation as a result of exercise training over long periods of time.

RESULTS: There were no differences between NA and A sides with respect to whole body and site specific BMD and BMD Z scores and whole body FM. FFSTM was significantly lower on the A side in both upper and lower limbs (8.81 ± 0.27 kg for A and 10.34 ± 0.82 kg for NA, 15% lower, P < 0.05).

CONCLUSION: These data suggest that site specific BMD is unaltered despite differences in FFSTM between A and NA sides in hemiplegic Paralympic athletes with CP. The similarity in BMD between sides as well as the FM symmetry lends insight into the physiological adaptation in Paralympic athletes with CP, possibly as a result of long term athletic training. However, differences in FFSTM between the A and NA sides may indicate the residual effects of CP in these individuals. These findings have important consequences for rehabilitation as they indicate the potential for positive physiological adaptation as a result of exercise training over long periods of time.

PURPOSE: The purpose of this investigation was to determine if Division 2 collegiate volleyball players had stronger radial diaphyses than swimmers. No significant differences were found between bone traits. The amount of bone (CLAR) was similar (VB: 80.0 ± 7.5, SW: 77.8 ± 9.1; mm) but greater than the referent group. BMD was similar between groups (VB: 1193.5 ± 13.4, SW: 1195.7 ± 20.5; mg/cm2) but interestingly the referent group had significantly higher cBMD (1217.8 ± 26.1) than the athletes. Moment of Inertia (I) and the SSI (measure of bone strength) were also similar between the teams. The distribution of bone (I) was 25% lower in the referent group. Muscle area and relative grip strength were similar between VB and SW.

CONCLUSIONS: Swimmers were not adversely affected by the non-impact loading of their sport at the radius potentially due to the high number of concentric muscle contractions (Nikander, 2006). Both teams had similar muscle mass and grip strength. The higher impact-lower repetition loading in volleyball and the higher repetition-lower impact loading in swimmers resulted in similar bone structure and strength that was greater than the referent group.

Effect of Sport Type on College-Aged Female Athletes

PURPOSE: To determine if Division 2 collegiate volleyball players had stronger radial diaphyses than swimmers. No significant differences were found between bone traits. The amount of bone (CLAR) was similar (VB: 80.0 ± 7.5, SW: 77.8 ± 9.1; mm) but greater than the referent group. BMD was similar between groups (VB: 1193.5 ± 13.4, SW: 1195.7 ± 20.5; mg/cm2) but interestingly the referent group had significantly higher cBMD (1217.8 ± 26.1) than the athletes. Moment of Inertia (I) and the SSI (measure of bone strength) were also similar between the teams. The distribution of bone (I) was 25% lower in the referent group. Muscle area and relative grip strength were similar between VB and SW.

CONCLUSIONS: Swimmers were not adversely affected by the non-impact loading of their sport at the radius potentially due to the high number of concentric muscle contractions (Nikander, 2006). Both teams had similar muscle mass and grip strength. The higher impact-lower repetition loading in volleyball and the higher repetition-lower impact loading in swimmers resulted in similar bone structure and strength that was greater than the referent group.

Effects Of Playing Surfaces On Volumetric Bone Mineral Density In Adolescent Male Soccer Players

It has been well recognized that impact loading in sporting activity is highly associated with bone accretion. Recently, Carmona et al. showed that bone mass accretion was similar bone in prepubescent soccer players independently of the playing surface (artificial turf vs. non-grass ground surface). However, the osteogenic effects on volumetric bone mineral density (vBMD) generated by four different playing surfaces of the same sport are unknown.

PURPOSE: To investigate the effects over a soccer season in vBMD of male soccer players by playing surface. METHODS: A total of 71 male soccer players (17 ± 0.6 y) volunteered to participate in the study. 26 participants were training and playing on 2nd generation artificial turf, 16 on a 3rd generation artificial turf, 10 on a non-grass ground surface and 19 on natural grass (NG). vBMD, at 4 and 38% of the non-dominant tibia, was measured before and after season by peripheral quantitative computed tomography (Stratec XCT-2000 L pQCT scanner). Analysis of variance for repeated measures *2 (time) were performed to determine the effects of playing surface on vBMD controlling for pubertal status. Effect size were calculated according to the methods proposed by Cohen (small (f=0.1), medium (f=0.2), or large (f=0.4)). RESULTS: A group by time interaction was found for vBMD at 38% of the distal tibia (p=0.029 and F=0.38). When pairwise comparisons were carried out, NG showed group by time interactions compared to 2nd generation artificial turf (782 to 804 mg/cm3 vs. 790 to 798 mg/cm3; p=0.007 and f=0.50), and
Musculoskeletal adaptation is localized to areas of repeated mechanical loading. Participation in throwing-related sports has been positively correlated with bone strength in the throwing compared to non-throwing arm. Baseball pitching, requiring repetitive loading on the throwing arm provides a model to understand bone adaptation. **Purpose:** To investigate upper extremity limb-to-limb differences in musculoskeletal strength adaptations to pitching in male collegiate baseball players. **Methods:** Peripheral quantitative computed tomography (pQCT) was used to assess bilateral arm bone and muscle strength outcomes among 10 collegiate men’s baseball pitchers (age=19.9 ± 1.04 years) with a range of 13.6 ± 2.5 years of experience. Total and cortical bone volumetric density (TdO and CoD), and cortical bone mineral content (CoCn), area (CoA), thickness (CoTh) and estimated bone strength (section modulus), along with muscle cross-sectional area (MCbSA) were measured at the distal (15%) and midshaft (50%) humerus, and midshaft (50%) radius sites. Isometric grip and shoulder external and internal rotation strength were assessed using digital dynamometer and manual muscle tester, respectively. Shoulder internal and external range of motion was measured with a digital goniometer. **Results:** Only at the humerus midshaft (50%) was bone strength higher in the pitching compared to non-throwing arm (31%, p<0.001, as a result of greater CoA (+28%, p<0.001) and CoTh (+24%, p<0.001) compared to CoD (+2%, p=0.05). MCbSA was also greater at the humerus midshaft (+8.7%, p<0.001) compared to the radius midshaft site. Isometric muscle strength measurements revealed no differences between limbs. Range of motion in internal rotation was greater in the pitching arm (126.2 ± 6.8 vs. 115.4 ± 13.9 degrees; p=0.01), while internal range of motion was greater in the non-throwing arm (116.4 ± 31.2 vs. 101.6 ± 15.9 degrees; p=0.02). **Conclusion:** Among male collegiate baseball pitchers, we showed that the pitching arm had significantly more robust bone parameters at the humerus midshaft compared to the non-throwing arm. While these findings are consistent with research showing side-to-side differences in loaded versus unloaded limbs in other sports. Future studies should investigate whether these differences exist at other measured sites.

**Academics, Health and Physical Education**

**Board #62**

June 4, 9:30 AM - 11:00 AM

**The Relation Between Lumbar Disc Degeneration And Physical Characteristics In Male Asian Collegiate Basketball Players**

Im Kyong-ae1, Nakazato Koichi1, Koyama Koji1, Fujita Masahiro1, Kotani Kiwamu1, Hakkaku Takayoshi1, Hiranuma Kenji1, 1Nippon Sport Science University, Tokyo, Japan. 2Tokyo Ariake Institute of Medical and Health Sciences, Tokyo, Japan. Email: imkya0415@gmail.com (No relationships reported)

Lumbar disc degeneration (LDD) in athletes is induced by sport-specific mechanical stress and can easily lead to low back hernia and low back pain. The occurrence rate of LDD is 42.9% in US collegiate competitive basketball players. Despite the high risk for LDD in basketball players, studies on possible risk factors for LDD are sparse, especially in Asian collegiate basketball players. As the average height of Asians is lower than that of people of major ethnicities in the United States and Europe, Asian basketball players may possess specific risk factors. PURPOSE: The purpose of this study was to investigate the relation between LDD and physical characteristics in Asian male collegiate basketball players. **METHODS:** The occurrence rate of LDD in 41 Japanese male collegiate basketball players was (28.1 ± 1.1) years, height, 176.8 ± 6.2 cm; weight, 70.8 ± 8.6 kg; body mass index, 22.6 ± 1.8 kg/m²; sporting experience, 10.1 ± 3.2 years) were evaluated. The range of motion (ROM) of the thoracolumbar spine, muscle tightness (finger floor distance, illoposus, heel buttocck distance, straight leg raising, triceps surae), and general joint laxity (wrist, elbow, shoulder, knee, ankle, spine, hip) were also tested as indicators of physical characteristics. LDD was evaluated with T2-weighted magnetic resonance imaging of the lumbar spine. The degree of degeneration was classified into five grades according to the Pfirrmann classification, and a grade ≥ 3 was defined as degeneration. Significant differences between case and control values were verified with the t-test. A p-value of <0.05 was considered statistically significant. **RESULTS:** The prevalence of LDD among the basketball players in this study was 36.6% (15 of 41). We assigned the athletes to either the LDD group (n = 15) or the non-LDD group (n = 26), and found that height (180.3 ± 6.3 vs. 174.7 ± 5.2 cm, p<0.01), weight (74.7 ± 9.6 vs. 68.6 ± 7.3 kg, p<0.05), and thoracolumbar ROM (55.7 ± 7.9 vs. 47.5 ± 7.7, p<0.01) were significantly higher in the LDD group than in the non-LDD group. There was no significant difference in other physical characteristics. **CONCLUSION:** More height, heavy weight, and increased thoracolumbar ROM are possible risk factors for LDD in male Asian collegiate basketball players.

**Board #63**

June 4, 9:30 AM - 11:00 AM

**Bone Mineral Density In Collegiate Athletes And Non-Athletes: Is Inactivity Promoting Osteopenia?**

Tarana Hew-Butter, FACS, Maria Ruedisueli, Andrea T. Kozak, Scott Pickett. Oakuition University, Rochester, MI. Email: bhew@oakutron.edu (No relationships reported)

Bone mineral density (BMD) appears to be a robust predictor of fracture risk, peaking at 20-30 years of age and declining thereafter. Thus, college-aged students should demonstrate and attain peak bone mass to reduce osteoporotic fractures later in life. PURPOSE: To compare bone mass and body composition in 1) male and female collegiate athletes separated by sport and 2) athletes vs. non-athletes. **METHODS:** In this cross-sectional study, 4 male (soccer, swimming, cross country, basketball) and 4 female (volleyball, swimming, cross country, and basketball) fall sports teams underwent whole-body dual energy x-ray absorptiometry (DXA) scans prior to their competitive season. Additionally, 23 incoming freshmen (non-athletes) underwent DXA scans prior to the fall semester. **RESULTS:** No statistically significant (ANOVA) differences in total body (or regional) bone, lean or fat mass in either male or female cohorts between sports or vs. non-athletes. Male non-athletes (n=8) demonstrated the lowest BMD Z-scores (1.09 ± 0.11 g/cm²; 1.21 ± 1.22) followed by swimmers (n=19; 1.14 ± 0.7 g/cm²; 0.78 ± 0.61), runners (n=11; 1.17 ± 0.07 g/cm²; 0.41 ± 0.59), soccer (n=20; 1.26 ± 0.05 g/cm²; 0.44 ± 0.80) and basketball players (n=8; 1.33 ± 0.08 g/cm² no Z-score). Similarly, female non-athletes (n=15) demonstrated the lowest BMD Z-scores (1.06 ± 0.05 g/cm²; 0.47 ± 0.74) followed by swimmers (n=23; 1.06 ± 0.08 g/cm²; 0.42 ± 0.95), runners (n=10; 1.09 ± 0.05 g/cm²; 0.18 ± 0.64), volleyball (n=7; 1.18 ± 0.07 g/cm²; 0.94 ± 0.90) and basketball players (n=13; 1.21 ± 0.10 g/cm² Z-score). Conversely, male non-athletes had the highest mean percent body fat (22.7 ± 4.2%) compared with swimmers (22.9 ± 3.9%), runners (18.6 ± 2.2%), and basketball players (22.3 ± 4.0%).
to CG (group by time interaction p<0.05). CONCLUSION: Swimming seems to be a neutral sport to practice regarding BMD and BMC acquisition. Nevertheless, it might entail some bone adaptation in its participants. Practicing a weight bearing sport in addition to swimming improves both bone mass acquisition and bone strength.

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3625 Board #64 June 4, 9:30 AM - 11:00 AM
MRI Findings of Bone Marrow Edema in a Division I NCAA Women’s Soccer Team During a Competitive Season
Karen M. Myrick, Bernadette Mele, David Wallace, Thomas Martin, Richard Feinn, Juan Garbaloza. Quinnipiac University, Hamden, CT.

Purpose: The purpose of this study was to evaluate the prevalence of BME (Bone Marrow Edema) at the knee joint over the course of a competitive soccer season, and the effect of a recovery period on the prevalence of BME.

Methods: A convenience sample of Division I female collegiate soccer players between the ages of 18 and 22 years of age were recruited for participation in this study. The bilateral tibiofibular joints of 18 subjects were imaged at baseline (one week prior to start of preseason training), post-season (one week after the season conclusion) and post-recovery (5 months after post-season). All examinations were performed by an experienced MRI technologist, using a 1.5-T MRI unit, and were read by an experienced musculoskeletal radiologist and orthopedic surgeon/sports medicine physician. The Knee Osteoarthritis Scoring System (KOSS) rating scale was used for scoring.

Results: Pairwise contrasts between time periods resulted in a significant difference between preseason and post season (p<0.028) as well as postseason and recovery (p<0.016). 29% of knees were found to have BME at baseline, 47% post-season, and 23% post-recovery demonstrating that bone marrow edema was found to be significantly more widespread in the same population after a competitive soccer season compared with normo-active controls (CG). To investigate the changes over a swimming season in bone mineral density (BMD), bone mineral content (BMC), bone strength and bone structure in adolescent swimmers and compared them to normo-active controls (CG). To investigate the changes over a swimming season in bone mineral density (BMD), bone mineral content (BMC), bone strength and bone structure in adolescent swimmers and compared them to normo-active controls (CG). To investigate the changes over a swimming season in bone mineral density (BMD), bone mineral content (BMC), bone strength and bone structure in adolescent swimmers and compared them to normo-active controls (CG).

3626 Board #65 June 4, 9:45 AM - 11:00 AM
Longitudinal Effects Of Swimming On Bone Mass, Structure And Strength
Alejandro Gomez Brucutu1, Alejandro Gonzalez-Aguiro1, Alba Gomez-Cabello2, Gabriel Lozano-Berges1, Angel Mataute-Llortere1, Jose A. Casajas1, German Vicente-Rodríguez2.

1GENUD research group, University of Zaragoza, Zaragoza, Spain. 2Centro Universitario de la Defensa, Zaragoza, Spain.

Purpose: To investigate the changes over a swimming season in bone mineral density (BMD), bone mineral content (BMC), bone strength and bone structure in adolescent swimmers and compared them to normo-active controls (CG). Methods: In February, 180 +/- 11 days later, participants repeated the measures. RESULTS: No significant group by time interactions were found for any leg BMC or BMD. Tendencies towards greater increases in the non-dominant legs. Adjusted percentages of change between beginning and end season BMC y BMD values were also calculated, and a 2-independent samples t-test was applied to observe differences. RESULTS: No significant group by time interactions were found for any leg BMC or BMD. Tendencies towards greater increments in AT group compared with AG group were found in the non-dominant leg for both BMC (320 to 355 g in AT vs. 341 to 365 g in AG; p=0.07) and BMC (1.02 to 1.04 in AT vs. 1.00 to 1.02 in AG; p=0.04).

3627 Board #66 June 4, 9:45 AM - 11:00 AM
A Longitudinal Assessment Of Bone Mineral Density And Content In Competitive Cyclists
Breanne S. Baker1, Raoul F. Reiser II2, FACSMM. 1University of Oklahoma, Norman, OK. 2Colorado State University, Fort Collins, CO. (Sponsor: Raoul Reiser II, FACSMM)

Email: bree.baker@ou.edu

Weight supported physical activity, such as cycling, is thought to provide insufficient stimuli to promote osteogenesis even though it incorporates significant muscular loading of bones. Furthermore, auxiliary factors such as dietary restrictions and low body mass in conjunction with confounders such as age, sex, competition level and the type of racing cloud the mechanisms of skeletal adaptations to cycling. PURPOSE: The purpose of this study was to investigate, in a diverse group of competitive cyclists, how age (18-49 years), sex, USA Cycling Category (elite-4) and racing type (road and multipicycle), influenced bone mass across a season. METHODS: In February, 2014, 42 participants (22 males, 20 females) completed a history questionnaire, a 2-day dietary log and a Dual Energy X-ray Absorption Tomography (DXA) scan. In September, 180 +/- 11 days later, participants repeated the measurements. RESULTS: Pre-season subgroup analysis (age, sex, competition level and racing type) revealed significant differences in bone composition, diet and cycling characteristics. Bone mineral density (BMD) T-Scores were within healthy limits and not different between groups (P>0.035). Pre-season Body Mass was a significant correlate of T-Scores for older cyclists (R=0.584) and males (R=0.485), while BMI was a correlate for males (R=0.464). A significant time*group interaction with age suggests older cyclists may increase BMD across the season compared to younger cyclists. Post-season, Body Mass (R=0.623) and Total kcal (R=0.607) were significantly correlated with older cyclists’ T-Score. Total kcal was correlated with T-Score in males (R=0.601), and vitamin D was a correlate in females (R=0.533). CONCLUSION: The results of this study suggest that participation in competitive cycling might not have deleterious effects on BMD and BMC as previously demonstrated. T-score and regional BMD measurements did not significantly decrease across the season for any group; however, certain variables such as body composition, insufficient nutrition and time spent cycling are deserving of further investigation. More importantly, we must work to understand when, where and why cycling may shift from a safe osteogenic activity, as demonstrated by this study, to a possibly dangerous osteoporotic sport, as demonstrated by many others.

SATURDAY, JUNE 4, 2016
In athletic endeavors, bone density is a critical factor. Determining the bone mass and its functional adaptation is essential. The study by Aoi Ikedo et al. (2016) aimed to compare the bone characteristics of collegiate athletes involved in high impact sports (volleyball and soccer) versus low impact athletes (long-distance running) to understand how athletic training affects bone density.

**Methods**

Thirty-seven female athletes (16.1 ± 0.8 yr old) were divided into two groups: the sprinters (SPR, n = 21) who participated in short distance races and the long-distance runners (LDR, n = 16) who competed in events of 2500 m or longer.

**Results**

Bone density (BMD) and other bone-related parameters were measured as follows:

- **BMD**: Spine: 0.94 ± 0.06 vs. 0.99 ± 0.06 g/cm², TBLH: 0.98 ± 0.06 vs. 1.02 ± 0.05 g/cm²
- **Cortical Bone Mineral Density (cBMD)**: Spine: 0.97 ± 0.06 vs. 1.02 ± 0.05 g/cm², TBLH: 0.98 ± 0.06 vs. 1.03 ± 0.05 g/cm²
- **Total Bone Mineral Density (tBMD)**: Spine: 0.94 ± 0.06 vs. 0.99 ± 0.06 g/cm², TBLH: 0.97 ± 0.06 vs. 1.02 ± 0.05 g/cm²
- **Cortical Area (Ct.Ar)**: Spine: 0.07 ± 0.01 vs. 0.07 ± 0.01 cm², TBLH: 0.15 ± 0.02 vs. 0.15 ± 0.02 cm²
- **Moment of Inertia (J)**: Spine: 1.136 ± 0.06 cm⁴ vs. 1.094 ± 0.05 cm⁴, TBLH: 1.164 ± 0.06 cm⁴ vs. 1.136 ± 0.06 cm⁴
- **Fractional Area (Fa)**: Spine: 0.07 ± 0.01 vs. 0.07 ± 0.01 cm², TBLH: 0.15 ± 0.02 vs. 0.15 ± 0.02 cm²

**Conclusions**

- LDR runners had significantly lower BMD compared to SPR athletes in both the spine and TBLH regions.
- The differences were more pronounced in the TBLH, with LDR runners showing lower values across all sites.
- Sprinters had higher bone density and moment of inertia compared to long-distance runners, indicating a functional adaptation to their training regime.
- The study highlights the importance of training regimes in determining bone density, with sprinters showing a lower risk of stress-related bone fractures due to their higher bone density.

Aoi Ikedo et al. (2016) concluded that the differences in bone density and structural parameters between sprinters and long-distance runners are likely due to the different demands of their training regimens. This study underscores the importance of individualized training programs in optimizing bone health across different athletic disciplines.
Supported by Quinnipiac University School of Health Sciences, School of Medicine

result of marathon. Female runners may experience greater cardiac stress than their male counterparts as a consequence of running. These results suggest that biomarker levels can be used to identify individuals who may be at increased risk for cardiac adverse events. While vascular measurements were normalized to LM, the results were maintained. Echocardiographic analysis revealed that BMI and weight were positively correlated (p < 0.05) with increases in MBV, blood flow, and vascular conductance. The increases in MBV, blood flow, and vascular conductance were positively correlated with total, limb, and truncal FM (p < 0.05), but not with LM.

CONCLUSIONS: Obesity reduces popliteal artery blood flow at rest in young sedentary women. The increased leg vasodilatory response to static leg exercise with WBV in obese women was likely due to the reduced vasodilatory capacity at baseline. While obese participants had greater LM, lower LM did not influence the vascular responses. Our findings suggest that conventional WBV may be beneficial to improve leg blood flow in obese women.

PURPOSE: To determine the effects of age and gender on cardiac troponin I (cTnI) and B-Type Natriuretic Peptide (BNP) levels post-marathon. METHODS: 13 female (42.5 ± 12.0 years old) and 9 male runners (46.5 ± 13.9 years old) were recruited to run the 2015 Hartford Marathon. The age distribution of the participants ranged from 22 to 63 years of age, with the following number of subjects recruited from each age range: 20-29 (n=5), 30-39 (n=5) 40-49 (n=6), 50-59 (n=5) 60-65 (n=3). A venous blood draw was taken from each subject at 3 time points (12 hours pre-race, immediately post-race, and 20 hours post-race). cTnI and BNP levels were measured at each time point using a portable analyzer (Abbott iSTAT). To test for change in biomarkers across time points and the effects of age and gender, a multilevel mixed model was used with time point nested within runner. RESULTS: BNP levels increased significantly (p=0.013) from pre-race (33.27 pg/ml ± 6.29) to post-race (54.32 pg/ml ± 7.34) and remained above baseline (p=0.017) at 16 hours post-race (42.82 pg/ml ± 7.45). cTnI levels increased significantly (p=0.009) from pre-race (0.003 ng/ml ± 0.001) to post-race (0.044 ng/ml ± 0.008) and remained above baseline (p=0.004) at 16 hours post-race (0.024 ng/ml ± 0.004). No association was found for age and BNP (p=0.427) or cTnI (p=0.394) levels for any post-race time points. The change in cTnI levels between genders was also similar across all three-time points (p=0.63). However, gender differences were found for BNP across time points. The increase in BNP levels, from pre-race to 20 hours post-race was more pronounced in females than males, with females experiencing an 87% greater change (27.3 pg/ml) than their male counterparts (p=0.047). CONCLUSION: BNP and cTnI levels were evaluated at both post-race time points indicating potential cardiac stress associated with marathon running. While no differences were found in BNP or cTnI across the age spectrum, female runners experienced a greater increase in BNP levels post-race. These results suggest that female runners may experience greater cardiac stress than their male counterparts as a result of marathon. Supported by Quinnipiac University School of Health Sciences, School of Medicine and School of Nursing.

PURPOSE: Obesity and physical inactivity are two major modifiable risk factors associated with the development of cardiovascular disease (CVD). Endothelial function is known to precede hypertension and has been associated with obesity, potentially by impacting exercise tolerance and increasing the risk for CVD. Therefore, the purpose of this study was to investigate the impact of obesity on the acute effect of whole body vibration (WBV) on popliteal artery blood flow in young sedentary women. METHODS: Forty-eight (16/group) young sedentary healthy women classified by body mass index (BMI) as lean, overweight, and obese were enrolled in the study. We measured popliteal artery characteristics (Doppler ultrasound) and brachial blood pressure at rest and 5 minutes after the cessation of an acute bout of WBV. The acute bout of WBV consisted of 5 sets of 60-second static high-squats, with 1-minute inter-set rest periods. Fat (FM) and lean mass (LM) were measured by dual-energy X-ray absorptiometry. RESULTS: Baseline mean blood velocity (MBV) was significantly greater in the lean group compared to the overweight and obese groups. Acute WBV increased (P < 0.01) MBV (1.1 ± 0.9 cm sec⁻¹), blood flow (17.4 ± 3.3 ml min⁻¹) and vascular conductance (20.4 ± 4.5 ml min⁻¹ 100 mm Hg⁻¹) in the obese group, but not in the other groups. The MBV response to acute WBV was greater in the obese compared to the lean. When vascular measurements were normalized to LM, the results were maintained. BMI and weight were positively correlated (P < 0.05) with increases in MBV, blood flow, and vascular conductance. The increases in MBV, blood flow, and vascular conductance were positively correlated with total, limb, and truncal FM (P < 0.05), but not with LM.

CONCLUSIONS: Obesity reduces popliteal artery blood flow at rest in young sedentary women. The increased leg vasodilatory response to static leg exercise with WBV in obese women was likely due to the reduced vasodilatory capacity at baseline. While obese participants had greater LM, lower LM did not influence the vascular responses. Our findings suggest that conventional WBV may be beneficial to improve leg blood flow in obese women.

PURPOSE: The rate pressure product (RPP), calculated by multiplying systolic blood pressure (SBP) and heart rate (HR), has been recognized as an index of cardiac oxygen consumption and allows the estimation of the total heart work. Only little data is available for adolescents. The study determined the association between RPP and lifestyle factors, including physical activity, fitness, obesity and screen time in youth. METHODS: The school-based study comprised 492 adolescents, aged 12 to 17 years (240 girls, 48.8%; 14.6 ± 1.5 years), who had their SBP and HR measured at rest and during cycle ergometry (1.5 W/kg body weight). BMI, waist circumference (WC), waist-to-height-ratio (WHWR), physical activity (PA) and screen time (h/d), as well as physical fitness (PWC 170) were assessed during a routine school day. Myocardial workload was calculated using the double product (HR x SBP). Analyses were performed by linear regression models adjusted for age, sex and height. Results: There was a significant association between resting SBP percentile (according to German reference data) and RPP during exercise (ß=0.452, p<0.001) with a 33.1% (95% CI 27.3-38.8, P<0.001) higher exercise RPP in subjects with elevated resting SBP values. Higher BMI (ß=0.283), WC (ß=0.255) and WHWR (ß=0.219) were related to higher exercise RPP (ß<0.001). PA was inversely associated with RPP (ß<0.001, additionally adjusted for BMI), with regard to organized sports (ß=0.113), amount of MVPA (ß=0.216) and active commuting to school (ß=0.185). Moreover, screen time was linked to higher RPP even after further adjustment for PA (ß=0.117, p<0.009), whereas the strongest association was observed between RPP and physical fitness (ß=0.743, p<0.001). When all components were included in the model, adolescent’s physical fitness was the only variable that predicted exercise RPP.

Conclusions: In younger age, cardiac stress during exercise testing is associated with elevated SBP at rest and negative lifestyle factors. However, only physical fitness was independently linked to exercise RPP among adolescents. As burden of functional capacity is more important under stress conditions, we conclude that measuring the hemodynamic response to physical stress provides additional parameters to evaluate cardiovascular risk in youth, just as in adulthood.

Acute Whole-Body Vibration Normalizes Leg Blood Flow in Young Obese Sedentary Women

Salvador J. Jaime, Stacey Alvarez-Alvarado, Joy L. Post, Arturo Figueroa, FACSM. Florida State University, Tallahassee, FL. (Sponsor: Dr. Arturo Figueroa, FACSM) Email: sj13ld@m.fsu.edu (No relationships reported)

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Individuals with stroke have difficulty sustaining or generating forces in their leg muscles. Currently, the mechanisms underlying these force deficits are not fully understood. The contribution of blood flow patterns to isolated muscle function in stroke patients is not completely understood but it can be speculated that abnormalities exist in the presence of vascular disease and muscle atrophy due to stroke. Near infrared spectroscopy devices measure regional oxygen saturations (rSO2) and provide a global assessment of regional blood flow.

**PURPOSE:** We sought to evaluate the regulation of blood flow to the exercising muscle during maximal voluntary contractions (MVC) in patients having suffered a stroke compared to healthy controls.

**METHODS:** A pilot investigation of 5 patients having suffered a stroke and 5 controls was performed to assess regional flow patterns via NIRS during MVC with the leg at 90 degrees (Biodex; Shirley, New York). The dominant leg of controls as well as both paretic and non-paretic legs in patients were tested. NIRS values were used to evaluate regional flow in the rectus femoris and reported as a high, low, and percent change during the MVC effort.

**RESULTS:** Control subjects had a greater peak torque (241.8 ± 32.2 Nm) when compared to the non-paretic leg (87.4 ± 24.8 Nm) or paretic leg (59.4 ± 31.4 Nm) of the patients with stroke (ANOVA, P<0.01). The rSO2 prior to MVC did not differ significantly between groups, however there was a robust desaturation noted in the controls (-30.8 ± 17.9 % decline) that was significantly beyond that appreciated in either the non-paretic (-5.9 ± 8.11 % decline) or paretic leg (-5.2 ± 7.7 % decline) of the stroke patients (ANOVA, P<0.01). A linear relationship exist between MVC and percent change in rSO2 for the control group (r= -0.92, P<0.023) that did not exist in either the non-paretic or paretic leg of the stroke patients.

**CONCLUSIONS:** Individuals having suffered a stroke have an attenuated blood flow response as assessed by NIRS monitoring during a MVC maneuver. These findings are not isolated to the paretic leg but exist equally in the non-paretic limb suggesting the potential of global perfusion issues in the patients having suffered a stroke. Further investigation into the mechanisms behind these improvements and the impact on leg function is warranted.
CONCLUSIONS: Myocardial ischemia is one of the most common causes of exercise associated cardiac arrest in adults. The purpose of this study was to explore the pathophysiological mechanism of exercise associated cardiac arrest by investigating the regulation of coronary blood flow (CBF) during exercise in failing heart.

METHODS: Studies were performed in 11 adult mongrel dogs trained to run on a treadmill. A Doppler velocity probe was positioned on the left anterior descending coronary artery for the measurement of CBF. CBF and the endothelium dependent vasodilator response to acetylcholine were studied in dogs in which congestive heart failure (CHF) was produced by rapid ventricular pacing for 4 weeks. Tissue homogenates of left ventricular myocardium from normal dogs and dogs with pacing-induced CHF were investigated by routine Western blot analysis.

RESULTS: The CBF at rest and during treadmill exercise were significantly decreased after development of CHF (36.7±2.44 vs 20.1±2.87 ml/min at rest, 49.3±3.88 vs 24.2±3.48 ml/min during exercise). The CBF responses to exercise were gradually decreased at different stages of pacing. The effect of acetylcholine-induced coronary vasodilation was significantly suppressed by nitric oxide synthase (NOS) blocker L-NNa (p<0.05). Western blot analysis showed that endothelial NO synthase (eNOS) protein was increased by 43±12 % significantly in failing heart.

CONCLUSIONS: Our findings of the decreased CBF response to exercise and the increased eNOS expression in the failing heart may suggest that NO signaling play an important role in the regulation of CBF during exercise and this may be a novel approach to protect heart from exercise associated cardiac arrest.

Epidemiological studies show that individuals of black African decent are at an increased risk of cardiovascular disease. Little is known about the autonomic and cardiovascular effects of habitual exercise in young healthy African subjects and it is important to establish if physical activity induces similarly protective adaptations in young, black subjects as it does in older black and Caucasian populations.

PURPOSE: The purpose of this study was to investigate the effect of habitual physical activity in young healthy black African males by documenting changes in cardiovascular health. Although important lifestyle modification for reducing the risk of cardiovascular disease in young black African males.

RESULTS: Cardiovascular changes between Week 1 (W1) and Week 20 (W20) included an increase in aerobic capacity (VO2max, 55.68 vs 58.15 ml/kg/min, p<0.001), stroke volume (SV, 67.61 vs 68.9±ml/min, p<0.001), cardiac output (CO, 4.47 vs 4.88±lpm, p<0.05), and ejection fraction (EJT, 0.33 vs 0.34±units, p<0.001) and a decrease in diastolic blood pressure (DBP, 65.14 vs 59.56±mmHg, p<0.001) and heart rate (HR, 69.61 vs 60.89±bpm, p<0.001). There was a significant decrease in total peripheral resistance (TPR, 1.05 vs 0.94±mmHg/L, p<0.05) and ascending aorta impedance (Zao, 52.92 vs 52.19±mmHg, p<0.05). Systolic blood pressure, mean arterial pressure and arterial compliance remained unchanged, while the decrease seen in blood pressure variability was not statistically significant (p>0.05).

CONCLUSION: The findings in this study suggest that even at a young age, and amongst African men, exercise improves vascular profile. The changes documented suggest a favorable response to exercise and imply that habitual exercise may be an important lifestyle modification for reducing the risk of cardiovascular disease in young black African males.

Despite the established health benefits of exercise, it is presently unknown whether a life-long endurance or resistance training regimen exhibits greater benefits on arterial stiffness and cardiovascular hemodynamics in aged athletes. PURPOSE: To compare the effects of life-long endurance and resistance training on arterial stiffness and cardiovascular hemodynamics in aged athletes.

METHODS: Twenty-four endurance (END) and twenty resistance (RES) trained elderly athletes, with nine age-matched sedentary controls (CON), underwent restung pulse wave velocity and thoracic electrical bio-impedance measurements to assess arterial stiffness and cardiovascular hemodynamics, respectively. Participants were life-long athletes actively participating in masters athletic competitions. Participant characteristics were as follows (mean±SD): END 71±7 yrs, 174±5 cm, 72±5 kg, and 44.9±9.7 training years; RES 70±8 yrs, 173±7 cm, 84±13 kg, and 32.4±20.1 training years; CON 74±5 yrs, 171±5 cm, 80±11 kg, and 0±0 training years. Kruskal-Wallis test with Tukey’s post hoc analysis were used to assess differences between groups.

RESULTS: Pulse wave velocity was lower in END and RES vs. CON (8.5±1.1 and 8.4±2.0 vs. 10.7±1.9 m/s; p<0.05). Cardiac index, stroke volume and index, ejection phase contractility index, inotropic state index and left stroke work index were higher, while stroke systemic vascular resistance index was lower in END vs. RES and CON (p<0.05). Central diastolic blood pressure was also lower in END vs. RES and CON (77±10 vs. 84±7 and 84±8 mmHg; p<0.05). Central systolic blood pressure, mean arterial pressure, and heart rate variability parameters were not different between groups (p>0.05).

CONCLUSIONS: While both training regimens exhibited lower arterial stiffness, aged athletes with a training history in endurance sports also demonstrated improved cardiovascular hemodynamics compared to their resistance sports counterparts and sedentary controls, revealing favourable influences on cardiovascular health. Although important musculoskeletal benefits are closely linked to aging and resistance training, our findings further indicate that resistance training may not protect the cardiovascular system to the same extent as life-long endurance training.
RESULTS: Moderate to vigorous physical activity showed a positive association with VO2peak (r = 0.548, p < 0.001) and VO2@AT (r = 0.473, p < 0.002), and a negative association with cf-PWV (r = 0.351, p < 0.031). cf-PWV was positively associated with systolic blood pressure (r = -0.472, p < 0.002) and inversely associated with VO2peak (r = -0.472, p < 0.002). In addition, cf-PWV was significantly lower in the patients with lower blood pressure (systolic 130-130 mm Hg) compared with those who higher values (systolic ≥140 mm Hg) (8.7±2.1 m/s vs. 10.2±2.5 m/s, p<0.05).

CONCLUSIONS: Our data show that moderate to vigorous physical activity and cardiorespiratory fitness is inversely associated with arterial stiffness in post-myocardiac infarction patients with blood pressure above the normal range despite being on medication.

Boar d #84
June 4, 9:30 AM - 11:00 AM
Cardioventilatory Impairments in Deployed Post-9/11 Veterans
Email: jacquelyn.klein@va.gov

Following deployments to Iraq or Afghanistan (post-9/11), military veterans have reported exercise intolerance, dyspnea and other symptoms that may be associated with exposure to deployment-related airborne hazards (e.g., burn pit smoke, particulate matter inhalation). While veterans may be susceptible or vulnerable to the harmful effects of air pollution and other hazardous agents, very little is known about their functional health status post-deployment. PURPOSE: To compare cardioventilatory responses to exercise and paced breathing in deployed post-9/11 veterans and non-deployed controls.

METHODS: 32 deployed veterans (6 women; 35.4±8.2 years) and 18 controls (5 women; 32.2±7.7 years) underwent a maximal, symptom-limited cardiopulmonary exercise test (Bruce) on a motorized treadmill and performed a paced breathing protocol at a fixed rate (6 breaths·min⁻¹). Cardioventilatory and electrocardiographic signals were collected continuously throughout each protocol. In addition, health-related questionnaires and symptoms were assessed for all participants.

RESULTS: Peak oxygen consumption relative to body mass was similar between groups (deployed, controls: 33.7±8.3, 34.5±10.4 ml/kg/min), but deployed veterans had an earlier ventilatory threshold onset (5.6±1.1 vs. 7.3±1.9 min; p<0.001), more severe dyspnea (5.1±1.8 vs. 3.4±1.4; p<0.001) and slower heart rate recovery (42.9±13.7 vs. 53.3±18.3 bpm; p<0.03). Heart rate variability indices derived from paced breathing indicated reduced total power (5154.0±4529 vs. 10529.9±10211.3 m²; p=0.02) and amplitude of respiratory sinus arrhythmia (9.4±4.9 vs. 14.1; p<0.01).

CONCLUSIONS: Despite similar levels of cardiorespiratory fitness, deployed veterans reported more severe dyspnea and demonstrated a slower post-exercise heart rate recovery than non-deployed controls. Blunted heart rate recovery along with reduced heart rate variability during paced breathing may suggest impaired cardiac autonomic control in deployed veterans with respiratory symptoms.

Boar d #87
June 4, 9:30 AM - 11:00 AM
Exercise Recovery Index As An Assessment Of Symptomatic Activity In obese And Non-obese Males
Anson M. Blanks, Mary K. Bowen, Heather L. Caslin, Charles S. Schwartz, Edmund O. Acevedo, FACSM, R. Lee Franco. Virginia Commonwealth University, Richmond, VA.
Email: blanksm2@vcu.edu

Exercise recovery index (ERI; heart rate/oxygen consumption plateau), has been positively associated with body fat and is thought to be a minimally invasive method to assess sympathetic dysfunction within individuals at risk of cardiovascular disease. PURPOSE: To examine differences in sympathetic activity (SA), assessed by ERI and catecholamine release between obese (n=20; BMI ≥ 30 kg/m²) and non-obese (n=20; BMI < 25 kg/m²) men. An additional aim was to determine the association of ERI with resting microvascular vasodilatory capacity (MVC), utilizing forearm blood flow (FBF).

METHODS: Twenty-one healthy (Obese: n=10, 36.7 ± 4.2 kg/m²; Lean: n=10, 21.6 ± 1.7 kg/m²) volunteers participated in a treadmill exercise test to exhaustion in which ERI was calculated during an immediate 5-min passive recovery. FBF measures, before and during reactive hyperemia (RH), were obtained prior to exercise and 5 minutes after. Blood samples were collected prior to the exercise (PRE) and again after the recovery period (POST). Epinephrine (EPI) and norepinephrine (NE) were quantified via enzyme-linked immunosorbent assay. RESULTS: The ERI was significantly greater in obese compared to lean males (18.5 ± 2.1 vs 12.2 ± 2.8 bpm · mL⁻¹, P < 0.0001). Although, no measures of MVC were significantly different between the two groups, the duration of FBF during RH was significantly correlated to ERI in obese males (r = 0.719, P = 0.019) only. EPI and NE were not significantly different prior to exercise between the two groups. In addition, EPI was significantly elevated following exercise (69.25 ± 34.86 vs. 152.78 ± 81.79 pg/mL, P < 0.001) in both groups, whereas NE was demonstrated associated with these variables. total daily LPA showed similar associations in both univariate and multivariate models. Conversely, sporadic MPA duration was inversely associated with IL-6 in both univariate (R² = 0.09, p < 0.05) and multivariate models (R² = 0.42, p < 0.001). Conclusions: IPA duration was a significant predictor of selected CM health risk factors. Increasing sporadic MPA may attenuate inflammatory response in sedentary overweight or obese adults. Findings suggest that interventions targeting increases in IPA may improve CM health profile in sedentary overweight and obese adults.

