Thematic Poster - Advancing Physical Activity Assessment Methods - Part I

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM
Room: 109

Chair: Scott E. Crouther. The University of Tennessee Knoxville, Knoxville, TN.

No relationships reported

Board #1
June 1, 9:30 AM - 11:30 AM
Towards Reducing the Features Used in Machine Learning Free-living Physical Activity Recognition Algorithms

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No relationships reported

PURPOSE: Machine learning (ML) methods for processing accelerometer data are gaining popularity and have been validated for identifying physical activities from raw data. However, these methods can be complex, requiring the computation of many features. Simpler methods are easier to understand and may be faster to apply. We investigated the extent to which we can reduce the number of features computed while still maintaining high classification accuracy.

METHODS: Forty overweight women (55.2 ±15.3 yrs) wore two ActiGraph GT3X+ accelerometers (right hip, non-dominant wrist) for 7 free-living days. Wearable cameras captured ground truth activity labels. For each accelerometer location, we used a ML classifier based on 41 acceleration features (identified in the literature), to classify 4 activities (sitting, standing, walking/running, riding in a vehicle). We partitioned participants into training (80%) and testing (20%) portions. We trained a classifier on the training set and ranked the features by importance to the random forest classifier on the training set. Then we repeated the following procedure until all features were removed: remove the feature with lowest importance score, re-train the classifier on the training set, and evaluate the performance on the test set. We did this separately for the hip and wrist accelerometers, and evaluated performance using balanced accuracy (BA) (mean of sensitivity and specificity).

RESULTS: The highest BA obtained with the hip accelerometer was 78.9% (36 features). Using only the most important feature (3 Hz frequency component) reduced BA by 11% (69.9%). Using 17 features BA was within 1% of maximal (78.4%). The highest BA obtained with the wrist accelerometer was 73.6% (37 features). Using only the most important feature (2 Hz frequency component) reduced BA by 12.5% (64.4%). Using 22 features BA was within 1% of maximal (73.3%).

CONCLUSIONS: These analyses indicate that a smaller number of features can be used without much loss in accuracy, but using only a single feature reduces accuracy more dramatically. As researchers adopt more complex methods it is important to understand the tradeoff between simplicity and value gained by complexity. Although simpler methods have been shown to work well in the lab, some complexity is still required for free-living classification.

Board #2
June 1, 9:30 AM - 11:30 AM
Describing The Methodology To Estimate Accelerometer Return Percentage From A Study Utilizing Mail-based Data Collection

Gregory Knell1, Deborah Salvo1, Kelley Pettée Gabriel, FACSM2, Casey Durand2, Abidoum Oluomy1, Michael Robertson2, Deanna M. Hoelscher1, Harold W. Kohl, III, FACSM3. "The University of Texas Health Science Center at Houston (UTHSC) School of Public Health, Austin, TX. "The University of Texas Health Science Center at Houston (UTHSC) School of Public Health, Houston, TX.

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No relationships reported

Recent advances in accelerometer design and battery life have improved the practicality of mail-based delivery and return for data collection in large epidemiologic studies. Mail-based administration can significantly reduce the cost and logistic challenges associated with in-person delivery/recovery, but requires other resources (e.g. phone calls, direct mailing) to optimize protocol compliance and monitor return. To date, there is no available method to forecast the number of monitors expected to be returned within a certain time-frame. This information is critical to appropriate allocate study staff and resources. PURPOSE: To describe a novel methodology to estimate accelerometer return percentage in the Houston TRAIN (Transit-Related Activity In Neighborhoods) Study.

Board #3
June 1, 9:30 AM - 11:30 AM
Differences In Physical Activity Estimates By Wear Time, Body Placement And Data Processing Of Accelerometers

Jacqueline Kerr1, Katherine Ellis1, Sunetta Godbole1, Catherine Marinae1, Jonathan Mitchell2, Aaron Hipp3, Peter James4, David Berrigan5. "UCSD, San Diego, CA. "Children’s Hospital of Philadelphia, Philadelphia, PA. "UMass Amherst, Amherst, MA. "University of Michigan, Ann Arbor, MI. "National Cancer Institute, Bethesda, DC.