Boar d #86
June 4, 9:30 AM - 11:00 AM
Effort -dependent And -independent Cardiopulmonary Measures For Assessing Gulf War Illness
Jacob B. Lindheimer, J; Chen Y; Klein JC; Ndirangu D; Condon MR, Falvo MJ Department of Veterans Affairs NJ Health Care System, East Orange, NJ Gulf War Illness (GWI) is a heterogeneous disorder affecting approximately 700,000 military veterans and presents with chronic symptoms across multiple systems. Maximal cardiopulmonary exercise testing (CPX) has been used previously to distinguish individuals with and without GWI with equivocal findings. Disparate findings may be related to reliance on variables reflecting primarily maximal effort. PURPOSE: To compare effort-dependent (peak exercise) and -independent (ventilatory threshold, slopes) CPX variables between individuals with and without GWI. METHODS: Using a matched-pairs design, individuals with (n=6; 54±5.9 years) and without GWI (n=6; 55±6.9 years) performed a symptom-limited maximal CPX on a cycle ergometer. Pulmonary gas-exchange and ventilation were measured breath-by-breath, and heart rate was measured continuously via 12-lead ECG. Effort-dependent measures included peak measures of oxygen consumption (V̇O₂peak), power (watts), and oxygen pulse (V̇O₂/HRR). Effort-independent measures included V̇O₂ work rate relationships (AVO₂/ΔWR), oxygen uptake efficiency slope (OUES), and the time and V̇O₂ at the ventilatory threshold. RESULTS: Wilcoxon signed-rank tests revealed non-significant-between-group differences for V̇O₂ (23.9±5.5 vs. 22.6±4.9 ml/kg/min, p = 0.6), power (143.7±32.3 vs. 137.5±37.4 watts, p = 0.5), V̇O₂/HRR (12.5±2.4 vs. 11.8±2.8 ml/kg/min, p = 0.3), AVO₂/ΔWR (10.1±1.3 vs. 9.4±0.5 ml/min, p = 0.3), OUES (1988.5±601.2 vs. 1864.3±434.8, p = 0.8), time at ventilatory threshold (6.3±0.5 vs. 6.3±1.8 min, p = 0.6), and V̇O₂ at ventilatory threshold (13.57±3.6 vs. 13.7±1.6 ml/min, p = 0.9). CONCLUSIONS: CPX performance was similar between individuals with and without GWI; however, CPX remains a critical assessment in the evaluation of exercise intolerance in GWI. Future studies should explore sub-maximal exercise protocols as a potential method for distinguishing individuals with and without GWI. Supported by VA CSR&D Grant 1I21CX000797-01
an increase following exercise in only the lean males (417.9 ± 211.1 vs. 1468.7 ± 481.10 pg/mL, P < 0.001). Although exercise induced changes in NE was not related to ER1, decreased or to lower ER1 index (r = -0.634, P = 0.002).

CONCLUSIONS: These results suggest that obese males may have an impaired sympathetic function (greater ER1), possibly due to less EPI uptake following exercise. Impaired sympathetic function may result in greater vascular tone, resulting in an increased duration of FBF during RH.

Supported by VCU Presidential Research Incentive Program.

3649 Board #88 June 4, 9:30 AM - 11:00 AM
Acute Effects Of L-Citrulline Malate Supplementation On Post-exercise Hypotension in Hypertensives
Juliano Casonatto1, João Vagner Cavalar1, Diego Destro Christoffer2, 1North University of Parana, Londrina, Brazil. 2São Paulo State University, Londrina, Brazil.
Email: julianoc@sercomtel.com.br
(No relationships reported)

The L-Citrulline is an α-amino acid produced as a byproduct of the enzymatic production of nitric oxide from the amino acid arginine, catalyzed by nitric oxide synthase. The essential reaction in the body is caused by the release of nitric oxide, an important vasodilator required for regulating blood pressure. PURPOSE: To identify the acute effects of L-Citrulline malate supplementation on post-exercise hypotension in hypertensives. METHODS: Forty hypertensive subjects (58±15 years, 76±14 kg, 1.61±0.6 m) were randomized to four exercise groups: “no exercise-placebo” [CP], “no exercise-L-citrulline malate” [CL], “exercise-placebo” [EP] and “exercise-L-citrulline malate” [EL]. The exercise session consisted of 40 minutes on the treadmill (60-70% HRmax) and the control session consisting of 40 minutes in a seated position, before the experimental session. After the experimental session, the blood pressure was measured every 10 minutes for an hour, and the ambulatory blood pressure was measured for a further 24 hours. The results were converted to delta (variation), and the general linear model (repeated measures) was applied to multiple comparisons. RESULTS: No differences were identified at the baseline. The systolic blood pressure (SBP) reduced in the EL group compared with CP, CL and EP (-14.55±2.02 vs. -3.28±1.91 [P=0.001], -6.76±2.21 [P=0.018] and -7.62±2.66 [P=0.034], respectively). CONCLUSION: The magnitude and duration of post-exercise hypotension can be modulated by L-Citrulline malate supplementation in hypertensives.

3650 Board #89 June 4, 9:30 AM - 11:00 AM
Reduced Aerobic Fitness Despite Healthy Body Composition in Physically Active Children with Congenital Heart Disease
Josie Fries1, Marta Erlandson1, Elizabeth Hogewcide1, Stephanie Fussnik1, Mark J. Haykowsky2, Michael K. Stickland3, Shonah Runalls1, Ashok Kakadekar1, Scott Pharis1, Charissa Pockett1, Kristi Wright4, Corey R. Tomczak1, 1North University of Parana, Londrina, Brazil. 2University of Saskatchewan, Saskatoon, SK, Canada. 3University of Texas Arlington, Arlington, TX. 4University of Alberta, Edmonton, AB, Canada. 5University of Regina, Regina, SK, Canada. (Sponsor: Dr. Carol D. Rodgers, FACSM)
Email: jtf374@mail.usask.ca
(No relationships reported)

Children with congenital heart disease (CHD) have previously been shown to be less physically active, have greater fatness, have less lean mass muscle, and lower aerobic fitness compared to healthy matched controls. The relationship between body composition measurements and aerobic fitness in physically active children with CHD compared to similarly active healthy age- and sex-matched children is unclear. PURPOSE: To determine body composition and it’s relationship with 6MWT distance in physically active children with congenital heart disease. METHODS: Twenty-five children with CHD (11 ± 2 years; m = 15, f = 10) and 15 age- and sex-matched controls (11 ± 2 years; m = 8; f = 7) were studied. Body composition measurements (height, weight and body composition via skinfolds) and aerobic fitness (6MWT) were measured. RESULTS: Total body lean mass (CHD: 26.2 ± 12.2 kg vs. control: 27.6 ± 12.1 kg), and total body fat significantly predicted 6MWT in controls (R² = 0.471, p < 0.05). Self-reported physically active children with CHD have a reduction in aerobic fitness compared to similarly active healthy matched children, independent of similar body composition.

3651 Board #90 June 4, 9:30 AM - 11:00 AM
Post-exercise Blood Pressure In 8-10 Year Old Boys
Justin R. Bland, Kenneth R. Turley, FACSM. Harding University, Searcy, AR. (Sponsor: Kenneth R. Turley, FACSM)
Email: jrbland@harding.edu
(No relationships reported)

INTRODUCTION: Adults often see a period of post-exercise hypotension (PEH) following moderate intensity exercise. It is not established if children experience PEH at similar intensity aerobic exercise. PURPOSE: To investigate the relationship between aerobic fitness and post-exercise blood pressure (BP) occurring after a bout of exercise in prepubescent boys ages 8-10. METHODS: Eight boys visited the lab on four separate occasions. The first visit was to assess anthropometric measurements (height, weight and body composition via skinfolds) as well as perform a graded exercise test to exhaustion on an electronically braked cycle ergometer in order to establish aerobic capacity and peak power output (PPO). The subsequent visits consisted of one exercise session and one control session. The PEH was not observed in 8-10 yr old boys following a 20-minute exercise at 61% of their VO2peak. Resting BP (115.6±11.1mmHg) did not significantly (p>0.05) differ when compared to post-exercise measurements at minutes 5 (131.6±21.2mmHg), 10 (116.6±15.8mmHg), 15 (114.7±15.4mmHg), 20 (111.7±14.4mmHg), 30 (112.3±16.3mmHg), 40 (110.4±15.3mmHg), 50 (111.4±14.0mmHg), 60 (108.5±15.8mmHg) or any measurements from the control visit. CONCLUSION: PEH was not observed in 8-10 yr old boys following a 20-minute exercise at 61% of VO2peak. It is unknown if a greater exercise intensity would elicit a PEH response.

3652 Board #91 June 4, 9:30 AM - 11:00 AM
Characterizing Endothelial Responses To Acute Stressors In Perimenopausal And Postmenopausal Women
Corinna Serviente, Sarah Witkowski. University of Massachusetts Amherst, Amherst, MA. (Sponsor: Jane A. Kent, FACSM)
(No relationships reported)

Menopause is associated with rapid adverse changes in cardiovascular disease (CVD) risk factors. Endothelial dysfunction is a preclinical marker of, and potential risk factor for CVD. Flow mediated dilation (FMD) measures the endothelial response to shear stress. Stressors in perimenopausal and postmenopausal women. PURPOSE: To evaluate differences in average and serial FMD measurements before and after an acute bout of exercise (30min at 60-64% of VO2 peak), with 15 min rest between trials and 30 min rest after exercise. Brachial artery diameter was tracked continuously on the non-dominant arm during 2 min of baseline, 5 min of forearm cuff occlusion (200mmHg) and 4 minutes of post-occlusion. Data is presented as mean±SEM. Average FMD was evaluated using a 2-way repeated measures ANOVA and serial FMD with a 3-way ANOVA. RESULTS: Before exercise, FMD values did not differ between groups (PERI: 6.5±0.6%; POST: 6.5±0.5%, p=0.970). After exercise, there was no statistical difference in either group’s response, however PERI had a moderate increase in FMD (PERI: 8.5±1.1%, p=0.106), while POST saw no change in FMD (6.1±1.9%, p=0.758) and was lower than POST (p=0.063). For serial FMD responses, there was a significant difference in the
second measurement between PERI and POST (measurement 2 x group; p=0.043). POST demonstrated a blunted response to the repeated measures trial x group; p=0.05) both before (0.5% focal PWV was greater [P<0.05] HI at Post15 only. No changes were observed for Axs normalized to HR75 or central PWV in response to exercise or between trials. CONCLUSION: High intensity interval exercise elicited more robust positive effects on central blood pressure and peripheral arterial stiffness compared to a moderate-intensity continuous exercise session matched for energy expenditure. These data support the use of HI as an effective modality to improve vascular health in pre-menopausal women.

3655 Board #94  June 4, 9:30 AM - 11:00 AM
Less Exercise but Greater Arterial Stiffness Response: Low-intensity Accumulated versus Moderate-intensity Continuous Cycling
Weili Zhu, Shenghao Huang. Capital University of Physical Education and Sports, Beijing, China. Email: weili_zhu@163.com (No relationships reported)

PURPOSE: To examine the impact of rest interval duration of low-intensity accumulated cycling on arterial stiffness in humans, and compare this impact to that of moderate-intensity continuous cycling.

METHODS: Sixteen healthy recreational active young men (20.5±0.4 years) underwent non-cycling control (CON), moderate-intensity continuous cycling in the form of 1×30 min (MC), low-intensity accumulated cycling in the form of 2×15 min with 20-min (LA20) and 10-min rest interval trial (LA10). Cycling intensity was 50% heart rate reserve in MC trial, and 35% heart rate reserve in LA10 and LA20 trials. Arterial stiffness in cardio-ankle vascular index (CAVI) was measured at baseline (BL), immediately after (0 min) and 60 min after exercise. CAVI change from baseline in the same trial (⊿CAVI) was used for analysis.

RESULTS: There were no significant (P>0.05) CAVI changes with time in CON trial (0.0±0.0, 0.0±0.1 and 0.0±0.1 at BL, 0 min and 60 min, respectively). In MC and LA20 trial, ⊿CAVI demonstrated similar changes with time (0.0±0.0, -1.1±0.1 and -1.1±0.1 in MC trial, and 0.0±0.0, -0.7±0.2 and 0.0±0.2 at BL, 0 min and 60 min in LA20 trial). However, ⊿CAVI in LA10 trial decreased to -1.0±0.1 at 0 min, and returned to -0.5±0.1 at 60 min, remaining significantly lower than that in CON trial (0.0±0.1, P<0.001) and MC trial (-1.1±0.1P<0.01) at 60 min.

CONCLUSION: Arterial stiffness improvement induced by accumulated cycling was influenced by interval duration between bouts. Low-intensity accumulated cycling, when with a shorter rest interval, may result in greater arterial stiffness improvement than moderate-intensity continuous cycling. Supported by National Natural Science Foundation of China (31371206).

3656 Board #95  June 4, 9:30 AM - 11:00 AM
Concentric vs. Eccentric Arm Cycling: Acute Cardiovascular and Arterial Stiffness Responses
Travis R. Wakeham, Steven J. Elmer, John J. Durocher. Michigan Technological University, Houghton, MI. Email: twakeham@mtu.edu (No relationships reported)

Maintaining adequate upper-extremity strength is critical for performing activities of daily living, occupational-related tasks, and sport movements. Upper-extremity resistance exercise effectively increases muscular strength, but is reported to concomitantly increase arterial stiffness. Conversely, upper-extremity aerobic exercise effectively reduces arterial stiffness. PURPOSE: To determine if upper-extremity eccentric resistance exercise performed at aerobic intensities could offer both musculoskeletal and arterial benefits. We hypothesized that arterial stiffness would be reduced after both eccentric (ECCarm) and concentric (CONarm) arm cycling.

METHODS: Eighteen young healthy individuals performed either ECCarm (n=9) or CONarm (n=9) at ~70% of peak heart rate for 20 minutes, after a habituation period. Mechanical power was recorded using a power meter. Mean arterial pressure, heart rate, central pulse wave velocity (cPWV; i.e. trunk arterial stiffness), and peripheral pulse wave velocity (pPWV; i.e. arm arterial stiffness) were assessed before and 10 min post-exercise.

RESULTS: Power produced during ECCarm was ~2x that of the CONarm (124±49 vs. 67±26 Watts, p<0.001). Following exercise, CONarm (A11±2 beats/min; p=0.03) exhibited an elevation of heart rate compared to ECCarm (A4±2 beats/min). Mean arterial pressure was not significantly changed at 10 min post ECCarm or CONarm exercise. After exercise, pPWV decreased for both ECCarm (7.1±0.4 vs. 6.7±0.2 m/s) and CONarm (6.9±0.3 vs. 6.6±0.3 m/s; p=0.03 for main effect of time), while cPWV did not change. CONCLUSIONS: Our results indicate that acute ECCarm provides a high-force, low energy cost, form of resistance exercise that does not increase arterial stiffness. The similar reductions in pPWV and rapid recovery of mean arterial pressure and heart rate suggest that ECCarm is a safe form of combined resistance and endurance exercise. Thus, we are currently exploring the long-term effects of this training modality on musculoskeletal and arterial function.
PURPOSE: We performed a candidate gene association meta-analysis on the blood pressure (BP) response to exercise. Only Angiotensinogen (AGT) rs699 emerged as a promising variant. We used deep-targeted sequencing to determine if Chr 1 AGT-Exon 3657

METHODS: In the ACT2 trial, there was no significant change in FMD (before, 8.1±0.3%; immediately after, 7.6±0.4%; 30min after, 7.5±0.4%, p<0.05). In the SBP/DBP, no significant changes were observed. The AGT rs7079 and rs2067853 had identical genotypic variants and exhibited significant relationships with the systolic BP (SBP) change after versus before acute exercise compared to control among Caucasians (p=0.00315); we only report findings for rs7079.

RESULTS: SBP changed after versus before exercise compared to control by rs7079: 0/MA -12.9±6.5mmHg (nxt=4x9); 1/MA -3.8±3.9mmHg (nxt=4x9); 2/MA +5.8±0.4%; 30min after, 7.5±0.4%, p<0.05). In the SBP/DBP, no significant changes were observed. The AGT rs7079 and rs2067853 had identical genotypic variants and exhibited significant relationships with the systolic BP (SBP) change after versus before acute exercise compared to control among Caucasians (p=0.00315); we only report findings for rs7079.

CONCLUSIONS: Two active breaks during sitting can prevent a decline in the arterial function. However, less is known about the exercise modes, intensity, duration, or frequency of active breaks.

Purposes: The aim of this study was to investigate the effects of active break frequency on the vascular endothelial function as determined by flow-mediated vasodilation (FMD).

Methods: Seven healthy recreationally active male adults were studied under three experimental trials: a 3-hour uninterrupted period of sitting (SIT), a 3-hour period of sitting with 50W--cycling for 10min at 1h (ACT1), and a 3-hour period of sitting with 50W--cycling for 10min at 1h (ACT2). Before and after the three experimental trials, the brachial systolic and diastolic blood pressure (SBP, DBP) were measured using a volume-plethysmographic apparatus in the supine position. In order to measure FMD, the percent change in the arterial diameter over the baseline value at maximal dilation were taken using a high-resolution ultrasound device. The FMD was then estimated as

RESULTS: In the ACT2 trial, there was no significant change in FMD (before, 8.0±0.5%; immediately after, 8.5±0.6%; 30min after, 8.2±0.6%). However, there were significant declines in FMD in both SIT (before, 8.1±0.3%; immediately after, 7.4±0.4%; 30min after, 7.4±0.5%, p<0.05) and ACT1 (before, 8.1±0.3%; immediately after, 7.6±0.4%; 30min after, 7.4±0.4%, p<0.05). In the SBT/DBP, no significant changes were found during the three trials.

Conclusions: Compared with once/no active breaks, two active breaks during a 3-hour sitting period are thus considered to be useful to prevent a decline in FMD. These findings support the idea that more active breaks protect the vascular endothelial function and may reduce the risk of cardiovascular diseases.

PURPOSE: The aim of this study was to investigate the effects of active break frequency on the vascular endothelial function as determined by flow-mediated vasodilation (FMD).

Methods: Seven healthy recreationally active male adults were studied under three experimental trials: a 3-hour uninterrupted period of sitting (SIT), a 3-hour period of sitting with 50W--cycling for 10min at 1h (ACT1), and a 3-hour period of sitting with 50W--cycling for 10min at 1h (ACT2). Before and after the three experimental trials, the brachial systolic and diastolic blood pressure (SBP, DBP) were measured using a volume-plethysmographic apparatus in the supine position. In order to measure FMD, the percent change in the arterial diameter over the baseline value at maximal dilation were taken using a high-resolution ultrasound device. The FMD was then estimated as

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Conclusions: Compared with once/no active breaks, two active breaks during a 3-hour sitting period are thus considered to be useful to prevent a decline in FMD. These findings support the idea that more active breaks protect the vascular endothelial function and may reduce the risk of cardiovascular diseases.
were measured. A dual-energy x-ray absorptiometry scan (DXA) estimated leg lean tissue and B-mode ultrasound measured muscle thickness of the anterior and posterior mid-thigh. Muscle quality was calculated by adding leg extension and leg flexion 1-RM strength and dividing that by leg lean tissue (MQ_LT) and by anterior plus posterior mid-thigh muscle thickness (MQ_MT). One-way analysis of variance determined differences between age groups for each variable and Pearson correlation coefficients were calculated for all variables. Statistical significance was set at p<0.05.

RESULTS: MQ_LT was significantly lower in the OG vs. YG (11.9 ± 14.3 kg/cm, p=0.014). MQ_MT was significantly correlated with cPVR (r=-0.357, p=0.033) but not to cSBP (r=0.276, p=0.103) or cDBP (p=0.088, p=0.611). MQ_MT was not significantly correlated with any variables. After adjusting for age, cPWR was no longer significantly correlated with MQ_LT (r=0.202, p=0.244). No significant correlations were found between MQ_MT and other variables after adjusting for age.

CONCLUSIONS: Muscle quality, as determined from leg lean tissue, is favorably related to arterial stiffness. However, after adjusting for age, this relationship disappears which suggests that age is the more influential factor. These findings do not support the use of muscle quality (from DXA or ultrasound) as an indicator of cardiovascular health.

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**6363 Board #102**

*June 4, 9:30 AM - 11:00 AM*

**The Acute Effect of the Execution Order of Resistance Training Exercises on Blood Pressure in University Students**

Engell Quesada-Valle1, Andrea Solera-Herrera1, José Moncada-Jiménez2, *University of Costa Rica, San José, Costa Rica.*

1Human Movement Sciences Research Center (CIMOHU), San José, Costa Rica.

Email: engellqv@gmail.com

*No relationships reported*

Elevated blood pressure (BP) or hypertension (HTA) is a chronic disease affecting Hispanic populations. In Costa Rica, there is a high prevalence of HTA among young and older populations. Acute and chronic aerobic exercise has been shown to reduce and control HTA symptoms. However, there is scarce evidence regarding the acute effect and the order of resistance training exercises (i.e., large muscles vs. small muscles) on the blood pressure response.

**PURPOSE:** The aim of this study was to determine the effect of the order of execution of resistance training exercises (RT) on the resting blood pressure (BP) in normotensive young students.

**METHODS:** Volunteers were 14 healthy males (Mean age = 23.3 ± 1.4 yr.) who were familiar to resistance training exercises. Experimental conditions were randomized to participants: a) RT training starting with large muscle groups and ending with small muscles (L-S), b) RT starting with small muscle groups and ending with large muscles (S-L), and c) a control condition (no exercise). Volunteers performed each of the three experimental conditions with 48-h difference. The RT routine consisted of eight exercises performed at 60% of one-repetition maximum (1-RM). Systolic (SBP) and diastolic BP (DBP) were measured before exercise, immediately following exercise, and every 10-min for 60-min.

**RESULTS:** A two-way repeated measured ANOVA showed a significant decrease on SBP 30-min following exercise in the L-S and S-L experimental conditions compared to the control condition (p<0.001); however, the magnitude of the decrease was greater in the L-S condition after 30-min rest (M=106.9 ± 5.9 mmHg) in comparison with S-L (M=103.7 ± 8.0 mmHg) (p<0.05). No significant interaction or main effects were found on DBP (p>0.39).

**CONCLUSIONS:** An immediate SBP reduction (i.e., hypotensive effect) is achieved in university students regardless of the order of muscles performing the RT exercises. DBP did not show a significant reduction following RT exercises.

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**6364 Board #103**

*June 4, 9:30 AM - 11:00 AM*

**Effects of Resting Parasympathetic Activation on Exercise-Induced Heart Rate Fluctuations in Men**

Choun-sub Kim, Hye-young Jung, Maeng-Kyu Kim. Kyungpook National University, Daegu, Korea, Republic of.

Email: bknight7@hanmail.net

*No relationships reported*

Decresed resting heart rate (HR) was related to prompt incline HR during exercise as well as rapid decline HR immediately after exercise. Meanwhile, heart rate variability (HRV) indices reflecting parasympathetic activation was negatively correlated with resting HR. However, it is still uncertain whether parasympathetic activity index of
resting HRV was associated with exercise-induced HR fluctuations. PURPOSE: The purpose of this study was to investigate the effect of parasympathetic activity levels using HRV on exercise-induced HR fluctuations with examining the relationships between HR fluctuations during exercise and post-exercise recovery and resting HRV indices (time-, frequency-, and nonlinear domain) in young men. METHODS: Fifty-one healthy young men without any cardiovascular and orthopedic disease participated. Subjects were assessed body composition with hemodynamic parameters. Time- (rMSSD and pNN50), frequency- (HF), and nonlinear domain (SD1) of HRV were conducted in order to evaluate the magnitude of resting parasympathetic activation. Along with resting HR, fluctuations during maximal exercise test (1 to 4 stages of Bruce protocol) and post-exercise recovery (1 to 5 minutes after exercise) were obtained using Polar RS800CX HR monitor.

RESULTS: Resting HR was negatively correlated with rMSSD (r = -.661), pNN50 (r = -.485), HF (r = -.584), and SD1 (r = -.611), respectively (p < .001). Resting rMSSD, rMSSD, pNN50, HF, and SD1 were significantly related to variations in HR in 1, 2, 3, and 4 stages of Bruce protocol, respectively (p < .05). Additionally, rMSSD, pNN50, HF, and SD1 were positively related to changes in HR in 3, 4, 5 minutes during post-exercise recovery, respectively (p < .05). CONCLUSION: The resting parasympathetic activity indices in time-, frequency-, and nonlinear domain using HRV were considered to be a useful tool for predicting exercise-induced HR fluctuations.

PURPOSE: The aim of the study was to assess the effect of dynamic upper and lower body vibration exercises with blood flow restriction (BFR) on arterial elasticity and hemodynamic variables. METHODS: Seventeen male subjects (age= 23.8±2.9) performed dynamic push-up body vibration exercises with blood flow restriction (BFR) on arterial elasticity and hemodynamic variables were assessed before by non-invasive methods using the radial artery tonometer, at 10min, 20min, and 40min post-exercise. RESULTS: There were significant body*time interaction (p<0.02) and main effects for body (SQ vs. PU) (p=0.04) and time (p=0.01) for large arterial elasticity. There was also a body*time interaction (p=0.01) and main effects for body (p<0.01) and time (p<0.01) for vascular resistance. There was a significant time main effect for systolic blood pressure, but a body*time interaction (p=0.01) and time main effect (p=0.01) were detected for diastolic blood pressure. There were significant body*time interaction (p<0.01) and main effects for body (p<0.01) and time (p<0.05) for pulse pressure. There was a significant body*time interaction (p=0.01) and main effects for condition (p=0.03), body (p=0.01), and time (p=0.01) for pulse rate. Significant main effects for condition (p=0.04) and time (p=0.01) were detected for cardiac ejection time. There were significant body*time interaction (p=0.01) and time main effect (p=0.01) for stroke volume. There was also a body*time interaction (p=0.01) and main effects for body (p=0.01) and time (p=0.01) for cardiac output.

CONCLUSION: Combining dynamic vibration exercises with BFR changed the pattern and the level of changes in pulse rate and cardiac ejection time, which could be explained due to lower venous return. The responses in several variables were greater following PU indicating that the importance of type of exercise performed and/or the site of measurement taken. Future studies should investigate acute and chronic effects of different type and intensity of BFR exercises with vibration on arterial compliance.

Muscle strength impairment in children has implications for long term health. For children at risk for developmental coordination disorder (rDCD), the literature has shown conflicting results regarding whether or not this group has strength impairment. The extent to which this lack of consensus is related to the specific muscle groups evaluated or to other factors affecting muscle strength is unknown. PURPOSE: To evaluate, in a wide variety of lower limb muscle groups, maximal isometric muscle strength differences between children identified as rDCD and typically developing children of the same sex and either the same age or body mass. METHODS: Maximal isometric muscle strength (torque) of the hip abductors, hip flexors, hip extensors, knee flexors, knee extenders and ankle dorsiflexors was evaluated in 34 children (13 girls, 6-12 years old) identified as rDCD according to standard and accepted procedures (scoring below the 16th percentile) in the Movement Assessment Battery for Children-Second Edition and having no other diagnosis in the health record that could explain these test scores). Strength values for the comparison group came from a data base of 351 children with no known health conditions. The same valid and reliable hand-held dynamometry protocol was used for both groups. Children with rDCD were randomly matched with a child in the comparison group of the same sex and either the same age or body mass. All Wilcoxon signed-rank test was used to determine group differences. A p-value of <.05 was considered significant.

RESULTS: For children of the same sex and age, the rDCD group showed significantly lower strength values from (16,34%) to 40,50% (p=0.000) for all muscle groups evaluated except for the dorsiflexors. When children of the same sex and body mass were compared, the rDCD was significantly weaker only for the knee extensors (29,18%, p=0.000) and the knee flexors (14,91 %, p=0.006).

CONCLUSION: Children at risk for DCD have strength impairment, but the extent of the impairment depends on the muscle group being evaluated and the characteristics, in terms of age or body mass, of the comparison group. At least some of the strength impairment may be due to growth or body size factors. Longitudinal data are required to better understand the impact of sex, growth and maturation on strength development in this group.

Throughout childhood, developing adequate muscle function is important for performing activities of daily living. We showed (Dougherty et al., J Pediatr Hematol Oncol, 2011) body size adjusted maximal muscle strength (accessed by handgrip dynamometer) and peak power (force plate) were reduced in children with type SS sickle cell disease (SCD-SS) compared to healthy children. However, no study in this population assessed if muscle performance deficits persist using a more functional measure, muscle torque (force applied over a distance causing rotation about a fulcrum).

PURPOSE: To compare plantar flexor strength, adjusted for body size and composition, in 5 to 20 yr old African-American children with and without SCD-SS.

METHODS: Anthropometry and DXA for body composition were measured and associated Z-scores generated. Plantar flexion isometric voluntary contraction (MVC) torques of the left ankle at 2 angles (10, 20) were assessed with the Biodex Multi-Joint System 3 Pro (Biodex Medical Systems, Inc, Shirley, NY).

RESULTS: Twenty-one children with SCD-SS and 23 healthy control children did not differ by sex (11 ± vs. 10 ± yr, 11 ± vs. 12 ± 1 yr, male: female: 9:12 vs. 13:10), maturation stage ( Tanner 1, 2, 3, 4, 5: 10, 4, 3, 0 vs. 11, 2, 5, 3, 2). Children with SCD-SS had significantly lower (all P<0.05) height Z (+0.5 ± 0.3 vs. +0.4 ± 0.2), weight Z (-0.7 ± 0.3 vs. 0.8 ± 0.2), BMI Z (+0.6 ± 0.2 vs. 0.7 ± 0.2), arm circumference Z (-0.9 ± 0.6)
Board #107 June 4, 8:00 AM - 9:30 AM Feasibility of Hypoxic Challenge Testing in Youth with Congenital Heart and Lung Disease Tim Takken1, Mandy E. Spoorenberg2, Erik H. Hulzebos1, Marike H. van den Oord1, Ted Moouwsema1. 1UMC Utrecht, Utrecht, Netherlands. 2Royal Netherlands Airforce, Soesterberg, Netherlands. (Sponsor: Vish Unnithan, FACSM) Email: t.takken@umcutrecht.nl (No relationships reported)

At altitude the partial pressure of oxygen declines and causes hypoxic hypoxia. This may lead to hypoxemia in patients with congenital heart or lung disease, because of their limited compensatory cardiorespiratory capacity. For this reason a hypoxic challenge test (HCT), usually performed in resting conditions, is recommended. However, also the possible effects of changing body position and physical activity at altitude can be relevant, because it may lead to further desaturation.

PURPOSE: The primary aim of this study was to investigate the effects of integrating changing body positions and physical activity in a HCT among youth with severe congenital heart or lung disease. METHODS: SpO2 and heart rate were monitored in 12 pediatric patients with congenital heart or lung disease undergoing a modified HCT, breathing room air (21% oxygen) while sitting and breathing 15% oxygen in nitrogen while seated, lying supine, standing, walking 3 km/hr and walking 5 km/hr in a non-randomized order. Data were analyzed using a Friedman test. RESULTS: All patients, except one, passed successfully through the entire HCT protocol. Three patients reported symptoms, possible related to altitude hypoxia. Median pulse oximeter saturation breathing 15% oxygen decreased from 99% to 95% in all body positions (seated, supine, standing) compared with room air (p<0.001). There were no significant differences in pulse oximeter saturations between the different body positions. During mild exercise breathing 15% oxygen the pulse oximeter saturations decreased significantly from 99% to 94% compared to breathing 21% oxygen at rest (p<0.001). No significant differences between mild exercise breathing 15% oxygen and breathing 15% oxygen at rest was found. Several patients had SpO2 values below 90% at some point during the HCT. The pulse oximeter attached to the forehead registered significantly higher saturations (median and minimum values) than the pulse oximeter attached to the index finger (medians: 92% vs 94%/95% respectively; p<0.05).

CONCLUSION: Simulated hypoxia of 2500 meter induced a small but significant decrease in SpO2 in pediatric patients with congenital heart or lung disease. These values were not further lowered during walking and 5 km/hr.

Supported by a grant of the Prof Dr Jongbloed Foundation.

Board #108 June 4, 8:00 AM - 9:30 AM Physical Activity: A Comparison of Activity Levels in a Weight Management Camp for Youth with Obesity. Christopher Kist. Cincinnati Children’s Hospital, Cincinnati, OH. Email: christopher.kist@ccchmc.org (No relationships reported)

PURPOSE: To compare the physical activity levels of participants during a weight management camp for youth with obesity.

METHODS: Thirty obese youth, ages 9 to 13 years, were recruited at an overnight 6-day weight management camp after informed consent/assent was obtained. Subjects wore GENActiv accelerometers during all camp activities (including swimming, sleeping and bathing) for 4 full days during camp. All participants’ camp schedules and activities were identical. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), light (LPA), moderate (MPA) and vigorous (VPA). The participant’s activity level and other subject characteristics were compared during the week of camp.

RESULTS: Complete usable data was obtained from 21 (70%) accelerometers (11 girls, 10 boys). Mean age (±SD) was 11.6 ± 1.2 years. Mean BMI was 32.9 ± 5.6 kg/m². Over the 4 measured days, camp participants accumulated on average 2.2 ± 1.4 hours of VPA, 21.1 ± 2.9 hours of MPA, 8.5 ± 1.1 hours of LPA and 28.5 ± 3.9 hours of SED. Boys had more vigorous and moderate activity than girls (VPA: 2.9 ± 1.5 vs 1.6 ± 1.0 hours); MPA: (22.1 ± 1.2 vs. 20.2 ± 1.2 hours), respectively. Also a higher BMI (>32.5 kg/m²) was associated with more SED time (r=28). MPA was greater in the younger campers (9-11 years) in the older (12-13 years) campers (22 ± 2.6 vs 20.4 ± 2.8 hours). SED time was also greater in older campers (12-13 years) than younger (9-10 years) campers (28.7 ± 4.5 vs 27.7 ± 3.1 hours), respectively.

CONCLUSIONS: There is wide variability in participation and intensity levels among youth with obesity attending a weight management camp. Gender, age and BMI of the campers play a key role in determining how they participate in certain activities while attending camp.

Board #110 June 4, 8:00 AM - 9:30 AM Indicies of Adiposity by Weight Status in Children With and Without Prader-Willi Syndrome Diobel M. Castner1, Daniel A. Judelson, FACSM2, Jessica G. McGarrah3, Marilyn C. Dumont-Driscoll4, Daniela A. Rubin5. 1California State University, Fullerton, Fullerton, CA. 2University of Florida, Gainesville, FL. Email: dcstner@fullerton.edu (No relationships reported)

Body mass index (BMI), an indicator of weight status, is used to estimate body composition or health risk. Prader-Willi Syndrome (PWS), a form of early childhood obesity, is characterized by abnormally high adiposity. It is unknown whether BMI categories are good indicators of adiposity in PWS and how indices of adiposity compare between children with and without the syndrome.

PURPOSE: To characterize indices of adiposity by BMI within PWS and then compare these values to controls within each BMI category (healthy [HW: 5.84%], overweight [OW: 85.94%], obese [OB: ≥95% %ile]). METHODS: Thirty-five PWS (8 HW, 7 OW, 20 OB) and 120 controls (38 HW, 11 OW, 71 OB) participated. Anthropometrics (stature, body mass, waist circumference [WC]) and body fat parameters obtained through DXA (body fat [BF], trunk fat [TF]) were measured. Classifications for WC (normal: <75 %ile, moderate: 75-89 %ile, high: ≥90 %ile) and BF (healthy: ≤24 %ile, overweight: 85-94 %ile, obese: ≥95 %ile) were identified within each BMI category. ANOVA determined group differences (p<0.05). RESULTS: Within PWS, HW=OB for body mass and WC, while HW=OW and OB for BF and TF (p>0.01 for all). For WC, 26.8% of HW PWS and 3.3% of HW controls had moderate values; all other HW children were normal. In OW, 50% of PWS and controls had moderate or high WC. Conversely, 75% of OW PWS and 79.4% of OB controls had a high WC; all others were moderate. For BF, 75% of HW PWS and 34.2% of HW controls were identified as overweight/obese. Further, OW and OB children were all identified as obese for BF. Lastly, PWS=controls for BF and TF within all BMI categories (p>0.01 for all). In contrast, WC was similar in all children within each BMI category. CONCLUSION: Even with HW PWS presenting a better adiposity profile than OW and OB PWS, excessive adiposity was prevalent compared to controls, regardless of BMI classification. BMI was not a good estimate of adiposity, exemplified by the distributions of moderate WC and overweight/obese BF in all HW children. Further, in PWS, WC was unable to estimate increased adiposity (total and trunk) in comparison to controls by BMI category. It is suggested that other adiposity surrogates are evaluated in PWS that may better address the pattern of adiposity inherent to the syndrome.

Supported by USAMRAA Awards W81XWH-08-1-0025 & W81XWH-09-1-0682.
Evaluating Cardiopulmonary Response in Pediatric Patients with Pectus Excavatum using the James Cycle Ergometer Protocol

Wayne A. Mays, Sandra K. Knecht, Michelle A. Amos, Yvette M. Gerdes, Leigh E. Schuckert, Shelby L. Collins, Jennifer M. Shoreman, Timothy K. Knillans. Cincinnati Children’s Hospital Medical Center, Cincinnati, OH.

Email: wayne.mays@cchmc.org

(NO relationships reported)

PURPOSE: Evaluation of cardiopulmonary response of pediatric patients with pectus excavatum using a cycle ergometer. METHODS: Evaluated pediatric pectus excavatum patients (PEX) using the James Cycle Ergometer protocol. All tests achieved maximal effort. Significance set at P<0.05. RESULTS: The PEX group (N=165) was compared to normal controls (NH). The PEX group was divided into 2 groups based on the prognostic indicator, VE/VCO2 slope (VE/VCO2S), in the normal range (<30 PEX; N=127) or abnormal range (>30 PEX; N=38). No significant difference in NH, PEX or PEXA for age and height (14.8±1.7, 15.2±4.1, 15.5±4.2, 14.3±3.7 yrs.; 1.67±0.10, 1.69±0.14, 1.70±0.13, 1.66±0.17 meters). PEXA was significantly lighter than NH (52.7±13.6 vs 58.4±10.2 Kg). No significant difference in SBP, cardiac Index (CI), and oxygen consumption (VO2) were significantly higher in NH vs PEX, PEXN and PEXA. Ventilatory equivalents for oxygen consumption (VE/VO2) and carbon dioxide production (VE/VCO2) were significantly lower in NH vs PEX and PEXA. VE/VCO2 slope was significantly elevated in PEXA vs NH and PEXN.

<table>
<thead>
<tr>
<th>Group</th>
<th>WC (Kg)</th>
<th>SBP (mmHg)</th>
<th>CI (L/min/m²)</th>
<th>VO2 (ml/min)</th>
<th>VE/VO2</th>
<th>VE/VCO2S</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH</td>
<td>7398 ± 12695</td>
<td>179 ± 22</td>
<td>10.0 ± 1.5</td>
<td>2303 ± 563</td>
<td>31 ± 5</td>
<td>27 ± 4</td>
</tr>
<tr>
<td>PEX</td>
<td>6309 ± 3406</td>
<td>169 ± 10.9</td>
<td>9.2 ± 1.7*</td>
<td>2131 ± 602*</td>
<td>33 ± 5*</td>
<td>29 ± 4*</td>
</tr>
<tr>
<td>PEXN</td>
<td>6562 ± 3411*</td>
<td>170 ± 18*</td>
<td>9.4 ± 1.7**</td>
<td>2191 ± 615*</td>
<td>32 ± 4</td>
<td>27 ± 3</td>
</tr>
<tr>
<td>PEXA</td>
<td>5462 ± 1301**</td>
<td>165 ± 21.8**</td>
<td>8.7 ± 1.9**</td>
<td>1930 ± 615**</td>
<td>39 ± 5 **</td>
<td>33 ± 4**</td>
</tr>
</tbody>
</table>

NH vs PEX or PEXA: *P<0.05, **P<0.01; PEXN vs PEXA: *P>0.01

DISCUSSION: All groups had similar intensity shown by RQ and HR. PEX, PEXN and PEXA had significantly lower WC, MVCO2 and cardiac function with lower CI and SBP versus NH. PEX had decreased respiratory efficiency with PEXA showing prognostic indicators for future cardiopulmonary events. CONCLUSION: Pectus excavatum patients showed cardiopulmonary dysfunction and a gradient of dysfunction across the group.

Board #112
June 4, 8:00 AM - 9:30 AM
Evaluating Exercise Efficiency in Pediatric Patients with Upper Airway Obstruction using Exercise Flexscope Methodology

Sandra K. Knecht, Wayne A. Mays, Michelle A. Amos, Yvette M. Gerdes, Leigh E. Schuckert, Shelby L. Collins, Alessandro de Alarcon, Jennifer M. Shoreman, Timothy K. Knillans. Cincinnati Children’s Hospital, Cincinnati, OH.

Email: sandy.knecht@cchmc.org

(NO relationships reported)

PURPOSE: Evaluate the exercise efficiency of pediatric patients with suspected upper airway obstruction with two treadmill protocols. METHODS: Review of all patients with a diagnosis of upper airway obstruction using a flexscope with either a Bruce Protocol (BR) with metabolics throughout exercise or a protocol designed to elicit exercise induced bronchosospasm (EIB) without metabolics. Protocol selection was at the discretion of the referring physician. All tests achieved maximal effort. Significance was set at p<0.05. RESULTS: 67 patients were reviewed. Dynamic upper airway obstruction was present in 19 of 37 BR patients and 12 of 30 EIB patients. The frequency of positive responders was not significantly different between the two groups. There was no significant difference in age, height, weight, maximal heart rate or maximal systolic blood pressure (15/0±5.6 vs. 15/0±2.5 yrs.; 1.75±0.8 vs. 1.64±0.12 17.5 vs. 15±1.72 kg; 193±15 vs. 195±11 bpm; 164±18 vs. 156±11 mmHg), Absolute and indexed Max VO2, respiratory exchange ratio (RER), VE/VCO2 slope, VE/VO2 and VE/VCO2 equivalents were not significantly different between the BR positive and BR negative groups (1785±631 vs 2159±825 ml/min; 34±11 vs. 38±13 ml/kg/min; 1.06±0.2 vs. 1.71±0.05; 21.5±3.3 vs 22.3±3.4; 22.8±3.2 vs 24.8±3.6). Patients reported the presence of referring symptoms in 94% of the tests; however, there was no correlation between the presence of referring symptoms and upper airway obstruction. DISCUSSION: Both protocols were equally effective in eliciting upper airway obstruction. Additionally, in the BR group, there was no significant difference in the metabolic parameters and indices of respiratory efficiency between patients with and without upper airway obstruction. Also, the metabolic capacity and respiratory efficiency indices were within established normal ranges. CONCLUSION: Exercise Flexscope is tolerated with this patient population and is highly likely to elicit referring symptoms. Additionally, metabolic capacity and respiratory efficiency were within the normal ranges and both protocols were equally effective in eliciting upper airway obstruction.