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No relationships reported

PURPOSE: As accelerometer methods advance, researchers may employ different body placements and data processing techniques. This may result in different physical activity (PA) estimates that will make study comparisons challenging. We compared three data processing techniques for hip worn accelerometer data; compared wrist and hip locations; and compared wake-time wrist to a 24-hour wrist protocol.

METHODS: 2606 days from 333 women (mean age 55) with matched hip and wrist accelerometer data were compared using generalized estimating equations adjusting for days within individuals. Participants were asked to wear hip accelerometers for waking hours and the wrist accelerometer (on the non-dominant hand) for 24 hours over 7 days. Standard wake wear time criteria (5 days, 600 mins/day) were applied to the hip and wrist. Minute level count (CPM) cut points from the vertical axis were applied to the hip data (1525 cpm (MPVA)). A laboratory developed algorithm (GGIR) for wrist and hip vector magnitude (VM) data was employed to identify MVPA. A free living machine learned (ML) behavioral algorithm was applied to classify walking in the hip and wrist. Meeting guidelines was considered as 30 mins PA per day.

RESULTS: Wear time compliance between the hip and wrist only varied by 2%. 25% of days included 30 minutes of PA with the hip cut points, 35% with the GGIR VM, the hip, and 71% with the ML walking algorithm. 54% of days were classified by the wrist GGIR wake time criteria compared to 58% with the 24 hour protocol. The ML algorithm classified 60% of days on the wrist wake time, compared with 61% with the 24 hour protocol. All differences were statistically significant at p<.05.

CONCLUSIONS: Different processing methods and body placements appear to significantly affect estimates of PA. Differences between methods could have been affected by the validity of the algorithms for this aged population: the CPM and VM algorithms were developed in younger adults in the laboratory, and the ML algorithm was developed in free-living women the same age as this cohort. These findings will inform consensus development for accelerometer wear and data processing protocols in future studies.

Board #4
June 1, 9:30 AM - 11:30 AM
Individualized Cutpoint Analyses May Better Estimate Physical Activity Intensity In Older Adults With Type 2 Diabetes Mellitus

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No relationships reported

PURPOSE: Determining the intensity of physical activity in older adults with T2DM using individualized, relative cutpoints may be more informative than using standard absolute cutpoints. METHODS: Forty seven older adult T2DM (69±6y; 57% male,
33.6± kg.m-2, 7.2±0.9% HBa1c) completed a two speed walking protocol (walking between 1-2.5 mph) for four minutes at each speed, followed by a peak exercise test. Participants wore an accelerometer-based physical activity monitor on their waist and oxygen consumption was measured using a portable metabolic system. Afterwards, participants wore the activity monitor for 7 days. A linear equation for each individual was derived from the activity counts and energy expenditure measured during the walking protocol. Relative intensity cutpoints were calculated by using 45% VO2peak to determine moderate and 59% VO2peak to determine vigorous intensity. Average times spent in intensity categories per day were calculated using relative versus absolute (Troiano, moderate 2020 cpm, vigorous 5999 cpm) cutpoints. Paired samples t-tests correcting for false discovery rate (p<0.05) were run to compare estimated time spent in intensity category by cutpoint. RESULTS: Mean VO2peak was 16±4 ml.kg-1.min-1 and calculated individualized cutpoints were, on average, 1043(SE=121) cpm for moderate and 1632(SE=174) cpm for vigorous activity. Using the individualized cutpoints, participants accumulated an average of 171.7(SE=12.6) min of light, 22.8(SE=2.8) min of moderate, and 27.4(SE=6.5) min of vigorous activity per day. Use of the standardized Troiano cutpoint resulted in significantly different estimations based on intensity category: light 216.5(SE=11.4, p<0.05) min, moderate 6.8(SE=1.3, p<0.005), and vigorous 0.006(SE=0.006, p<0.01) min of activity per day. CONCLUSION: These results suggest utilization of absolute cutpoints may underestimate daily relative intensity levels of physical activity in older adults with T2DM. This misclassification may improperly inform true dose-response relationships, and population-based prevalence of physical activity in these and other clinically important populations.