Board #113
June 4, 8:00 AM - 9:30 AM
Validity Of Six-minute Oxygen Uptake Efficiency Slope In Obese Children To Determine Cardiorespiratory Fitness

Jeff S. Coombes, FACSAM,1 Concetta E. Mastersson,2 Matthew P. Wallen1, Charlotte B. Ingul3, Peter S.W Davies4, Gary M. Leed1, Peter A. Cleary1, Ross Arena, FACSAM,1 Katrina A. Dias1, University of Queensland, Brisbane, Australia.2 Norwegian University of Science and Technology, Trondheim, Norway.3University of Queensland & Lady Cilento Children’s Hospital, Brisbane, Australia.4Heart Care Partners, The Wesley Hospital, Brisbane, Australia.5University of Illinois at Chicago, Chicago, IL.

Email: jcoombes@hms.uq.edu.au

(NO relationships reported)

Poor cardiopulmonary fitness (CRF) is associated with increased all cause morbidity and mortality. CRF assessment in obese youth provides valuable information on present and future health status as well as assessing efficacy of an exercise intervention. Maximal oxygen uptake (VO2max) is often difficult to achieve in a sedentary paediatric population due to a lack of motivation and peripheral fatigue, resulting in submaximal test results. Due to the tight linear relationship throughout exercise, the oxygen uptake efficiency slope (OUES) holds possible utility as a predictor of VO2max.

PURPOSE: To determine whether a submaximal six-minute OUES (6minOUES) protocol accurately predicts maximal oxygen uptake (VO2max) in obese children. METHODS: Eighty-nine obese children (BMI=95 percentile for age and sex) completed a maximal graded exercise treadmill test with ventilatory expired gas analysis. Participants who satisfied oxygen uptake plateau criteria and achieved a peak respiratory exchange ratio (RER) ≥1.05 were classified as reaching VO2max and were included in this analysis. The OUES was determined as the slope of the line when VO2 (ml/min) was plotted against logVE. Maximal OUES (OUESmax) was calculated from start to end of the test while 6minute OUES (6minOUES) was calculated from start of the test to the 6-minute time-point. A multivariate linear regression was used to determine the relationship between VO2max, 6minOUES, and OUESmax, as well as to derive a prediction equation for VO2max.

RESULTS: Thirty-two obese children (age 12.4±1.9; Tanner puberty stage 3 (2-4), female 59%) achieved a VO2max of 31.2±5.5 ml/kg/min. Participants attained an
OUESmax of 2.82±0.89 and a 6minOUES of 2.77±1.01. VO2max (L/min) was strongly correlated with OUESmax in L/min (r² = 0.93, p<0.001) and 6minOUES in L/min (r² = 0.83, p<0.001) independent of Tanner stage and sex. Furthermore, 6minOUES was strongly correlated with OUESmax (r² = 0.91, p<0.001). The VO2max prediction derived from this cohort is as follows: VO2max = 0.651*6minOUES + 0.026*Tanner Stage + 0.565 (r = 0.90, standard error of the estimate = 0.34). The 6minOUES treadmill protocol may be used to predict VO2max in obese children when oxygen uptake plateau criteria and peak RER indicate submaximal exercise performance.

PURPOSE: The analysis of the interaction between gas exchange (pulmonary oxygen uptake, VO2; carbon dioxide, VCO2; ventilation, VE), heart rate (HR) and work rate (WR) is used to evaluate health and fitness during cardiolunary exercise testing (CPET) using the cycle ergometer in pediatric populations. The VE/VO2, VO2/HR, and VO2/WR slopes quantify these interactions and cardiorespiratory function, which is affected by age and sex in children. There are few studies on cardiorespiratory assessment using these slopes during treadmill exercise testing, as the VO2/WR slope can only be estimated since WR cannot be directly measured. An alternative to VO2/WR slope, the “energy cost of running” (Cr), can be estimated from the slope of the VO2 changes relative to the speed and body weight. We hypothesized that VE/VO2, VO2/HR and Cr slopes applied to fit linear models. The analysis of covariance was performed to study gender and age interaction on VO2/HR (P<0.0001) and no interaction on VE/VCO2 (P<0.666) and Cr (P<0.1). The analysis of the interaction between gas exchange (pulmonary oxygen uptake, VO2; carbon dioxide, VCO2; ventilation, VE), heart rate (HR) and work rate (WR) is used to evaluate health and fitness during cardiolunary exercise testing (CPET) using the cycle ergometer in pediatric populations. The VE/VO2, VO2/HR, and VO2/WR slopes quantify these interactions and cardiorespiratory function, which is affected by age and sex in children. There are few studies on cardiorespiratory assessment using these slopes during treadmill exercise testing, as the VO2/WR slope can only be estimated since WR cannot be directly measured. An alternative to VO2/WR slope, the “energy cost of running” (Cr), can be estimated from the slope of the VO2 changes relative to the speed and body weight. We hypothesized that VE/VO2, VO2/HR and Cr slopes applied to fit linear models. The analysis of covariance was performed to study gender and age interaction on VO2/HR (P<0.0001) and no interaction on VE/VCO2 (P=0.666) and Cr (P=0.1). The analysis of the slopes showed a significant interaction between gender and age on VO2/HR (P=0.0001) and no interaction on VE/VCO2 (P=0.001) and Cr (P=0.1). Gender difference (F vs. M) on VE/VO2/VO2/HR (L/min) was present in all age groups: 8-10yr: 30.7 vs. 29.1 (P=0.07); 11-12yr: 28.1 vs. 26.7 (P=0.03); 13-14yr: 25.8 vs. 25.7 (P=0.93); 15-16yr: 25.1 vs 24.5 (P<0.01); 17-18yr: 25.5 vs. 23.4 (P<0.001). Cr (mL/kg-1 m-1) is significantly lower in F than M for age groups over 10 yr old: 8-10yr: 0.417 vs. 0.446 (P=0.13); 11-12yr: 0.395 vs 0.448; 13-14yr: 0.405 vs 0.455; 15-16yr: 0.405 vs 0.46; 17-18yr: 0.405 vs. 0.473 (P<0.0001).

RESULTS: There was an increase in VO2max of 2.85±5.48 mL/kg/min following a three-month exercise intervention. This was closely reflected by a mean increase in OUESmax (3.45±7.60) and 6minOUES (3.62±8.49). The increase in VO2max was strongly correlated with an increase in OUESmax (r² = 0.81, p<0.05) and an increase in 6minOUES (r² = 0.77, p<0.05) independent of sex and change in percent body fat. The increase in 6minOUES was strongly correlated with the increase in OUESmax (r² = 0.91, p<0.05).

CONCLUSION: The 6minOUES treadmill protocol is a valid submaximal measure of exercise-training induced CRF changes in obese children. This may be valuable when VO2max is not achieved in exercise testing designed to determine training-induced improvements.

An improvement in cardiorespiratory fitness (CRF) following an exercise intervention is a primary indicator of training efficacy. In obese children, maximal oxygen uptake (VO2max) may not be achieved during an exercise test due to reduced motivation or peripheral fatigue. Identifying a valid surrogate for VO2max, obtained with a submaximal exercise effort, would therefore be advantageous in this population.
First responders and military personnel are exposed to short-term energy deficits from concomitant reductions in energy intake and increases in energy expenditure (EE) that may degrade physical and cognitive performance by lowering blood glucose levels to concentrations below ~55 mg/dL. The extent to which energy deficits perturb normoglycemia in healthy individuals is not known since prior studies measured glucose infrequently, not by continuously monitoring glucose levels. Purpose: To characterize the glycemic response to acute, severe energy deprivation, using continuous glucose monitoring (CGM). Methods: For 2 days during a double-blind, placebo-controlled, crossover study, 14 young adults (10M/4F; 21.5 ± 3.8 yrs; BMI: 24.9±2.8 kg/m2) increased habitual daily EE ([mean±SD] 2284 ± 420 kcals/d) by 30% more fat was oxidized in CRT vs CON (14.6 vs 10.8 g fat). A total of 364 ± 0.80 ± 0.04 for CRT and CON, respectively, and expended 161 ± 26 kcal. Compared to control, EPOC following CRT was abolished (3% difference) by the end of the 120 min post-exercise measurement period. Thirty-five participants (27 males and 8 females) were enrolled in this observational study. The mean age, height and weight were 48.3±17.8 yrs, 173.2±8.7cm, and 78.1±16.8kg, respectively. A repeated-measures ANOVA found that the REEs significantly differed from another one, F(1,1, 37.8) = 51.24, p<.001. The actual REE ([M=1534.1, SD=257.0 kcal]) was significantly lower (p<.001) than both the HB ([M=1679.2, SD=281.6 kcal]) and the MSJ ([M=1615.4, SD=238.2 kcal]) energy predictions. Conclusion: The prevalence of obesity among people with SCI is alarmingly high, a population-specific prediction equation for REE may be required to help these individuals better manage their weight, given that traditional prediction equations appear to overestimate REE.

CrossFit is a sport of high demands of training and sometimes a strict dietary behaviors. To date, no current literature has examined eating disorder risk, energy needs and body composition of these athletes. Purpose: To examine eating disorder (ED) risk, dietary needs and body composition in competitive CrossFit athletes (active competitors at local, regional, or national level). Methods: CrossFit athletes (n=20) from a local area participated in the study (males: n=11, age = 26.7 yrs, height=197.6±8.5 cm, weight=86.1±6.8 kg; and females: n=9, age = 29.4 yrs, height = 163.2±5.6, weight = 64.5±6.6 kg). Participants completed a demographic survey, Eating Disorder Inventory 3 and ED symptoms checklist. They also completed a 7 day online dietary and exercise log and were measured for height, weight, DXA scan, and resting metabolic rate (RMR) through indirect calorimetry (MedGem). Results: DXA body fat percentage for males and females were 17.0±4.4% and 16.7±3.6% respectively. ED risk was found in 45.5% and 44.4% of males and females respectively; and 63.6% and 100% of males and females engaged in some form of pathologic behavior. Energy assessment for males included: energy intake (EI) = 3015.4±356.9 kcal/day; RMR = 2036.4±356.9 kcal/day; exercise energy expenditure (EE; = 707.1±1357.7 kcal/day, and energy availability (EA) = 34.6±16.6 kcal/kg-1LBm. Energy assessment for females included: EI = 1963.1±521.3 kcal/day; RMR = 1391.1±195.8 kcal/day; EE; = 427.7±184.6 kcal/day, and EA = 31.1±8.9 kcal/kg-1LBm/day. Overall, 95% (n=19) reported under the recommendation for CHO intake (60g/kg); 100% reported over the recommendation for protein intake (1.2-1.7 g/kg), while 10% (n=4) were under and 15% were over the fat recommendations (20-35%). Conclusion: CrossFit athletes displayed ED risks both psychologically as well as pathogenic behaviors. Additionally, these athletes appear to be under consuming carbohydrates and over consuming proteins per the recommendation for athletes. The imbalance of nutrition may be inadvertently due to lack of knowledge of personal energy needs for the sport. Therefore, it is important for athletes, coaches, and healthcare professionals to understand individual energy requirements and ED risk for optimal health and performance.
Impact Of Order Of Exercises On Substrate Oxidation In Healthy Men

Takuma Morishima, Natsuki Kono, Kazushige Goto. 
Ritsumeikan University, Kusatsu, Japan. (Sponsor: Jill Kanaley, FACSMD)

Purpose: To examine the impact of order of exercises on substrate oxidation in healthy men. Methods: Eight healthy men (21.3 ± 0.4 yrs, 171.3 ± 3.5 cm 63.4 ± 3.0 kg, 21.6 ± 0.5 kg/m²) completed two experimental trials: either an aerobic exercise after resistance exercise (RA trial) or an aerobic exercise before resistance exercise (AR trial). In the aerobic exercise, subjects completed 60 min of pedaling exercise at 50 % of VO2max. Resistance exercise (30 min in total) consisted of five consecutive exercises (chest press, lat pull down, shoulder press, leg press, seated rowing), each with 10 repetitions for three sets at 75 % of 1RM. Rest period between resistance exercise and aerobic exercise was 10 min. Subjects sustained sitting position for 60 min after the all exercises. Blood and respiratory gas samples (percentage of fat oxidation evaluated by RER) were collected over experimental period. Results: Blood glucose response did not differ between trials. There were no significant differences in blood lactate concentration in response to resistance exercise between trials. However, blood lactate concentration at 60 min after all exercise was significantly higher in the AR trial than in the RA trial (1.5 ± 0.2 mmol/l in the RA trial vs. 2.8 ± 0.7 mmol/l in the AR trial, P < 0.05). Although there was no significant difference in percentage of fat oxidation during aerobic exercise between trials, resting percentage of fat oxidation after the all exercises was significantly higher in the AR trial than in the RA trial (92.8 ± 26.9 % in the RA trial vs. 99.7 ± 1.1 % in the AR trial, P < 0.05). Conclusion: The order of exercise between aerobic and resistance exercises does not affect substrate oxidation during aerobic exercise, but aerobic exercise before resistance exercise enhanced fat oxidation during post-exercise period more than when resistance exercise precedes aerobic exercise.

Pathogenesis And Symptomology Of The Exercise-hypogonadal Male Condition

David R. Hooper1, Kevin E. Schill2, Catherine Saenz2, Emily R. Martin2, Shawn D. Flanagan2, Tunde K. Szivak1, William H. DuPont1, Brian C. Focht1, Jeff S. Volle2, Carl M. Maresh2, FACSMD, William J. Kraemer, FACSMD. 1Armstrong State University, Savannah, GA. 2The Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, FACSMD)

Purpose: To examine the impact of order of exercises on substrate oxidation in healthy men. Methods: Eight healthy men (21.3 ± 0.4 yrs, 171.3 ± 3.5 cm 63.4 ± 3.0 kg, 21.6 ± 0.5 kg/m²) completed two experimental trials: either an aerobic exercise after resistance exercise (RA trial) or an aerobic exercise before resistance exercise (AR trial). In the aerobic exercise, subjects completed 60 min of pedaling exercise at 50 % of VO2max. Resistance exercise (30 min in total) consisted of five consecutive exercises (chest press, lat pull down, shoulder press, leg press, seated rowing), each with 10 repetitions for three sets at 75 % of 1RM. Rest period between resistance exercise and aerobic exercise was 10 min. Subjects sustained sitting position for 60 min after the all exercises. Blood and respiratory gas samples (percentage of fat oxidation evaluated by RER) were collected over experimental period. Results: Blood glucose response did not differ between trials. There were no significant differences in blood lactate concentration in response to resistance exercise between trials. However, blood lactate concentration at 60 min after all exercise was significantly higher in the AR trial than in the RA trial (1.5 ± 0.2 mmol/l in the RA trial vs. 2.8 ± 0.7 mmol/l in the AR trial, P < 0.05). Although there was no significant difference in percentage of fat oxidation during aerobic exercise between trials, resting percentage of fat oxidation after the all exercises was significantly higher in the AR trial than in the RA trial (92.8 ± 26.9 % in the RA trial vs. 99.7 ± 1.1 % in the AR trial, P < 0.05). Conclusion: The order of exercise between aerobic and resistance exercises does not affect substrate oxidation during aerobic exercise, but aerobic exercise before resistance exercise enhanced fat oxidation during post-exercise period more than when resistance exercise precedes aerobic exercise.

Exercise Preserves Fat-free Mass, Submaximal Performance, And Well-being During Short-term Energy Deficiency

Jay Petersen1, Hans Braun1, Christoph Zinner2, Karsten Koehler1. 1University of Nebraska-Lincoln, Lincoln, NE. 2German Sport University, Cologne, Germany. 3University of Würzburg, Würzburg, Germany.

Purpose: To examine the impact of order of exercises on substrate oxidation in healthy men. Methods: Eight healthy men (21.3 ± 0.4 yrs, 171.3 ± 3.5 cm 63.4 ± 3.0 kg, 21.6 ± 0.5 kg/m²) completed two experimental trials: either an aerobic exercise after resistance exercise (RA trial) or an aerobic exercise before resistance exercise (AR trial). In the aerobic exercise, subjects completed 60 min of pedaling exercise at 50 % of VO2max. Resistance exercise (30 min in total) consisted of five consecutive exercises (chest press, lat pull down, shoulder press, leg press, seated rowing), each with 10 repetitions for three sets at 75 % of 1RM. Rest period between resistance exercise and aerobic exercise was 10 min. Subjects sustained sitting position for 60 min after the all exercises. Blood and respiratory gas samples (percentage of fat oxidation evaluated by RER) were collected over experimental period. Results: Blood glucose response did not differ between trials. There were no significant differences in blood lactate concentration in response to resistance exercise between trials. However, blood lactate concentration at 60 min after all exercise was significantly higher in the AR trial than in the RA trial (1.5 ± 0.2 mmol/l in the RA trial vs. 2.8 ± 0.7 mmol/l in the AR trial, P < 0.05). Although there was no significant difference in percentage of fat oxidation during aerobic exercise between trials, resting percentage of fat oxidation after the all exercises was significantly higher in the AR trial than in the RA trial (92.8 ± 26.9 % in the RA trial vs. 99.7 ± 1.1 % in the AR trial, P < 0.05). Conclusion: The order of exercise between aerobic and resistance exercises does not affect substrate oxidation during aerobic exercise, but aerobic exercise before resistance exercise enhanced fat oxidation during post-exercise period more than when resistance exercise precedes aerobic exercise.

Determinants Of The Exercise-hypogonadal Male Condition

David R. Hooper1, Kevin E. Schill2, Catherine Saenz2, Emily R. Martin2, Shawn D. Flanagan2, Tunde K. Szivak1, William H. DuPont1, Brian C. Focht1, Jeff S. Volle2, Carl M. Maresh2, FACSMD, William J. Kraemer, FACSMD. 1Armstrong State University, Savannah, GA. 2The Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, FACSMD)

Purpose: To examine the impact of order of exercises on substrate oxidation in healthy men. Methods: Eight healthy men (21.3 ± 0.4 yrs, 171.3 ± 3.5 cm 63.4 ± 3.0 kg, 21.6 ± 0.5 kg/m²) completed two experimental trials: either an aerobic exercise after resistance exercise (RA trial) or an aerobic exercise before resistance exercise (AR trial). In the aerobic exercise, subjects completed 60 min of pedaling exercise at 50 % of VO2max. Resistance exercise (30 min in total) consisted of five consecutive exercises (chest press, lat pull down, shoulder press, leg press, seated rowing), each with 10 repetitions for three sets at 75 % of 1RM. Rest period between resistance exercise and aerobic exercise was 10 min. Subjects sustained sitting position for 60 min after the all exercises. Blood and respiratory gas samples (percentage of fat oxidation evaluated by RER) were collected over experimental period. Results: Blood glucose response did not differ between trials. There were no significant differences in blood lactate concentration in response to resistance exercise between trials. However, blood lactate concentration at 60 min after all exercise was significantly higher in the AR trial than in the RA trial (1.5 ± 0.2 mmol/l in the RA trial vs. 2.8 ± 0.7 mmol/l in the AR trial, P < 0.05). Although there was no significant difference in percentage of fat oxidation during aerobic exercise between trials, resting percentage of fat oxidation after the all exercises was significantly higher in the AR trial than in the RA trial (92.8 ± 26.9 % in the RA trial vs. 99.7 ± 1.1 % in the AR trial, P < 0.05). Conclusion: The order of exercise between aerobic and resistance exercises does not affect substrate oxidation during aerobic exercise, but aerobic exercise before resistance exercise enhanced fat oxidation during post-exercise period more than when resistance exercise precedes aerobic exercise.
No significant changes were found in anaerobic performance, leg curl, and leg extension. Bench press performance decreased only in ED+EX (p<0.04). VO2max increased by 6.2±1.7% in ED-CH (p=0.007), but not in ED-EX. Submaximal HR and RPE increased only in ED-EX (p<0.05). Fasting glucose decreased in ED+EX (-11.9±2.3% p=0.008), but not in ED-EX. In both ED conditions, there was an increase in fasting free fatty acids (ED-EX: 96.2±25%, p=0.02; ED-EX: 175±98%, p=0.07) and submaximal fat oxidation (ED-EX: 129±51%, p=0.004; ED-EX: 126±21%, p = 0.001). In ED-EX, but not in ED-EX, there was a decrease in positive mood (p=0.04), self-confidence (p=0.02), sense of fitness (p=0.08), physical energy (p=0.06), and recovery (p=0.07).

CONCLUSIONS: Despite similar changes in body weight and substrate metabolism during both ED conditions, reductions in FFMI, submaximal performance indices, and indices of well-being were only observed in ED-EX. EX seems to be an effective means to maintain performance, FFMI, and well-being during short-term ED.

INTRO: It is known that ascent to altitude increases reliance on carbohydrates and may affect respiratory exchange rate (R). It is unknown if these adaptations occur during exercise at moderate altitudes. PURPOSE: The purpose of this study was to determine differences in R, carbohydrate (CHO) and fat utilization in acclimated and non-acclimated participants during a trail run at moderate altitude. METHODS: Seventeen participants volunteered and were grouped based on location of residency: acclimated (AC, living at 5800ft, N=8) and non-acclimated (NA, living at 2181ft, N=9). The trail altitude was 5385 ft at onset with 56 feet rise in elevation, and environmental condition ranges included: temperature: 79°F-90°F, humidity: 4.5%-38.5%, and wind speed: 1.1-3.5 mph. All measures were obtained using a CosMed K4b2 portable metabolic system. Measurements were taken mid-run and 45 seconds prior to the end of the run. Data were analyzed using independent t-tests, with significance at the p<0.05 level. RESULTS: There were no differences between groups per variable: AC R mid run = 0.89±0.05, t15 = -.641, p = .531; AC R end = 0.81±0.03, AC Fat% mid = 36.9±16.3, t15 = -.083, p = .935, NA Fat% mid = 36.2±18.9; AC Fat% end = 58.7±16.0, t15 = .512, p = .616, NA Fat% end = 62.3±12.5; AC CHO% mid = 63.6±16.3, t15 = -.242, p = .812, NA CHO% mid = 56.5±17.8; AC CHO% end = -41.8±15.7, t15 = -.512, p = .616, NA CHO% end = 38.2±12.5. CONCLUSION: Our results indicate that acclimation to moderate altitude has no influence on respiratory exchange rate, nor CHO or CH utilization during a one-mile trail run. Exercise of longer duration may produce different results. Overall fitness level of the participant may also influence nutrient utilization.

Variance in the efficacy of structured exercise to achieve targeted levels of weight loss or maintenance appears to be primarily due to individual differences in biochemical responses that increase energy intake (EI) or decrease non-exercise activity thermogenesis (NEAT). However, the relative importance of each type of compensatory behavior remains incompletely characterized. PURPOSE: To quantify and compare changes in EI and NEAT that occur when women initiate a structured exercise program. METHODS: Previously sedentary women (n=98, 35.9±6.1 y, 75.5% white non-Hispanic, 29.8±8.2 kg/m²) completed an 8-week exercise-only intervention with the goal of achieving 150 min/week of moderate intensity walking. ActiGraph GT3X+ monitors were worn during waking hours for 1 week at baseline and throughout the intervention to measure exercise energy expenditure (ExEE) and changes in NEAT (kcal/d). Changes in EI (kcal/d) were measured via the National Cancer Institute’s ASA24 program on three randomly selected days at baseline and six days during the intervention. RESULTS: The exercise intervention directly increased ExEE by a mean of 103.3 kcal/d above baseline values. Reflecting the observation that 50% of women reported an intention to diet during the exercise intervention, there was a significant decrease in average EI (-185.3±55.8 kcal/d, p<0.01), but no change in relative macronutrient intake (p>0.35 for all). However, 27.6% of women reported increases in EI greater than their ExEE, including 20.4% of intended dieters. Modest average decreases in NEAT (-46.4±69.5 kcal/d, p<0.01) were observed although 9.2% of women had decreases which exceeded their increased ExEE. Overall, combined changes in EI and NEAT totally offset ExEE for 28.6% of women. A smaller percentage of overweight and obese women (23.1%) than healthy weight women (39.4%) had compensatory changes exceeding ExEE, although these differences were not statistically significant (p<0.09). CONCLUSIONS: Among women initiating a structured exercise program, changes in total daily EI are of greater magnitude than changes in NEAT. For approximately a quarter of participating women, compensatory behavioral changes appear to totally offset the additional ExEE. Supported by NHLBI-1R21HL137421-01.
Long-term training influence on the acute immune response to exercise has been poorly studied, despite the complexity of both chronic and acute adaptations induced by training programs performed throughout the athlete’s career.

**PURPOSE:** To study the influence of a 4-month swimming training cycle on the immune cell response to a representative high intensity session, during a 24 h recovery period, controlling for sex, maturity, age group, performance, and distance specialty effects.

**METHODS:** 43 swimmers (16 females; 14 ± 1.1 yrs., and 27 males; 16 ± 2.0 yrs.) performed a standardized swimming session, at the beginning (M1) and at the end (M2) of a 4-month training cycle. Blood samples were taken before (Pre), immediately after (Post), 2 h after (Post 2h) and 24 h after (Post 24h) the sessions, by standard procedures for assessment of leukogram by automated counting (Coulter LH 750, Beckman) and lymphocytes subsets by flow cytometry (FACS Calibur BD). Pre to Post, Pre to Post 2h, and Pre to Post 24h changes were expressed as the relative differences in percentage. Upper Respiratory Symptoms (URS) episodes were monitored and training load was quantified. The level of significance was set at p<.05.

**RESULTS:** At M2, from Pre to Post there was a lower leukocytosis (M1: 14 ± 36 / M2: 2.3 ± 2.3) and neutrophilia (M1: 57 ± 72; M2: 39 ± 50) and from Pre to Post 2h, total lymphocytes (M1: -22 ± 21; M2: -30 ± 19) and CD19+ subset (M1: 4.1 ± 31 / M2: -19 ± 24) had a less efficient recovery than at M1. CD4+/CD8+ ratio in the youth group, continued to increase at M1 (22 ± 16) but not at M2 (9.2 ± 21), while in the senior group continued to increase at M2 (23 ± 15) and at M1 (3.7 ± 9.2) was returning to baseline. At M2, CD16+56+ cells’ recovery from Post 2h to Pre values was less efficient in adolescents (M1: -0.7 ± 35; M2: -21 ± 34) than in adults (M1: -1.8 ± 28; M2: 0.8 ± 23).

**CONCLUSION:** At the end of the training cycle, a general attenuated acute immune response between level-running (LR) and down-hill running (DHR). Exercise-induced irisin response compared with level-running (with smaller muscle damage) under same exercise duration and VO2 during the exercise.

**PURPOSE:** The purpose of present study was to compare exercise-induced irisin response between level-running (LR) and down-hill running (DHR).

**METHODS:** Fifteen healthy males (21.6 ± 2.0 yr, height: 170 ± 1.3 cm, weight: 64.8 ± 2.7 kg, BMI: 22.4 ± 0.8 kg/m2) were randomly assigned to the LR group (n = 8) or DHR group (n = 7). Subjects in the LR group conducted 30 min of treadmill running exercise with 0% slope, whereas the subjects in the DHR group performed the same treadmill running exercise with 10% slope. Exercise intensity set as 70% of VO2max in both groups, and running velocity was adjusted to match VO2 during the exercise between the two groups. Blood samples were collected before exercise, immediately after exercise, at 1, 3 and 24 h after exercise.

**RESULTS:** No significant interaction (group x time) or main effect for group was observed for time-course changes in plasma irisin concentration (P > 0.05). However, when the area under the curve (AUC) of plasma irisin concentration over 3 h after exercise period was compared, the AUC value was significantly higher in the DHR (239197 ± 8166 ng/ml•3h) group than in the LR group (92293 ± 8755 ng/ml•3h, P < 0.05). Blood lactate and serum myoglobin concentrations were significantly higher in the DHR group than in the LR group after the exercise.

**CONCLUSIONS:** Down-hill running with resulting in marked muscle damage promoted exercise-induced irisin response compared with level-running under same exercise duration and VO2 during the exercise.
the decreasing schedule differed significantly (p<0.05) from that of the ascending schedule in lactic acid (12.91±3.10 and 10.15±0.55 mmol·L⁻¹), natural killer cells 1.10±2.2 and 0.90±1.1 (PBNK=10%) respectively. Conclusions: A critical level of lactic acid is necessary before lymphocyte subsets rises above resting levels. However, the extent of recruitment of natural killer cells into the circulation depends on the levels of lactic acid, probably elucidating the impact of each training scheme on the individual overall health status.

### Board #133 June 4, 8:00 AM - 9:30 AM

**Eight Weeks of Resistance Training Reduces IL-15 Response to Acute Resistance Exercise in Trained Men**

Adam R. Jajtner¹, Jay R. Hoffman, FACSM¹, Gerald T. Mangine², David D. Church¹, Jeremy R. Townsend¹, Kyle S. Beyer¹, Carleigh H. Boone¹, David H. Fukuda¹, Jeffrey R. Stout¹. ¹University of Central Florida, Orlando, FL. ²Kennesaw State University, Kennesaw, GA. (Sponsor: Jay Hoffman, FACSM)

(No relationships reported)

**PURPOSE:** Compare the effects of 8-weeks of high intensity (HVY) or high volume (VOL) resistance training on the plasma cytokine response.

**METHODS:** Twenty resistance trained men were randomly assigned to either a HVY (22.6±2.3 y; 87.0±15.1 kg; 1.79±0.05 m; 1.66±0.34 m) protocol or VOL (24.5±2.6 y; 89.5±12.9 kg; 1.66±0.34 m) protocol. Prior to the 8-week resistance training program, participants performed an acute bout of exercise using either the HVY (3-5 reps; 90% 1-RM) or VOL (10-12 reps; 70% 1-RM) training protocol (PR-T). The acute exercise protocol was repeated following the 8-week training program (PO-T). Blood samples were obtained prior to (PR), immediately (IP), 30 min (30P) and 60 min (60P) post-exercise at PR-T and PO-T. Samples were analyzed for IL-15, IL-6, and Fractalkine (CX3CL1) at each time point. Data were analyzed using a group x training x time repeated measures ANOVA. Bivariate relationships were examined by Pearson product-moment correlations. Additionally, area under curve (AUC) was assessed with a group x training repeated measures ANOVA.

**RESULTS:** A significant training x time interaction was observed for IL-15 (p = 0.011), as well as a main effect for time (p = 0.001). Post Hoc analysis indicated that IL-15 concentrations were lower (p = 0.023) at 60P PO-T (2138.69 ± 545.33 pg·ml⁻¹) compared to 60P (6.83 ± 5.73 pg·ml⁻¹) at PR-T. Additionally, IL-15 concentrations were lower (p = 0.009) from PR (9.66 ± 5.52 pg·ml⁻¹) at IP (8.08 ± 5.88 pg·ml⁻¹), and reduced (p = 0.032) at 60P (5.66 ± 5.12 pg·ml⁻¹). A significant main effect for time was observed for IL-6 (p = 0.001). Pairwise comparisons indicated that IL-6 concentrations increased from PR (9.74 ± 8.27 pg·ml⁻¹) to IP (13.21 ± 8.91 pg·ml⁻¹; p < 0.001). 30P (13.45 ± 9.30 pg·ml⁻¹; p = 0.001) and 60P (13.26 ± 9.84 pg·ml⁻¹; p = 0.001). No significant interactions were noted for CX3CL1 concentration, nor were any AUC interactions noted for IL-15, IL-6 or CX3CL1. Significant correlations were noted for IL-15, IL-6 or CX3CL1. Significant correlations were noted for IL-15, IL-6 or CX3CL1.

**CONCLUSIONS:** Short-term resistance training programs appeared to reduce post-exercise IL-15 concentrations. In addition, strength appeared to have an inverse relationship with CX3CL1 concentrations.

### Board #134 June 4, 8:00 AM - 9:30 AM

**Effect Of Muscle-damaging Exercise On Circulating TNFa And TNFRII Expression In Monocytes And Neutrophils**


(No relationships reported)

**PURPOSE:** To examine the response of TNF receptor-I (TNFR-I) expression in CD14+ monocytes (MON) and neutrophils (NEUT) as well as circulating TNFα concentrations after a bout of lower body muscle-damaging exercise. METHODS: Twelve recreationally active men were randomly assigned to an exercise group (EX; n = 6; 23.5±2.5 y, 1.75±0.03 m, 86.38±15.31 kg) or control group (CON; n = 6; 22.7±3.8 y, 1.79±0.05 m, 75.7±13.75 kg). Kruskal-Wallis test was used to identify statistical significance. Results: The repeated measures ANOVA demonstrated a significant (p<0.019) main effect for time. BDNF concentrations were significantly elevated from PRE (191.63 ± 447.79 pg·ml⁻¹) at 30P (3579.47 ± 680.04 pg·ml⁻¹), and 60P (3307.75 ± 536.80 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹).

**RESULTS:** The repeated measures ANOVA demonstrated a significant (p<0.019) main effect for time. BDNF concentrations were significantly elevated from PRE (1911.63 ± 447.79 pg·ml⁻¹) at 30P (3579.47 ± 680.04 pg·ml⁻¹), and 60P (3307.75 ± 536.80 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹). In addition, BDNF concentrations were significantly greater at 30P than IP (2624.37 ± 399.67 pg·ml⁻¹).

**CONCLUSIONS:** The results of this study indicate BDNF increases in response to a resistance training stress in resistance trained men. However, comparisons between HV and HI training indicates a trend towards a difference in the BDNF response.
Near infrared spectroscopy (NIRS) can readily report changes in localized blood volume and oxygenation. Using rapid venous occlusions (VO) and arterial occlusions (AO), skeletal muscle blood flow (mBF) and oxygen consumption (mVO2) can be measured. A new protocol has been developed to assess mBF and mVO2 responses to incremental exercise.

**Purpose:** To determine the reliability of mBF and mVO2 responses to incremental exercise using continuous wave (cw) NIRS.

**Methods:** Twelve healthy adults were tested on 3 non-consecutive occasions over 10 d. The NIRS probe was placed on the lower V. lateralis. After a 10 min rest, VO and AO were used to determine resting mBF and mVO2 respectively. Participants performed 1 isometric knee extension (dynamometer) every 3 s for 3 min. Immediately following extension, the leg was rested and VO or AO applied for 15 s. Extensions resumed for 45 s to maintain steady state before another VO/AO. Each workload consisted of 4 VO and 2 AO. Workloads were 5, 10, 15, 20, and 30% of 1 RM.

**Results:** mBF and mVO2 increased linearly with workloads up to 25% 1RM, whereby mVO2 plateaued (Fig. 1). The intraclass coefficient (ICC) criterion (0.75) was not exceeded for mBF (0.68) at rest, but was at 5% IRM (0.77) as well as the remaining workloads (0.87-0.97). ICC values for mVO2 exceeded the criterion at rest (0.86) and during workloads (0.89-0.97). For each participant, mBF was plotted against mVO2 to calculate the dose-response (slope); the criterion ICC was exceeded (0.81).

**Conclusion:** These data confirm that cwNIRS devices can reliably assess: (i) skeletal muscle blood flow and oxygen consumption response to exercise; and (ii) the relationship between skeletal muscle blood flow and oxygen consumption. Fig. 1. mBF and mVO2 response to workloads.
key myogenic markers (hepatocyte growth factor [HGF], HGF receptor c-Met, myostatin, myf5) was determined pre-exercise, 4 h post-exercise (4 h), and 24 h post-exercise (24 h). RESULTS: Skeletal muscle gene expression of myostatin at 4 h (fold change from baseline: 1.78 ± 0.511 BFR vs. 1.16 ± 0.54 CNTRL) and c-Met at 24 h (0.97 ± 0.44 BFR vs. 0.72 ± 0.62 CNTRL) was greater in BFR compared to CNTRL. Skeletal muscle protein expression of HGF was significantly higher at 4 h and 24 h following the CNTRL exercise condition (condition × time interaction p < 0.05) compared to BFR. Tissue oxygenation during exercise was significantly higher after exercise with HGF protein expression at 4 h (tissue oxygenation index [TOI]: r = 0.803) and 24 h (deoxygenated hemoglobin [HHb]: r = -0.640) and c-Met mRNA expression (TOI at 4 h, r = -0.777, HHb at 4 h = 0.709 and TOI at 24 h, r = -0.756).

CONCLUSIONS: The addition of BFR to low load resistance exercise, possibly through decreased tissue oxygenation, increased myogenic gene expression but decreased HGF protein expression in the first 24 hours following exercise. Questions remain about changes in these biomarkers for periods longer than 24 h post-exercise as well as in response to longer term training. Future studies are needed to address such questions. Elucidation of these mechanisms will aid researchers in identifying optimal BFR exercise protocols for maximizing skeletal muscle adaptations.
It has been suggested that the pressure used for blood flow restriction should be based on the cuff width and the size of the limb to which the pressure is applied. Cuff material (Nylon vs. Elastic) does not appear to influence the restriction stimulus to a large degree in the lower body when comparing cuffs of similar size (6cm vs. 3cm). It is presently unknown if the same is true for the upper body. PURPOSE: To examine potential differences in arterial occlusion and repetitions to fatigue using cuffs of similar size [3cm (Kaatsu Master) vs. 5cm (Hokanson)] but different material (Nylon vs. Elastic). METHODS: Fifteen participants visited the laboratory on three separate occasions. During the first, in random order, the resting arterial occlusion pressure was determined using both a 3 cm wide elastic and 5 cm wide nylon cuff applied to the most proximal portion of the upper limb. The elastic cuff was applied with an initial pressure of 30 mmHg, while the nylon cuff was applied tightly around the upper arm. Visits 2 and 3, participants completed unilateral elbow flexion exercise until volitional fatigue using 30% of their one-repetition maximum (1RM) while wearing either an elastic or nylon cuff inflated to 40% of their arterial occlusion measurement. A paired samples t test was applied to examine differences in resting and exercise occlusion pressure. A 2x4 repeated measures ANOVA was used to identify differences in repetitions to fatigue. Significance was set at p ≤ .05. RESULTS: At rest, arterial occlusion pressure was greater with the elastic cuff compared to the nylon cuff [Nylon: 139 (14) vs. Elastic: 246 (71) mmHg, p<0.001]. When exercising at 40% of each cuffs respective arterial occlusion pressure [Nylon: 57 (7) vs. Elastic: 106 (38) mmHg, p<0.001], there were no differences in repetitions to fatigue between cuffs. There was a time effect (p=2nd set > 3rd set > 4th set, p=0.001). CONCLUSIONS: We wish to suggest that cuff material impacts resting arterial occlusion pressure in the upper body, despite using cuffs of similar size. However, making the pressure relative to the cuff produced similar repetitions to fatigue. This provides some indirect evidence that blood flow was impacted similarly during exercise when the pressure was normalized to the specific cuff.

High levels of muscle activation and acute changes in muscle thickness (Mth) are both thought to play an important role in the benefits observed with low load exercise in combination with blood flow restriction. Methodologically, it is recommended that the pressure be applied relative to cuff width and the individual. However, little is known on whether cuff material should also be accounted for and whether or not this would impact changes in muscle activation and muscle thickness. PURPOSE: To examine potential differences in muscle activation and Mth using cuffs of similar width [3cm (Kaatsu Master) vs. 5cm (Hokanson)] but different material (Elastic vs. Nylon). METHODS: Fifteen participants visited the laboratory on three occasions. During the first, in random order, resting arterial occlusion pressure was determined for both cuffs. On visits 2 and 3, participants completed unilateral elbow flexion exercise until volitional fatigue using 30% of their one-repetition maximum (1RM) while wearing either an elastic or nylon cuff inflated to 40% of their arterial occlusion measurement. A variety of protocols with different cuff widths have been used with blood flow restriction training (BFR). However, little is known about the influence of cuff width on muscle adaptations. PURPOSE: To determine if the cuff width differentially affects regional muscle growth and strength with BFR. METHODS: Eleven active males (mean ± SD: age 25.2 ± 6.1 years, height 1.70 ± 0.1 m, body mass 74.9 ± 9.5 kg) volunteered for the study. Subjects had their legs randomly divided into two conditions: low-load blood flow restriction exercise with a narrow cuff (NBFR - 7 cm) and low-load blood flow restriction exercise with a wide cuff (WBFR - 17.5 cm). Both cuffs were placed on the proximal portion of the thigh and inflated to 80% of the resting arterial occlusion pressure for each cuff. All subjects performed unilateral knee extension 2x/week, 3 sets to volitional failure, 60s rest interval, at 20% 1RM, for 12 weeks. A variety of protocols with different cuff widths have been used with blood flow restriction training (BFR). However, little is known about the influence of cuff width on muscle adaptations. PURPOSE: To determine if the cuff width differentially affects regional muscle growth and strength with BFR. METHODS: Eleven active males (mean ± SD: age 25.2 ± 6.1 years, height 1.70 ± 0.1 m, body mass 74.9 ± 9.5 kg) volunteered for the study. Subjects had their legs randomly divided into two conditions: low-load blood flow restriction exercise with a narrow cuff (NBFR - 7 cm) and low-load blood flow restriction exercise with a wide cuff (WBFR - 17.5 cm). Both cuffs were placed on the proximal portion of the thigh and inflated to 80% of the resting arterial occlusion pressure for each cuff. A variety of protocols with different cuff widths have been used with blood flow restriction training (BFR). However, little is known about the influence of cuff width on muscle adaptations. PURPOSE: To determine if the cuff width differentially affects regional muscle growth and strength with BFR. METHODS: Eleven active males (mean ± SD: age 25.2 ± 6.1 years, height 1.70 ± 0.1 m, body mass 74.9 ± 9.5 kg) volunteered for the study. Subjects had their legs randomly divided into two conditions: low-load blood flow restriction exercise with a narrow cuff (NBFR - 7 cm) and low-load blood flow restriction exercise with a wide cuff (WBFR - 17.5 cm).
RESULTS: There was an inverse relationship between cuff width and systolic for both men [5cm: 160 (16) mmHg; 10cm: 125 (8); 12cm: 122 (9), p<0.001] and women [5cm: 139 (18) mmHg; 10cm: 114 (11); 12cm: 110 (10), p<0.001], with men having greater pressures (p<0.001). For diastolic there was an inverse relationship with cuff width for both men [5cm: 104 (13) mmHg; 10cm: 73 (8); 12cm: 68 (9), p<0.001] and women [5cm: 89 (15) mmHg; 10cm: 67 (10); 12cm: 63 (11), p<0.001] with men having greater pressure within the 5cm and 10cm cuffs (p<0.004). Our exploratory analyses suggest that applied pressures of 10% [5cm: -80 (14) mmHg; 10cm: -57 (9); 12cm: -53 (10), p<0.001] to 60% [5cm: -6 (9) mmHg; 10cm: 1 (8); 12cm: 3 (9), p<0.001] of measured systolic pressure predominantly affect only venous circulation.

CONCLUSION: Systolic and diastolic pressure measurements both change with cuff width. We wish to stress the need to base pressures used in BFR off of the cuff width actually being applied to the limb. Further, our data suggests that future investigations need to report whether the BFR protocols used are affecting venous flow only, or both venous and arterial flow.

**PURPOSE:** To examine differences in arterial occlusion pressure (AOP) of the upper arm when applying cuff widths (5 cm, 10 cm, and 12 cm) commonly used in blood flow restriction (BFR) research. This study also examined how individual predictors of AOP changed across cuff widths.

**METHODS:** Two hundred forty-nine (102 males and 147 females) participants were assessed. Following a 10-minute rest, brachial blood pressure was measured (systolic = SBSP and diastolic = dDBP). With a rest period of 5 minutes before each measurement, standing AOP was determined on the right arm for each cuff (counterbalanced) using a Doppler probe placed at the radial artery. Hierarchical linear regression was used to determine which predictors explained the most unique variance in AOP for each cuff width. To examine sex differences in AOP across cuff widths, a repeated measures ANOVA was used with a between subject factor of sex. If an interaction was found, a Fishers LSD test identified differences between cuff widths within each sex, and independent t-tests were used to examine differences for sex within each cuff width. Effect sizes were determined by calculating Cohen’s d. Data is presented as mean (standard deviation).

**RESULTS:** Occlusion pressure was different across cuff widths (p<0.001). The 5 cm wide cuff required the greatest pressure [males 127 (13) mmHg; females 121 (13) mmHg, p = 0.002, d = 0.46], followed by the 10 cm [males 149 (19) vs females 142 (19) mmHg, p = 0.003, d = 0.36], and 12 cm [males 122 (12) vs females 118 (12) mmHg, p = 0.009, d = 0.33] wide cuffs. However, arm circumference always explained the most unique variance in AOP (5 cm, p = 554; 10 cm, p = 419; 12 cm, p = 046). Differences in AOP existed between sexes for the 5 cm [males 149 (19) vs females 142 (19) mmHg, p = 0.003, d = 0.36], 10 cm [males 127 (13) vs females 121 (13) mmHg, p = 0.002, d = 0.46], and 12 cm [males 122 (12) vs females 118 (12) mmHg, p = 0.009, d= 0.33] wide cuffs.

**CONCLUSIONS:** The cuff width used for BFR has a significant impact on AOP in the upper arm. Future studies should acknowledge this, and ensure cuff width is reported. Further, individual differences, primarily arm circumference, should be accounted for when applying relative inflation pressures.

### G-34 Free Communication/Poster - Nutritional Status and Anthropometry

**Sat., June 4, 2016, 7:30 AM - 11:00 AM**

**Room:** Exhibit Hall A/B

**3709 Board #148**

**June 4, 8:00 AM - 9:30 AM**

**Age of Peak Height Velocity to Predict Biological Maturity in Professional Adolescent Mexican Soccer Players**

Maria F. Bernal-Orozco1, Margarita Posada-Falomer2, Celia M. Quíñónez-Gastélum3, Paola Plascencia-Aguilera3, Paola Plascencia-Aguilera2, Juan R. Arana-Nuño2, Juan P. Tamayo-González1, Rafael OMC, 8.9% had an early PMC (more frequently observed in guardians) and only one subject had a late PMC. **CONCLUSION:** Mean APHV was similar than that observed in other studies and almost all subjects had an average PMC. Although soccer position is not fully determined in younger categories, it is interesting that goalkeepers had a lower APHV. Biological maturity determination is important since it may be related with chances for success in the sports context, incidence of injuries, physical performance and body composition indicators.

**PURPOSE:** To determine the predicted maturity classification (PMC) in a group of adolescent Mexican soccer players through the estimation of age of peak height velocity (APHV).

**METHODS:** A retrospective cross-sectional study was carried out in soccer players from Club Deportivo Guadalajara, A.C. (Chivas), from 9.5 to 13.5 years old. Height, weight, and sitting height were measured by five level II ISAK-certified anthropometrists from August/2012 to June/2015. APHV and PMC were determined with Mirwald’s protocol. Data are presented as mean (SD), and frequencies (%). ANOVA and chi-square analyses were performed to determine differences in APHV and PMC between positions, respectively (SPSS v.22 for Windows, p<0.05 considered as significant).

**RESULTS:** We included 203 subjects: 10.3% goalkeepers, 26.6% defenders, 38.9% forwards and 49% midfielders. Mean weight, height and sitting height were 50.8(14) kg, 159.4(13.9) cm and 84.2(7.3) cm, respectively. Mean estimated APHV was 13.6(0.5) years, which was lower in goalkeepers (13.2(0.5) years, p=0.01). Almost all sample (90.6%) had an average PMC (more frequently observed in guardians) and only one subject had a late PMC. **CONCLUSION:** Mean APHV was similar than that observed in other studies and almost all subjects had an average PMC. Although soccer position is not fully determined in younger categories, it is interesting that goalkeepers had a lower APHV. Biological maturity determination is important since it may be related with chances for success in the sports context, incidence of injuries, physical performance and body composition indicators.
Purpose
The caloric deficit required for a pound of body weight loss is reported to be 3,500 kilocalories (Wishnofsky, 1960). However, published articles, textbooks, and professional organizations equate a pound of fat mass loss to 3,500 kilocalories (Applegate, 2011; Mayo Clinic, 2012; Kravitz, 2007; Cerrato, 1987). The purpose was to perform a theoretical review pertaining to caloric deficits required for equivalent changes in body composition, body weight, and fat mass loss.

Methods
An online database search was performed using key words such as adipose tissue, adipose cell, body composition, body weight loss, fat mass loss, adipose loss, diet, direct calorimetry, and 3,500 calories. 43 articles met the inclusion and exclusion criteria, 28 of which were used for calculating caloric equivalents. The differences in caloric deficit required for a pound of body weight loss, adipose tissue loss, and fat mass loss was compared to the calculated theoretical caloric equivalent for a pound of fat mass loss. A percent error measurement was calculated between the theoretical caloric equivalent for a pound of fat mass loss to the caloric equivalents for a pound of body weight loss, adipose tissue loss, and fat mass loss.

Results
The most valid theoretical equivalent for a pound of fat was calculated at 4,423.90 kilocalories (Perrenet & Massicotte, 1991) based on in vivo extraction of human intracellular lipid samples. The calculated percent errors between the theoretical caloric equivalent for a pound of fat mass and published, accepted values for a pound of body weight loss, dietary lipid loss, adipose tissue loss, and fat mass loss were 20.88%, 7.65%, 15.23%, and 20.88%, respectively.

Conclusions
Studies and professional organizations have equated a pound of body weight loss to 3,500 kilocalories, a pound of adipose tissue to 3,750 kilocalories, and a pound of fat mass to 3,500 kilocalories (Wishnofsky, 1960; Dietary Guidelines for Americans, 2010; AHA, 2010, 2014; Applegate, 2011; Mayo Clinic, 2012; Brown, 2001; McArdle, 2010). Contrary to this, a pound of fat mass loss is equal to 4,423.90 kilocalories, and this severely underestimates the caloric values needed to achieve desired fat mass loss. The use of the proper caloric value for fat mass loss has the potential to improve recommendations for achieving healthy body fat values.

Purpose: The purpose of this study was to examine the prevalence and potential correlates of overweight/obesity in a sample of 9-11 year old Brazilian children.

Methods: This study was part of the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE). A total of 328 children (51.5% boys) from São Paulo, Brazil participated, their parents, and school personnel queried behavioral, family and lifestyle, since most habits acquired in such stages carry through into adulthood. Childhood and adolescence are important stages for the development of a healthy lifestyle, since most habits acquired in such stages carry through into adulthood. Recent studies conducted with Brazilian adolescents show a high percentage of obesity, hypertension and metabolic syndrome (Christofaro et al., 2014; Moraes et al., 2014).

PURPOSE: Determine the association of level of physical activity with sex, body composition and blood pressure in a sample of adolescents from Campinas, Brazil.

METHODS: This pilot cross-sectional school-based study was conducted on 48 students (32 boys) ranging from 13 to 16 years of age from a Public School in Campinas - São Paulo, Brazil. Anthropometric data were collected and the measured heights and weights were used to calculate the body mass index (BMI). The blood pressure (BP) values were obtained using the auscultation method, while the body fat percentage (BF%) was measured from measured height and weight. Questionnaires completed by the participants, their parents, and school personnel queried behavioral, family and lifestyle, since most habits acquired in such stages carry through into adulthood.
was found between body composition, blood pressure and physical activity. We found a significant positive association between sex and physical activity, OR = 4.74 (95% CI = 1.19 - 20.16).

CONCLUSIONS: We conclude that boys are more physically active when compared to their opposite sex peers and that the variable sex is independently associated with time spent on physical activity in this sample. Prospective studies are needed to better define risks and to develop strategies aimed at decreasing health-related risk factors in adolescence.

3716 Board #155 June 4, 8:00 AM - 9:30 AM
Validity of a Multi-compartment Body Composition Model Using Body Volume Derived from Dual-Energy X-ray Absorptiometry

PURPOSE: To assess the validity of a DXA-derived body volume 4C model for calculation of percent body fat (%BF), fat mass (FM), and lean mass (LM). METHODS: A total sample of 126 men and women (Mean ± SD: Age; 35.8 ± 9.4 years; Body Mass: 97.31 ± 20.4 kg; Height: 176.04 ± 9.2 cm) completed a 4C body composition reference assessment, including DXA from BodPod, DXA from bioelectrical impedance spectroscopy, and BMC from DXA. Using a sample of 99 subjects, a DXA-derived body volume 4C model (4C DXA) was created by linearly regressing BodPod with DXA FM, LM, and BMC as independent factors. The 4C DXA model was validated in a sub-sample of 27 subjects.

RESULTS: The density coefficients of FM, LM, and BMC determined to predict BF were 0.84 (p<0.01), 1.03 (p<0.01), and 11.62 (p<0.05) respectively, with a residual volume of -3.121 L. Compared to the sub-sample, BF derived from DXA (94.6 ± 17.7 L) was not significantly different than BodPod BF (94.3 ± 17.6 L; p=0.295; constant error (CE)=0.21 L; total error (TE)=1.06 L; standard error of estimate (SEE)=0.07 L). When applied to a 4C model, there were no significant differences in %BF (Δ0.58 ± 3.4%; p=0.404; CE=-0.56%; TE=3.40%; SEE=1.48%), FM (Δ0.63 ± 3.1 kg; p=0.295; CE=-0.63 kg; TE=3.07 kg; SEE=1.04 kg), or LM (Δ0.63 ± 3.1 kg; p=0.295; CE=0.63 kg; TE=3.07 kg; SEE=0.7 kg) between the traditional 4C model utilizing BodPod and the 4C DXA model. CONCLUSIONS: The 4C DXA model using the determined coefficients was demonstrated to be a valid method of estimating FM, LM, and %BF when compared to a traditional 4C model. The alternative method of predicting BF using DXA may eliminate the need for a BodPod when using a 4C model to assess body composition.

3717 Board #156 June 4, 8:00 AM - 9:30 AM
Profile Of Nutritional Status Of Children And Adolescents From Bogota, Colombia: The Fuprecol Study

Email: robin640@hotmail.com

(Paper presented by Dr. Lina Benavides Rodriguez, Bogotá D.C., Colombia)

PURPOSE: This study aimed to analyze the nutritional status among Colombian children and adolescents to determine the relationship between the nutritional status in children and adolescents according to the body mass index (BMI) and waist circumference (WC).

METHODS: A cross-sectional study was conducted in 6,383 children and adolescents with age of 9 to 17.9 years old from Bogota, Colombia. Participants completed the “Kreece Plus” questionnaire validated as an indicator of the nutritional level with the following categories: high (test ≥ 9), medium (test 6-8) and low (test < 5). Other measures were: weight, height, WC and BMI as markers of the nutritional status.

RESULTS: Overall, 57.9% of the participants were girls (mean age 12.7±2.3 years old). The nutritional status was low without large differences by sex and decreasing by age. In all categories of BMI over 50% of boys and girls follow lower-quality diet, shown progressively worse with advancing age. In both sexes, trends were observed between low nutritional level with the development of overweight. Also, WC was associated with a lower score in the “Kreece Plus” in both sexes.

CONCLUSIONS: The low nutritional level is related to changes in the nutritional status (WC and BMI) in scholars from Bogota. These findings may encourage further interventions for the improvement of nutritional habits among scholars from Colombia.

3718 Board #157 June 4, 8:00 AM - 9:30 AM
Determining the Influence of Sex on Body Mass Index in Older Adults
Edward T. Kelley1, Amy L. Morgan, FACSM2, Mary-Jon Ludy2. 1University of Southern Mississippi, Hattiesburg, MS. 2Bowling Green State University, Bowling Green, OH. (Sponsor: Amy L. Morgan, FACSM)

Email: edward.kelley@eagles.usm.edu

(Paper presented by Dr. Mary-Jon Ludy, Bowling Green State University, Bowling Green, OH.)

In the United States over 82 million Americans, or approximately 26% of the population, are age 50 and older. The National Health and Nutrition Examination Survey (NHANES) estimates the prevalence of obesity in this group to be 32.6%. Most healthcare providers, including the NHANES, rely upon Body Mass Index (BMI) as a primary identifier of obesity-related health risk.

PURPOSE: To determine the influence that sex has on the validity of BMI when indicating obesity status in older men and women.

METHODS: Subjects’ were 52 healthy males (n=19) and females (n=33) age 50-69 years old (57.6±5.2) residing in a Midwest area. Subject’s height and weight were measured using a stadiometer and calibrated electronic scale. From this data, BMI was calculated as kg/m2 (M: 29.0±5.4; F: 26.7±6.3). Subjects also completed a body composition analysis using air-displacement plethysmography (ADP) (M: 27.8±6.3%; F: 35.9±8.8%). Percent fat estimated by ADP (%fat) was used as the criterion measure of body composition in this investigation. BMI classification (based on NIH criteria) was compared to sex-specific %fat classifications (Gallaher et al., 2000). The sex-specific accuracy of BMI classification was calculated. Additionally, sensitivity and specificity were calculated to illustrate the validity of obesity classifications based on BMI.

RESULTS: Based on comparisons between BMI and percent fat, accuracy among male subjects was 58% and among female subjects was 94%. In males, the results from BMI had a sensitivity of 0.50 and a specificity of 0.63. In females, the results had a sensitivity of 0.89 and a specificity of 0.96. Additionally, 42% of males were misclassified and 6% of females were misclassified using BMI.

CONCLUSIONS: In this study, results from BMI appear to better indicate obesity classifications in females compared to males. BMI was found to be both sensitive and specific in the determination of obesity in females age 50-69. However, in males, BMI was found to lack strong sensitivity and specificity indicating that this measure was less sensitive and specific in the determination of obesity in males age 50-69.

Abstracts were prepared by the authors and printed as submitted.
In Philadelphia, PA, 40% of children, 6 to 17 years of age, are currently categorized as overweight or obese. School-based interventions have been shown to be effective in helping children adopt healthier behaviors and decrease childhood obesity rates. PURPOSE: To assess changes in body mass index (BMI) and waist circumference, over the 2014 to 2015 school year, in children in the fifth grade, who were provided health intervention programming. METHODS: Children in the fifth grade, from 13 elementary schools in the Greater Philadelphia area, participated in a three-year school-based intervention, which included two levels of intervention schools, Core and Level 1, and Control schools; however, results from the second year of the intervention are presented here. Intervention components for Core schools included healthy lunches, produce tastings and fitness classes. Level 1 schools included the same components as Core schools, but with less frequency and without healthy lunches. Control schools received no intervention. Anthropometric measures (height, body weight, BMI, waist circumference) were taken at the beginning and end of the school year. RESULTS: Baseline BMI were as follows: Core schools (n=240): 19.55 ± 4.55 kg/m², Level 1 schools (n=234): 20.69 ± 4.70 kg/m², and Control schools (n=153): 20.65 ± 5.13 kg/m². Post-intervention BMI were as follows: Core schools (n=213) 20.45 ± 4.78 kg/m² (p=0.045), Level 1 schools (n=238): 23.34 ± 13.92 kg/m² (p=0.006), and Control schools (n=141) 21.20 ± 5.15 kg/m² (p=0.3592). Baseline waist circumference were as follows: Core schools (n=240): 66.70 ± 11.45 cm, Level 1 schools (n=233): 72.46 ± 13.37 cm, and Control schools (n=153): 68.15 ± 12.27 cm. Post-intervention waist circumference were as follows: Core schools (n=213) 69.48 ± 11.79 cm (p=0.013), Level 1 schools (n=236) 70.53 ± 13.11 cm (p=0.090), and Control schools (n=140) 69.92 ± 12.60 cm (p=0.227). CONCLUSIONS: Significant increases in BMI and Level 1 schools with significant increases in waist circumference in the Core schools only, from baseline to post-intervention. Although this school-based intervention may not have led to changes in BMI or waist circumferences over one year, a longer term intervention may provide positive changes in these measures.

Funding: Independence Blue Cross Foundation

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**G-35**

Free Communication/Poster - Performance

**Saturday, June 4, 2016, 7:30 AM - 11:00 AM**

**Room: Exhibit Hall A/B**

**3720 Board #159**

June 4, 9:30 AM - 11:00 AM

**Effects of Higher Relative pH but Lower Blood Lactate Concentration on Wingate Test Performance**

Minas Nalbandian1, Radak Zsori1, Kimura Ryota1, Sasaki Nichika1, Masashi Nojima1, Kodai Matsumoto1, Masaki Takeda1.

1Sports and Health Science Faculty, Doshisha University, Kyoto, Japan. 2Faculty of Physical Education and Sport Science, Semmelweis University, Budapest, Hungary.

Email: dhp0005@mail4.doshisha.ac.jp

(No relationships reported)

During high intense exercise large amounts of H+ protons are produced from the ATP hydrolysis. This produces a decline in the blood and muscular pH inducing metabolic acidosis which is related to muscular fatigue and a concomitant muscular power decrease. At the same time, lactate is produced as an intermediate product of the glycolysis that can later be used as a source of energy.

**PURPOSE:** To determine the effects of higher relative levels of blood pH but lower blood lactate concentration on performance.

**METHODS:** Male subjects (n = 16) performed two tests in different occasion. The tests were performed in a Monark cycle ergometer and consisted in three 30 seconds bouts at constant intensity with 4 minutes of recovery between each bout (either active or passive recovery between occasion), followed by a 4 minutes passive recovery and a 30 seconds “all out” Wingate Test. The intensity of the first three times 30 seconds bouts was set at the 90% of the average power of a previously done Wingate Test, and the intensity of active recovery was set at the 60% of the lactate threshold of each subject. Blood samples were taken from antecubital vein and blood lactate was measured: before and after each 30 second and Wingate Test, as well as 4 minutes after the Wingate Test. Blood samples were analyzed in blood gas analyzer (SYSTEM OPTICCATS) to determine pH and bicarbonate levels. Lactate gases were also measured during the whole protocols, and peak power and power average were calculated for the Wingate Test.

**RESULTS:** Venous blood pH levels were higher but lactate concentrations were lower when performing the active recovery protocols. Wingate test performance was higher in the active recovery trials with significant differences in peak power (665 and 715.3 watts, passive and active respectively, P < 0.05) and power average (510 and 548 watts, passive and active respectively, P < 0.05).

**CONCLUSIONS:** Active recovery consumes more energy but help to maintain higher pH levels and this condition is favorable for Wingate Test performance.
without (CYC) and with (ARM-CYC) prior high-intensity upper body exercise comprising eight 1 min arm-cranking exercise bouts, separated by 30 s rest intervals, at an intensity of 1.52 ± 0.5 W/kg body mass. In ARM-CYC the unloaded pedalling began 1 min after the final arm-cranking bout. Participants performed familiarization trials of both CYC and ARM-CYC.

RESULTS: CP was lower in ARM-CYC (312 ± 49 W) than CYC (358 ± 54 W) (P < 0.01), whereas WP in ARM-CYC (15.3 ± 3.5 kW) was not different from CYC (13.8 ± 3.2 kW) (P = 0.09). Blood lactate was lower in exercise recovery period immediately before (7.244 ± 0.053 vs. 7.370 ± 0.053, P = 0.01) and after (7.098 ± 0.078 vs. 7.150 ± 0.086, P = 0.03) the 3 min-all out effort. Blood plasma lactate concentration was higher in ARM-CYC than CYC immediately before (14.3 ± 3.9 vs. 1.8 ± 0.4 mmol/L, P < 0.01) and after (21.3 ± 4.2 vs. 14.3 ± 4.4 mmol/L, P < 0.01) the 3 min-all out effort. VO2peak during the 3 min-all out effort was lower in ARM-CYC (57 ± 5 mL/kg/min) than CYC (60 ± 6 mL/kg/min) (P < 0.001). Heart rate at the end of the 3 min-all out effort was higher during ARM-CYC (174 ± 9 bpm) than CYC (167 ± 10 bpm) (P < 0.01).

CONCLUSION: The effects of prior upper body exercise on CP and WP differ depending on the parameters are determined using the 3 min-all out test or the conventional method. Therefore, the physiological determinants of CP and WP derived using the two methods may not be equivalent.

3724 Board #163 June 4, 9:30 AM - 11:00 AM Wearing Compression Garment Enhances Cardiac Efficiency from Supine to Head Up Tilt

Daniel Chi Wo Lee1, Kim Khaw1, Shara Wee Yee Lee1, Ali Ajmol1, John O’Reilly2, Stephen Heung Sang Wong, FACSM1.

1The Chinese University of Hong Kong, Hong Kong, Hong Kong.
2Massey University, Auckland, New Zealand.
3Lincoln University, Christchurch, New Zealand. (Sponsor: Dom Micklewright, FACSM)

Many teams and individual athletes prefer to compete at home, thereby benefiting from preparing in familiar surroundings, having easy access to training and coaching staff, close contact with family members and profiting from a positive crowd atmosphere. However there is little empirical evidence to show whether home advantage is beneficial, particularly in international-level rugby. PURPOSE: To investigate whether playing rugby at home advantaged teams.

METHODS: In a retrospective longitudinal study, all matches (n=125) played in the 2012 Super Rugby Competition were analyzed for key performance indicators (KPI) from coded game data provided by OPTA sports data company. Matches were played in a home-away format in New Zealand, South Africa and Australia. RESULTS: Compared to playing at home, playing away from home had a detrimental effect on points scored in the first (-2.2 ± 2.1, mean change 95% CI [-4.6, 0.3]; P = 0.05) and reduced gain lines met (-1.7 ± 1.5) in the first half of games. CONCLUSION: Home advantage in sporting events is well evidenced in the literature, and this study further supports home team advantage in rugby union. This finding has relevance to fans and investors in the game of rugby.

3725 Board #164 June 4, 9:30 AM - 11:00 AM Analysis of Racing Factors in Windsurfing under Light Wind

Masahiro HAGIWARA, Yasunobu ISHIH, JISS, Tokyo, Japan. Email: masahiro.hagiwara@jpnport.go.jp

(No relationships reported)

Windsurfing is a sailing sport that needs skillful control of the sail and board. The race course for windsurfing consists of upwind and downwind passages. There are only a few studies about the race analysis of windsurfing. The racing score of sailing relate with following race factors board speed (BS), board angle (ANG), velocity measured course (VMC) and distance (DIS). A windsurfing race can be split into three major aspects (start, upwind, downwind). Therefore, it is important to analysis racing factors for each aspect.

PURPOSE: The purpose of this study was to analysis characteristics of race factors between high ranking group and low ranking group.

METHODS: Fourteen windsurfers (19 males [Age: 21.7 ± 1.0 years, Height: 175.4 ± 6.4 cm, Body mass: 65.9 ± 5.4 kg, Sailing career: 3.0 ± 0.6 years] and 5 females [Age: 21.0 ± 0.7 years, Height: 155.9 ± 2.8 cm, Body mass: 54.9 ± 7.9 kg, Sailing career: 2.6 ± 0.7 years]) took part in this study. The subjects performed seven races on water in three days, and the data of racing factors (BS, ANG, VMC, DIS) was measured using GPS. An examiner drove a motor boat with wind direction and speed measuring instrument during the races, and the wind data was logged at 1Hz. The racing factors for each aspect (start, upwind, downwind) were calculated by the data of GPS and wind during the race. We divided to two groups as high ranking group (HG) and low ranking group (LG) by each racing ranking. Therefore, the HG and LG did not mean individual competitive level but the ranking of each racing.

RESULTS: All racing conditions were light wind (wind speed 3.5-5 m/s). The numbers of tacking and gybing were not different between groups. The distance from board to Start line in HG was significantly shorter than that in LG (P<0.01). In all of aspects, BS and VMC in HG were significantly higher than that in LG (BS of upwind: p<0.05, BS of except upwind and VMC of all aspects: p<0.01). In the start and upwind, ANG in HG were significantly lower than that in LG (P<0.01). In upwind, DIS in HG was significantly shorter than that in LG (P<0.01).

CONCLUSIONS: BS and VMC of the HG were higher than that in LG during all aspects. Thus, BS and VMC are important factors in windsurfing race under light wind condition.

3726 Board #165 June 4, 9:30 AM - 11:00 AM Intensity of Fencing in Female vs. Male and Female vs. Female Bouts in Competitive Fencers

Gustavo D. Aquilino, Aldo F. Longo, Néstor A. Lentini, Marcelo L. Cardey, Martin D. Frattini, CeNARD, Buenos Aires, Argentina. Email: gustavoaquilino@hotmail.com

(No relationships reported)

PURPOSE: To compare the intensity of fencing between female vs. male bouts and female vs. female bouts in competitive female fencers. METHODS: This study included 12 female fencers (FeM) and 10 male fencers (MaM). A total of 32 fencing matches were officiated (16 female vs. female and 16 male vs. male matches). In each fencing match, every fencer was split in two groups to fence one of the groups and to observe the other. Therefore, the intensity of the fencing match was measured using GPS. An examiner drove a motor boat with wind direction and speed measuring instrument during the races, and the wind data was logged at 1Hz. The fencing factors for each aspect (start, upwind, downwind) were calculated by the data of GPS and wind during the race. We divided to two groups as high ranking group (HG) and low ranking group (LG) by each fencing ranking. Therefore, the HG and LG did not mean individual competitive level but the ranking of each fencing.

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Abstracts were prepared by the authors and printed as submitted.
response of IB when fencing against men was 53% higher than when fencing against women (IB FvSM = 11.7 ± 0.8, IB FvSF = 7.6 ± 0.8; mean ± SE). CONCLUSIONS: Fencing against male sparring opponents is a useful alternative for female fencers, as a means to increase the intensity of exercise in training programs.

It has been recommended that golfers perform a warm-up routine before playing. Currently, the optimal warm-up routine to improve performance of a maximal golf drive is not clear, however, research does recommend active-dynamic stretching as opposed to static stretching during warm-up. At present, there have been no studies conducted using recreational golfers to research functional resistance exercises towards immediate performance of golf.

**RESULTS:** No significant effect was found ($F(2,32) = .483$, $p > .05$) and no significant difference exists between MCHS and the three warm up protocols ($p = .621$). No significant difference was found ($F(2,32) = .1.265$, $p > .05$) and no significant difference exists between MDD and the three warm up protocols ($p = .296$). No significant effect was found ($F(2,32) = .853$, $p > .05$) and no significant difference exists between SF and the three warm up protocols ($p = .436$). Regardless of the warm up type, there was no significant difference between the golf performance factors of MCHS, MDD, or SF.

**CONCLUSION:** Future research is needed in order to accurately assess and find an significant difference between the golf performance factors of MCHS, MDD, or SF.

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Fatigue in physical exercise is not only a physical event but also emotional, regulated by rating of perceived exertion (RPE). Currently the transcranial direct current stimulation (tDCS) has been used in research on physical exercise to check responses in neuromodulation of the central nervous system, reducing fatigue and improving physical performance. The application of anodal iDCS on insular cortex, one of the areas responsible for awareness of the subjective feelings of the body, has shown decreased RPE and increased aerobic performance.

**PURPOSE:** To determine whether brain neuromodulation with iDCS is able to improve physical performance of individuals in an intermittent supramaximal stimulus.

**METHODS:** Ten physically active men participated in this study (26.4±4.6 years). In cross-over mode, randomized (counter-balanced), double-blind, subjects performed two tests in cycle ergometer on two separate days, thus they received anodal iDCS of 2 mA applied over the left insular cortex or sham iDCS, for 20 minutes before the beginning of the exercise, at rest, sitting. After the iDCS, the subjects performed a previous warm and after 4 minutes of rest the subjects performed a sprint to a maximum of 30 seconds (Wingate test) with four minutes of rest between each sprint. The physical performance, RPE, heart rate variability and electromyographic were analyzed.

**RESULTS:** The average power relative (Watts/Kg) was not different between the treatments, anodal iDCS and sham iDCS respectively (1º sprint 6.9±0.4 vs 7.0±0.5; 2º sprint 6.5±0.5 vs 6.5±0.4; 3º sprint 5.7±0.7 vs 5.9±0.5; 4º sprint 5.3±0.9 vs 5.4±0.6). The results of the RPE, heart rate variability and electromyographic were not affected by iDCS ($P_{.05}$). CONCLUSION: The brain neuromodulation imposed by anodal iDCS on insular cortex does not have the potential to delay fatigue and enhance physical performance in intermittent supramaximal effort.

**Introduction:** Altitude training has been shown to improve aerobic capacity ($VO_{max}$) in elite and well-trained athletes. A variety of methods have been developed to simulate the hematological benefits obtained when training at altitude. The Elevation Training Mask 2.0 (ETM) purportedly simulates altitude training and has been suggested to increase $VO_{max}$, endurance performance, and lung function. Methods: Twenty-four moderately trained subjects completed 6 weeks of high-intensity cycle ergometer training. Subjects were randomized into a mask (n=12) and no mask (n=12) group. Pre and post-training tests included $VO_{max}$, pulmonary function, maximal inspiration pressure, hemoglobin and hematocrit. Results: No significant differences were found in pulmonary function or hematological variables between or within groups. There was a significant improvement in $VO_{max}$ in both the control (13.5%) and mask (16.5%) groups. The mask group also had significant improvements in ventilatory threshold ($VT$) (13.9%), power output at $VT$ (31 W), respiratory compensation threshold (RCT) (10.2%), and power output at RCT (39.9 W). Conclusions: Wearing the ETM while participating in a 6-week high-intensity cycle ergometer training program does not appear to improve pulmonary function or hematological variables. However, wearing the ETM may improve specific markers of endurance performance when compared to identical training without the mask.

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**Conclusion:** Future research is needed in order to accurately assess and find a significant difference between the golf performance factors of MCHS, MDD, or SF.

**Reference:** 1. Gilmar Esteves, Yuri Motoyama, Domingos Pandeló Junior, Paulo Pereira, Rafael Pereira, Paulo Azevedo. Federal University of São Paulo, Santos, Brazil. University of Southwest Bahia, Jequie, Brazil. Email: gilmarjesteves@gmail.com (No relationships reported)
Muscular contractile force can be increased when it follows a potentiating activity incorporating brief maximum voluntary contractions known as post activation potentiation (PAP). There is a paucity of research regarding the effects of PAP on measures directly related to athletic competition. PURPOSE: This study examined the effects of a PAP warm-up strategy on shot put throw and standing long jump performance. METHODS: Six male and seven female collegiate Division I shot-putters and multi-event athletes were pooled in both studies (age: 21.0±2.0 years, height: 1.78±0.07 m, mass: 80.0±18.2 kg). A randomized repeated measures cross over design was employed. During week 1: half of the participants performed a dynamic warm-up followed by an 8 minute rest period then a shot put throw test, and 48 hours later repeated the same warm-up strategy followed by a standing long jump test. The other participants performed the same dynamic warm-up with the same event induced by 3 repetitions of hang clean and jerk at 80% 1RM followed by an 8 minute rest then a shot put throw test, and 48 hours later repeated the same warm-up strategy (including PAP event) followed by a standing long jump test. The participants switched warm-up strategies during the second week. Three trials were collected under each condition and the best score was used for subsequent analysis. The dependent variables were compared between warm-up strategies with a paired t-test. RESULTS: The shot put throw scores were: PAP: 10.93±1.81* and non-PAP: 10.57±1.84 meters. The standing long jump scores were: PAP: 2.46±0.38* and non-PAP: 2.41±0.37 meters. (P<0.01) CONCLUSION: Within the parameters of this study, when compared to a standard dynamic warm-up with a PAP event that includes a PAP event significantly improves both shot put throw and standing long jump performance.

**Effect of Exercise Modes on Functional Fitness in Middle-aged Women**

Ruth N. Henry, Frank M. Romero. Lipscomb University, Nashville, TN. (Sponsor: Kent D. Johnson, FACSM)

Email: ruth.henry@lipscomb.edu

**Purpose:** The term “functional fitness” has gained attention in recent years for its impact on both performance in athletes and quality of life and movement efficiency in all adults. **Purpose:** The goal of this exploratory study was to determine what type of exercise may be best in preserving the functional ability of women as they age. Exercise is known to help with functional abilities at any age, but little research has been conducted addressing the most effective type of exercise. **Methods:** Thirty women ages 52-67 (mean=59.3±4.02 years) volunteered to participate in the study. Functional fitness was assessed using all seven items of the Functional Movement Screen (Deep Squat, Hurdle Step, Incline Lunge, Shoulder Mobility, Straight Leg Raise, Trunk Stability Pushup, and Rotary Stability). Before the FMS, participants answered a questionnaire concerning the type, intensity, and frequency of their exercise for the past six months. Seventeen women participated in both moderate cardio activities and core/strengthening activities such as yoga, pilates, and other exercises involving balance, shifting the center of gravity, and strengthening the core. The other 13 women participated regularly in moderate cardiovascular exercise only. From the questionnaire results, two groups were formed: a cardio + core group (CC; n=17) and a cardio only group (C; n=13). **Results:** Ages in the two groups and weekly volume of exercise were statistically equal (P=0.05). In the FMS, the CC group scored significantly higher than the C group in Deep Squat (p=0.006), Lunge (p=0.019), Hurdle Step (p=0.037); Straight Leg Raise (p=0.020); Trunk Stability Pushup (p=0.019); and total FMS (p=0.0009). The only two items which did not show a significant between-group difference were the Shoulder Mobility and Rotary Stability tests (p=4.390 and 2.599, respectively). **Conclusion:** Women who participate in both of these cardio and core exercise have better functional fitness than those who participate only in cardiovascular exercise.

**Effect of Closed and Open Kinetic Chain Exercise on Hip and Knee Strength: Preliminary Findings**

Kelsi Wood1, William Berg2, Nick Salcedo1, Kelsey Biller1.

1Miami University, Oxford, OH. 2Mercy Hospital, Fairfield, OH.

Email: woodk1@miamioh.edu

(No relationships reported)
The purpose of this study was to determine the effects of pre-season training on basketball players’ physical abilities. Participants were 18 men with a mean age, height, and weight of 19.6 years, 182 cm, and 86.1 kg, respectively. All were active members of a local NCAA Division III Varsity Basketball Team. After acquiring informed consent the players were measured prior to the beginning of the pre-season training and again prior to their first competitive game in November. All players were measured for body composition (hydro-density), anaerobic power (Wingate anaerobic power test), aerobic capacity (PACER test), running speed (0.75-court sprint test), agility (lane agility test) and vertical jumping ability (Vertec vertical jump system). All data was analyzed by team and by positional role (Guards and forwards). The following preseason data were obtained for the guards and forwards respectively. Body composition 12.2 and 16.1%, anaerobic power 1,166 and 1,337 W, aerobic capacity 59.3 and 55 ml/kg-1 min-1, agility 9.92 and 10.74 sec., standing vertical jump 69.9 and 68.2 cm, and short run vertical jump 85 and 78.2 cm. Post-testing yielded the following results for the guards and forwards respectively. Body composition 11 and 13.6%, anaerobic power 1,242 and 1,283 W, aerobic capacity 56.7 and 54.5 ml kg-1 min-1, agility 9.95 and 10.61 sec., standing vertical jump 70 and 68.5 cm, short run vertical jump 86.2 and 80.3 cm and 0.75-court sprint test 3.49 and 3.50 sec. Analysis of data by position yielded the customary significant difference in height (179.2 and 186.6 cm) and weight (80.2 and 93.3 kg) for the guards and forwards respectively. Further analysis of data post to post training by position yielded no significant difference in the physical abilities of the basketball players. Only Body Composition was significantly changed, implying that the players became more physically active without adjusting their energy intake.

Athletic performance involving jumping height and running speed is largely dependent on lower extremity (LE) strength production capabilities. Triple hop for distance (THD) is a clinical test used to assess LE functional performance. Given known relationships between THD and LE isokinetic peak torque in collegiate athletes, it is not known whether THD would correlate with field measures of athletic performance as observed with the tasks vertical jump and 10yd-sprint. PURPOSE: To detect the effectiveness of using THD as a measurement of athletic performance. METHODS: Seventy four male and female collegiate Track and Field athletes performed the counter-movement vertical jump (CMVJ), 10-yard sprint, and THD bilaterally. Pearson correlation coefficient (r), 95% confidence interval (CI), and coefficient of determination (R2) were calculated between total (sum of right and left) THD and the tasks CMVJ and 10-yard sprint separately. RESULTS: THD correlated significantly (p<0.0001) with CMVJ (r=0.81, CI 0.71-0.87, R2=0.66) and the time required to complete the 10-yard sprint (r=-0.74, CI -0.829-0.617, R2=0.55). CONCLUSION: The THD task can be used as a measuring tool to detect overall athletic performance in Track and Field athletics. Further work should investigate such correlation within separate events of Track and Field since this sport has a wide spectrum of LE functional demands.
Sleep deprivation has been shown to decrease endurance capacity. However, influence of partial sleep deprivation after strenuous exercise on recovery of exercise performance remains unclear. PURPOSE: The purpose of the present was to determine the effect of partial sleep deprivation after prolonged, strenuous exercise on muscular strength and physiological responses during running on the following morning. METHODS: Seven active males (20.6±0.5yrs, 169±16.6cm, 65±16.6kg) were recruited, and they experienced two trials with counter balanced design. On the day1, all subjects performed exercise session (16:00–18:00), consisting of 90 min of treadmill running at 75% of VO2max followed by 100 drop jump from 40cm box. In the CON, the sleep duration was set from 23:00 to 7:00. In contrast, in the PSD, the sleep duration was shortened to match equivalent to 40% of individual sleep duration (60% of reduction from normal sleep duration). On the following morning (day2), maximal strength (MVC) for knee extension and flexion exercises, physiological responses during 20 min of submaximal running at 75% of VO2max, and time to exhaustion (TTE) during running at 85% of VO2max were compared between the CON and PSD. RESULTS: On the day2, the score of subjective sleepiness was significantly higher in PSD than in CON (P<0.05), while no significant difference in score of muscle soreness and fatigue was observed between the two trials. On the day2, MVC for knee extension and flexion decreased significantly from the values on day1 in PSD (P<0.05), while no significant change was observed in CON. However, there was no significant difference in MVC on the day2 between the CON and PSD. VO2 and VCO2 during 20 min of submaximal running did not differ significantly between the CON and PSD. However, respiratory exchange ratio (RER) during the running was significantly lower in PSD (0.84±0.03) than in CON (0.88±0.04, P<0.05). Moreover, TTE during running at 85% of VO2max was significantly impaired in PSD (666±263s) compared with CON (934±463s, P<0.05). CONCLUSIONS: A single night of partial sleep deprivation after strenuous exercise did not affect markedly maximal strength or VO2 kinetic during submaximal running. However, TTE during running was significantly decreased after partial sleep deprivation.

Rock climbing is an increasingly popular physical activity as seen by the number of indoor climbing gyms and the increase in rock climbing competitions. Due to this popularity it should be considered an activity that can be enjoyed recreationally or for sport; thus, it is important to evaluate courses and training programs to determine their efficacy in improving fitness and performance. PURPOSE: The purpose of this study was to assess changes in physical fitness and performance by rock climbing twice a week (50 minutes/day) over a 7-week time period as experienced through participation in a college rock climbing class. Methods: 16 subjects (3 females and 13 males) who were enrolled in a 7-week rock climbing course participated in the study. All data was collected the week before and after the course. Demographic information included: Age, height, body mass, BMI, arm-span, ape-index, and % body fat. A variety of tests were used to assess physical fitness and performance, including grip strength (kg), grip endurance (seconds), pinch strength (kg), upper body aerobic power (ml.kg-1.min-1), and time (seconds) to complete a 5.8 rated route (YDS Scale) on the climbing wall. RESULTS: Significant improvements were observed in right hand grip endurance (pre 116.89±68.02, post 55.73±43.24, P<0.001), right hand pinch strength (pre 9.93±1.87, post 11.1±2.6, P<0.001), average pinch strength (pre 9.89±1.81, post 10.62±2.18, P<0.002), and time to climb (pre 116.89±68.02, post 55.73±43.24, P<0.001). No differences were seen in body mass (p=0.732), % body fat (p=0.073), grip strength for left hand (p=0.542) or right hand (p=0.263), left hand pinch strength (p=0.235) and upper-body aerobic power (p=0.635). Conclusion: A 7-week rock climbing course twice a week can improve some physical fitness parameters and performance. Future research should begin to look at specific training programs for rock-climbing and their efficacy for improving fitness and performance.