Supported by Veterans Affairs, Rehabilitation Research and Development Merit Review.

**Board #5**

**June 1, 9:30 AM - 11:30 AM**

Validation of a 2-Regression Model for Estimating Physical Activity in Youth Using an Ankle Accelerometer

Scott E. Crouter, FACSM1, Jennifer I. Flynn1, David R. Bassett, FACSM1, 2The University of Tennessee Knoxville, Knoxville, TN. 2University of South Carolina, Columbia, SC. (No relationships reported)

**PURPOSE:** The purpose of this study was to develop three 2-regression models (2RM) for use with ankle ActiGraph data in youth using the 1) vector magnitude (VM), 2) vertical axis (VA), and 3) all three axes (3ax) as individual predictors. The models were developed using unstructured physical activity (PA). **METHODS:** For development of the 2RM, 84 girls and 97 boys (mean ± SD; age, 12.0 ± 1.5 yr) completed 30-35 min of lying rest and two to seven structured activities (from a list of 25) for 1-2 min each. For cross-validation, 27 boys and 15 girls (age, 12.7 ± 0.8 yrs) completed approximately 2-hrs of unstructured PA. PA data were collected using an ActiGraph GT3X or GT3X+, positioned on the non-dominant ankle and were converted to youth METs (METy; activity VO2 divided by resting VO2). A coefficient of variation (CV) was calculated for each activity to determine if the activity was continuous walking/running or an intermittent activity and separate regression equations were developed for each activity group using the VA only.VM only, and 3ax as individual predictors. Predicted METy values were used to compare measured and predicted METy, and time spent in sedentary (SED), light (LPA; 1.5-2.99 METy) and moderate (MPA; 3.0-5.99 METy) activity. CONCLUSION: Based on SE/SP to detect SB and agreement κ=.29 (95% CI,.29, .30); right wrist κ=.32 (95% CI,.32, .33); right hip κ=.35 (95% CI,.3, .35) vs ActiGraph κ=.32 (50% female), Mage= 30.25 ± 6.43 years, normal BMI (85%) gave informed consent to participate. SE/SP analyses identified different cts/sec to detect SB for each accelerometer placement: ActiGraph [left wrist 5 cts/sec (SE,.68/ SP,.64); right wrist 14 cts/sec (SE,.69/SP,.66); right hip 0 cts/sec (SE,.88/SP,.41)]; GENEScript [left wrist 2 cts/sec (SE,.65/SP,.66); right wrist 3 cts/sec (SE,.71/SP,.70)]. Kappa's was modest but statistically significant (p<0.005) for all devices and placement sites: ActiGraph [left wrist κ=.29 (95% CI, 29, 30); right wrist κ=.32 (95% CI,33, 33); right hip κ=.35 (95% CI,.35, .35)] ;GENEScript [left wrist κ=.29 (95% CI, 28, 29); right wrist κ=.31 (95% CI,.30, 31)]. CONCLUSION: Based on SE/SP to detect SB and agreement with direct observations, the best locations for the ActiGraph and GENEScript accelerometers were the right hip and right wrist, respectively. Machine-learning algorithms may improve SB detection and future studies should confirm these findings.

**Board #7**

**June 1, 9:30 AM - 11:30 AM**

The Energy Cost of Work Station Sitting vs Standing

John Wygand, FACSM, Robert M. Otto, FACSM, Ryan Page, Lauren Chandler, Luisa Echeverry, Richard Happel, Kaitlyn Monteith, Joanna Venezia, Jonathan Lester, Joelle Hecht, John Donnelly, John Petrizzo, Adelphi University, Garden City, NY. Email: wygand@adelphi.edu (No relationships reported)

A debate regarding the benefits of standing (STA) vs sitting (SIT) is common in the workplace. A reduction in sedentary lifestyle and increased caloric expenditure are touted as prime reasons to abandon a SIT workstation in favor of a STA or treadmill based workstation. Buckley (2013) reported a Caloric expenditure of 2.6 vs 3.3 kcal/ min and a heart rate of 79 vs. 89 bpm for sitting vs standing postures, respectively. With the average 8 hour work day requiring 341 minutes of sitting, a change to standing for a comparable amount of time would increase energy expenditure by 239 kcal/work day. These reported values are astounding. ** PURPOSE:** The purpose of this study was to investigate the energy cost of workstation sitting and standing. METHODS: 15 volunteers (age 22.4 ± 1.7 yr, ht. 1.73 ± 0.12 m, body mass 73.9 ± 1.3 kg, 8.7) completed a medical screening, informed consent, and reported to the lab in an hydrated state. Continuous open circuit spirometry and heart rate by telemetry were employed during 30 minutes of SIT activity followed immediately by 30 minutes of STA activity. Activity included typical work related tasks of reading, typing, computer interaction and telephone usage during both trials. RESULTS: Statistical analysis by paired sample t test revealed a significant difference (p<0.05) between SIT and STA protocols across all variables. Oxygen consumption (L/min) was 0.28± 0.076 and 0.336 ± 0.082, VO2 (ml.kg-min) was 3.9 ± 0.60 and 4.5 ± 0.6, VO2 (L/min) was 7.71 ± 1.6 and 8.83 ± 1.9, RER was 0.81 ± 0.04 and 0.80 ± 0.04, heart rate (bpm) was 73.2 ± 13.7 and 79.9 ± 11.4, and Caloric expenditure (kcal/min) was 0.07 ± 0.09 and 1.57 ± 0.09, for SIT vs STA, respectively. CONCLUSION: A limited, but significant difference between SIT vs STA with a benefit of 0.18 kcal/min or a total of ~61.4 kcal over the estimated 341 minutes of an 8 hour workday substituted for sitting was noted. Ancillary concerns from prolonging standing of peripheral edema, leg fatigue, and varicose veins may preclude the use of standing at the workplace other than in small intervals. Whether an individual is standing or sitting they are still sedentary, thus frequent intermittent standing in one minute intervals may counteract the negative effects of maintaining a single posture for prolonged periods. Intermittent walking throughout the workday may be a better alternative.
A-26 Thematic Poster - Protein Metabolism I

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM
Room: 101

84 Board #1 June 1, 9:30 AM - 11:30 AM
Exercise Enhances The Overnight Muscle Protein Synthetic Response To Pre-sleep Protein Feeding In Older Males

Andrew M. Holwerda1, Imre W.K. Kouw1, Jorn Trommelen2, Shona L. Haison3, Will K. W. Hodziga, Lex B. Verdijk2, Luc J.C. van Loon1. 1Maastricht University, Maastricht, Netherlands. 2Australian Institute of Sport, Belconnen, Australia. (Sponsor: Janice Lee Thompson, FACSM) Email: andy.holwerda@maastrichtuniversity.nl

PURPOSE: The age-related decline in skeletal muscle mass is, at least partly, attributed to anabolic resistance to food intake. To compensate for anabolic resistance, we recently introduced the ingestion of dietary protein prior to sleep as a nutritional strategy to increase overnight muscle protein synthesis rates. Here we aimed to assess whether resistance-type exercise performed in the evening can further augment the overnight muscle protein synthetic response to pre-sleep protein ingestion in older males.