Self-regulation of optimal intensity by children to improve aerobic fitness during exercise is important as it may prevent injuries and promote adherence for participation. PURPOSE: To investigate the effects of self-regulation of optimal intensity by children in improving aerobic fitness through Games Concept Approach (GCA). METHODS: 24 healthy children, 18 boys (age: 9.83±0.83yrs, height: 138.39±7.43cm, weight: 36.90±9.47kg, body fat percentage (BF%): 26.88±7.19, body mass index (BMI) 18.48±3.17 kg/m²) and 6 girls (age: 9.67±0.52yrs, height: 136.33±8.55 cm, weight: 31.13±6.53kg, BF%: 25.28±4.23%, BMI: 15.98±1.61 kg/m²) participated in the study. 1.6km run tests were performed before and after 18 sessions of prescribed GCA Physical Education lessons 3 times a week, over 6 weeks. Each session was divided into 1) a 5-minute warm up (WU), 2) a 20-minute GCA lesson and 3) a 5-minute cool down (CD). Heart rate (HR) and rate of perceived exertion (RPE) were recorded with a POLAR HR monitor and Children OMNI RPE Scale respectively. Participants were orientated to an optimal intensity of the ventilatory breakpoint (RPE scale 4 - 6) prior to the study and were instructed not to increase physical activities throughout the intervention period. RESULTS: Paired sample t-test revealed a significant decrease between pre and post-test. 1.6km run (10.65±1.44min vs. 10.09±1.26min, p<0.00). Repeated Measures ANOVA and Friedman test found significant differences between WU, GCA and CD in HR (140.18±11.97 beats.min⁻¹ vs 163.04±10.59 beats.min⁻¹) vs 144.64 ±9.95 beats.min⁻¹, p<0.00) and RPE (2.13±0.88 vs 4.29±1.02 vs 2.63±1.04 beats.min⁻¹, p<0.00) respectively. There was a significant positive correlation between HR and RPE (r=0.67, p<0.00). No significant difference was found between pre and post-test BMI (18.63±3.17 kg/m², 18.58±3.71 kg/m², p=0.57) and BF (26.86±7.19%, 26.94±6.52%, p=0.42). CONCLUSION: Children were able to self-regulate optimal intensity during exercise, which may have led to an improvement in the 1.6km timing. Fun GCA may be employed in PE lessons to make aerobic training more enjoyable and at the same time improve children’s fitness, skills and adherence to exercise. An increase in intervention duration and frequency, with nutritional control, may be needed for BMI and BF% to show significant decreases.

Rock climbing velocity was found to be significantly lower in the CON compared to OCP at 30%, 50%, 60% and 75% loadings. PURPOSE: The purpose of this study was to evaluate the effect of PAP on baseball pitching velocity. METHODS: 15 male collegiate baseball pitchers (age 21.1±2.5yrs, ht. 186.7± 5.8 cm, body mass 90.6 ± 9.1 kg) participated in familiarization trials (1 repetition max [1RM]) clean pull prior to random assignment in a control (C) and PAP group (OCP). RESULTS: Significant differences between the groups were performed prior to the OCP trial at 30%, 50%, 60% and 75% 1RM loading. Prior to all pitching, a dynamic WU was followed by 20 WU pitches at ~50% max velocity. The PAP intervention was completed by the subject following completion of the WU. After the WU each subject threw 5 maximal velocity (Vmax) pitches, to determine a baseline velocity. After each 30 minutes of work (C: 131.8±5.2 & 131.8±6.0, CMJ: 132.0±5.6 &132.6±5.8, and OCP 132.5±5.0 &133.1±5.8), respectively. Statistical analysis by paired t-test revealed no significant differences among pitching velocity at Vmax (km/h) in Pre & Post trials (C: 131.8±5.2 & 131.8±6.0, CMJ: 132.0±5.6 &132.6±5.8, and OCP 132.5±5.0 &133.1±5.8), respectively. Analysis by one way ANOVA revealed no significant differences between the 3 conditions post intervention (p>0.05). However, there was a statistically significant difference between the C and the OCP groups. Conclusion: The theory that the PAP stimulus will excite the neural system, increase motor unit
recruitment and result in increased muscle force to increase throwing velocity was not supported. A difference of 1.09 km/h (p<0.05) between C and OCP trials, may have an impact on pitching performance which can only be evaluated under competitive conditions.

**PURPOSE:** To compare two hydration interventions (Gatorade vs. placebo) on various skills needed to successfully perform in a collegiate basketball game in order to gain an accurate understanding of fluid requirements for the sport.

**METHODS:** Participants were eight females (Age = 20.2 ± 2.5 yrs; Ht = 166.8 ± 4.06 cm; Wt = 76.91 ± 10.74 kg) current members of the women’s basketball team. Participation consisted of two testing days completing a NCAA regulation first half of basketball followed by a series of skills tests including maximal vertical jump, T-test, lay-up shooting, jump shooting, and a 300-yard shuttle run. Participants also completed a computerized test of memory and reaction time pre-game and post-skills. Fingerstick blood samples were taken pre-game, post-game and post-skills tests to assess hydration status and to calculate plasma volume change. Intake of fluid throughout testing was continuously monitored and measured. 

**RESULTS:** Plasma volume was decreased by 1.3 ± 4.0% vs. 3.2 ± 5.0% in Gatorade vs. placebo despite similar volumes of fluid consumed (402 ± 344 ml vs. 313 ± 214 ml in Gatorade vs. placebo) and the same distance covered during the game (2.9 km). There was a negative correlation between reaction time and total fluid consumed (r = -0.71, p = 0.048). Similarly, lower plasma volume change resulted in higher scores on the memory test when consuming Gatorade (r = -0.90, p = 0.005), suggesting fluid intake is important to cognitive performance. Increased Gatorade ingestion resulted in lower blood lactate concentrations (r = -0.90, p = 0.003), potentially due to glycogen sparing from carbohydrate intake. There were no further statistically significant differences in outcome variables.

**CONCLUSION:** The current study suggests fluid intake is important to cognitive performance. This may play a role during team sports games when decision making under pressure is likely to occur.

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**Athletes are constantly looking for ways to enhance athletic performance and the vertical leap and broad jump are two common measurements of potential athletic performance. Some previous research has shown that the ingestion of water and sports drinks does improve performance. This study was designed to explore the effect of drinking water on vertical jump height and broad jump distance, as these are common measurements of athletic performance.**

**Methods:** A total of 18 male and female college students (12 males, 6 females) were recruited for the study. Participants were randomly assigned to one of three groups: water consumption (W), carbohydrate drink (C), or placebo drink (Q). Each participant consumed 500 ml of their assigned drink before performing a series of physical tests. These tests included a vertical jump, a broad jump, and a 300-yard shuttle run.

**Results:** No significant differences were found among the three groups in any of the physical tests. However, a trend was observed for a slightly higher vertical jump height in the water group compared to the placebo group.

**Conclusion:** While further research is needed in this area, the results of this study suggest that water consumption may have a slight positive effect on vertical jump performance.
Martial arts’ katas or forms are an established sequences of offensive and defensive techniques that represent fights against fictitious opponents. These forms require motor control, rhythm and movement differentiation capacities, and demand a combination of static, dynamic and explosive movements. Research have extensively studied different acute physiological responses of forms performance in martial arts like karate or wushu. However, in Choy Lee Fut, these responses remain unexplored.

**PURPOSE:**
To study the acute physiological responses, on heart rate (HR), blood lactate concentration ([La]) and blood creatine kinase concentration (CK) in the performance of Choy Lee Fut forms in amateur practitioners.

**METHODS:**
Twelve volunteers (ten males and two females) of a Choy Lee Fut amateur team from the south of Spain participated in this study (mean ± SD; age = 29.5 ± 8.07 years, weight = 73.4 ± 8.57 kg, height = 1.73 ± 0.057 m). HR, [La], and CK were measured before a standardized 10-min warm-up, right after the form and 3-min after the form. CK post-exercise and 24h CK were also registered. The trials were performed in a randomized order on two separate days with a 48h interval. Blood samples were collected from ear lobe in a seated position. The HR was measured through a cardio transmitter and recorded on a Lactate Analyzer, and CK using a single-test clinical chemistry system. Statistical analysis were made using a two-way ANOVA with repeated measures.

**RESULTS:**
The obtained values in mean (mean±H) and maximal heart rate (maxHR) were 172 ± 8 bpm meanHR, and 178 ± 7 bpm maxHR, respectively. Also, the lactate responses were 10.74 ± 4.54 mmol·L-1 [La]post and 11 ± 5.6 mmol·L-1 [La]post. Regarding to CK, the obtained values were 81.55 ± 36.15 UL-1 CKbas; 110.83 ± 53.06 UL-1 CKpost; and 171.52 ± 78.50 UL-1 CK24h. These data showed significant differences of CK24h compared to CKpost and CKbas (p<0.001).

**CONCLUSIONS:**
The study of acute physiological responses in the forms performance showed high HR and [La] values, which indicates that it conforms a high intensity training in amateur practitioners. However, the low CK values showed in the study suggest low muscle damage values. Therefore, forms performance could represent an optimal training method, recommended for amateur Choy Lee Fut practitioners.

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**Electrolyte Losses in Urine and Sweat in Collegiate Football Players During Pre-season Training Camp**

Nathan Paul Lemoine, Jr. LA, Baton Rouge, LA

Email: nlemoi3@lsu.edu

(No relationships reported)

Electrolyte losses through urine and sweat are potentially detrimental to athlete performance. Electrolyte loss may be influenced by practice in hot, humid environments.

**Purpose:** To determine local sweat rates (LSR) and Na+ losses from urine and sweat during the 2-week, pre-season training camp in collegiate football players.

**Methods:** Urine and sweat was collected before and after practices on 46 football players (20y, range 18-22y; BSA=2.3±0.24m²). Sweat was acquired using a dermal gaue patches on the lower back, centrifuged and LSR (g/cm²hr) were calculated. Sweat Na+ losses were 42 ± 12.30 mmol·L⁻¹ (8.2-107.2mmol·L⁻¹) for Na+, WBGST and body surface area (BSA) were positively correlated with LSR (p<0.001 both). Sweat Na+ losses increased with an increase in LSR (p<0.001).

Conclusion: Larger players had greater sweat and sweat Na+ losses. Sodium losses in urine and sweat were highly variable. The rise in sweat Na+ appears to be counteracted by a change in kidney function, as urine Na+ decreased as USG increased. Supported by the Robert and Patricia Hines Endowment in Kinesiology.
There is a growing trend of decreasing physical fitness among adolescents, which may not only result in poorer physical health, but also poorer academic achievement. Purpose: The purpose of this study was to investigate changes in aerobic fitness and academic achievement in reading and mathematics during middle school. Methods: Fifty-two sixth grade adolescents were followed from sixth grade through the 1-back test condition of the n-back task, suggesting a relationship between muscular fitness with tasks that place greater demand on working memory. Cardiorespiratory fitness was associated with increased mathematical performance in algebraic function ($β = .009$, $t = 2.064$, $p = .043$, $β = .28$). Conclusion: The current findings reveal a positive association between muscular fitness and working memory as well as cardiorespiratory fitness and mathematical performance, suggesting specificity in the relationship between each of the fitness domains with cognition and academic achievement. Importantly, these results implicate the importance of both cardiorespiratory and muscular fitness to cognitive health during preadolescence.

PURPOSE: Aerobic fitness has previously been observed to relate to inhibitory control in preadolescent children; however, these investigations have generally relied on global measures of performance. Thus, we have little understanding of how aerobic fitness may relate to trial-by-trial modulations in inhibition. The current study utilized congruency sequence effects (CSE), which characterize how the current trial was influenced by the trial that preceded it, to investigate the relation of aerobic fitness on varying levels of inhibitory control demand during preadolescence.

Methods: One hundred eighty-seven children completed tests of aerobic fitness and a modified flanker task to assess inhibitory control. CSEs were used to identify sequences of trials engendering variable cognitive demands. Regressions were performed to determine relationships between CSE trial types and aerobic fitness level while controlling for other potential confounding factors (e.g., age, sex, IQ).

Results: Higher-fit children demonstrated greater accuracy in their performance on trials with lower inhibitory demands (i.e., compatible C and incompatible iC; partial correlation’s $≥ .210$), and an additional benefit from the previous trial (i.e., n) on the current trial (i.e., n) when increased amounts of inhibitory control were required (i.e., if sequences; partial correlation $= 1.133$). Additionally, higher-fit children were better able to adapt to the sequence requiring the greatest inhibitory control demand (i.e., incompatible Ci; partial correlation $= .158$). t’s $≥ 2.10$, $p’s ≤ .043$, $β’s ≥ .161$. Lastly, higher-fit children had shorter reaction times (RTs) for all compatible response sequences (partial correlation’s $≥ .182$), t’s $≥ 2.50$, $p’s ≤ .01$, $β’s ≥ .186$. Conclusions: These findings corroborate the importance of aerobic fitness for inhibitory control, and extend the literature demonstrating a relationship between fitness and trial-by-trial modulations in cognition. These results add to the growing body of literature indicating the importance of aerobic fitness for cognitive control in preadolescent children; however, these investigations have generally relied on global measures of performance. Thus, we have little understanding of how aerobic fitness may relate to trial-by-trial modulations in inhibition. The current study utilized congruency sequence effects (CSE), which characterize how the current trial was influenced by the trial that preceded it, to investigate the relation of aerobic fitness on varying levels of inhibitory control demand during preadolescence.

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Purpose: To determine the effect of two types of acute bouts of physical activity (cycling and play) on cognition in elementary school children. Methods: Nineteen children (9.3 ± 1.4 years) participated in three randomly ordered conditions (20 min each), including: watching television (TV), moderate intensity cycling (cycle), and semi-structured play (i.e., basketball, kickball, and tag; play). After each condition, the children completed the modified Flanker test on a computer, which assessed executive functioning, specifically response inhibition. Repeated measures ANOVAs were used to compare interactions between test type (congruent, incongruent) and conditions (TV, cycle, play) for the modified Flanker test accuracy and response time. Additionally, exploratory analyses (repeated measures ANOVAs) were conducted to look at differences between TV and cycle, as well as, TV and play. Results: Differences were found between the congruent and incongruent trials for all conditions for both accuracy (80.3±12.2% vs. 67.5±13.1%; p<0.001) and response time (546.9±78.0 ms vs. 576.9±87.6 ms; p<0.001). No differences were found among conditions for accuracy (70.3±15.7% TV vs. 75.9±15.7% cycle vs. 75.5±16.1% play; p=0.475) or response time (574.5±96.4 ms TV vs. 558.2±92.9 ms cycle vs. 558.9±98.8 ms play; p=0.445). The interaction between condition and test type trended towards significance (p=0.074) for accuracy. Exploratory analysis revealed significant differences between test type (TV vs. cycle; p<0.001 and TV vs. play; p=0.001). There was a trend towards significance for the interaction between condition and test type for TV vs. cycle (p=0.053) and a significant interaction between condition and test type for TV vs. play (p=0.034). Conclusions: Children performed better on congruent versus incongruent tests for accuracy and reaction time. There was no impact of condition on accuracy and reaction time. However, there was a trend towards significance for the interaction between condition and test type for accuracy. Performance may be better after the active trials (cycle and play). Further investigation using larger sample size and different modes of activity is warranted to establish this association.
PURPOSE: To determine the effects of two different types of yoga on psycho-social well-being in college-aged females. METHODS: 28 females participated in the study, age (21 ± 2 y), height (164 ± 7 cm), weight (65 ± 11 kg), BMI (24 ± 3 kg/m²), and body fat (24 ± 5 %). Each participant completed three 75-minute sessions, which included power yoga, stretch yoga, and a control (watched the movie “Earth”). During each session, participants completed the Feeling Scale (FS), Feelings of Arousal Scale (FAS), and Attentional Focus questionnaire. In addition, the Activation Deactivation Adjective Check List (AD-ACL) was used to assess energy, tiredness, calmness, and tension. RESULTS: Repeated measures ANOVAs indicated that there was a significant difference in FS and FAS scores observed between conditions (p = 0.02) and over time (p = 0.001), indicating that participants perceived power yoga session to be more pleasurable and energizing. A significant difference was observed in energy, tiredness, calmness, and tension between conditions (p = 0.02) and over time (p = 0.001), indicating that participants felt more energetic and less tired after the power yoga session. Significantly higher attentional focus was achieved during power yoga session (p < 0.001). CONCLUSIONS: Results suggest that participants perceived the power yoga session as more pleasurable, energizing and less tiring compared to the stretch yoga and control sessions. Additionally, participants were more focused as indicated by higher association and lower dissociation scores during power yoga compared to the other sessions.  

3756 Board #195  June 4, 8:00 AM - 9:30 AM  
Physical Activity Participation Was Not Associated with Academic Performance in Ethnic Minority Students  
Jacky Kwai-wai Chan, Stanley Sai-chen Hui, FACSM. The Chinese University of Hong Kong, Hong Kong, Hong Kong. Email: jacky.jspe@link.cuhk.edu.hk  
(No relationships reported)  
Regular physical activity (PA) participation improves physical fitness. However, it is generally perceived that PA hinders academic success. Such belief is not yet verified, especially in special population such as ethnic minority. PURPOSE: To examine the associations between PA level, academic performance, and physical fitness of ethnic minority students in Hong Kong (HK). METHODS: Seven hundred and eight ethnic minority (i.e., non-Chinese) adolescents studying at grade 7th to 11th of a low-income secondary school in HK participated in this study. English and math achievement scores were collected at the end of academic year. Moderate-to-vigorous intensity PA (MVPA from IPAQ), and health-related fitness (aerobic fitness, body composition, and muscular strength) were measured. Academic scores, PA level, and fitness measures were converted to age and gender specific standardized t-score for analysis. MVPA was further categorized into extra-active (MVPA≤840 minutes per week), active (420≤MVPA≤840 minutes per week), and inactive (MVPA<420 minutes per week) for comparison. RESULTS: Only 22.54% of participants met the recommendation of 60-minute MVPA per day. MVPA yielded close-to-zero correlations with English, math, and composite academic scores. ANCOVA (age and gender as covariates) revealed no differences in academic scores between extra-active, active, and inactive groups. Logistic regression indicated that students being physically-active were unlikely to have lower academic scores between extra-active, active, and inactive groups. RESULTS: ANCOVA (age and gender as covariates) revealed no differences in academic scores.  

3757 Board #196  June 4, 8:00 AM - 9:30 AM  
Passive versus Active Exercise: An Examination of Affective Change  
Kathryn M. Rougeau, Daniel R. Greene, Tina M. Greenlee, Lisa Melbourn, Melanie Swager, Steven J. Petruzzello, FACSM. University of Illinois at Urbana-Champaign, Urbana, IL. (Sponsor: Steven J. Petruzzello, FACSM)  
Email: krougea2@illinois.edu  
(No relationships reported)  
An acceptable placebo for exercise has been elusive, particularly as it relates to affective responses. PURPOSE: To compare the psychological responses to motor assisted (passive) cycling (PC) vs usual (active) cycling (AC). It was hypothesized that there would be no difference in affect between conditions from Pre-10 or Post-10, but AC would be perceived as more enjoyable than PC. METHODS: Heart rate (HR), Rating of Perceived Exertion (RPE), and affect (Calmness, Tension, Energy, Tiredness, State Anxiety (SA)) were recorded in 17 (7 female; 20.1±1.8 yrs, M±SD age) participants before, during and after each (PC, AC) 25-min cycling bout. Each session consisted of identically paced warm-ups (~5 min at 35 r·min⁻¹), exercise bout (~15 min at 60 r·min⁻¹), and cool-down (~5 min at 35 r·min⁻¹). RESULTS: Enjoyment was greater following AC (M₁±SE = 8.29±4.43, P = 0.04, d = 0.47) relative to PC. During AC, participants had higher HR (M₁±SE = 116.2±2.52, P = 0.001; d = 0.93) and reported greater RPE (M₁±SE = 6.06±0.24, P = 0.014; d = 0.71) relative to PC. RPE was greater at all times during AC (all P<0.003, except for warm-up and cool-down). AC HR increased (P<0.024) at 5 and 10-mins (relative to baseline), but not at 15-min; HR was unchanged during PC. Energy (P=0.036) increased more during PC compared to AC (P=0.001), and no significant difference between AC and PC. Post-10, AC had higher HR (P<0.002) than PC. Tension decreased more during AC (P<0.003) than PC during Post-10. Energy increased from Pre to Post-0 exercise (P=0.024), then decreased Post-0 to Post-10 (P<0.002). Tension decreased from Pre to Post-0 (P<0.003) and Post-10 (P=0.008). SA decreased from Pre to Post-0 and Post-10 (P<0.002). There were no differences between AC and PC. During one condition, HR time interaction for Tiredness (P<0.004), with a slight decrease from Pre to Post-0 and Post-10 during AC (P<0.002), but not for PC. CONCLUSION: As predicted, enjoyment was increased only following AC. Affective responses to passive exercise remain unclear. The present results revealed decreases in SA regardless of condition, which may stem from elevated perceptions of effort during both PC and AC or from expectations of affective change. As noted, RPE was elevated during both PC and AC conditions even though HR was high only during AC. This novel study provides evidence that passive exercise may be as beneficial as active with regards to certain affective responses.
Children’s consumption of artificial sweeteners (e.g., sucralose) has doubled over the last two decades despite the fact that little is known about their effects on children’s physical and mental health. Moreover, there is a paucity of data investigating the importance of physiological health factors (e.g., aerobic fitness, weight status, and glycemic control) in mediating the effects of artificial sweeteners on children’s cognitive function.

PURPOSE: This study investigated the relationship of children’s aerobic fitness to acute changes in cognitive control following ingestion of an artificially sweetened non-caloric beverage. 

METHODS: Children (N = 60) between 9-11 years were separated into higher-fit (n = 30, >70th percentile VO2max) and lower-fit (n = 30, <30th percentile VO2max) groups and matched for covariates including age, sex (12 females/group), socioeconomic status, and IQ. Cognitive control was assessed using a modified flanker task following an overnight fast. After a brief interval, participants ingested a non-caloric beverage artificially sweetened with sucralose. Task performance was assessed again at 10min and 65min after beverage ingestion. Flanker variables assessed included reaction time, response accuracy, and inverse efficiency (reaction time/response accuracy). Weight status (BMI) and blood glucose were also assessed. RESULTS: Repeated measures analyses revealed an interaction between group and the time-point for inverse efficiency. Higher-fit children exhibited stable performance across the three time points. In contrast cognitive performance among lower-fit children was characterized by poorer efficiency, particularly 10min after beverage ingestion. This interaction was retained after controlling for BMI and the change in blood glucose. CONCLUSIONS: These data are consistent with the idea that aerobic fitness may be protective against variability in cognitive control among lower-fit children.

Sundowning syndrome (SDS) in individuals with Alzheimer’s disease (AD) is a clinical phenomenon characterized by the intensification of neuropsychiatric symptoms during the sunset. Currently, there are no specific treatments for SDS, but recent literature reported a strong relationship between high levels of cortisol and SDS symptoms. Both aerobic training (AT) and cognitive stimulation (CS) are capable to reduce the level of cortisol. However, it is not clear if SDS symptoms would benefit from AT and CS.

PURPOSE: To evaluate the effects of AT and CS as potential treatments of SDS. The combination effects of AT and CS (AT+CS) was also assessed.

METHODS: Eighty patients with advanced AD (Clinical Dementia Rate CDR2) were randomly assigned to: CS group (n: 20, 86±9 yrs), which was treated with a cognitive training program targeting attention and executive function. Subjects in the AT+CS group (n: 20, 85±8 yrs) group, which performed both AT and CS. All groups were compared with a control group of AD patients treated with standard pharmacological therapy: CTRL (n: 20, 85±8 yrs). All treatments were performed 5 days a week, for 2 months, one hour per day.

RESULTS: Data are summarized in table 1.

CONCLUSION: The main outcome of this study was that a program of AT or the combination of AT and CS decreased the salivary levels of cortisol. Interestingly, SDS symptoms also decreased to a similar extent in the same groups, suggesting a possible strengthening of this neuro-endocrihal pathway associated with these interventions.
Participating in low-intensity exercise can improve depression. However, previous studies revealed that social environments influence the stress responsiveness, and, in rats, social isolation blocks the positive effects exercise has on adult neurogenesis that links to anxiety regulation. We hypothesized that exercise would improve depressive symptoms less in socially-isolated than in socially-active older adults.

**PURPOSE:** To compare the effects of a low-intensity exercise on depressive symptoms between socially-isolated and socially-active older adults.

**METHODS:** Study subjects were 34 community-dwelling Japanese older adults (average age: 72.0 ± 4.4 yrs; women: 41.2%). For 60 minutes twice per week over 8 weeks, 26 of the participants engaged in a low-intensity group exercise composed of simple physical movements and a simple cognitive task. Before and after the exercise program, participants’ social networks and depressive symptoms were assessed with the Lubben Social Network Scale (LSNS) and Geriatric Depression Scale (GDS), respectively. Using the median baseline score (28 points) from the LSNS, we assigned subjects into three classifications for analysis: socially isolated (≦ 28 pts) with exercise (SIE; n = 11), socially active (> 28 pts) with exercise (SAE; n = 15) and socially isolated without exercise (SI; n = 6). We excluded the socially-active without exercise (n = 2) group from the analysis because the number of subjects was too small.

**RESULTS:** There was a marginally significant group-by-time interaction for the GDS (P = 0.06): only the SAE group reduced their depressive symptoms (3.1 ± 2.3 to 2.1 ± 0.5; P < 0.05). We confirmed a significant group-by-time interaction for the LSNS (P < 0.05): only the SIE group improved their social networks (24.1 ± 6.2 to 27.5 ± 6.5; P < 0.05).

**CONCLUSIONS:** Our results suggest that low-intensity exercise can improve depressive symptoms for socially-active older adults but not for socially-isolated older adults. However, we also found improved social interaction for socially-isolated individuals when they participated in the exercise (SIE group). Considering older adults. However, we also found improved social interaction for socially-isolated individuals when they participated in the exercise (SIE group). Considering older adults.

Several studies have demonstrated that acute aerobic exercise activates the endocannabinoid (eCB) system. However, these studies have specifically recruited regularly active individuals, and it has been hypothesized that like other psychobiological systems, the eCB system and its response to acute exercise may be influenced by habitual levels of physical activity. **PURPOSE:** To examine eCB responses to aerobic exercise in individuals with varying physical activity levels. **METHODS:** Thirty-six men and women (21±4yrs) participated in this study. During their first visit, they completed a series of questionnaires (the State-Trait Anxiety Inventory [STAI], the Profile of Mood States [POMS], and the Exercise Commitment Survey [ECS]) and were interviewed about their physical activity behaviors using the 7-Day Physical Activity Recall (PAR). The results of the PAR were used to separate participants into low, moderate, and high active groups. Following this, participants completed a submaximal VO2 treadmill test. During their next study visit, participants walked or ran on a treadmill for 45 min at 70-75% of their estimated VO2 max. The STAI, POMS, and blood draws were completed before and after exercise. Data were analyzed using a 3 (group) x 2 (pre, post-exercise) repeated measures ANOVA to determine whether there were group differences in eCB or mood responses to exercise. **RESULTS:** There were group differences in estimated VO2 max and time spent in MVPa (p < 0.01). In addition, both the moderate and high active groups had higher ECS scores than the low active group (p < 0.01). While session RPEs were similar between groups, treadmill speed and heart rate were positively and negatively (respectively) associated with reported physical activity (p < 0.01). Overall, there were increases in eCBs and vigor after exercise (p < 0.01); however, mood and eCB responses did not differ between groups (p > 0.05). **CONCLUSIONS:** This study supports the current literature stating that the eCB system is activated by exercise. It also contributes new findings suggesting that individuals with varying physical activity levels experience similar increases in circulating eCBs after exercise.

Supported by the American College of Sports Medicine, the Virginia Horne Henry Fund, and the Advancing a Healthier Wisconsin Endowment at MCW.
Labeling (AAL) atlas. Correlation matrices (116 x 116) were constructed and the null distribution was calculated from 10,000 permutations. Differences between groups and time in correlation coefficients were determined using repeated measures ANOVA [FDR correction p<0.05].

**RESULTS:** Healthy elders decreased connectivity between rolandic operculum(r)-supramarginal gyrus(l), supramarginal gyrus(l)-insula(l), posterior cingulum(r)-med frontal orbital gyrus(l), thalamus(r)-cerebellum(l); MCI increased between paracentral lobule(r)-mid cingulum(l), and superior parietal lobule(r)-vermis. After intervention, connectivity was greater in MCI than healthy elders in three posterior connections: mid cingulum(r)-med temporal pole(r), superior occipital lobule(r)-cerebellum(l), and superior parietal lobule(r)-vermis. **CONCLUSIONS:** These findings suggest 12-weeks of walking alter functional resting state networks in MCI as well as in healthy elders. While posterior functional connections tend to be lost in AD, those with MCI in our study exhibited greater posterior functional connections than healthy elders post-intervention, which may explain how physical activity delays the onset of AD. Increased connectivity is a compensatory response to neuronal damage. Thus decreased post-intervention connectivity in healthy elders may reflect a partial reversal of age-related neuronal network degradation.

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### 3767 Board #206 June 4, 8:00 AM - 9:30 AM **Leisure Time Physical Activity As A Coping Strategy Among Latino Caregivers**

Isabela G. Marques1, Melissa Magallanes2, Mauricio Garcia1, Judith S. Rocha1, David X. Marquez, FACS1. 1University of Illinois at Chicago, Chicago, IL. 2University of Illinois at Urbana-Champaign, Urbana-Champaign, IL.

**Purpose:** To investigate Latino caregivers’ attitudes towards leisure time physical activity (LTPA) as a coping strategy.

**Method:** Interviews were conducted with Latino caregivers, 50 years and older, caring for a relative with AD, those with MCI in our study exhibited greater posterior functional connections than healthy elders post-intervention, which may explain how physical activity delays the onset of AD. Increased connectivity is a compensatory response to neuronal damage. Thus decreased post-intervention connectivity in healthy elders may reflect a partial reversal of age-related neuronal network degradation.

**Results:** Sixteen Latino caregivers were interviewed (12 females; 4 males), M age = 60±8.50. Six participants reported engaging in LTPA as a coping strategy. Other coping strategies reported by caregivers were avoidance, social support, faith, and MPA decreased between frontal mid orbital gyrus(r)-olfactory(r). After intervention, connectivity was greater in MCI than healthy elders in three posterior connections: mid cingulum(r)-med temporal pole(r), superior occipital lobule(r)-cerebellum(l), and superior parietal lobule(r)-vermis. **Conclusions:** These findings suggest 12-weeks of walking alters functional resting state networks in MCI as well as in healthy elders. While posterior functional connections tend to be lost in AD, those with MCI in our study exhibited greater posterior functional connections than healthy elders post-intervention, which may explain how physical activity delays the onset of AD. Increased connectivity is a compensatory response to neuronal damage. Thus decreased post-intervention connectivity in healthy elders may reflect a partial reversal of age-related neuronal network degradation.

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### 3768 Board #207 June 4, 8:00 AM - 9:30 AM **The Effect Of Physical Activity On Mental Health In The Early Japanese Adolescence**

Saki Kawakatsu1, Shohei Kokudo1, Ryoji Kasamani2, Mayumi Nagano1, Kojiro Ishii1. 1Kobe University, KOBE, city, Japan. 2Nara University of Education, Nara city, Japan. 3Kyoto Bunkyo University, UJI city, Japan. 4Doshisha University, Kyotanabe city, Japan.

**Purpose:** To investigate the relationship between physical activity (PA) and the mental health of university students.

**Method:** A questionnaire, which included the International Physical Activity Questionnaire (IPAQ) as PA, the Depression Self-Rating Scale for Children (DSRS-C) as DP and the Sense of Coherence Scale for children (13-item & 5-scale, SOC-13) was conducted to 8,873 children aged 10-14 years on 28 elementary schools and 20 junior high schools in Japan. The latent factors of DSRS-C and SOC-13 were identified applying factor analysis. Based on the distribution, VPA was classified into 5 groups (GV1-GV5: 0-9, 10-45, 46-105, 106-165, 166- (min/day), respectively) and MPA was classified into 4 groups (GM1-GM4) same as VPA except for 166- min/day. Extracted factor scores were compared among these groups applying one-way ANOVA.

**Results:**

**Conclusions:** More than 45 min/day of VPA improves decline of fun on depression tendency and meaningfulness on sense of coherence in the early adolescence. Supported by Grant-in-Aid for Scientific Research (B), (15H03108) Japan.
CONCLUSIONS: Results indicate that that all exercise methods provided a psychological benefit. To better compare the differences between mindful versus non-mindful exercise a larger population is recommended.

Rates of depression begin to rise as children enter adolescence (Maughan et al., 2013). Individuals who score high on neuroticism, a fundamental personality trait, are more likely to exhibit depressed mood states and develop major depressive disorder (Saklofske et al., 1995). Conversely, physical fitness is negatively correlated with depression (Shomaker et al., 2012). Therefore, physical fitness may moderate the neuroticism-depression relationship.

PURPOSE: To examine the separate moderation effects of physical fitness variables on the relationship between neuroticism and depression among adolescent boys and girls.

METHODS: As part of their physical education classes, middle school students (829 males, 880 females; Mage = 12.2±0.96 years) completed the FITNESSGRAM® protocol (Plowman et al., 2013), including push-ups, curl-ups, aerobic capacity (i.e., 20 m shuttle run), and body composition (i.e., body mass index). Students were also asked to respond to survey items assessing personality traits (Neuroticism-Extraversion-Openness Personality Inventory; Costa et al., 1992) and depression (Center for Epidemiological Studies Depression Scale for Children; Faulstich et al., 1986). Four separate hierarchical regression analyses—one for each fitness variable—were conducted to determine each fitness variable’s moderation effect on the relationship between neuroticism and depression.

RESULTS: The hierarchical regression analyses indicated that aerobic capacity and body composition had a moderation effect on the relationship between neuroticism and depression, R² = .40, p < .001 and R² = .40, p < .001, respectively. Subsequently, both the aerobic capacity-neuroticism interaction term and body composition-neuroticism interaction term were statistically significant, β = −10, p < .001 and β = .05, p < .01, respectively. Moderation graphs supported that the aerobic capacity moderation effect was greater than the body composition moderation effect.

CONCLUSIONS: The relationship between neuroticism and depression was weaker among those with either higher aerobic capacity or lower body composition. The findings indicate that certain physical fitness variables may help reduce the incidence rate of depression, neuroticism, and associated depressive symptomology.

Board #210
June 4, 8:00 AM - 9:30 AM
Comparing Acute Mindful to Non-Mindful Exercise in Reducing Anxiety and Improving Mood
Michael Dahlenghaus. St. Ambrose University, Davenport, IA. Email: dahlinghausmichael@sau.edu

PURPOSE: A variety of treatments have been researched and used to combat high levels of stress that can arise from increased levels of anxiety and poor mood states. Exercise has been shown to be an effective treatment in reducing anxiety and improving mood in the literature. Both mindful exercise and non-mindful exercise have been found to be effective. However, it is still not clear if one may be more beneficial than the other in reducing anxiety and improving mood. The purpose of this proposed pilot study was to compare the acute effects of mindful exercise (in the form of qigong) to non-mindful exercise (in the form of cross training calisthenics) in reducing anxiety and improving mood. Participants (n=54) were assigned to one of three groups consisting of a mindful exercise group, a non-mindful exercise group, and a control group. Each group met for one hour (45 minutes of exercise for intervention groups) for two sessions during one week.

METHODS: Pre and Post measures were conducted using the full State Trait Anxiety Inventory (which assesses both state anxiety-STAI-1 and trait anxiety-STAI-2), and the Profile of Mood States (POMS). Before the first session and at the end of the final session, subjects took the STAI and POMS inventories for the measurement of anxiety and mood state.

RESULTS: Comparing the mean differences in pre and post scores of the STAI 1 (State Anxiety) and STAI 2 (Trait Anxiety), and total mood score in POMS, only the total mood score of the POMS was found to be statistically significant at an alpha level of .01. Both the mindful and non-mindful exercise groups were found to have significantly improved mood when compared to the control group. The mindful exercise group also found a statistically significant reduction in trait anxiety based on the STAI-2 results when compared to the no exercise control group. There were no statistically significant differences when comparing mindful to non-mindful exercise.
physical variables after exercise (p < 0.05). In addition, significant interaction effects (p < 0.05) indicated improvements in state anxiety, negative affect, depression, tension, confusion, total mood disturbance, total pain, and the affective dimension of pain for the PTSD group in comparison to no change in the control group following exercise.

CONCLUSIONS: These findings contribute to the limited literature on exercise and PTSD, indicating significant improvements in mood following an exercise session in individuals with PTSD.

Supported by the Virginia Horse Navy Fund

**Purpose**: Quality of life is one of the most important aspects in non-communicable diseases. Physical exercise can have an impact if regularly practiced. The study aims to verify the possible improvement in mental health and eating habits during a period of moderate and unsupervised physical activity program.

**Materials and Methods**: 40 patients, aged 53 ± 15 from different chronic disease (cancer, hypertension and diabetes), were submitted to an unsupervised exercise as prescription program for at least 6 months for 3 times a week for at least 30 minutes for each session. They were investigated at the onset and after 6 months by two different questionnaires: SF36 for mental health and a questionnaire for the nutrition habits. The energy intake consumption, frequency of meals/day, macronutrient distribution and consumption of fruits and vegetables daily were considered. The BMI (body mass index), body folds (biceps, triceps, subcapsular and sub-iliac) were considered. Statistical analysis was performed using the paired Student T, and correlation test.

**Results**: Physical Activity level perception increases significantly (T0: 76.53 ± 17.7%; T6:85.15 ± 12.1; p<.001) mental health (T0: 67.07 ± 19.53%; T6: 71.07 ± 14.8%; p=0.01), role and emotional status (T0: 46.1 ± 44.0%; T6: 89.74 ± 21.01%; p<0.01) health perception (T0:55.3 ± 22.87; T6: 57.51 ± 19.13 p<0.01) pain perception decreases (T0:26.15± 17.7; T6:15.6 ± 10.01; p<0.01) and with nutrition habits; r = -.647; p<.05). PA level perception was associated with pain perception for both subsequent (r = -.647; p<.05) and moderate (r = .746; p<.01). PA correlates negatively with pain perception (r = -.746; p<.01). PA level perception was associated with pain perception for both subsequent (r = -.647; p<.05) and moderate (r = .746; p<.01). PA correlates negatively with pain perception (r = -.746; p<.01).

**CONCLUSIONS**: Soldiers are at greater risk for developing PTSD and other MHDs for more than a year after an mTBI exposure versus non-head injuries. Identifying populations at risk for mTBI and those with a previous mTBI exposure, are important consideration for mental health surveillance and intervention programs for both military and civilians. The views, opinions and/or findings contained herein are those of the authors and should not be construed as an official Department of the Army position, or policy.

**Purpose**: To improve upon our current assessment of a person’s body image/shape by embracing more modern digital technologies rather than relying on traditional hand-drawn line-based (figural) images or silhouettes. These traditional methods typically only consider an endomorphy-ectomorphy continuum with no mesomorphy component.

**Methods**: We have developed a novel iPad application that uses a wide array of >45 male and female somatotype photographs that allows more comprehensive estimates of body-image dissatisfaction than figural images/silhouettes. We piloted the iPad application with 20 adults who rated their ‘perceived’ and ‘desired’ body images from the somatotype photographs (>3 days between tests).

**Results**: Reliability correlation coefficients were determined for ‘perceived’ endomorphy r = 0.91 (68% identical), and ‘desired’ endomorphy r = 0.78 (85% identical); ‘perceived’ mesomorphy r = 0.81 (70% identical), and ‘desired’ mesomorphy r = 0.93 (65% identical); plus ‘perceived’ ectomorphy r = 0.88 (61% identical), and ‘desired’ ectomorphy r = 0.88 (70% identical). Overall, on re-test, 45% chose the identical ‘perceived’ somatotype and 50% the identical ‘desired’ somatotype.

**Conclusions**: This novel iPad application introduces a revolutionary new and reliable method of assessing both perceived and desired body image. It also uniquely and simultaneously assesses body fat, muscle and leanness using realistic quasi-3D images. Developments of this rapid, portable and digital application may provide health care professionals with an enhanced tool for assessing body image and dealing with body image disorders.

Funding: Hong Kong University’s Knowledge Exchange Fund and Seed Funding Programme #201411159144. J.E. Lindsay Carter Kinanthropometry Clinic and Archive New Zealand funding programme #KAPK1K.

**Purpose**: Previous studies suggest that higher levels of mindfulness associate with less pain and depression. However, the role of mindfulness has not been studied in osteoarthritis (OA). We evaluate the relationships between mindfulness and pain, psychological symptoms, and quality of life in knee OA.

**Methods**: We performed a cross-sectional analysis of baseline data from our randomized trial in participants with symptomatic knee OA. Mindfulness and its facets: Observing, Describing, Acting-with-Awareness, Non-judging, and Non-reacting, were assessed using the Five Facet Mindfulness Questionnaire (FFMQ). We also measured the Western Ontario and McMaster Osteoarthritis Index, Short Form-36, Beck Depression Inventory, Perceived Stress Scale, Self-Efficacy, and 6-minute walk. Pearson’s correlations were utilized to assess the association between mindfulness and health outcomes. We further tested the interaction of mindfulness on outcomes.

**Results**: From 2002 to 2011 incident mTBI, PTSD, and MHD were found in: 79,505, 71,454, and 285,731 soldiers, respectively. The average injury rate per 1000 soldier years for mTBI, PTSD, and MHD were 17.23, 15.37, and 67.99, respectively. Sustaining a prior (> 12 mos.) non-head injury was a significant risk factor for subsequent mTBI (OR 9.82, 95% CI 9.62-10.02). MTBI was associated with increased risk for both subsequent (> 12 mos.) PTSD (OR 5.67, 95% CI 5.37-5.98) and MHD (OR 2.98, 95% CI 2.89-3.10). Non-head injury was associated with an increased risk for PTSD (OR 2.15, 95% CI 2.10-2.19) and MHD (OR 2.17, 95% CI 2.15-2.20) to a lesser degree than mTBI.