METHODS: In a parallel group design, twenty-three healthy older men (71±1 y) were randomly assigned to ingest 40 g casein protein before going to sleep with (PRO+EX: n=11) or without (PRO: n=12) performing resistance-type exercise earlier that evening. Overnight protein digestion and absorption kinetics, whole body protein metabolism and muscle myofibrillar protein synthesis rates were assessed using primed, continuous infusions of L-[ring-2H5]-phenylalanine and L-[ring-2H2]-tyrosine with the ingestion of intrinsically L-[1-13C]-phenylalanine labeled casein protein. RESULTS: Exogenous phenylalanine appearance rates expressed over time did not differ between treatments. A total of 53±2 vs 55±2% of the ingested protein-derived phenylalanine appeared in the circulation during overnight sleep in the PRO+EX and PRO treatment, respectively (P=0.49). Myofibrillar protein synthesis rates were 31% higher during overnight sleep when exercise was performed earlier that day (0.058±0.002 vs 0.044±0.003 %·h⁻¹ in PRO+EX vs PRO, respectively; P<0.01; L-[ring-2H5]-phenylalanine). In line, 27% more L-[1-13C]-phenylalanine was incorporated into myofibrillar protein in PRO+EX compared with PRO (0.042±0.002 vs 0.033±0.002 MPE, respectively; P<0.05; L-[1-13C]-phenylalanine).

CONCLUSIONS: Resistance-type exercise augments the overnight muscle protein synthetic response to pre-sleep protein ingestion and allows more of the ingested protein to be directed towards de novo muscle protein synthesis during overnight sleep in older males.

Funding: Top Institute Food and Nutrition (TIFN)

85 Board #2 June 1, 9:30 AM - 11:30 AM
Protein Requirements Are Increased In Active Females As Determined By Indicator Amino Acid Oxidation

Denise J. Wooding1, Jeffrey E. Packer1, Glenda Courtney-Martin2, Paul B. Pencharz1,2, Daniel R. Moore1. 1University of Toronto, Toronto, ON, Canada. 2Research Institute, Hospital for Sick Children, Toronto, ON, Canada. (No relationships reported)

PURPOSE: Protein requirements in athletes are generally greater than the current recommended daily allowance (RDA) based on nitrogen balance (NBAL), which may underestimate true requirements. Compared to males, less is known about requirements for this daily allowance (RDA) based on nitrogen balance (NBAL), which may underestimate true requirements. Compared to males, less is known about requirements for this.

Methods: Thirty-six healthy young males performed a single bout of resistance-type exercise in the evening (19:45 h) after a full day of dietary standardization. All subjects were provided with adequate recovery nutrition (20 g protein + 45 g carbohydrate) immediately after exercise (20:20 h) and, after a thirty minute min prior to sleep (23:30 h), subjects ingested a beverage containing 30 g intrinsically L-[1-13C]phenylalanine-labeled protein with (PRO+leu, n=12) or without (PRO, n=12) 2 g free leucine or a noncaloric placebo (PLA, n=12). Continuous intravenous L-[ring-2H5]-phenylalanine, L-[1-13C]-leucine and L-[ring-2H2]-tyrosine infusions were applied. Blood and muscle tissue samples were collected to assess whole-body protein balance, myofibrillar protein synthesis and next morning overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation. METHODS: Determine in overweight and obese men if casein (CAS, 30 g protein), as compared to a non-caloric placebo (PLA), consumed before bed would alter blood markers but elicit similar changes in overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation. Results: There were no differences between treatments in overnight SCAAT glycerol (CAS, 175.0±26.5; PLA, 184.8±20.7 μmol/L; p=0.77), next morning fat oxidation (CAS, 0.76±0.01; PLA, 0.76±0.01; p=0.75) or metabolic rate (CAS, 2126±111; PLA, 2145±106 kcal/day; p=0.94). Similarly, there were no differences in any blood markers; however, the participants were hyperinsulinemic (fasting insulin > 30 μU/L) prior to the study. Conclusion: SCAAT lipolysis and next morning fat oxidation, metabolic rate and blood markers were similar between CAS and PLA. CAS before bed did not promote fat storage and may help with long-term weight control. Supported by FSU and Dymatize® Nutrition.

Funding: University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Janice Lee Thompson, FACSM)

86 Board #3 June 1, 9:30 AM - 11:30 AM
The Influence of Nighttime Protein Intake on Overnight Lipolysis and Next Morning Fat Oxidation

Amber W. Kinsey1, Stacy R. Cappadona1, Lynn B. Panton, FACSM1, Robert C. Hickner, FACSM1, Michael J. Ormsbee, FACSM1. 1University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Janice Lee Thompson, FACSM) Email: amber.kinsey@uab.edu

Purpose: To determine the impact of ingesting 30 g casein protein with and without 2 g free leucine prior to sleep on myofibrillar protein synthesis rates during postexercise overnight recovery.

METHODS: Thirty-six healthy young males performed a single bout of resistance-type exercise in the evening (19:45 h) after a full day of dietary standardization. All subjects were provided with adequate recovery nutrition (20 g protein + 45 g carbohydrate) immediately after exercise (20:20 h) and, after a thirty minute min prior to sleep (23:30 h), subjects ingested a beverage containing 30 g intrinsically L-[1-13C]phenylalanine-labeled protein with (PRO+leu, n=12) or without (PRO, n=12) 2 g free leucine or a noncaloric placebo (PLA, n=12). Continuous intravenous L-[ring-2H5]-phenylalanine, L-[1-13C]-leucine and L-[ring-2H2]-tyrosine infusions were applied. Blood and muscle tissue samples were collected to assess whole-body protein balance, myofibrillar protein synthesis and next morning overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation.

CONCLUSIONS: Our results suggest that the safe protein intake for active females during the luteal phase is 47-120% greater than the RDA in non-active individuals and is at the upper range of recommendations for athletes based on NBAL (i.e. 1.2-1.7 g/kg/d, ACSM). Importantly, the EAR determined herein is similar to our previous study using the IAAO in active males (i.e. 1.35g/kg/d) suggesting that sex per se does not affect protein requirements after variable intensity exercise. Funded by the Ajinomoto Innovation Alliance Program.

87 Board #4 June 1, 9:30 AM - 11:30 AM
Protein Ingestion Before Sleep Provides Precursors For Post-exercise Overnight De Novo Muscle Protein Synthesis

Jorn Trommelen1, Andrew M. Holwerda1, Imre W.K. Kouw1, Shona L. Haison1, Lex B. Verdijk1, Luc J.C. van Loon1. 1Maastricht University, Maastricht, Netherlands. 2Australian Institute of Sport, Belconnen, Australia. (Sponsor: Janice Lee Thompson, FACSM) Email: jorn.trommelen@maastrichtuniversity.nl

Previously, we have demonstrated that ingestion of 40 g protein prior to sleep increases overnight muscle protein synthesis rates during postexercise overnight recovery. It remains to be established whether ingestion of a more moderate amount of protein increases overnight muscle protein synthesis rates and provides precursors for de novo muscle protein synthesis.

PURPOSE: To determine the impact of ingesting 30 g casein protein with and without 2 g free leucine prior to sleep on myofibrillar protein synthesis rates during postexercise overnight recovery.

METHODS: Thirty-six healthy young males performed a single bout of resistance-type exercise in the evening (19:45 h) after a full day of dietary standardization. All subjects were provided with adequate recovery nutrition (20 g protein + 45 g carbohydrate) immediately after exercise (20:20 h) and, after a thirty minute min prior to sleep (23:30 h), subjects ingested a beverage containing 30 g intrinsically L-[1-13C]phenylalanine-labeled protein with (PRO+leu, n=12) or without (PRO, n=12) 2 g free leucine or a noncaloric placebo (PLA, n=12). Continuous intravenous L-[ring-2H5]-phenylalanine, L-[1-13C]-leucine and L-[ring-2H2]-tyrosine infusions were applied. Blood and muscle tissue samples were collected to assess whole-body protein balance, myofibrillar protein synthesis rates and next morning overnight subcutaneous abdominal adipose tissue (SCAAT) lipolysis and next morning whole-body fat oxidation.