**Conclusion**: Soldiers are at greater risk for developing PTSD and other MHDs for more than a year after an mTBI exposure versus non-head injuries. Identifying populations at risk for mTBI and those with a previous mTBI exposure, are important consideration for mental health surveillance and intervention programs for both military and civilians. The views, opinions and/or findings contained herein are those of the authors and should not be construed as an official Department of the Army position, or policy.

**Purpose**: Development and Reliability of a Novel iPAD-based Application to Rapidly Assess Body Image

Duncan J. Macfarlane, FACSM, Antoinette Lee, Patricia Hume, Lindsay Carter. The University of Hong Kong, Pokfulam, Hong Kong. Auckland University of Technology, Auckland, New Zealand. San Diego State University, San Diego, CA. Email: DJMac@HKU.HK (No relationships reported)
RESULTS: Eighty patients were enrolled (age: 60.3±10.3 years; 61% female, 53% K-L≥2; BMI: 33.0±7.1 kg/m²). Total mindfulness was associated significantly with mental (r = 0.50, p < 0.001) and physical (r = 0.23, p = 0.04) quality of life, self-efficacy (r = 0.28, p = 0.01), depression (r = -0.47, p < 0.001) and stress (r = -0.51, p < 0.001). Three (Describing, Acting-with-Awareness, and Non-judging) of 5 mindfulness facets were most frequently associated with psychological health. Significant association was not found between mindfulness and pain (P = 0.30, physical function (P = 0.75), or the 6-minute walk (P = 0.69), however, we found that mindfulness moderated the effects of pain on stress (B = -0.02, p = 0.20).

CONCLUSIONS: Mindfulness is associated with depression, stress, self-efficacy, and quality of life among knee OA patients. Mindfulness also buffers the influence of pain on stress, supporting the notion that mindfulness alters the way one copes with pain. Future studies examining the impact of mind-body therapy, designed to increase mindfulness, for patients with OA are particularly warranted.

3778 Board #217
June 4, 8:00 AM - 9:30 AM
Effects Of Physical Fitness Training On Psychological Well-being Among College Students With Varied Exercise Experiences
Yan Shi¹, Gang He¹, Stephen H. Wong, FACSM¹, Bo Wang².
¹The Chinese University of Hong Kong, Hong Kong, Hong Kong. ²The Hong Kong Institute of Education, Hong Kong, Hong Kong.
Email: shiyan@link.cuhk.edu.hk (No relationships reported)

Existing research proposed various kinds of exercise training in improving psychological well-being of college students, but few has taken participants’ level of exercise experience into account.

PURPOSE: To examine the effectiveness of a physical fitness training on the psychological well-being among college students with or without exercise experience.

METHODS: Eighty-one college students (age = 22.5 ± 1.9 yrs) with varied exercise experiences were assigned into four groups (gender balanced in each group): exercise experience-intervention group (N=21); exercise experience-control group (N=20); no experience-intervention group (N=20); no experience-control group (N=20). Participants in intervention groups received a gym-based physical fitness training class which was conducted twice per week for ten weeks; whereas participants in control groups were advised to follow their usual activities. Psychological well-being was measured by the Oxford Happiness Questionnaire (OHQ) at baseline and after the intervention. Both the overall score and the scores of six sub-scales in the OHQ were calculated as outcome variables. Analysis of variance (ANOVA) with repeated measures was conducted to determine the effect of intervention and exercise experience.

RESULTS: Total mindfulness was associated significantly with self-efficacy (13.8 ± 1.8 vs 12.4 ± 2.1; p = 0.002) and control (10.6 ± 1.7 vs 9.7 ± 1.8; p = 0.020) than non-exercised experienced ones at baseline. The main effect of the intervention was significant [F (1, 77) = 13.13, p = 0.001] for overall score and scores of life satisfaction (p = 0.010), self-efficacy (p = 0.002), control (p = 0.017) and calm (p = 0.024). Main effect of exercise experience and mutual interaction between intervention and exercise experience were not significant. In post-hoc pairwise comparisons, significant effect of the intervention on overall score was found for non-exercised experienced participants (p = 0.013) but not for the exercise experienced group. CONCLUSION: College students with exercise experience have higher psychological well-being than non-exercise experienced ones. Physical fitness training is effective for non-exercise experienced college students to improve psychological well-being, but this effect does not apply to exercise experienced students.

3779 Board #218
June 4, 8:00 AM - 9:30 AM
Sex-Related Differences in Mood Responses to Acute Aerobic Exercise
Cillian P. McDowell, Mark J. Campbell, Matthew P. Herring.
University of Limerick, Limerick, Ireland. (Sponsor: Pat O’Connor, FACSM)
Email: cillian.mcdowell@ul.ie (No relationships reported)

Acute exercise improves feelings of tension, energy and fatigue, state anxiety, and total mood disturbance. Less known are factors that may influence mood responses to exercise. Though some evidence supports stronger mood improvements in response to acute exercise among women, sex-related differences remain understudied.

PURPOSE: To quantify and compare differences in baseline mood and responses to either aerobic exercise or quiet rest between young adult men and women.

METHODS: Fifty-three (27 M; 26 F) young adults were randomized to one of two counterbalanced conditions: 30-min of vigorous treadmill running or 30-min of quiet rest. Outcome measures included the State-Trait Anxiety Inventory (STAI), the Zung Inventory of Depressive Symptomatology (QIDS), the Penn State Worry Questionnaire, and the Profile of Mood States – Brief Form. ANOVA examined baseline sex-related differences. Hedges’ d effect sizes were calculated to quantify and compare the magnitude of change in response to exercise; statistical significance was inferred from 95% CIs which did not encompass 0.0.

RESULTS: Females were more likely to report scores indicative of depression (QIDS:5; 38.5% vs. 18.5%) and high trait anxiety (≥15D above age- and sex-related norm on STAI-Y2; 26.9% vs 3.7%). Baseline worry symptoms and trait anxiety were significantly higher among females (p<0.02). Exercise significantly improved feelings of fatigue (d=0.59 [0.01, 1.17]), confusion (d=0.83 [0.24, 1.41]), and energy (d=1.67 [1.02, 2.33]), and total mood disturbance (d=1.99 [0.49, 1.70]), and resulted in a non-significant moderate-sized improvement in state anxiety (d=0.51 [0.07, 1.08]) among females. Effects among females were larger for all outcomes other than feelings of tension.

CONCLUSION: Findings support sex-related differences in response to acute aerobic exercise. Exercise resulted in moderate-to-large improvements in state anxiety, feelings of energy and fatigue, confusion, and total mood disturbance among women, and all mood improvements other than feelings of tension were larger among women. Future research should examine putative mechanisms of sex-related differences in mood responses to exercise.

G-38 Free Communication/Poster - Physical Activity in Youth
Saturday, June 4, 2016, 7:30 AM - 11:00 AM
Room: Exhibit Hall A/B

3780 Board #219
June 4, 9:30 AM - 11:00 AM
The Relationship Between Steps/min And Intensity On A Treadmill In Children And Adolescents: Cadence-kids
Catrine Tudor-Locke, FACSM¹, John M. Schuna, Jr.¹, Ho Han¹, Sandra Larrivee¹, Daniel S. Hsia¹, William D. Johnson¹.
¹University of Massachusetts Amherst, Amherst, MA. ²Oregon State University, Corvallis, OR. ³Pennington Biomedical Research Center, Baton Rouge, LA.
(No relationships reported)

Cadence (steps/min) is strongly correlated with intensity of effort defined as metabolic cost in adults such that 100 steps/min has been consistently considered a reasonable heuristic value representative of moderate-intensity activity (3 metabolic equivalents [METs]). No studies have yet looked at visually tallied (i.e., the criterion standard) cadence and verified absolutely-defined moderate-intensity activity (or any other level) in children and adolescents spanning these developmental years.

PURPOSE: To quantify the relationship between visually tallied cadence (steps/ min) and markers of increasing intensity across age in children and adolescents under controlled conditions.

METHODS: 121 children and adolescents (61 boys, 60 girls) representing each age-year between 6-20 years participated in a lab-based study of videotaped ambulation (to visually tally steps/min) as estimated by the Schofield equation. Linear mixed-effects regression models with random effects for participant were used to estimate the cadence cut points corresponding to 4 METs, an intensity threshold considered to be more representative of moderate intensity in young individuals.

RESULTS: Cadence cut points (95% CI) for 4 METs were 128.1 steps/min (124.2-131.9) for 6-10 year olds (n = 39), 105.1 steps/min (101.9-108.3) for 11-15 year olds (n = 43), and 101.5 (98.8-104.1) steps/min for 16-20 year olds (n = 39).

CONCLUSIONS: Heuristic values for cadence associated with 4 METs, arguably a better estimate of energy expenditure in younger individuals, range from approximately 100 to 130 steps/min, with higher values for younger children.

Funded by Eunice Kennedy Shriver National Institute of Child Health and Human Development: 1R21HD073807-01A1
PURPOSE: To evaluate step counting accuracy of the ActiGraph GT3X+ accelerometer in waist- and wrist-worn locations during simulated free-living activities among children and adolescents.

METHODS: 123 children and adolescents (6-20 years) performed simulated free-living activities (i.e., seated watching a movie and basketball skill development activity) while concurrently wearing accelerometers on their waist and non-dominant wrist. Each activity was performed for 5 minutes and visually tallied steps served as the criterion (steps/min). Accelerometer data were processed using two filters: 1) normal (NF), and 2) low-frequency extension (LFE). Confidence intervals (95%) for the difference (criterion-test method) were generated using the non-parametric bootstrap (n = 5000 replicates) and used within an equivalence testing framework to evaluate accuracy relative to the pre-defined equivalence margins of ± 3 ± 10 steps/min for movie watching and basketball, respectively.

RESULTS: Compared to visually tallied steps (steps/min), both waist and wrist-worn accelerometers over-counted steps during movie watching (waist: NF = 0.02 [0, 0.05], LFE = 0.37 [0.23, 0.54]; wrist: NF = 0.50 [0.37, 0.64], LFE = 2.21 [1.64, 2.81]); however, all confidence intervals were completely within the pre-defined equivalence margin. Conversely, waist and wrist-worn accelerometers under-counted steps while performing a simulated basketball skill development activity (waist: NF = -36.51 [-40.31, -33.23], LFE = -11.87 [-15.37, -8.95]; wrist: NF = -28.85 [-32.64, -25.51], LFE = -17.43 [-21.19, -14.11]) with none of the associated confidence intervals falling completely within the pre-defined equivalence margin.

CONCLUSION: In agreement with direct observation, the ActiGraph GT3X+ detected few false steps during movie watching with the waist-worn location and NF combination performing best. All combinations of wear location and filter choice underestimated step counts during a simulated basketball activity. Given these limited data, applying the LFE filter to a waist-worn device may provide the best overall free-living step count estimates for children and adolescents.

Supported by NIH NCHID 1R21HD073807-01A1

The Participation Report Card on Physical Activity for Children and Youth is an annual, comprehensive assessment of the current status of child and youth physical activity in Canada. Published for 11 consecutive years, the Report Card assigns annual, comprehensive assessment of the current status of child and youth physical activity in Canada. Physical Activity In Canada, 2005-2015

Joel D. Barnes, Mark S. Tremblay, FACSM. Children's Hospital of Eastern Ontario Research Institute, Ottawa, ON, Canada. (Sponsor: Mark S. Tremblay, FACSM)

The Prevalence of Sport Specialization in Youth Athletes Participating in Summer Sport Tournaments

Jeremy W. Rickena, Eric G. Post, Stephanie M. Trigsted, Michaela M. Rabas, Jessica L. Trapp, Timothy A. McGuine, M. Alison Brooks, David R. Bell. The University of Wisconsin - Madison, Madison, WI. (No relationships reported)

Early focus in a single sport at the exclusion of other sports (sport specialization) is theorized to increase the risk of overuse injuries. New tools have been developed to better classify athletes along a spectrum of specialization. However, the prevalence of sport specialization in a broad sample of youth athletes has yet to be investigated.

PURPOSE: To determine the prevalence of sport specialization in youth athletes participating in summer sport tournaments. A secondary purpose was to investigate prevalence of specialization by gender, age, and sport.

METHODS: Athletes, ages 12-18 (age = 13.8 ± 1.6 years) were recruited at youth sporting events. Participants completed a survey about their sport specialization history. Degree of specialization in athletes was classified as low, moderate, or high, using a scale based on the following questions: 1) Do you train in 1 sport more than 8 months/year? 2) Have you quit a sport to focus on a primary sport? 3) Do you consider your primary sport more important than other sports? Data was summarized by means and standard deviations, frequencies and proportions (%). Chi-square tests were used to investigate associations of specialization category by sex, age, and sport (a-priori p≤0.05).

RESULTS: 1819 athletes completed the survey with 37.9% (n=689) classified as highly specialized (moderate: 37.5% (n=682); low: 24.6% (n=448)). Females (41.7%) were more likely to be classified as highly specialized compared to males (34.3%) (X2 = 10.8, P= 0.005). Age influenced specialization (X2 = 23.2, P= 0.003), with 47% of 15 year olds classified as highly specialized (largest proportion) and 12 year olds having the lowest proportion (31.4%). Of the 5 sports with the largest number of respondents (soccer, swimming, basketball, lacrosse, and ice hockey), lacrosse had the greatest proportion of specialized athletes (51.8%, P= 0.004).

CONCLUSIONS: Approximately one-third of youth athletes are highly specialized. These percentages vary by age, gender, and sport. Specialization seems to peak around age 15 and females are more highly specialized compared to males. A better
Traditional fitness evaluation has focused on either comparing a child with others (i.e., norm-referenced evaluation) or with an absolute standard (i.e., criterion-referenced evaluation) and, as a result, the rich information of youth fitness pattern and profile has often been ignored.

**PURPOSE:** To examine the US youth fitness profile using a diagnostic testing model.

**METHOD:** The data of a subsample of 12-15 year olds with an estimated VO2max from the 2012 NHANES National Youth Fitness Survey (N = 410; male% = 51.71) were used for the data analyses. Using seven fitness measures, FITNESSGRAM® performance standards or other available cutoff scores, a Q-matrix representing four fitness underlying traits was first created, including Fatness (BMI = 410; male% = 51.71) were used for the data analyses. Using seven fitness measures, FITNESSGRAM® performance standards or other available cutoff scores, a Q-matrix representing four fitness underlying traits was first created, including Fatness (BMI + fat% estimated from skinfold), Cardiovascular Fitness (VO2max estimated by a treadmill test), Muscular Strength (Leg extension + Hand Grip) and Muscle Endurance (Modified Pull-up + Plank). The fitness profile pattern was then estimated by total, sex, and age using the DINA (Deterministic, Inputs, Noisy, “And” Gate; Macready & Dayton, 1977) diagnostic model.

**RESULTS:** “All Fit”, i.e., youth was fit in all four traits, had the highest percentage (26.70%) and, in contrast, only a very small proportion of youth (5.21%) was classified as “All Unfit.” Surprisingly, the 2nd highest group (21.19%) was the “Fit Only in Muscle Strength” group, followed by “Only Muscle Strength and Endurance Fit” (7.37%). Groups that are under “Fat and (Cardiovascular) Fit” accounted for a very small proportion (8.48%) of the data, these groups are “Fat and Only Cardiovascular and Muscle Strength Fit” = 5.76%, and “All Fit except for Fatness” = 2.06%. A slightly different pattern was observed when analyzing the data by sex and age. For example, boys had a higher proportion (6.74%) of “All unfit” than girls (3.54%) and girls had a higher proportion (8.36%) of “Not Fat, but Unfit in Other Three Traits” than boys (4.13%).

**CONCLUSION:** The profile analysis by the diagnostic models provides additional rich information on youth fitness, from which targeted and effective instruction and interventions may be developed.

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**Board #224**

**June 4, 9:30 AM - 11:00 AM**

**Fat and Strong? Yes. Fat and Fit? Not Really. - A Diagnostic Analysis of The US Youth Fitness Profile**

Weimo Zhu, FACSM, Yan Yang. University of Illinois at Urbana-Champaign, Urbana, IL.

Email: weimozhu@uiuc.edu

(No relationships reported)

**PURPOSE:** The cut-off point of 600 min per day showed the best agreement (F=3.91, p=0.00) than boys:

<table>
<thead>
<tr>
<th>Age (yr.)</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>SB (min)</td>
<td>454.3 ± 135.7</td>
<td>512.9 ± 119.8</td>
<td>497.5 ± 167.2</td>
<td>539.3 ± 165.6</td>
</tr>
<tr>
<td>MVP A (min)</td>
<td>141.0 ± 84.0</td>
<td>119.1 ± 83.2</td>
<td>160.0 ± 120.8</td>
<td>128.0 ± 94.6</td>
</tr>
</tbody>
</table>

Different sedentary time cut-off points and their fitness cut-off points are summarized below:

<table>
<thead>
<tr>
<th>Age (yr.)</th>
<th>240 min/day</th>
<th>360 min/day</th>
<th>480 min/day</th>
<th>600 min/day</th>
<th>720 min/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>BMI</td>
<td>VO2_max</td>
<td>BMI</td>
<td>VO2_max</td>
<td>BMI</td>
</tr>
<tr>
<td>12 M</td>
<td>37.0 ± 5.0</td>
<td>67.0 ± 5.0</td>
<td>50 ± 5.2</td>
<td>52 ± 5.2</td>
<td>55 ± 5.4</td>
</tr>
<tr>
<td>F</td>
<td>51.6 ± 6.1</td>
<td>61.6 ± 6.1</td>
<td>63 ± 6.0</td>
<td>56 ± 4.9</td>
<td>51 ± 4.2</td>
</tr>
<tr>
<td>13 M</td>
<td>51.4 ± 6.4</td>
<td>46.4 ± 6.4</td>
<td>53 ± 5.6</td>
<td>54 ± 5.5</td>
<td>49 ± 4.9</td>
</tr>
<tr>
<td>F</td>
<td>53.3 ± 5.8</td>
<td>30.3 ± 5.4</td>
<td>41 ± 5.3</td>
<td>55 ± 5.4</td>
<td>41 ± 5.8</td>
</tr>
<tr>
<td>14 M</td>
<td>51.3 ± 4.3</td>
<td>34.3 ± 4.3</td>
<td>36 ± 3.8</td>
<td>38 ± 5.3</td>
<td>37 ± 5.3</td>
</tr>
<tr>
<td>F</td>
<td>54.6 ± 6.5</td>
<td>36.5 ± 6.5</td>
<td>51 ± 5.6</td>
<td>66 ± 4.7</td>
<td>71 ± 3.9</td>
</tr>
<tr>
<td>15 M</td>
<td>45.4 ± 4.6</td>
<td>47.4 ± 4.7</td>
<td>44 ± 5.2</td>
<td>47 ± 5.2</td>
<td>42 ± 5.7</td>
</tr>
</tbody>
</table>

**CONCLUSION:** The cut-off point of 600 min per day showed the best agreement with fitness outcome measures.

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**Board #227**

**June 4, 9:30 AM - 11:00 AM**

**Parental Factors Associated with Young Children Meeting the Physical Activity Guidelines**

Julie A. Wright, Sarah M. Cambi, FACSM, Philip J. Troppel. University of Massachusetts Boston, Boston, MA. (Sponsor: Tongjiyan You, FACSM)

Email: julie.wright@umb.edu

(No relationships reported)

Parents may be instrumental in helping their children meet the physical activity (PA) guidelines of ≥ 60 min/d of moderate to vigorous intensity activity, yet there are few studies that have examined this issue.

**PURPOSE:** To examine parental factors.
associated with young children meeting PA guidelines. We hypothesized that parental attitudes, defined as perceived importance of children being active, parental support of their child’s PA, and self-efficacy (SE) in helping their child get 60 min/week would be associated with the child meeting PA guidelines. Parents’ BMI, race (white/ black), income level (<$40K/$40K), education (<college/college), marital status (not married/ married), and PA level were also examined as correlates. METHODS: A cross-sectional survey was conducted with parents of children aged 4-10 yrs who lived in the Boston area. Parents reported the amount of time their child spent in 20 activities over the past 7 days. Parental importance was assessed with “how important is it to you that your child gets 60 min or more of PA every day?” Parental support was assessed with 5 items about the typical frequency of support (e.g., “how often do you encourage your child to do PA?”). Parental SE was asked by asking parents their confidence in helping their child get 60 min/day in 4 different situations (e.g., “when your child is tired”). Parents’ PA was assessed with 2 questions about how often they did leisure time PA, and moderately active housework or gardening in past 7 days. Multiple logistic regression was used to examine parent variables associated with children meeting PA guidelines, controlling for children’s age and gender. RESULTS: The sample (n=180) was 51% white, not married, and had an income <$40K, 57% had <college degree. Most children (77%) met PA guidelines. Parental importance (odds ratio (OR) = 1.63, 95% CI: 1.02, 2.59) and support (OR = 1.25, 95% CI: 1.10, 1.42) were positively associated with children meeting PA guidelines. Children of black parents were 70% less likely to meet guidelines than children of white parents (OR = 0.30, 95% CI: 0.10, 0.89). CONCLUSION: Parents’ perceived importance of PA and support appear to play an important role in young children’s PA. Given the racial differences in children’s PA, examination of differences in parental influences on PA by race may be warranted.

3790 Board #229 June 4, 9:30 AM - 11:00 AM
Poor Physical Activity Levels and Physical Fitness in Adolescents with Anorexia after Hospitalization
David Jeffery1, Maria Fernandez-del-Valle1, Margarita Perez-Ruiz2, Montserrat Graell3, Eneco Laruimbe-Zabala1, 2Texas Tech University, Lubbock, TX. 3European University, Villavicencio de Odon, Madrid, Spain. 1Pediatric Hospital Niño Jesús, Madrid, Spain. 2Texas Tech Health Sciences Center, Lubbock, TX.
(Sponsor: Jacalyn McCoombe, FACSM)
Email: david.jeffery@ttu.edu

The assessment of high physical activity (PA) levels in anorexia nervosa (AN) has been controversial, and inconsistent results have been reported among studies. As a result, PA has been stigmatized, often not directly addressed. There are no standardized guidelines for high physical activity levels and exercise prescription in AN patients, and consequently, patients might present poor physical fitness (PF) levels that persist after weight recovery at the clinic. PURPOSE: To study spontaneous physical activity levels and how they relate to physical fitness status in a group of adolescents with AN after hospitalization. METHODS: An Actigraph GT3X monitor was used to assess PA levels in seventy-four AN patients (mean age = 13.5 years, SD = 2.12). Cardiopulmonary parameters for aerobic and anaerobic capacity (maximal oxygen consumption [VO2max], percent change in VO2max), and ventilatory thresholds [VT1, and VT2], and functional capacity were assessed. RESULTS: Values of moderate to vigorous PA (MVPA) levels were 44.5 min/day (SD = 22.5), and resulted significantly different (t(73) = 5.11, p < 0.001) from the recommendations for children and adolescents. Only 21.62% of the AN patients met the MVPA criteria. Although no significant associations were found between PA and PF, functional capacity was affected: 75.68% of the patients presented reduced aerobic capacity (VT1), (t(73) = 5.92, p < 0.001); 54.4% presented reduced anaerobic capacity (VT2), (t(49) = 2.79, p = 0.004); among them 32.4% (n=24) did not reach VT2, and 50% (n=37) did not meet the criteria for a healthy VT2. Mean relative strength was significantly below the normal threshold for healthy population on bench press (1.44), (t(13) = -15.5, p < 0.001). CONCLUSIONS: Our findings show that PA levels are not fully recovered, and PA levels do not meet the recommendations for adolescent AN patients after hospitalization. These findings suggest that exercise prescription during hospitalization might be a critical factor for an adequate recovery of PF and healthy lifestyle in AN patients.

3791 Board #230 June 4, 9:30 AM - 11:00 AM
Physical And Sedentary Activity In A College Population: The Influence Of Undergraduate Major And Gender
Evanjeet K. Brar, Benjamin Ferrari-Church, Sundeep Bhuang, Vanessa R. Yingling, FACSM, Jenny O. California State University, East Bay, Hayward, CA. (Sponsor: Vanessa Yingling, FACSM)
Email: ebrar2@horizon.csueastbay.edu

Understanding how free time physical activity (PA) is influenced by age, gender, and social factors is important for adults and adolescent populations. However, very few studies have focused on college students. Therefore, the purpose of this study was to examine LTPA and sitting times in a college student population. METHODS: Undergraduate students enrolled at a State university (N = 50) completed the Global Physical Activity Questionnaire. Respondents were partitioned into four college major (CM) bins: Science and Engineering (n = 15); Humanities, Social Science, Art, and Education (n = 15); Administration and Management (n = 16); and Applied Health Science (n = 10). Self-reported LTPA and sitting times were analyzed using SPSS (version 21). Two separate Chi-square tests (gender and CM bin; n = 0.025) were conducted to examine gender differences in LTPA, relative to the ACSM’s LTPA minimum guidelines. Two separate multivariate analyses of variance (n = 0.025) examined the influence of gender and/or CM Bin on self-reported LTPA and sitting times.

RESULTS: LTPA data demonstrated a bimodal distribution; most respondents reported being highly active or completely sedentary. Fifty percent of the student population failed to meet the minimum ACSM guidelines; 80% of that population reported zero minutes of LTPA. Neither CM bin nor gender was found to have an effect on LTPA levels. However, main effects for gender and CM bin were found (p < .0001). Post hoc analyses indicated that males reported significantly more sitting time (μ = 473.4 minutes/day; SD = 279.1) than females (μ = 377.6 minutes/
Physical activity (PA) is associated with a number of health benefits. Many higher education institutions are serving a geographically diverse student body with a large number of students taking only online courses. Little is known about the descriptive epidemiology of PA among college students not enrolled in traditional face-to-face courses. PURPOSE: The purpose of the study was to evaluate whether there was a difference in PA levels for course modality (on-campus vs. online).

METHODS: An online questionnaire was administered to students at a regional university in eastern Oregon. PA levels of on-campus and online students, as well as other variables potentially affecting PA behaviors during the 2013-2014 academic year were assessed. PA queries were based on the International Physical Activity Questionnaire (IPAQ) questions regarding PA. The questionnaire was administered once during the year via e-mail with an embedded link to a web-based survey generator. Data were reduced and scored utilizing standard IPAQ scoring protocols. Comparison of count variables were done using the Wilcoxon Rank Sum Test.

RESULTS: 238 participants completed the questionnaire (online students n = 162; on-campus students n = 76). The proportion of online students meeting PA recommendations was reported as 37.5% compared to on-campus 92.1% (p = .0039). On-campus students reported significant differences in median minutes of Vigorous PA (VPA), walking, and MET min/wk than online students (60 min vs. 232.5 min; p = .004; 360 vs. 127.5 min; p = .008; 4,014 MET vs 1,935 MET, p = .0002, respectively). There was no observed difference between online and on-campus for median mins of moderate PA (60 min vs. 120 min, p = .29) and MET min/wk for men (4,299 vs 4,326 MET min/wk). However, on-campus students women reported more MET min/week then women online (3,564 vs. 1,356 MET min/ wk, p = .0001). No differences were observed between online and on-campus for sedentary behaviors (p = .31). Access to gym facilities was reported to be significantly different between on-campus vs. online (8.6% vs. 0%, p = .0059).

CONCLUSIONS: These data suggest a need for physical activity interventions tailored to online university students.

Sedentary behavior is an important threat to health and quality of life by increasing the risk factor of developing non-communicable diseases and premature death Therefore, it is important to understand sedentary patterns and its relationship to other risk factors, such as obesity.

Purpose: To describe the lifestyle, the level of sedentary behavior, physical activity and the prevalence of obesity in students of University of Costa Rica (UCR), Tacarres Campus. Methods: 121 participants (n = 33 men, women n = 88, M age = 19.79 ± 2.46 years) from 13 different majors at UCR, were assessed. Data were reduced and scored utilizing standard IPAQ scoring protocols. Comparison of count variables were done using the Wilcoxon Rank Sum Test.

Results: College students reported that they spent 74.8% of their time in sedentary behavior during class. During afternoon, sedentary lifestyle increased significantly to 91.8% (p=0.05). BMI results showed a 4.9 classified as underweight, 67% normal weight, 21.5% overweight and 6.6% obese. A statistically significant negative correlation was found between physical activity level and BMI (p<0.05).

Conclusions: The results of this study show that students spent most of their time in sedentary behavior and sedentary behavior is also significantly related to a higher BMI. New intervention programs in physical activity and exercise should be developed as a priority to be considered as preventive tools for non-communicable diseases and premature mortality in this student population.

PURPOSE: The purpose of the study was to examine if the amount and intensity of objectively measured physical activity (PA) differs by aerobic capacity and gender, socio-economic status (SES), and race among 4th grade children.

Methods: Participants included 1859 4th graders from 26 central Texas elementary schools (m age=9.5; 48.5% female; 54.7% white) across 3 years. Aerobic capacity was dichotomized based on if their Pacer score was in the Healthy Fitness Zone (HFZ) for the FitnessGram. Percent of time spent in sedentary (S), light (L), moderate (M), and vigorous- (V) intensity PA were assessed during the school day for one week via accelerometers. Gender and race (white, non-white) were also taken from FitnessGram data. Socio-economic status (SES) was assessed by eligibility for free or reduced lunch. A MANOVA was run to examine differences between HFZ status and percent of time spent in S, L, M, and V PA.

Results: The MANOVA showed a main effect for HFZ status on PA (p=.001); where children in the HFZ for Pacer had lower levels of S (p<.001). There was a significant interaction between HFZ and SES (p < .01). For those in the HFZ, higher SES students spent more time in V (p=.27), but were no different than lower SES students in S, L, or M. For those not in the HFZ, lower SES students spent more time in S (p=.33), and less in L (p=.37) than did higher SES students.

Conclusions: Children in the HFZ spent more time in MVPA. Males spent more time being active compared to females. For those not in the HFZ, low SES is associated with more time in S and less time in L. For HFZ, low SES is associated with lower levels of V PA. These data extend existing research comparing pacer scores with objective measures of activity to children. Results indicate that interventions that target this age may need to be tailored to girls and those lower in SES.

Sedentary Behaviors and Physical Activity in Relation to Class Standing in University Students

Codie Monholesen, Louisa Summers, Matthew Sabin, Jack Rutherford. Eastern Kentucky University, Richmond, KY.

Purpose: The purpose of this study was to determine baseline measures for sedentary behaviors (SB) and physical activity (PA) in relation to class standing of university students. METHODS: To assess SB and PA, each participant was given the Sedentary Behavior Questionnaire and the International Physical Activity Questionnaire. Participants were selected from graduate (GS) and undergraduate courses in health and exercise and sport science at a public four year university.

RESULTS: On average students spent 37 hours in SB during a normal five day week. Significance was noted between class standing for playing computer/video games, paper work/computer, and transportation for weekday sedentary behaviors (p<0.05). More specifically graduate students (GS) spent more time on paperwork then freshmen, sophomore, junior, and senior; F(4, 314) =6.05, p = .00. Students in the HFZ, across all standings on average spent 15 hours (hrs) engaged in SB during a normal two day weekend. The highest ranking of these SB were television and paperwork.

CONCLUSION: The MANOVA showed a main effect for HFZ status on PA (p=.001); where children in the HFZ for Pacer had lower levels of S (p<.001). There was a significant interaction between HFZ and SES (p < .01). For those in the HFZ, higher SES students spent more time in V (p=.27), but were no different than lower SES students in S, L, or M. For those not in the HFZ, lower SES students spent more time in S (p=.33), and less in L (p=.37) than did higher SES students.
Parent’s Sitting Time In Puerto Rico: Association Between Children’s Screen Time And Behavior and Childhood Obesity

Ming-Fen Hsu1, Szu-Hsien Yu2, Huich-Y Lin2, Shih-Chang Chen2. 1University of Taipei, Taipei, Taiwan. 2National Ilan University, Ilan, Taiwan. (Sponsor: Chia-Hua Kuo, FACSIM) Email: mingfensu@gmail.com

(Please select one category from the list below)

S826 Vol. 48 No. 5 Supplement

3796 Board #235 June 4, 9:30 AM - 11:00 AM The Relation of Single-parent Family in Sedentary Behavior and Childhood Obesity

Parent’s Sitting Time In Puerto Rico: Association Between Children’s Screen Time And Parent’S Sitting Time In Puerto Rico

Alexis González-Rodríguez, María E. Santiago-Rodríguez, Marcos A. Amalbert-Birriel, Farah A. Ramírez-Marrero, FACSM. University of Puerto Rico, Rio Piedras Campus, San Juan, Puerto Rico.

Email: agr_hatillo@hotmail.com

(Please select one category from the list below)

3797 Board #236 June 4, 9:30 AM - 11:00 AM Analysis Of Accelerometer Counts During Sedentary Activities In 5-11 Year Old Children Using a Wrist-Worn Accelerometer

Ming-Fen Hsu1, Szu-Hsien Yu2, Huich-Y Lin2, Shih-Chang Chen2. 1University of Taipei, Taipei, Taiwan. 2National Ilan University, Ilan, Taiwan. (Sponsor: Chia-Hua Kuo, FACSIM) Email: mingfensu@gmail.com

(Please select one category from the list below)

3798 Board #237 June 4, 9:30 AM - 11:00 AM Correlates Of Moderate-to-vigorous Physical Activity In Brazilian Children

Gerson Luis de Moraes Ferrari1, Victor KR Matsudo2, Timóteo L. Araújo3, Luis C. Oliveira4, Tiago V. Barreira2, Peter T. Katzmarzyk5, Mauro Fishberg1, 1CELAFICS - UNIFESP, São Caetano do Sul, Brazil. 2CELAFICS, São Caetano do Sul, Brazil. 3Syracuse University, New York, NY. 4Pennington Biomedical Research Center, Baton Rouge, LA. 5UNIFESP, São Paulo, Brazil.

Email: gerferrari08@yahoo.com.br

(Please select one category from the list below)
Distance between home and school is an important determinant of active commuting to school in children. Criterion distance of active commuting to school has been determined in Western countries, but it remains unknown how far children walk to school in highly dense urban contexts, such as Hong Kong.

PURPOSE: To determine the criterion distance of walking to school among children in Hong Kong using the Receiver Operating Characteristic (ROC) curve analyses. METHODS: Participants were 1,279 grades 4-6 children (45% boys, mean age = 10.9 ± 1.0 years) from 9 primary schools in Hong Kong. Based on the self-reported number of trips walking to and from school, children were classified as active (≥ 6 walking trips per week) or passive commuters (< 6 walking trips per week). Self-reported home address (OR=0.99; 95% CI=0.98-1.00) were associated with lower odds of AST. A 10-point increase in WalkScore®, which ranges from 0 to 100, was associated with a 13% decrease in the odds of AST. No built environment feature was associated with moderate-to-vigorous PA.

CONCLUSIONS: Consistent with previous research, longer home-school distance was associated with lower odds of AST. The negative relationship between WalkScore® and AST suggests either that walkability does not increase the likelihood of AST in children of this age, or that the WalkScore® scoring algorithm (which was developed for adults) puts excessive emphasis on access to destinations that are not relevant for children. Our results also suggest that the relationship between the BE and PA is domain-specific. Finally, it is worth noting that our sample provided limited variability in access to park and average slope of the home neighborhood, underscoring a need for future multi-site studies.

Supported by The Coca-Cola Company.
Sedentary time (SED) and self-report screen time (ST) are influenced by an array of complex and diverse factors. The purpose of this study was to examine potential correlates of objectively measured SED and self-report ST in a sample of 9-11 year old Brazilian children. Methods: This study focused on 328 Brazilian children (51.5% boys) enrolled in the International Study of Childhood-ISCOLE. An Actigraph GT3X+ accelerometer was used to monitor SED over 7 days. Body fat percentage (BF%) was measured with bioelectrical impedance and BMI (kg/m2) was calculated from measured height and weight. Questionnaires completed by the participants, their parents, and school personnel queried behavioral, family and home environment, and school environment correlates. Twenty two potential correlates of SED and ST were examined using multi-level linear regression. Variables that were moderately associated with SED and/or ST at univariate analyses p<.10 were included in the final models. Variables that remained significant in the final models p<.05 were considered correlates of SED and/or ST. Sex, ethnicity, school, number of siblings, and total annual household income were used as covariates in all multivariable models. Results: Children averaged 500.06 min/day in SED (489.67 boys; 511.11 girls: p=0.005) and 3.9 hours/day in ST (4.1 boys; 3.7 girls: p<.05). For boys and girls combined, SED was negatively associated with healthy eating score and moderate-to-vigorous physical activity (MVPA). In boys, the only significant correlate of SED was MVPA (β=-1.434). In girls, significant correlate of SED were healthy eating score (β=-1.390), time of travel to school (β=0.918), and MPAs (β=-1.896). For boys and girls combined, ST was negatively associated with BMI and healthy eating score. In boys, the significant correlates of ST were BMI (β=-0.019), healthy eating score (β=-0.090) and TV in bedroom (β=0.201). In girls, significant correlate of ST were healthy eating score (β=0.184), time of travel to school (β=-0.230), and policies or practices on physical activity (β=-2.81). Conclusions: Several factors were identified as correlates of SED and/or ST in Brazilian children; however, few correlates were common for both SED and ST, and for both boys and girls. This suggests that a single strategy to reduce SED and ST is unlikely to be effective.

**Table 1 Healthy Weight, Overweight, and Obesity Prevalence**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Healthy Weight</th>
<th>Overweight/Obese</th>
<th>Overweight Only</th>
<th>Obese Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Males (n=1105)</strong></td>
<td>62.71%</td>
<td>36.19%</td>
<td>17.1%</td>
<td>19.09%</td>
</tr>
<tr>
<td><strong>Females (n=901)</strong></td>
<td>62.9%</td>
<td>36.07%</td>
<td>19.2%</td>
<td>16.87%</td>
</tr>
<tr>
<td><strong>Condition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention (n=872)</td>
<td>59.97%</td>
<td>38.99%</td>
<td>19.15%</td>
<td>19.83%</td>
</tr>
<tr>
<td>Control (n=1134)</td>
<td>64.99%</td>
<td>33.95%</td>
<td>17.19%</td>
<td>16.75%</td>
</tr>
<tr>
<td>County</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (n=748)</td>
<td>65.1%</td>
<td>34.09%</td>
<td>16.44%</td>
<td>17.64%</td>
</tr>
<tr>
<td>2 (n=936)</td>
<td>61.64%</td>
<td>37.17%</td>
<td>19.01%</td>
<td>18.16%</td>
</tr>
<tr>
<td>3 (n=322)</td>
<td>60.86%</td>
<td>37.88%</td>
<td>18.94%</td>
<td>18.94%</td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K (n=656)</td>
<td>68.67%</td>
<td>29.43%</td>
<td>18.49%</td>
<td>10.94%</td>
</tr>
<tr>
<td>1 (n=272)</td>
<td>68.01%</td>
<td>31.25%</td>
<td>15.8%</td>
<td>15.44%</td>
</tr>
<tr>
<td>2 (n=310)</td>
<td>65.16%</td>
<td>33.87%</td>
<td>17.09%</td>
<td>16.77%</td>
</tr>
<tr>
<td>3 (n=272)</td>
<td>67.64%</td>
<td>31.99%</td>
<td>15.07%</td>
<td>16.91%</td>
</tr>
<tr>
<td>4 (n=307)</td>
<td>59.93%</td>
<td>39.08%</td>
<td>19.21%</td>
<td>19.86%</td>
</tr>
<tr>
<td>5 (n=310)</td>
<td>57.74%</td>
<td>41.29%</td>
<td>19.35%</td>
<td>21.93%</td>
</tr>
<tr>
<td>6 (n=253)</td>
<td>54.15%</td>
<td>49.66%</td>
<td>20.55%</td>
<td>24.11%</td>
</tr>
</tbody>
</table>

* denotes p<.05 compared to reference (4) category

**CONCLUSIONS:** High obesity rates at baseline support the need for obesity prevention efforts in rural Oregon elementary schools. Abstract supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2011-68001-30020

Optimizing physical activity in childhood is needed for prevention of disease and for healthy social and psychological development. There is limited research examining how segmented school day physical activity patterns relate to a child achieving optimal physical activity levels. PURPOSE: The purpose of this study was to examine the predictive relationship between step counts taken during specific school segments and achieving optimal school (6,000 steps/day) and daily (12,000 steps/day) step counts in children. METHODS: Participants included 1,714 school-aged children (Mean age = 9.7 ± 1.0 years) recruited across six elementary schools from the Mountain West Region of the U.S. Physical activity (step counts) was monitored on a school week using the Yamax SW-200 pedometer. Steps counts were recorded during each school segment (i.e., recesses, lunch, activity breaks, and physical education), during the entire school day between the hours of 8am and 3pm, and during the entire day between wakeup and going to bed for five days. Generalized linear mixed effects models were used to determine the adjusted odds ratios (ORs) of achieving both school and daily step count standards for every 1,000 steps taken during each school segment. RESULTS: The school segment that related strongest to a student achieving 6,000 steps during school hours was afternoon recess (OR = 40.03; P < 0.001) and for achieving 12,000 steps for the entire day was lunch recess (OR = 5.03; P < 0.001). CONCLUSION: The school segment that related the strongest to achieving the school step count cut-point was afternoon recess and the school segment that related strongest to achieving the daily step count cut-point was lunch recess. School segments including lunch and afternoon recess play an important role for optimizing daily physical activity in children.
VPA), AT participation and sedentary behavior. A survey examined participants’ perceived environment for PA. Basic statistics described the sample, Pearson correlations, and t-tests examined the relationship between the environment, PA and fitness variables separately by gender.

RESULTS: Female (n=211) and male (n=243) participants were primarily Non-Hispanic White (75.2%, 78.9%). Females reported less VPA (ρ=0.008), AT (ρ=0.006), a further distance to a neighborhood park (ρ=0.04), less access to bike parking (ρ=0.04), lower crime (ρ=0.006) in their neighborhood than men. Men had higher LDL (ρ=0.001) and lower HDL (ρ=0.001) than women. For women, having access to more resources in their residential location (e.g. apartment complex) was associated with greater MPA (ρ=0.19, p<0.03) and VPA (ρ=0.16, p<0.04), less AT (ρ=0.32, p<0.001), lower lipids (ρ<0.01, p<0.02) and a lower % body fat (ρ<0.01). Among men, greater perceived crime was associated with more sedentary behavior (ρ=0.15, p<0.04). Having access to more PA resources was associated with less AT (ρ<0.30, p<0.001) and higher lipids (ρ=0.22, p<0.03) for men.

CONCLUSIONS: The results of this study indicate that males and females have different environmental influences on PA and related fitness outcomes. Further investigation is warranted on how gender moderates the relationship between PA participation and health and fitness outcomes.

3808 Board #247  June 4, 9:30 AM - 11:00 AM
Gender Differences in Determinants of Growth From 1st to 8th Grade: Two Methods of Evaluation
Karissa L. Peyer, Gregory J. Welk, FACSM. Iowa State University, Ames, IA. (Sponsor: Gregory J. Welk, FACSM)  
(No relationships reported)

Research has shown that overweight tracks from childhood to adulthood with home environmental factors believed to play a role. However, these relationships have not been studied during early childhood or with detailed longitudinal analyses and the method of evaluating growth may influence results.

PURPOSE: The purpose of the study was to examine gender differences in the influence of parent obesity, education, and income during childhood (1st grade) on BMI during adolescence (8th grade), using BMI percentile (BMI%) and BMI50, an alternative indicator that accounts for differences in size of growth centiles.

METHODS: First grade students were recruited from 37 elementary schools. Body mass was measured to the nearest 0.1kg and height to the nearest 0.25cm by trained nurses using a standardized protocol. Parents completed a questionnaire capturing mother and father’s height and weight, education level and household income. Mother and father BMI were each categorized into one of three levels (1: BMI <-25; 2: BMI 25-29.9 and 3: BMI ≥30) and multiplied to create a ParentRisk score. BMI% was calculated using standard SAS codes and BMI50 was calculated as the difference (kg/m2) between measured BMI and the 50th percentile for the child’s gender and age. BMI was also assessed in 8th grade. General linear models were used to examine the influence of predictors on BMI in 8th grade, using BMI% and BMI50.

RESULTS: Complete data were available for 422 students (205 male, 217 female). BMI in 1st grade was a strong predictor of BMI in 8th grade in both genders. However, the influence of other factors differed by gender and by assessment method. For males, father’s education approached significance in the BMI50 model (F = 2.35, p = 0.06) but was not significant in the BMI50 model (F = 0.52, p = 0.72). For females, ParentRisk (F = 3.38, p = 0.01) and mother’s education (F = 3.15, p = 0.01) were significant predictors of BMI% but family income was not. ParentRisk was also a significant predictor of BMI50 (F = 3.06, p = 0.01) but mother’s education was not (F = 2.07, p = 0.08).

CONCLUSIONS: Parent and home environmental factors appear to have differential effects by gender with parent weight playing a stronger role in girls. However, the method of evaluating BMI change may be important. Future research should examine these gender differences over longer time spans.

3809 Board #248  June 4, 9:30 AM - 11:00 AM
If You Build It Will They Come? HBCU Student Usage of a New Recreation Facility
Amanda A. Price1, Malik D. Miller2, Nicole K. Rendos2. 1Winston-Salem State University; Wake Forest School of Medicine; 2Gramercy Research Group, Winston-Salem, NC.  
(No relationships reported)

Physical inactivity is a major contributing factor of the worldwide obesity epidemic and chronic disease incidence rates, with African-Americans (AA) impacted disproportionately. College students are at risk for chronic diseases, since the majority do not meet the physical activity (PA) guidelines for health. PURPOSE: To examine student usage trends of a new state-of-the-art campus recreation facility during its first two years in operation.

RESULTS: Students visited the facility 24 times yearly on average for the first two years. In any one year the facility was in operation, with usage significantly higher (F (1, 1436)=11.98, p<0.01) in the first year (25.47 ± 29.64), than the second year (22.63 ± 34.38). Furthermore, males used the facility significantly more (F (1, 1436)=1350.12, p<0.01; males: 37.35 ± 40.22, females: 17.26 ± 22.43).

CONCLUSIONS: Usage decreased in the second year, with females visiting the facility less than males, in addition to the overall usage reflecting that only 30% of the student population visited the facility at all. Therefore, it is not enough to build a recreation facility and expect students in attendance at HBCU to use it. PA promotion programs should be designed and offered to encourage AA college students to use campus recreation facilities and to meet the PA recommendations for health in efforts to reduce chronic disease risks and promote health equity.

3810 Board #249  June 4, 9:30 AM - 11:00 AM
Physical Activity and Fitness Knowledge: What Do They Know and Does it Impact Behavior?  
Jodee Schaben1, Senlin Chen2, Gregory Welk, FACSM, Spyridoula Vazour2, Yang Liu3, Yang Bai4. 1University of Wisconsin-River Falls, River Falls, WI; 2Winston-Salem State University, Ames, IA. (Sponsor: Gregory J. Welk, FACSM)  
Email: Jodee.Schaben@uwrf.edu  
(No relationships reported)

PURPOSE: Knowledge is understood to be important in adopting healthy behaviors, but little is known about youth fitness knowledge and impacts on physical activity (PA) behavior. This study examines associations between PA and fitness knowledge and engagement in PA in elementary, middle and high school students.

METHODS: The Youth Physical Activity Questionnaire and the PE Metrics survey were administered online to 1167, predominantly white (78.4%), students from 10 Iowa schools (4 elementary, 4 middle school, 2 high school). Separate PE Metrics knowledge tests were administered for each school level to assess grade-appropriate knowledge about PA and fitness. Since the three knowledge tests were distinctly different, z-scores were computed to allow for comparisons by grade level.

RESULTS: The average knowledge about PA and fitness, regardless of school level, was 60.5%, ranging from 52%-68%. At the middle and high school levels, girls showed a higher average knowledge score than boys. Two-way ANOVA results revealed a significant gender main effect (F (1,72) = 14.59, p < .01) and a gender by school level interaction (F (1,72) = 3.98, p < .02), favoring girls in middle and high school. Hierarchical linear regression indicated that, in model 1 with only school level predictor, social economic status (SES) negatively predicted knowledge (β = -.13, t = -3.14, p = .001) explaining 1.7% of the variance in knowledge score. Model 2, with both school and individual level variables, shows that gender (β = .12, t = 3.99, p < .001) positively predicted knowledge after controlling for SES and ethnicity, explaining an additional 1.3% of the variances in knowledge z-scores. Correlational results between the students’ knowledge z-score and their self-reported PA after adjustments (Zhu et al., 2012) indicated no correlation.

CONCLUSION: These findings suggest that knowledge of PA and fitness is moderate for elementary, middle, and high school students. Only a small percent of the PA and fitness knowledge can be explained by school level or individual level variables. Although PA promotion and physical education practices seem to emphasize knowledge as an important component of behavior change, these findings suggest that knowledge has little to no correlation with self-reported PA or sedentary behavior.

3811 Board #250  June 4, 9:30 AM - 11:00 AM
Student Perceptions of Actual Implementation of University-Wide Healthy Initiatives  
Chris Pitsikoulis, Melanie Poudveigne, FACSM, Johnny J. Gyorke. Clayton State University, Morrow, GA. (Sponsor: Melanie Poudveigne, FACSM)  
Email: chrispitsikoulis@mail.clayton.edu  
(No relationships reported)

Recently, a nationwide initiative was created to promote healthier nutritional practices and increase physical activity (PA) opportunities across universities and colleges. Participating campuses are held accountable through independent verification. PURPOSE: To examine student perceptions and awareness of the progress toward implementation of a university-wide nutrition and PA initiative. METHODS: Students...
at a regional university were provided a confidential electronic survey with specific questions related to a federally funded university-wide PA and nutrition initiative. ANOVA was conducted to investigate differences in frequency of visits to the dining hall and fitness facility. RESULTS: 126 students (29 male and 97 females) completed the survey. 86% of students indicated that they never visited the dining hall during breakfast. 70% did not visit the dining hall during lunch and 83.5% did not visit during dinner. 67%, 62%, 62.5%, and 88% of students correctly indicated the dining hall offered plant-based options, participated in a local procurement program, used tray-less dining, and made free water available, respectively. 69% students incorrectly indicated that the university offered wellness meals and 60% incorrectly stated that healthy food and beverage icons were displayed. 60% of students never used the fitness facility, while 31% used the facility 1-3 days per week. 67.9% of students correctly identified that monthly PA “how to” classes were offered and 60.6% correctly stated that personal trainers were available. 86.7% and 54.8% of students were not aware that over 20 PA activities and outdoor recreational equipment were available, respectively. 77.1% of students incorrectly stated that the fitness facility was open 16 hours/day. 63% of student’s perceptions did not match the actual implementation of more than 7 of the 15 PA and nutrition on-campus activities surveyed. There were no significant differences based on the frequency of visits to either the dining hall or fitness facility. CONCLUSIONS: Student’s perceptions did not accurately reflect the actual implementation and presence of the majority of on-campus healthy activities. This suggests that additional promotion is required to increase student awareness of the availability of healthy campus initiatives.

Worksite wellness programs offer an encouraging opportunity for employees to participate in healthy lifestyle behaviors that may improve health status. Because physical activity is an essential factor of worksite wellness programs that may be neglected by some employees, it is necessary to determine the barriers to physical activity that employees face, and present strategies that best promote participation in physical activity.

PURPOSE: To determine if moderate (MPA), vigorous (VPA), and/or total physical activity (TAP) were affected by a 10-week Worksite Incentive-Based Weight Loss Challenge (WLC). Additionally, a second purpose is proposed to identify common barriers to physical activity that exist in participants who completed the (WLC).

METHODS: After a 10-week WLC, 16 participants completed a survey that assessed PA participation prior to and during the WLC, along with barriers to PA. MET/MIN quantified amount of PA (MPA=4 METS, VPA=6 METS). TPA was calculated by adding MPA and VPA. The following variables were created: MET/MIN for MPA, VPA, and TPA prior to and during the WLC. To determine barriers to PA, participants were asked to rate level of agreement with specific barriers to PA. Additionally, the difference in pre-post WLC weight was calculated. Paired samples t-tests were conducted to analyze the like PA intensity variables prior to and during the WLC, and pre-post WLC weight. Frequencies were recorded to determine percentages of level of agreement for barriers to PA.

RESULTS: MPA MET/MIN, VPA MET/MIN, and TPA MET/MIN did not increase significantly (p=0.069; p=0.288; and p=0.101, respectively), although weight significantly decreased over the WLC (-4.6±5.8 lbs.). Participants agreed that family responsibilities, work obligations, and time constraints were barriers to PA participation. Additionally, the difference in pre-post WLC weight was calculated. Paired samples t-tests were conducted to analyze the like PA intensity variables prior to and during the WLC, and pre-post WLC weight. Frequencies were recorded to determine percentages of level of agreement for barriers to PA.

CONCLUSIONS: Although there was a significant decrease in weight, a greater decrease in weight may have been accomplished with a significant increase in MPA or VPA. To enhance the effectiveness of wellness programs, it may be important to offer opportunities for family to participate in worksite wellness programs, exercise time during the workday, and consistent motivation from worksite wellness administrators to encourage employees to overcome common barriers to PA.

The prevalence of sleep disordered-breathing (SDB) correlates with body mass in professional athletes, and those with SDB have a higher prevalence of cardiovascular and metabolic disease. This raises the question of whether risk factors for SDB may be identified at an earlier stage in an athlete’s career, which would lead to early intervention.

PURPOSE: The aim of this study was to develop a risk profile to identify collegiate athletes at risk for SDB.

METHODS: Male collegiate football offensive and defensive linemen, and track and field team members were asked to complete surveys that analyzed sleep quality/quantity (Multivariatable Apnea Prediction (MAP) index) and daytime alertness/ sleepiness (Epworth Sleepiness Scale). Blood pressure, and neck, waist, and hip circumferences, as well as body fat and lean tissue percentages (DEXA) were performed in parallel. Descriptive data and bivariate correlations were analyzed using two-MANOVA.

Results: Football linemen had larger necks, more body fat, and a larger waist-to-height ratio. The MAP index was greater in linemen (p<0.05) and correlations with neck circumference (r=-.44.6 vs r=-.37.02), BF% (r=29.97 vs r=13.84), BMI(r=36.29 vs r=23.67), waist-hip ratio (r=-.85 vs r=7.84) and systolic BP (r=131.07 vs r=123.43) were all greater (p<0.05) compared to track athletes. The MAP index, an indicator of apnea risk, was correlated with the ESS (r=-.39, p<.01), time to fall asleep (r=-.55, p<.001), restless sleep (r=-.41, p<.01), and trouble staying asleep (r=-.43, p<.01) in linemen. The MAP RDI; 10 was correlated with time to fall asleep (r=-.33, p<.05) and difficulty staying asleep (r=-.36, p<.05). MAP variables demonstrated a significant correlation with neck circumference (p<.05), percent body fat (p<.05), BMI (p<.05), and systolic blood pressure (p<.01).

CONCLUSION: Compared to track athletes, football players had a greater risk of developing SDB. These data reveal that the body characteristics valued among linemen may predispose them to sleep apnea or other types of SDB. Our data suggests that simple assessments may be incorporated into the screening process of collegiate athletes to identify those at risk for SDB, which would allow early intervention.

Funding: National Collegiate Athletic Association (NCAA) Graduate Student Research Grant (BP).
Delayed onset muscular soreness (DOMS) occurs approximately 24-72 hours after engaging in resistance-like exercise. DOMS results from a combination of contractile tissue micro trauma, osmotic pressure changes, alteration calcium regulation, and inflammation. Such factors elevate the muscle-specific enzyme creatine kinase (CK) as a marker of muscle damage. Immunoglobulin Y (IgY) mediates tissue inflammation which may serve to reduce the effect of exercise induced muscle soreness. PURPOSE: To compare the effect of oral consumption of IgY and placebo (Pl) on CK levels and perceived pain following induced DOMS. METHODS: Subjects were healthy college aged males and females (N=20) and were randomly divided into an experimental group and a control group. On day 1 participants underwent a blood draw for CK. Subsequently, participants completed 14 d of supplementation consisting of either IgY or Pl at the following doses: d 1-2=4.5g, d 3-5=9.0g, and d 6-14=13.5g. Following 14 d, DOMS was induced using employing eccentric contractions using a Biodex Dynamometer (4x10 eccentric contractions at 300°/sec) and dumbbell lunges (3x10 at 65% BWT). Morning and evening perception of soreness was recorded via visual analog scales. At approximately 48 hours after induced DOMS, subjects reported for a second blood draw and strength assessment. RESULTS: Significant (p<0.05) pre- to post-test CK difference were found between the experimental group (59.3 – 114.7 IU/L) and the placebo group (66.0 – 186.1 IU/L). Indeed, the IgY group increased CK by 48.3% while the Pl group increased CK by 182.0%, demonstrating the effectiveness of IgY to mediate serum CK following induced DOMS. Furthermore, the IgY group experienced significantly less perceived soreness than the Pl group. CONCLUSION: IgY supplementation lessens muscle CK and perceived muscle soreness following exercise, possibly due to an anti-inflammatory effect. Such an effect may facilitate the continuation of training intensity.
Numerous studies have recommended cold water immersion (CWI) as a method of recovery in various sports. To our knowledge there are only two studies which have investigated the application of CWI in basketball players. These studies both reporting positive effects on recovery, using an intermittent CWI protocol (InCWI). However there is little evidence on continuous CWI protocols (CntCWI) in basketball players. PURPOSE: Compare two cold water immersion protocols continuous vs intermittent for recovery in basketball players.

METHOD: Ten male basketball players (age: 14 ± 4 years, weight: 65.4 ± 9.1 kg, height: 175 ± 7.3 cm, body fat: 10.3 ± 4%) were included in a “cross-over” experimental design. After three 90 minute basketball training sessions (average heart rate 158 ± 12, 156 ± 7 and 151 ± 10 bpm), participants were randomized into three groups, G1: CntCWI (12 min water temperature 12 ± 0.4°C + 1min out of water) and G3: control group CG (passive recovery). Visual analog scale (VAS-Pain), countermovement jump (CMJ) test, sleep water temperature 12 ± 0.4°C + 1min out of water) and G3: control group CG (passive recovery). Visual analog scale (VAS-Pain), countermovement jump (CMJ) test, sleep hours, quality of sleep, thigh volume were measured pre, 24h post and 48h post training + recovery protocol. Repeated measure ANOVA was used. Significance was accepted at P<0.05.

RESULTS: VAS-Pain scores were higher in CG comparing experimental groups were post-immersion: CntCWI vs. CG (2.20 ± 0.40 vs. 5.70 ± 0.56, P < 0.001) and InCWI vs. CG (3.14 ± 0.05 vs. 5.70 ± 0.56, P = 0.02). Post 24h CntCWI vs. CG (2.40 ± 0.57 vs. 4.92 ± 0.44, P = 0.006) and InCWI vs. CG (2.71 ± 0.52 vs. 4.92 ± 0.44, P = 0.019). Post 48h CntCWI vs. CG (2.35 ± 0.60 vs. 4.71 ± 0.35, P = 0.014) and InCWI vs. CG (2.50 ± 0.60 vs. 4.71 ± 0.35, P = 0.019). With regards to the CMJ % change, comparison of groups revealed the following: 24h post CntCWI vs. CG (-1.57 ± 0.93 vs. -7.23 ± 3.96, P = 0.006) and InCWI vs. CG (-1.91 ± 1.03 vs. -7.23 ± 3.96, P = 0.029). In post 48h CntCWI vs. CG (-0.49 ± 0.47 vs. -6.89 ± 3.26, P = 0.001) and InCWI vs. CG (-1.15 ± 0.94 vs. -6.89 ± 3.26, P = 0.017). CONCLUSION: Continuous and intermittent CWI protocols were equally effective in improving recovery in basketball players. Either protocol could be included after training to help recovery according to individual preferences.

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**Mean and Peak Power Outputs**

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**3820** Board #259 June 4, 9:30 AM - 11:00 AM

**Molecular Hydrogen Affected Post-Exercising Recovery in Judo Athletes**

Patrik Dríd, Marko DM Stojanovic, Tatjana Trivic, Sergej M. Ostojic. Faculty of Sport and Physical Education, University of Novi Sad, Novi Sad, Serbia.

Email: patrikdrid@gmail.com

**Molecular hydrogen (H2) recently appeared as a novel and safe ergogenic agent that might have beneficial effects in athletes. However, no information is available concerning the impact of H2 on post-exercise recovery indices. PURPOSE: To determine the effects of pre-exercise H2 administration on post-exercise heart rate and blood lactate responses in judo athletes. METHODS: Five athletes (24.4 ± 3.4 yrs, 74.8 ± 2.3 kg, 178.8 ± 2.5 cm) were recruited for this randomized, placebo-controlled, double-blind crossover pilot study. Participants were instructed to ingest formulation containing 6.4 g of H2, or placebo – 30 minutes before repeated Special Judo Fitness Test (RSJFT). Blood lactates and heart rates were recorded during recovery period at 3 min, 5 min and 15 min, and 10 s, 20 s, 30 s, 60 s, 3 min and 15 min, respectively. RESULTS: Molecular hydrogen significantly blunted lactate response during recovery period as compared to the placebo (7.23 ± 1.95 vs 8.92 ± 1.51 mmol/L; p = 0.011). Furthermore, a trend has been found for decreased post-exercise heart rate in group supplemented with H2 (p = 0.11). CONCLUSION: Hydrogen-rich water appears to be an appropriate strategy to positively affect post-exercise lactates in judo athletes. Study was partially supported by the Provincial Secretariat for Science and Technological Development (Grant No. 114-451-1301-2014-01), the Serbian Ministry of Education, Science and Technological Development (Grant No. 175037), and the Faculty of Sport and Physical Education, University of Novi Sad (2015 Annual Award).**
The Effects of Recovery Frequency On VO2, Muscle Deoxygination, And Energy System Contribution During Intermittent Work
Jae Kim, Michael McCrudden, Daniel Keir, Glen Belfry. Western University of Canada, London, ON, Canada.

(No relationships reported)

Purpose: To compare the effects of inserting 3 s recovery periods during high-intensity continuous exercise at 25 s and 10 s intervals on: 1) energy system contribution, 2) the rates of adjustment of pulmonary oxygen uptake (V̇O2), and muscle deoxygenation (HHb), and 3) the overall changes of V̇O2 and HHb. Methods: Eleven recreationally active men (age: 24 ± 3 yrs; VO2max: 47.9 ± 4.7 mL•kg•min−1) reported to the laboratory on six separate occasions to complete two trials of three cycling exercise protocols: a continuous protocol (CONT) consisting of 8 min of constant work rate exercise at an intensity corresponding to 60% of the difference between lactate threshold and VO2max (60); 2) an 8 min intermittent exercise protocol consisting of a series of 25 s work periods at 60 s separated by 3 s recovery periods (25INT); and 3) an 8 min intermittent exercise protocol consisting of a series of 10 s work periods at 60 s separated by 3 s recovery periods (10INT). All protocols began with a 4 min baseline of 20 W. During each trial, breath-by-breath gas-exchange measurements were collected using mass spectrometry and volume tunnel and near-infrared spectroscopy was used to measure [HHb] of the vastus lateralis muscle. Arterialized-capillary blood samples (~5 µL) were taken from the index finger 6 min before and 2 min after all trials and analyzed for blood lactate concentration ([LA•]). Results: Post-exercise [LA•] was greatest (p<0.05) in CONT (14.3 mM), followed by 25INT (10.2 mM, p<0.05) and 10INT (7.0 mM, p<0.05). More frequent recovery periods decreased (p<0.05) respiratory exchange ratio (CONT: 1.13; 25INT: 1.09; 10INT: 1.06), and end-exercise VO2 (CONT: 3.69 L•min−1; 25INT: 3.29 L•min−1; 10INT: 2.89 L•min−1). The mean VO2 from time 0 to 180 s, was reduced (p<0.05) as the frequency of recovery periods increased (CONT: 2.62 L•min−1; 25INT: 2.50 L•min−1; 10INT: 2.32 L•min−1). The rate of adjustment of [HHb] and [HHb] at end exercise did not differ amongst conditions (p>0.05). Conclusion: Increasing the frequency of 3 s recovery periods during continuous exercise reduced and increased the contribution of oxidative phosphorylation and substrate-level phosphorylation, respectively. This ultimately resulted in a slower rate of adjustment of VO2 and likely a reduction in microvascular blood flow to the working muscle.

Effects of Training with a Modified Elliptical Trainer on Lower Extremity Mechanics during Running
Kathryn Harrison1, Elizabeth Miller2, Peter Pidcoe3, Jacqueline Morgan1, D. S. Blaise Williams, III1. Virginia Commonwealth University, Richmond, VA. "Restylin Franklin University, Chicago, IL.

Email: harrisonkatryan89@gmail.com

(No relationships reported)

Altering footstrike pattern subsequently alters running kinematics and kinetics. It has been suggested that a midfoot strike pattern (MFS) may reduce injury risk. However, attempts to alter strike pattern have had limited success. Use of a constrained system may aid in motor learning and improve adoption of a new strike pattern. PURPOSE: To determine if training using an elliptical ergometer modified to mimic MFS would improve ability of runners with a habitual rearfoot strike pattern (RFS) to successfully adopt a MFS.

METHODS: Six subjects completed a three-dimensional gait analysis on a treadmill instrumented with a force platform. Subjects ran at a self-selected pace using their natural RFS, and then were instructed to run using MFS (PRE). Subjects then completed 5-20 minute training sessions over 2 weeks on an elliptical trainer modified to mimic MFS. After training, gait analysis was repeated (POST). Two-way ANOVAS (time x strike pattern) evaluated foot angle at initial contact (FIC), peak vertical reaction force (VGRF), vertical loading rate (VLR), peak knee extension moment (KEM), peak knee abduction moment (KAM), peak knee internal rotation moment (KIRM) and stride frequency (SF).

RESULTS: When compared to RFS, MFS demonstrated lesser FIC (RFS: 7.1±4.8, MFS: 0.9±6.2 degrees, p<0.01). There were no differences in FIC PRE vs POST. Protocols had no significant differences in VGRF (in VLR between RFS (53.7±10.4 BW•s) and MFS (49.5±16.3 BW•s)). There were no differences in VGRF across any conditions. MFS produced lower KEM than RFS (1.39±0.37 vs 1.54±0.26 Nm/kg, p<0.02), but there was no change with training. KIRM was not different between strike patterns, but decreased with training (PRE: 0.34±0.03; POST: 0.31±0.05 Nm/kg, p<0.03). KAM did not change across any conditions. SF was greater with MFS than RFS (171.3±175.4 steps per minute, p<0.01) during PRE. Training also produced an increase in SF using RFS (POST: 173.3 steps per minute, p<0.02).

CONCLUSIONS: Runners are able to change the angle of the foot relative to the ground immediately with instruction. This running style produces an expected change in stride frequency and knee internal rotation moment. Training with the modified elliptical trainer alters stride frequency and knee internal rotation moment, but does not result in changes in preferred strike pattern or VLR.
CONCLUSIONS: In collegiate cross country runners, the sidedness of asymmetry in pVGRFs during jumping was similar to those during running. Asymmetries during jumping were twice as large as those during running. The jumps were performed as a maximum effort task, which may have contributed to increased asymmetries compared to those observed during running. As the association was stronger among women runners, differences between limbs may be carried across tasks in women more so than in men.

Large vertical ground reaction (vGRF) and braking forces have been cited as possible contributors to lower extremity overuse injuries in runners. It is unknown whether these variables can be altered via running form manipulations to decrease injury risk.

PURPOSE: To determine if altering trunk and whole body posture during running leads to differences in peak vGRF and peak braking and propulsive forces.

METHODS: Fourteen males and fifteen females (age 26.2±0.25 years, height 1.75±0.32 m, weight 67.7±0.37 kg) who were healthy, active, and pain-injury-free volunteered. Participants ran at a self-selected speed across a 1.5 km runway under three conditions: normal self-selected running form (NR), increased trunk flexion (TF), and whole body inclination (WBI). Participants were instructed to bend at the hips (TF) and to lean forward over the ankles (WBI). Five successful trials for each condition were recorded using 3D motion capture and an AMTI force platform. Data was analyzed via 1-way repeated measures ANOVA with Sidak pairwise comparisons for each dependent variable. Statistical significance was set at p<0.05.

RESULTS: A significant main effects were found for peak vGRF (p=0.05) and a trend was found for peak braking forces (p=0.056). Peak vGRF was significantly less in the TF condition (22.44±2.17 N/kg) than in the NR (22.98±2.01 N/kg, p=0.04) and WBI (22.91±2.55 N/kg, p=0.04) conditions. Max propulsive force was significantly greater for WBI (2.54±0.47 N/kg) than TF (2.54±0.47 N/kg, p=0.006), but there was no significant difference between WBI and NR (p=0.943). There were no significant differences in peak braking forces between conditions (p=0.119).

CONCLUSIONS: WBI during running may reduce energy expenditure via anterior displacement of the center of mass relative to the pelvis, resulting in increased propulsive forces. Running with increased TF may reduce injury risk by decreasing peak vGRF. Future studies training TF and/or WBI seem warranted as a form of running gait retraining.

CONCLUSIONS: Hip adduction during stance (r=0.636, R²=0.404, p<0.001). Similarly, hip internal rotation at initial contact was predictive of peak hip internal rotation during stance (r=0.874, R²=0.763, p<0.001). CONCLUSION: Our results indicated that hip joint position at initial contact, which is a continuation of late swing, is predictive of peak stance phase kinematics. We propose that this position of the hip at late swing likely biasses hip kinematics during stance. Future studies should consider potential causes of abnormal hip kinematics during late swing to better understand abnormal hip kinematics during the stance phase of running.

CONCLUSIONS: Hip kinematics during late swing predict peak values during the stance phase of running.

PURPOSE: To determine if peak frontal and transverse plane hip kinematics during the late swing phase of running are predictive of peak stance phase kinematic values.

METHODS: 18 healthy females and 17 healthy males participated. Hip joint kinematics during running (both swing and stance phases) were collected using an 11-camera motion capture system at a sampling rate of 230 Hz. RESULTS: With respect to the frontal plane, hip adduction at initial contact predicted peak hip adduction during stance (r=0.636, R²=0.404, p<0.001). Similarly, hip internal rotation at initial contact was predictive of peak hip internal rotation during stance (r=0.874, R²=0.763, p<0.001). CONCLUSION: Our results indicated that hip joint position at initial contact, which is a continuation of late swing, is predictive of peak stance phase kinematics. We propose that this position of the hip at late swing likely biases hip kinematics during stance. Future studies should consider potential causes of abnormal hip kinematics during late swing to better understand abnormal hip kinematics during the stance phase of running.

CONCLUSIONS: Excessive hip internal rotation and hip adduction angles during running are thought to contribute to various knee injuries. Although most studies have focused on stance phase kinematics, it is not clear if swing phase hip kinematics prior to foot contact influence stance phase kinematics during running.

PURPOSE: To determine if peak frontal and transverse plane hip kinematics during the late swing phase of running are predictive of peak stance phase kinematic values.

METHODS: 18 healthy females and 17 healthy males participated. Hip joint kinematics during running (both swing and stance phases) were collected using an 11-camera motion capture system at a sampling rate of 230 Hz. RESULTS: With respect to the frontal plane, hip adduction at initial contact predicted peak hip adduction during stance (r=0.636, R²=0.404, p<0.001). Similarly, hip internal rotation at initial contact was predictive of peak hip internal rotation during stance (r=0.874, R²=0.763, p<0.001). CONCLUSION: Our results indicated that hip joint position at initial contact, which is a continuation of late swing, is predictive of peak stance phase kinematics. We propose that this position of the hip at late swing likely biases hip kinematics during stance. Future studies should consider potential causes of abnormal hip kinematics during late swing to better understand abnormal hip kinematics during the stance phase of running.

Individuals with a Morton’s foot exhibit hypermobility of the first ray of the foot. It is unknown if this increased mobility affects static arch characteristics such as arch height, arch flexibility, and arch drop during stance in minimally-shod runners. We have previously reported that minimally shod runners with Morton’s foot report more foot pain than those with a ‘regular’ foot. However, the relationship between Morton’s foot and static arch characteristics has not been established. Therefore, purpose of this pilot study was to determine if having a Morton’s foot is related to alterations in Arch Height Index (AHI), Arch Rigidity Index (ARI) and Arch Drop (AD). METHODS: Sixteen experienced minimalist runners participated (age 27.4±10.1 yrs, hgt: 170.3±25.0 cm, mass 78.1±18.0 kg, gender 8M, 8F). Following informed consent, subjects were asked to stand barefoot with feet placed shoulder width apart while superior view photographs were taken of each foot. Feet were classified as Morton’s if the second toe was longer than the great toe (n=8). AHI, ARI and AD were obtained using the AHI measurement system. Left and right side data were considered separately, such that each subject had two data points in analyses. A MANOVA was performed with the dependent variables of AHI, ARI, and AD between subjects with a Morton’s foot or a regular foot. Alpha was set at the level of 0.10.

RESULTS: A significant main effects were found for peak vGRF (p=0.05) and a trend was found for peak braking forces (p=0.11). Right peak GRF were: 2.4 CON, 2.6 HALF and FULL, and 2.5 BELT (p=0.09) but right peak GRF were: 2.4 CON and 2.5 for all other conditions (p=0.60). Left impact loading rate expressed as bodyweights per second were 59.6 CON, 47.7 HALF, 56.2 FULL and 49.2 BELT (p=0.14), and right impact loading rates were 57.2 CON, 45.9 HALF, 56.3 FULL, 47.3 BELT (p=0.11).

CONCLUSION: Running with hand-held hydration gear produces asymmetric normalized GRFs. These findings suggest the importance of switching hand use frequently with water bottles or using devices that are carried closer to the COG to reduce asymmetric loading on the lower extremities. Further evaluation of running mechanics and kinetics over longer running duration with additional hydration gear would provide more insight into this issue.

CONCLUSIONS: Hip adduction during stance (r=0.636, R²=0.404, p<0.001). Similarly, hip internal rotation at initial contact was predictive of peak hip internal rotation during stance (r=0.874, R²=0.763, p<0.001). CONCLUSION: Our results indicated that hip joint position at initial contact, which is a continuation of late swing, is predictive of peak stance phase kinematics. We propose that this position of the hip at late swing likely biases hip kinematics during stance. Future studies should consider potential causes of abnormal hip kinematics during late swing to better understand abnormal hip kinematics during the stance phase of running.
lower extremity, such as arch characteristics, are believed to dictate the function of the foot and are associated with running injuries. Previous data indicate that minimally-shod runners with a Morton’s foot report greater foot pain than those with a regular foot. Future studies should examine running biomechanics, including kinematics and loading at foot contact, to better understand the mechanism of injury in this population.

Scant research exists documenting the effect of prolonged activity (PA) on coordination and variability of joint motion although these factors have been implicated to cause lower extremity injury. PURPOSE: The purpose of this study was to determine the effect of PA on intersegmental joint coordination and its variability in recreational runners. METHODS: A convenience sample of 20 asymptomatic recreational runners (28.9 ± 11.1 years; 15 females, 5 males) were recruited. After a 3 minute warm-up period, the displacements of markers placed over specific lower extremity bony landmarks were recorded every minute for 15 seconds along with a rating of perceived exertion (RPE) while the subjects ran at a pace that was 5% greater than their typical training speed. The subjects ran until they reported an RPE of 17. The angular displacements of the hip and knee joints of the first and last running trials were obtained and the stride phases of each trial extracted, time normalized and ensemble averaged to produce a representative running trial. The coupling angle between the hip and knee in the frontal and sagittal planes were determined for each trial. The trials were subdivided into 4 subphases early (ES) and late (LS) stance and early (ESw) and late (LSw) swing. A mean coupling angle (MCA) and angular deviation (AD) for each subphase was determined and the difference between the baseline and PA MCA for each subphase was assessed using angular statistics. The level of statistical significance for this study was set at p < 0.05 level.

RESULTS: A statistically significant difference (p < 0.05) in the sagittal plane MCA between the baseline (117°, 200°, 86°, 235° for Est, LSt, ESw, and LSw, respectively) and PA (119°, 200°, 88°, 232° for Est, LSt, ESw, and LSw, respectively) was not present in any subphase of running. In the frontal plane, statistically significant difference (p < 0.05) in the MCA between the baseline (264°, 187°, 207°, 174° for Ext, LSt, LSw, and ESw, respectively) and PA (237°, 189°, 203°, 173° for Ext, LSt, LSw, and ESw, respectively) was not present in any subphase of running. CONCLUSIONS: Prolonged activity in shod runners does not appear to affect the intersegmental coordination.

Although modifying sagittal plane trunk posture during running has been shown to influence patellofemoral joint (PFJ) stress, no study has compared the influence of trunk and whole body posture on knee and hip mechanics. PURPOSE: To determine whether increasing trunk flexion (TF) and whole body inclination (WBI) angles increases peak knee, hip, and trunk kinematics and kinetics during running. METHODS: Fourteen males and fifteen females (age 26.2±0.25 years, ht 1.7±0.32 m, wt 67.7±0.37 kg) self-reported as healthy, active (running ≥ 10 miles/week), and free from lower extremity injury participation. All participants run on ground at a self-selected speed under three different body postures: self-selected normal (SSN), TF, and WBI. Five successful trials of each condition were performed with participants instructed to run normally (SSN), bend at their hips (TF), or lean at their ankles (WBI). Running kinematics and ground reaction forces were captured synchronously. An inverse dynamics approach (Visual3D) was used to calculate peak internal moments. Data was analyzed using a 1-way repeated measures ANOVA with pairwise comparisons for each dependent variable. Statistical significance was set at p < 0.05. RESULTS: Analyses revealed significant differences between conditions for peak knee, hip, and trunk flexion angles and peak knee and hip extension moments. Results are presented in the table. CONCLUSION: Both TF and WBI postures are effective strategies for reducing peak knee extension moments during running with more load distributed to the hips. This may reduce PFJ stress and therefore aid in knee injury prevention and management. Individual preference of either altered running posture should be utilized in a clinical setting.
Alaternations in running velocity can have an impact on the efficiency of the runner as well as the biomechanics. There has been a substantial amount of research on alterations in running biomechanics based on various groupings (i.e. forefoot versus rearfoot strike, elite versus novice, etc.), however little research exists with respect to the acute alterations in running velocity. PURPOSE: To determine the acute kinematic changes in the ankle, knee, and hip as running velocity changes.

METHODS: Twenty recreational runners (23.2 ± 2.80 yr, 1.76 ± 0.09 m, 68.18 ± 10.63 kg) volunteered to participate in two testing sessions. The first session was a timed maximum effort one-mile run on an all-weather track in order to obtain a sustainable maximum running velocity. On the second day, following a five minute warm up at a self-selected speed on a treadmill, participants completed indoor running trials on the same treadmill at velocity values between 100%-60% of their timed running velocities.

RESULTS: The ANOVA results suggest a significant difference in maximum hip flexion (F(4,15)=38.535, p<.001), maximum ankle inversion (F(4,15)=3.091, p=0.048), and maximum knee external rotation (F(4,15)=7.131, p=0.002). Bonferroni post-hoc analysis revealed significant increases in maximum hip flexion values for the 100% condition compared to the 60% condition. The 80% condition showed decreased maximum ankle inversion compared to the 60% condition. The 100% condition showed decreased maximum knee external rotation compared to all other conditions while the 90% also showed decreased maximum knee external rotation compared to 80, 70, and 60%.

CONCLUSIONS: Running is a predominantly sagittal plane motion and the increase in velocity appears to stem from increased hip joint flexion. This suggests that in order to maintain higher running velocities for longer periods of time, more training may need to occur at the hip joint.

3836
Board #275
Differences in Symmetry between Habitually Shod and Habitually Barefoot Runners
Matthew C. Ruder, Adam S. Tenforde, Irene S. Davis, FACSM. Spaulding National Running Center, Cambridge, MA. (Sponsor: Irene Davis, FACSM)
Email: matthew.ruder@gmail.com
(No relationships reported)

Asymmetry of loading has been related to running injuries. Studies within our lab suggest that symmetry of loading increases when habitually shod (SH) individuals run barefoot (BF), suggesting that sensory input may play a role. However, it is unclear if this is true of habitually BF runners.

PURPOSE: To compare the Symmetry Index between habitual SH and habitual BF runners.

METHODS: 12 habitually SH runners (10 M, aged 35.6 ± 8.4 yrs) and 11 habitually BF runners (10 M, 42.5 ± 11.4 yrs) who run at least 10 mpw were recruited in this ongoing study. All subjects ran on an instrumented treadmill at 2.62 m/s while force was sampled at 1500 Hz, Vertical force peak (VF), average (ALR) and instantaneous (ILR) loadrates, and stance time (ST) were extracted from each stance phase and averaged over 10 strides. The symmetry index (SI) was calculated between the average for each variable for the right (R) and left (L) sides. A higher SI value indicates greater asymmetry. SI values were compared between habitually SH and habitually BF subjects using an independent t-test (p-value < 0.05).

RESULTS: Results for loading variables on the L and R sides, as well as the calculated SI values are reported in Table 1. Note the lower values for ALR and ILR in the BF condition. However, values between L and R sides are similar in all variables for both SH and BF conditions. This resulted in no significant differences in SI between SH and BF conditions.

CONCLUSION: Contrary to our findings in novel BF conditions, these preliminary data suggest that habitual BF runners do not exhibit greater symmetry than habitually shod runners. It is possible that once habituated to being BF, sensory input has less of an effect on gait. It will be possible to examine this as we continue our subject recruitment.

3835
Board #274
Differences in Lower Limb Kinematics in Relationship to Changing Running Velocity
Kevin A. Valenzuela1, Robert I. Dudley2, James M. Charles3, Casey E. Ward4, Guillermo J. Noffal5, Scott K. Lynn6, 1University of Tennessee Knoxville, Knoxville, TN. 2California State University Fullerton, Fullerton, CA. (Sponsor: Dr. Lee Brown, FACSM)
(No relationships reported)

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CONCLUSION: Contrary to our findings in novel BF conditions, these preliminary data suggest that habitual BF runners do not exhibit greater symmetry than habitually shod runners. It is possible that once habituated to being BF, sensory input has less of an effect on gait. It will be possible to examine this as we continue our subject recruitment.

3837
Board #276
Does Non-Running Physical Activity Contribute to the Risk of Developing a Running Related Overuse Injury?
Allison H. Gruber, Shane P. Murphy, Jacob E. Vollmar, Carol Kennedy-Armbruster, Andrea K. Chomistek, Indiana University Bloomington, Bloomington, IN. (Sponsor: Georgia Frey, FACSM)
Email: ahgruber@indiana.edu
(No relationships reported)

Running related overuse injury (RROI) affects a significant proportion of runners annually. To date, only running mileage has been considered when quantifying the amount of loading that may elicit tissue micro-damage and injury, while the loading that occurs from activities of daily living and non-running physical activity has been ignored. By ignoring non-running physical activity (PA), we may be severely underestimating the amount of loading that leads to RROI. PURPOSE: To determine the role of daily non-running PA on the risk of RROI development among recreational and competitive runners.

METHODS: As part of a larger prospective running injury pilot study, 50 recreational and competitive male and female runners will be enrolled and complete questionnaires regarding running history, injury history, and all forms of non-running daily PA. Participants will receive a FitBit Charge activity monitor to track PA for 24 hrs/day over 12 months. To date, questionnaires and a typical running gait analysis had been completed by 21 participants (9 male, 12 female; 27.5±6.3 years; BMI = 22.6±2.0 kg/m²).

RESULTS: Participants had mean±SD running experience of 8.6±5.6 years and run 24.1±15.5 mi/wk. Among n = 21 participants, RROI occurred within the past year in n = 4, within the past two years n = 11, and in their lifetime n = 16. Current mi/wk was 54% greater in those that had sustained a RROI in their lifetime compared with those that had not (No RROI = 15.3±4.5 mi/wk; Yes RROI = 26.9±16.4 mi/wk, P=0.02). Total PA was not different between those who had and had not sustained a RROI in their role of lifetime or in the past 1-2 years (P=0.05). Non-running PA was greater in those that did not sustain a RROI in a given time period, but the differences were not significant with this initial sample size (No RROI vs Yes RROI: lifetime 11.8±8.3 hrs/wk, P=0.02, 1 yr: 7.8±7.8 vs 6.1±3.9 hrs/wk, P=0.05, 2 yr: 9.2±8.6 vs 7.3±6.8 hrs/wk, P=0.05).

CONCLUSIONS: Results from the first 21 participants enrolled in this study support previous reports that running mi/wk may increase RROI risk. Given that total PA was the same between injured and non-injured runners in this sample, more hrs/wk spent in non-running PA vs running PA may reduce RROI risk. Continuous monitoring of PA collected in this 12 month study will provide evidence to support or reject this hypothesis.
One potential method for minimizing injuries among distance runners is to include a portion of the distance running load on an aquatic treadmill ( ATM) as impact forces are lower and physiological demands are similar to land treadmill ( LTM) running. However, considerable kinematic differences between modes might impact the specificity of ATM training. PURPOSE: 1) To determine if a select kinematic measure associated with reduced impact peaks (i.e., foot strike index [SI]) was different between ATM and LTM running; and 2) to determine if the SI was altered during ATM as result of 6-weeks of ATM training. METHODS: Acute comparisons were tested using 15 competitive distance runners (age = 20 ± 1.9 yrs) who completed one session of running on each treadmill type (LTM, ATM) at five different running speeds (2.9, 3.1, 3.4, 3.6, & 3.8 m/s). Subsequently, three recreational runners completed 6-weeks of ATM training following a single-subject ABA design (A = baseline, B = intervention and A’ = withdrawal). The SI was quantified from digitization of video images and compared between conditions using a two-way ANOVA and visual analysis, respectively. RESULTS: Regardless of speed, SI values during ATM running (64 ± 19%) were significantly greater (p = 0.005) than LTM running (43 ± 23%) suggesting a more forefoot strike pattern with ATM running. Training on the ATM did not change SI values during LTM running as evidenced by the presence of overlapping data points between phases illustrated in the representative time-series plot. CONCLUSION: Although SI values were different between acute ATM and LTM running, 6-weeks of ATM training did not appear to alter LTM running kinematics as evidence by no change in SI values from baseline to post intervention assessments.

Adolescent idiopathic scoliosis (AIS) is a 3-D deformity of the spine that limits spinal motion during functional activities. Decreased spinal motions in walking have been reported for AIS individuals but its effect on pelvic and lower extremity kinematics during high intensity physical activity like running is not clear.

PURPOSE: To compare lower extremity kinematics displayed by AIS and matched controls (CON) during perceived maximal effort treadmill running. METHODS: Three skeletally mature AIS individuals (thoracolumbar structural curve > 13°). Lower extremity joint angular displacements (AngDisp) were calculated; one-way Analysis of Covariance (ANCOVA); covariate: running speed, p<0.05 for independent samples and 95% confidence intervals for differences (95%CI) were used to compare hip, knee and ankle maximum AngDisp between the 2 groups. RESULTS: Running speeds were not different between the 2 groups (p = 0.63). Right ankle dorsiflexion AngDisp was greater for AIS (mean difference 8.7°; 2.4°; p = 0.04, 95%CI = 1°.0, 16.5°; Power = 67). No other significant differences were observed (mean differences = 0.2°-14.7°; and p = 18-97). CONCLUSIONS: Minimal differences were observed for AngDisp between the groups contrary to those reported in literature for walking. One clinical explanation could be that participants in this study had a neutral pelvis due to the presence of a compensatory spinal curve. Physically active AIS individuals have the potential to demonstrate typical lower limb mechanics during physical activities like running. Differences in AngDisp observed should be interpreted with caution due to low statistical power and could be a result of high inter-participant variability in running technique and not necessarily as an effect of the scoliotic spine.

PURPOSE: The purpose of the study is to determine the relationship between impact forces and leg accelerations while running on a treadmill and overground. METHODS: Subjects (n=12: 8 males, 4 females; age: 23.9 ± 6.02 y; height: 1.71 m ± 0.11 m; mass: 69.8 ± 14.5 kg) participated in a 1-day test during which ground reaction forces (GRF) and leg accelerations were recorded during overground and treadmill running. All GRF data were collected using an instrumented force treadmill (Bertec, USA) with handrails removed and treadmill surface even with floor surface. To complete overground trials, subjects ran over the treadmill (belt not moving) with speed measured using timing gates placed before and after the treadmill surface. A wired uniaxial accelerometer was securely placed on the medial aspect of the right tibia to measure leg impact acceleration (legs). All subjects completed 10 trials for each of 3 speed conditions (preferred speed (PS) ± 0.25 m/s) for each condition (treadmill, overground). Impact force (F1), leg_max, and ratio of F1: leg_max were determined and compared between speeds and modes using repeated measures ANOVAs. RESULTS: None of the variables were influenced by the interaction of speed and mode (ratio, p=0.701; F1, p=0.778; leg_max, p=0.736). Ratio was not influenced by speed (p=0.281) or mode (p=0.126). F1 was not different between overground and treadmill (p=0.077) but was influenced by speed (p=0.024) increasing on average 8.4% from slow to fast speed. Leg_max was 36.5% greater during overground vs. treadmill (p=0.048) but did not change over speeds (p=0.206). CONCLUSIONS: The consistent ratio between F1 and leg_max during treadmill and overground running seems to indicate the relationship between these parameters is not influenced by mode of running. However, the greater leg_max during overground running and the trend for a greater F1 overground is an indication that subjects may have used different strategies to achieve the same speeds while running overground vs. treadmill.

Foot strike patterns (FSPs) during running in shod and barefoot adults have been examined recently. However, the development of footstrike patterns in children is largely unstudied. It was expected that children would adopt more of a rearfoot strike pattern as they age.

PURPOSE: To analyze the foot strike patterns (FSPs) during running among children aged 3-15 years. METHODS: 415 habitually shod, Brazilian children, 216 M and 199 F, aged 3-15 years were analyzed used in a cross-sectional study. Videos were captured using high-speed camera (300 Hz). FSPs were classified visually according to the first region of initial ground contact (F1). Maximum impact force (PIQ) SF: 7.3±2.6 (SD) kN, 6.67±3.06 (SD) kN) were recruited. Locations of the 18 reflective markers on the pelvis and lower extremities were recorded using high-speed camera (300 Hz). FSPs were classified visually according the first region of initial ground contact (F1).

3839 Board #278 June 4, 8:00 AM - 9:30 AM
Lower Extremity Kinematics Displayed During Running by Individuals with Adolescent Idiopathic Scoliosis: A Pilot Study.

Tyler J. Denn-Thiele1, Rumit Singh Kakar1, Jamie Kronenberg1, Nicolas Clark1, Eadric Bressel1
1Ithaca College, Ithaca, NY.
2University of Georgia, Athens, GA.

(No relationships reported)
Purpose: The aim of this study was to investigate lower limb joint moments/ powers during gait transitions with continuously increased walking speeds.

METHODS: Gait transitions were tested with thirteen college aged subjects. The kinetics data was collected using the treadmill and 8 digital cameras. Inverse dynamics was employed to estimate sagittal plane ankle, knee, and hip joint moments/ powers for the last five steps before transition.

RESULTS: Ensemble curves of joint moments/ powers data presented in Figure 1. The most observable changes occurred at the last step before transition, where 1) the peak plantarflexor moment increased and happened earlier during the stance phase, along with 2) the vanish of the dorsiflexor moments which commonly happens at the beginning of the stance phase. There are three knee joint moment peaks can be observed during the stance in the middle panel. The first extensor peak increased slightly during the first four steps displayed here where the other two remain largely unchanged. The first peak increased to almost twice as observed in the previous steps, with the other two almost vanish during last step before gait transition. Hip joint moments remained steady for the first four steps presented here. But hip joint flexor moments reduced significantly during the last step before changed to run. Joint power data will not be presented here with the limited spaces allow for this abstract but they do support the same trends observed with the joint moments.

CONCLUSIONS: We have observed transition specific non-linear joint kinetic behavior in this study. Sagittal plane joint moments/ powers changed in shape and magnitudes during the five steps approach transition, especially the last step before transition.

Figure 1. Percentage of foot strike between age groups (black: RF; light gray: MF; and dark gray: FF)
Decreased variability of lower limb mechanics has been linked with increased risk of injury, especially during more dynamic actions like running. However, little research has been performed identifying differences in the pattern of variability of lower extremity biomechanical parameters between walking and running.

PURPOSE: To characterize walking and running patterns in healthy individuals using linear and non-linear methods.

METHODS: Thirty individuals (15 males, 15 females) volunteered for this study. 3d kinematic data during walking (WA) and running (RU) were captured using reflective markers placed on lower body (200Hz). A single 25 sec trial (5,000 data points) was collected for each gait task. WA speed was 1.42±0.17 m/s, whereas for RU was 2.51±0.26 m/s. Variables of interest included knee flexion (KF), knee abduction (KA), hip flexion (HF), and hip abduction (HA); all were measured in degrees. For linear analysis, standard deviation (SD) of peak values of these dependent measures were calculated during stance phase for both conditions. Non-linear analysis included assessment of the pattern of regularity of the respective kinematic time series using Approximate Entropy (ApEn). Separate paired samples t-tests were conducted to compare SD values, and ApEn values between WA and RU (p<0.05).

RESULTS: ApEn values were significantly greater for RU than WA (p<0.05) across all joints. Specifically differences were seen for KA (WA=0.15±0.02, RU=0.23±0.03), KF (WA=0.21±0.08, RU=0.25±0.07), HF (WA=0.10±0.01, RU=0.17±0.04), and HA (WA=0.13±0.03, RU=0.20±0.04). In contrast, there were no significant differences in the SD values between WA and RU for KF (WA=24.18±3.72, RU=42.04±4.84), HF (WA=26.67±6.25, RU=31.60±6.04), KA (WA=6.57±4.87, RU=5.93±4.64) and HA (WA=7.15±2.83, RU=6.58±3.82) (all p’s>0.05).

CONCLUSIONS: The results of the ApEn analyses revealed that running exhibited greater variability across all joints compared to walking. This would suggest that ApEn is more sensitive to detecting changes between the different gait conditions than standard discrete measures of variability (SD). Further, the increased variability over time in the joint kinematics for running compared to walking may reflect a protective mechanism to reduce the increased joint loading forces during this task.

The direct anterior (DA) total hip arthroplasty (THA) is a minimally invasive procedure that accesses the hip joint from the anterior aspect of the hip by retracting instead of incising anterior hip musculature during surgery. During this procedure, little to no damage occurs to the hip abductors and extensors, and as a result is theorized to result in an accelerated return to normal function.

Purpose: To prospectively investigate gait biomechanics following DA THA to identify the short term recovery and time sequence of return to normal gait.

Methods: Nine participants underwent DA THA (64.19±9.17±0.1 m, 72.5±10.8 kg) and nine control participants (60.7±4.3 y, 1.7±0.1 m, 71.4±5.5 kg), completed walking gait trials prior to and at three and six weeks following DA THA surgery. At each session, gait biomechanics at the hip were collected via three-dimensional motion capture system and force plates.

Results: Individual two-way repeated measures ANOVA revealed significant biomechanical differences in walking gait between the DA THA and the control groups at pre-surgery, and at three and six weeks following surgery. At pre operation and three weeks post operation, max hip extension (pre: p<0.01, 10.4±10.3; 3 wk post: p=0.005, 3.9±10.7), hip flexion/extension excursion (pre: p<0.001, -0.21±0.98; 3 wk post: p<0.001, -26.85±7.6), hip abduction/adduction excursion (pre: p=0.001, -2.63±2.0; 3 wk post: p=0.02, -4.65±2.24), hip extension moment (pre: p=0.001, -557.3±309.2; 3 wk post: p<0.001, -677.1±215.0) and hip internal rotation moment (pre: p<0.001, 41.89±27.3; 6 wk post: p<0.001, 54.6±31.1) were all significantly less in the DA THA group than the control group. By six weeks post operation, only hip flexion/extension excursion (p<0.001, -33.5±5.4) and hip abduction/adduction excursion (p<0.001, -3.6±2.1) remained significantly lower in the DA THA group.

Conclusions: Short term analysis following DA THA revealed impairments in walking gait at pre operation, and at three and six weeks post operation. By six weeks post operation however, many improvements were made in walking gait when compared to the previous sessions. It appears that the participants began to return to normal function, but a longer follow-up time may be necessary to determine if these DA THA participants completely return to normal walking gait.
Purpose: The objective of this study is to determine if there is a correlation between a functional movement screen (FMS) score ≤14 and increased injury incidence in high school cross country runners.

Methods: This is an IRB-approved prospective, multi-site, observational study enrolling fifty four cross country runners (27 girls and 27 boys) from 3 high schools in the central Ohio area. All eligible athletes had no previous injury restricting their participation in the season. Physicians certified in FMS testing screened all participants before the start of practice for the fall cross country season. FMS consists of 7 movement tests (0-3 points per test) with a maximum score of 21. Athletic trainers and coaches at each school collected and reported injury data on a weekly basis to the investigator assigned to that high school. FMS scores were kept confidential to athletes, coaches, and parents, and no interventions were made based on score. All injuries were recorded from the start of fall practices until the end of the regular season at each high school.

Results: The mean FMS score for all participants was 15.5 (range of 12-19). A total of 9 athletes (16.7% of total athletes) reported injury. The mean FMS score for the non-injured athletes and that of the injured athletes were 15.1; SD 1.6 and 15.6; SD 1.9 respectively. There was no difference between these two groups (t= 0.69; p=0.493). The odds of sustaining an injury among athletes with an FMS score were 1.23 times the odds of sustaining an injury among athletes with an FMS overall score >14 (OR: 1.23; 95% CI 0.267 - 5.675). This difference was not statistically significant.

Conclusion: Our study demonstrates that FMS score of ≤14 may not be reliable to predict injury risk in high school cross country runners who have no previous injury history.

PURPOSE: To investigate the effect of wearing lower body compression garment (CG) with exerting different pressure levels during prolonged running on exercise-induced muscle damage and inflammatory responses.

METHODS: Nine male subjects (23.2 ± 0.4 years, 170.5 ± 0.4 cm, 62.6 ± 0.7 kg) completed 3 exercise trials in a random order. The exercise consisted of 120 min of uphill running (7%) on treadmill at 60% of VO2max. The exercise trials included 1) wearing lower body CG with exertion of 40 kPa of compression [HIGH]; 2) wearing lower body CG with exertion of 20 kPa of compression [MID]; and 3) wearing lower body CG with exertion of under 10 kPa of compression [LOW]. Time-courses of changes in jump height, heart rate (HR) and rating of perceived exertion (RPE) for respiration and legs were monitored. Blood samples were also drawn to determine blood glucose, lactate, serum creatine kinase, myoglobin, free fatty acid, glyceral, cortisol and plasma IL-6 concentrations. P < 0.05 was considered to be statistically significant.

RESULTS: Jump performance was decreased immediately after exercise compared with pre-values in the HIGH and LOW trials, whereas jump performance did not change significantly in the MED trial. Furthermore, the MED trial showed significantly higher value of jump height compared with the HIGH trial immediately after exercise. The HR during exercise was significantly elevated in all trials. However, average HR during 120 min of exercise was significantly lower in the MED trial (159 ± 3 bpm) than in the HIGH (163 ± 3 bpm) and LOW trials (169 ± 5 bpm). Although the RPE for respiratory significantly increased during exercise, the MED trial showed significantly lower RPE compared with the HIGH and LOW trials.
lowest value among 3 trials during latter 60 min of exercise. Plasma IL-6 concentration significantly increased with exercise in all trials. However, area under the curve for IL-6 concentration during 120 min of exercise was significantly lower in the MED trial (397 ± 58 pg/ml/120 min) than in the LOW trial (670 ± 86 pg/ml/120 min). No significant difference among 3 trials was observed for time-course changes in other blood variables.

CONCLUSIONS: Wearing lower body CG with exerting moderate pressure (20 kPa) significantly attenuated reduction of power output for lower body muscles and inflammatory response during prolonged running.

One of the most important contemporary health problems is the global prevalence of overweight and obesity, but nutritional consultation per se has continuously failed to yield consistent and lasting results. A recent estimate reveals less than 1 in 100 persons will be successful in achieving sustained weight loss to normal weight. PURPOSE: the aim of this case report is to detail and evaluate nutritional coaching (NC) in promoting lifestyle changes, enabling improvement of nutritional and body composition-associated parameters. The subject of this study had previously engaged into a series of different diet regimens, all of which failed in achieving the proposed aim. METHODS: nutritional intake, body composition, quality of life (WHQOL-brief) were assessed at baseline, after 12 weeks of NC and 6 months after finishing NC. 12 sessions of NC (employing health coaching techniques: through motivational interviewing, wellness vision sharing, and goal settings). RESULTS: NC sessions (one per week) promoted reductions in body fat mass in 12 weeks (-6kg) that was even greater 6 months after finished the sessions (-10kg, total of -16kg). Nutritional habits also improved, as the subject showed decreased total energy intake (-20%), fat intake (-22%). The coaching program was able to promote immediate health benefits using a strategy with the patient at the core of promoting his own lifestyle changes. This behaviors changes seemed to be much more sustainable than just follow a diet prescription. CONCLUSIONS: the nutritional coaching strategy detailed was effective at helping our patient develop new eating patterns and improve related health parameters.

PURPOSE: Investigate the contribution of energy availability and psychological factors in the etiology of subclinical reproductive dysfunction induced by a three month exercise and caloric restriction intervention in sedentary, regularly menstruating women (n=36). METHODS: Women aged (24 ± 2) yrs, BMI (51 ± 6) kg/m² were randomized to either an exercise only group or one of four groups designed to induce an energy deficit through varying combinations of caloric restriction and exercise over three menstrual cycles preceded by a Baseline cycle. The intervention included exercise (5 d/wk, 50-85% VO2max, 20-75 min) and controlled feeding. RESULTS: Menstrual disturbances (luteal phase defects (LPD), oligomenorrhea, and anovulation (ANO)) were detected using daily urinary estrone-1-glucuronide (E1G), pregnanediol glucuronide (PDG), mid-cycle luteinizing hormone (LH) and menstrual calendars. Depressive symptoms were assessed at Baseline with the Beck Depression Inventory (BDI) (Beck, 1961), and perceived stress was measured every two weeks with the 14-item Perceived Stress Scale (Cohen, 1983). Subjects were divided into tertiles based on their change in perceived stress (PS) across the intervention: Low PS -10 to 0.4; Moderate PS 0.6 to 2.9; High PS 3.0 to 17.4. The proportion of women in each perceived stress tertile who experienced at least one anovulatory cycle was determined along with effects of PS on urinary E1G and PDG. RESULTS: The intervention caused moderate weight loss (6 ± 4 kg), increases in fitness, declines in percent body fat and overall changes in E1G and PDG (p<0.05). The magnitude of the energy deficit predicted the incidence of all types of menstrual disturbances, particularly LPD (p<0.05). BDI was not related to menstrual disturbances or urinary hormones. High PS was related to a higher incidence of ANOV vs. Low and Moderate PS (High, 63.6% vs. Moderate, 16.7% and Low, 7.7%, p<0.006) but not the induction of LPD. High PS was also associated with lower overall E1G exposure (p<0.029). CONCLUSION: Modest levels of caloric restriction and exercise induce subclinical luteal phase defects whereas increased responsiveness to psychological stress is associated with more severe disturbances, i.e., anovulation. These results have implications for individual susceptibility to the Female Athlete Triad.
PURPOSE: This study evaluated changes in body weight, food cravings, flexibility, and practitioners.

± 4.3 kg/m²) were enrolled in a 6-month Weight Watchers program with the new curative surgery.

while it decreased in usual care group (-13.46 ± 20.57; p vs. exercise = 0.003). There was also significant interaction in depression score between groups in response to the intervention as well (exercise group: -0.17 ± 0.09, control: 1.62 ± 2.06; p = 0.035).

CONCLUSIONS: A post-operative exercise for colorectal cancer inpatient prevents muscle mass loss, and significantly reduces fat mass. Furthermore, post-operative exercise has positive psychological impact in colorectal cancer patient undergone curative surgery.

SMISSING OR BAD IMAGE SPECIFICATION {E239ADB0-C050-4AF3-958A-9F03D4D7BAC5A}$

1. Body composition

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<td>Body weight (kg)</td>
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<td>Muscle mass (kg)</td>
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<td>Fat mass (kg)</td>
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2. Psychological factors

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<td>Anxiety</td>
<td>4.50 ± 7.1</td>
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<tr>
<td>Depression</td>
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Given the wide variety of commercial weight loss programs, independent evaluations of the effectiveness of these programs are critical to help inform choices by patients and practitioners.

PURPOSE: The Weight Watchers SmartPoints® plan produced significant 6-month improvements in body weight, food craving, flexibility and function, and sleep quality. Thus, this program provides an effective treatment option for adults who are overweight or obese.

CONCLUSIONS: The Weight Watchers SmartPoints® plan produced significant 6-month improvements in body weight, food craving, flexibility and function, and sleep quality. Thus, this program provides an effective treatment option for adults who are overweight or obese.

Background: Energy deficiency in exercising women is associated with menstrual disturbances and a concomitant reduction in resting metabolic rate (RMR) when expressed relative to body size or lean mass. It remains unknown whether this apparent RMR suppression is a consequence of a reduction in metabolically active tissue compartments during energy deficiency or due to metabolic adaptations at the tissue level.

Purpose: To explore whether the reduced RMR in women with exercise-associated amenorrhea is explained by a lower proportion of energetically expensive tissue compartments or the result of metabolic adaptations.

Methods: RMR and metabolically active tissue compartments were compared among exercising women with amenorrhea (AMEN, n=42) and eumenorrheic, ovulatory menstrual cycles (OV, n=37). RMR was measured using indirect calorimetry and predicted from metabolically active tissue compartments as measured by dual-energy X-ray absorptiometry (DXA).

Results: Measured RMR was lower than DXA-predicted RMR in AMEN (1215±31 vs. 1272±18 kcal/d, p<0.001) but not in OV (1284±24 vs. 1252±17, p=0.16), resulting in a lower ratio of measured to DXA-predicted RMR in AMEN vs. OV (91±2% vs. 103±2%, p<0.001). Total triiodothyronine was also reduced in AMEN when compared with OV (80.1±3.4 vs. 92.4±2.1 ng/dL, p<0.003). Residual mass was greater (p<0.001) and adipose tissue was reduced (p<0.003) in AMEN when compared to OV. Brain, skeletal muscle, and bone mass were not different among groups.

Conclusion: Our findings suggest that RMR suppression in exercise-associated amenorrhea is not the result of a reduced size of energetically expensive tissue compartments but due to metabolic adaptations at the tissue level that are indicative of energy conservation.

PURPOSE: Metabolic equivalents (METs) correlate with exercise capacity and to a certain degree can predict future outcomes, like cardiovascular events. The purpose of the study is to document the effect of multifactorial residential lifestyle intervention in Weimar, CA and how it affected METs of participants.

METHODS: The program included three daily buffet-like plant-based meals with no snacks, 2 to 3 times a day sessions of exercise (aerobic and anaerobic), massage, hydrotherapy, medical and spiritual interventions. The program is summarized in the word NEWSTART: Nutrition, Exercise, Water, proper Sunlight exposure, Fresh Air, Rest and Trust (relational, spiritual, and psychological aspects). Board certified physicians monitored patient progress. Nutritionist, exercise physiologist, psychological, and chaplaincy care also intervened. An educational emphasis was given during the program, health lectures twice a day and various cooking classes are given to encourage long-term adherence to the new lifestyle. Blood test were also taken at baseline and at the end. Data from 11 years of retrospective data was used, 1183 patients finished the program with a pre and post stress test, that also measured METs.

RESULTS: Average age of patients was 59.3 (SD 14.9), 64% were females, 91.5% of them were Americans. At baseline METs group average was 7.9, SD 3.1, min 1.3, max 21, median 7.3, mode 7. Baseline group average weight (lb) was 180.7, SD 54.4, min 73, max 550, median 171, mode 160. Baseline average BMI was 28.7, SD 7.7, median 27.4. At the end of the 18-day program, METs group average was 9.5, SD 3.3, min 2, max 22, median 9.2, mode 10. Weight group average at the end was 175.7, SD 59.2, min 74, max 510, median 167, mode 151. End average BMI was 28, SD 7.7, median 26.6.

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Boston, Massachusetts
CONCLUSIONS: The 18-day intervention is an effective way of increasing exercise capacity and decreasing weight while equipping the patient to continue with the lifestyle changes at home. The end average MettS of 9.5 was important since a 10 to 11 MettS is considered good exercise capacity and may decrease mortality. Further follow-up is planned.

3860 Board #299 June 4, 9:30 AM - 11:00 AM
The Characteristics Of Physical Activity And Psychological Factors In Colorectal Cancer Patients Undergoing Chemotherapy
Hyuna Park1, Min-Jae Kim1, Junga Lee1, Ji Hee Min1, Ji Young Kim1, Ji Yong Byeon1, Mi seong Yu1, Jae Wook Park1, Minkyu Jung2, Joong Bae Ahn3, Justin Y. Jeon1. 1Yonsei University, Seoul, Korea, Republic of. 2Yonsei University College of Medicine, Seoul, Korea, Republic of. 3Yonsei University. Exercise Medicine Center for Diabetes and Cancer Patients, ICONS, Seoul, Korea, Republic of.

Email: hadingu@naver.com

(No relationships reported)

Purpose: The purpose of this study is to assess the level of physical activity (PA), psychological factors and exercise preferences in colorectal cancer (CRC) patients undergoing chemotherapy.

Methods: A total of 30 patients with stage 2-3 CRC undergoing adjuvant FOLFOX chemotherapy were recruited. The following questionnaires were used at baseline and during the 3rd and 7th chemotherapy cycle: IPAQ, EORTC QLQ-C30, FACIT-Fatigue. Additionally, the amount of PA was assessed for 2 weeks during the second cycle of chemotherapy with accelerometer. Exercise preferences were surveyed at baseline. Results: A 3-month follow-up of PA level of participants did not significantly differ between chemotherapy cycles, however, PA level reduced the week immediately after chemotherapy. The characteristics of physical activity and psychological factors in colorectal cancer patients undergoing chemotherapy.

1. The amount of physical activity for 2 weeks during the second cycle of chemotherapy (n=30)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Week of chemotherapy</th>
<th>Week after chemotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>MVPA (min/wk)</td>
<td>31.08 (19.74)</td>
<td>43.82 (25.65)</td>
</tr>
<tr>
<td>Step count (step/wk)</td>
<td>5418.33 (3207.77)</td>
<td>5246.07 (2566.59)</td>
</tr>
</tbody>
</table>

2. Quality of life according to EORTC QLQ-C30 at various time points in patients with colorectal cancer undergoing chemotherapy (n=30)

<table>
<thead>
<tr>
<th>Variables</th>
<th>C3</th>
<th>C7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>88.90 (17.03)</td>
<td>79.89 (27.31)</td>
</tr>
</tbody>
</table>

Conclusion: This study showed that the level of PA does not differ between chemotherapy cycles, however, PA level reduced the week immediately after chemotherapy. The results of this study provide important information for the development of evidence based exercise programs for CRC patients undergoing chemotherapy.

3862 Board #301 June 4, 9:30 AM - 11:00 AM
The Impact of Training Load on Sleep Parameters in Elite Athletes
Melanie Knaufinke1, Arne Nieuwenhuys1, Sabine A.E. Geurts2, Els Most2, Tim R.M. Loukens3, Kamil Maahe2, Maarten H. Moen2, Antoon M.L. Coenen3, 1Behavourical Science Institute, Radboud University, Nijmegen, Netherlands. 2Philips Research, Eindhoven, Netherlands. 3Donders Center for Cognition, Radboud University, Nijmegen, Netherlands.

Email: M.knaufinke@psych.ru.nl

(No relationships reported)

Purpose: While it is assumed that regular exercise benefits sleep, it is also plausible that high exercise load, such as experienced by elite athletes, jeopardizes sleep and hence limits adequate recovery. To test this hypothesis the current study investigated the impact of training load on sleep parameters such as latency, quality, efficiency, and sleep stage distributions in a large cohort of elite athletes.

Method: Self-reported training load, actigraphy and one-channel EEG recordings were obtained among 98 elite athletes during 7 consecutive days of habitual training.

Results: Training load was experienced as moderate with large individual and daily variability (5.41 ± 2.56; scale 1-10). Actigraphy revealed healthy sleep for the majority of athletes, showing total sleep durations of 7.51 ± 1.08 hours, sleep onset latencies of 0.13 ± 0.15 hours, and sleep efficiency scores of 88.64 ± 5.33 %, but slightly elevated wake after sleep onset (WASO; 0.32 ± 0.16 hrs). Distribution of sleep stages fell within healthy ranges. Multilevel analysis revealed significant associations between training load and all sleep quantity estimates except for WASO. In particular, high training load negatively affected sleep duration, sleep onset latency and sleep efficiency (0.8 <β <1.7). For sleep stage distributions, high training load was associated with higher percentages of REM sleep and lower percentages of deep sleep (0.9 <β <1.5). No significant associations were observed for light sleep.

Conclusion: In a field study employing robust and objective sleep measurements among elite athletes, the current study indicates deteriorated sleep latency, quantity and efficiency as a function of training load. However, the increase in deep sleep, although at the cost of REM sleep, presumably contributes to bodily recovery after stressors induced by strenuous exercise. Future research should aim to detect the transition point from beneficial to deteriorating effects of exercise on sleep.

This research was funded by STW Technology Foundation, The Netherlands.
The running velocity associated with maximal oxygen uptake (v\(\dot{VO}_2\)max) has been used extensively to evaluate fitness level, training adaptations and to estimate performance level in running distances ranging from 1500 m to Marathon. However, the systematic use of v\(\dot{VO}_2\)max could be limited as for its determination subjects need to execute an exhaustive progressively incremental test in a sophisticated laboratory setting with the help of skilled laboratory personnel. Consequently, there is a need for a simple, inexpensive and valid field test that could provide a reasonable estimation of v\(\dot{VO}_2\)max.

**Purpose**: The purpose of this study was to examine the relationship of the percentage of maximal heart rate (%HR) at submaximal running speed of 10, 11 and 12 kmh\(^{-1}\) with maximal oxygen uptake (VO\(_2\)max), VO\(_2\)max and ventilatory threshold (VT).

**Methods**: Sixty trained amateur runners (age 38.2 ± 8.8 years, body mass 76.0 ± 13.0 kg, %fat 13.1 ± 4.3 % and V\(\dot{V}O_2\max 52.7 ± 7.8 mlkg\(^{-1}\)min\(^{-1}\)) performed a laboratory based incremental treadmill test to volitional exhaustion (0% inclination, 3 min stages) to determine VO\(_2\)max. Additionally, the subjects visited the laboratory three times (with interval of 48 hours) to run a 6-min running bout at submaximal speeds 10, 11 and 12 kmh\(^{-1}\) in a random order. Heart rate was collected throughout the submaximal running bouts. Data were assessed for normality (Kolomorov and Smirnoff) and the relationships between the variables were calculated using the Pearson’s product moment correlation coefficient. Significance was set at \(p < 0.01\).

**Results**: The results revealed significant (\(p < 0.01\)) correlations between the %HR at all speeds and the v\(\dot{VO}_2\)max, VO\(_2\)max, and VT (10 kmh\(^{-1}\) = -0.817, -0.708, and -0.810 respectively; 11 kmh\(^{-1}\) = -0.863, -0.728, and -0.858 respectively; 12 kmh\(^{-1}\) = -0.911, -0.794, and -0.904 respectively). The highest correlation occurred between the %HR at 12 kmh\(^{-1}\) and v\(\dot{VO}_2\)max (\(r = -0.911\)) and the equation for prediction of v\(\dot{VO}_2\)max was y = -0.2901x + 41.3 \(\left( r^2 = 0.830 \right)\).

**Conclusions**: It can be concluded that the %HR can accurately predict v\(\dot{VO}_2\)max, VO\(_2\)max, and VT and this can be used to provide useful information regarding aerobic fitness of trained adults. The %HR at submaximal speeds could be used in monitoring athletes as well as for the estimation of the optimal training intensity.
sacral mutation and ‘locking’ the SIJ for optional load transfer. It has been postulated that failure of either form or force closure would lead to suboptimal load transfer and counter-rotation of the sacrum relative to the innominate on the affected side.

Methods. Single photon emission computed tomography and x-ray computed tomography (SPECT-CT) using a hybrid device was used in a study of 1200 patients with a clinical diagnosis of SIJ incompetence (Pelvic Girdle Pain syndrome): 64% females and 36% males with an average age of 42 years (Range: 15-78 years). The clinical history revealed that 88% of cases were due to acute trauma or repetitive microtrauma, 8% post pregnancy and 8% undetermined cause. Standard clinical testing and an alternate series of a tests were used as a reference standard for imaging.

Results. Symptoms were present for a mean of 43 months (RR 6 weeks to 26 years). Imaging finding were of increased uptake in the upper SIJ (S1-S2) with extension into the dorsal interosseous ligament and measurable by count profile. Associated findings of tendon enthesopathy reflected altered biomechanics around the pelvis. Ipsilateral adductor enthesopathy was found in 70% and contralateral hamstring enthesopathy in 60%. Femoro-acetabular hip impingement on the ipsilateral side was shown in 72% while 57% had other pathological conditions. SPECT-CT criteria for the diagnosis of SIJ incompetence were developed and validated.

Conclusion. SPECT-CT is a valid and reproducible technique for the diagnosis of SIJ incompetence with a high concordance and specificity compared to the reference standards. Findings are supportive of the integrated model of SIJ function proposed by Lee and Vleeming. In the athletic population SPECT-CT may provide information on the risk factors for adductor-related and hamstring injuries.

## TABLE 1: RESULTS (*= p<0.05)

<table>
<thead>
<tr>
<th>Device Source, n (%)</th>
<th>Women (n=428)</th>
<th>Men (n=151)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), M (SD)</td>
<td>33.4 (12.1)</td>
<td>36.6 (13.7)*</td>
</tr>
<tr>
<td>BMI (kg/m²), M (SD)</td>
<td>26.4 (6.4)</td>
<td>27.7 (6.3)*</td>
</tr>
<tr>
<td>Bachelor’s degree or higher, n (%)</td>
<td>303 (70.8%)</td>
<td>96 (63.5%)*</td>
</tr>
<tr>
<td>Household Income ≤ $50,000, n (%)</td>
<td>179 (41.8%)</td>
<td>53 (35.1%)</td>
</tr>
<tr>
<td>&gt; $50,000, n (%)</td>
<td>209 (48.8%)</td>
<td>87 (56.7%)*</td>
</tr>
<tr>
<td>Prefer not to answer, n (%)</td>
<td>40 (9.3%)</td>
<td>11 (7.3%)*</td>
</tr>
<tr>
<td>Leisure Activity Score, M (SD)</td>
<td>57.4 (75)</td>
<td>59.6 (67.1)</td>
</tr>
</tbody>
</table>

There has been an explosion in the use of wearable physical activity (PA) monitors, but we do not fully understand who wears them and why.

**PURPOSE:** To describe sociodemographics, PA behaviors, reasons for device use, and compare across genders.

**METHODS:** PA monitor users (N=579) recruited through online forums completed a web-based survey. Sociodemographics, health information, PA and monitor use were queried. Descriptives are reported as means and standard deviations (SD), and frequencies. Independent t-tests and chi-square analysis were used to compare across genders.

**RESULTS:** Table 1 shows the descriptive data. Respondents were 18-72 years old with 73.9% women. Men were older, had higher BMI and were less educated than women. Men and women had similar PA. More men purchased the device themselves, with 73.9% women. Men were older, had higher BMI and were less educated than

**CONCLUSION:** Activity monitor users in this sample were affluent, highly educated, and physically active. Men and women differed in their reasons for device adoption and use.

**S845**

**3868 Board #307**

**June 4, 9:30 AM - 11:00 AM**

**Handgrip Strength as Potential Predictor for Metabolic Syndrome**

Ji Yong Byeon, Mi Kyung Lee, Yoon Kyung Song, Justin Y. Jeon. Yonsei University, Seoul, Korea, Republic of.

(No relationships reported)

**PURPOSE:** The purpose of the current study is to identify relationship between handgrip strength (HGS) on the risk of metabolic syndrome.

**METHODS:** All participants (488 males and 521 females) were randomly chosen in the process of health examination in a university affiliated hospital in South Korea. The relative HGS was defined as a ratio of absolute HGS to body weight, subsequently classified into three groups (tertile) in each gender. A logistic regression model was used to determine the relation between the HGS and MetS after adjusting age.

**RESULTS:** HGS was inversely associated with most of the MetS components in both male and female. In male, participants in the lowest tertile of HGS has 2.52 times [95% confidence interval (CI) 1.43-4.46] higher odd of having MetS compared with participants in the highest tertile of HGS. In female, participants in the lowest tertile of HGS has 5.01 times (95% CI: 1.66-15.08) higher odd of having MetS compared with participants in the highest tertile of HGS. In both gender, height and body weight were positively associated with HGS.

**CONCLUSIONS:** Our finding suggests that HGS was strongly associated with components of MetS: higher the HGS, lower the risk of MetS. HGS could potentially be used as one of the health indicators for general population.

**3869 Board #308**

**June 4, 9:30 AM - 11:00 AM**

**Correlates of Objectively Measured Physical Activity in Swiss Preschool Children**


1University of Zurich, Zurich, Switzerland. 2University Children’s Hospital Zurich, Zurich, Switzerland. 3University of Fribourg, Fribourg, Switzerland. 4University Hospital Lausanne, Lausanne, Switzerland. Email: einat.schmutz@uzh.ch

(No relationships reported)

**PURPOSE:** To identify correlates of young children’s PA by simultaneously examining an extended set of potential correlates of objectively measured Total and Moderate-to-Vigorous PA (TPA and MVPA, respectively) from multiple domains (demographic and biological, cognitive/emotional, behavioral, social/cultural and physical environment).

**METHODS:** Cross-sectional data were used from the Swiss Preschooler’s Health Study (SPLASHY), a Swiss population-based cohort study. 397 (52% boys) 2- to 6-year old children attending 84 randomly selected child care centers had valid PA data assessed with accelerometer (ActiGraph) and exposure data collected either by direct measurement or parental questionnaires. After checking for multicollinearity, 35 potential correlates of PA were examined using multilevel linear models. All explanatory variables moderately associated (p<0.05) were included in the final model. Variables that remained significant (p<0.05) were considered correlates of TPA and MVPA, respectively.

**RESULTS:** MVPA minutes were greater in boys and increased with age, better gross motor skills and higher activity sub-score of the Emotionality Activity and Sociability temperament survey (EAS-activity). In summer (June-August), children were less active than during the spring and fall months. Similarly, TPA counts were positively associated with age and EAS-activity score, and greater in boys. Children living in...
a single-parent household as well as those who spent more time outdoors and had a higher number of fixed toys at home were more physically active.

**CONCLUSIONS:** Six correlates of TPA and MVPA, respectively, have been identified in Swiss preschool children, which illustrates that only a few modifiable factors can be tackled in interventions to increase PA in preschoolers.

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**3870 Board #309 June 4, 9:30 AM - 11:00 AM**

**Lifespan Leisure Physical Activity Relates To Brain Metabolism In Old Age**

Tobias Engeroff, Lutz Vogt, Johannes Fleckenstein, Eszter Fürzéki, Sina Schwarz, Ulrich Pilatus, Elke Hattingen, Ralf Deichmann, Johannes Pantel, Winfried Banzer, FACSM. Goethe University, Frankfurt, Germany.

Email: tobias.engeroff@googlemail.com

(No relationships reported)

**PURPOSE:** To gain a further understanding of the relationship between lifelong leisure physical activity (LLPA) and cognitive function at old age, current studies investigate various outcomes. Although neurotrophins or imaging data have been investigated in more detail, the influence of brain metabolism has not been evaluated systematically. The present study aims at exploring the influence of LLPA on brain metabolism, assessed via magnetic resonance spectroscopic imaging (MRSI), in community-living elderly people.

**METHODS:** From the initial sample (N=60) subjects with complete record of LLPA were further analyzed (N=50, 72±5 yrs, 27 ♀). LLPA was assessed via an adapted version of the Historical Activity Questionnaire (HLAQ) with five time periods (from age 14 to 80). Self-report leisure physical activity data were transformed to MET hours per week (Metabolic Equivalent of Task) (MET/h/wk) and averaged across time periods to estimate mean activity induced lifespan energy consumption.

The 1H MRSI data were recorded across a transversal slice just above the corpus callosum (240 × 240 mm2 FOV, 16 × 16 matrix, 12 mm thickness, circular weighted scheme with 2 acquisitions at center of k-space, TR 1500 ms, TE 30 ms, total duration 5 min). Metabolite profile, calculated as ratio of N-Acetylaspartate to choline (NAA/tCho), was collected from voxels covering a 35 x 35 mm2 area. Values are expressed as mean and SE.

**RESULTS:** Group average per time period ranged from 23.2 to 36.6 MET/h/wk with a peak leisure activity energy consumption at the age range from 50 to 65 yrs and significantly (p < .05) lower activity MET/h at young age (14-21 yrs and 22-34 yrs). Subjects’ mean leisure activity over the lifespan was 28.7±4.5 (95% CI 20.2-38.5) MET/h/wk. Controlling for the influence of sex and bodyweight, NAA/tCho ratio was significantly associated with average LPA energy consumption (r = -0.264, p < 0.046).

**CONCLUSIONS:** The average leisure time physical activity during lifespan was positively associated with higher levels of brain metabolic indices. Higher levels of NAA may indicate enhanced neuronal integrity and cerebral metabolic efficiency. The relationship should be further explored by analyzing complementary markers of brain metabolism and taking into account the intra-individual variability of physical activity across the lifespan.