CONCLUSIONS: There were no differences in any blood markers; however, the participants were hyperinsulinemic (fasting insulin > 30 μU/L) prior to the study. Conclusion: SCAAT lipolysis and next morning fat oxidation, metabolic rate and blood markers were similar between CAS and PLA. CAS before bed did not promote fat storage and may help with long-term weight control. Supported by FSU and Dymatize® Nutrition.
RESULTS: Protein ingestion prior to sleep improved overnight whole-body net protein balance (PRO: 53.7; PRO+leu: 59.12, and PLA: 61.4 mol kg⁻¹ per 7.5 h; P<0.001). Myofibrillar protein synthesis rates did not differ between treatments and averaged 0.055±0.008, 0.055±0.015 and 0.057±0.003 %·h⁻¹, respectively (P=0.850).

Myofibrillar [L-¹-¹³C]phenylalanine enrichments increased following protein ingestion and did not differ between the PRO and PRO+leu treatments.

CONCLUSIONS: Protein ingestion prior to sleep supports overnight recovery by providing precursors for de novo muscle protein synthesis during sleep. However, the ingestion of 30 g of casein protein with or without additional free leucine does not increase muscle protein synthesis rates during postexercise overnight recovery.

Funding: TIFN

90 Board #6
June 1, 9:30 AM - 11:30 AM
Amino Acid Transport after Sprint Exercise and Oral Amino Acids
Hakan C. Rundqvist¹, Mona S. Björnsson1, Olav Rooyackers¹, Apro William², Marcus Moberg³, Ted Österlund₁, Eva Jansson¹. ¹Karolinska Institutet, Stockholm, Sweden. ²University Hospital, Umeå, Sweden. ³University of Nottingham, Nottingham, United Kingdom. (No relationships reported)

PURPOSE: To study if oral ingestion of essential amino acids (oral EAA) increases protein synthesis in response to sprint exercise and to quantify the role of SNAT2 in this response.

METHODS: 10 healthy-weight (24±1 y, BMI 22.7±0.4 kg/m², HOMA-IR 1.4±0.2), 10 overweight (26±2 y, BMI 27.1±0.5 kg/m², HOMA-IR 2.5±0.11), and 10 obese (27.3±3 y, BMI 35.9±1.3 kg/m², HOMA-IR 5.8±0.8) men and women underwent a primed continuous L-[ring-¹³C]phenylalanine infusion. Blood and muscle biopsy samples were collected at rest and after ingestion of 36 g of protein to assess plasma amino acid and insulin concentrations and myofibrillar protein synthesis rates.

RESULTS: Protein ingestion increased plasma essential amino acid concentrations similarly in all participants (time effect: P<0.05) with concentrations peaked at 2 h and returning to baseline values at 5 h. The obese participants had a greater peak postprandial plasma insulin response to protein ingestion than the overweight and healthy-weight participants (p = 0.86) compared to overweight 11.9±1.6 and overweight 14.3±1.7 µIU/L, P=0.001). Protein ingestion increased myofibrillar protein synthesis in both the healthy-weight (rest: 0.057±0.006 %/h, fed: 0.084±0.014 %/h) and overweight groups (rest: 0.061±0.007, fed: 0.087±0.019 %/h) (P<0.05) with no increase in the obese group (rest: 0.055±0.005 %/h, fed: 0.067±0.005 %/h, P=0.45).

CONCLUSIONS: Increased adiposity led to an impaired postprandial muscle protein synthetic response to protein ingestion in obese adults when compared to healthy-weight and overweight individuals. These data suggest that poor skeletal muscle remodeling may underlie early metabolic impairments in apparently “healthy” obese adults.

Funding provided by the National Pork Board

91 Board #7
June 1, 9:30 AM - 11:30 AM
Diminished Postprandial Muscle Protein Synthetic Response To Protein Ingestion In Obese Adults
Joseph W. Beals, Richard A. Sukienicki, Stephan van Vliet, Justin R. Young, Alexander V. Ulavon, Lucas Li, Scott A. Paluska, FACS, Nicholas A. Burd. University of Illinois Urbana, IL. (Sponsor: Scott Paluska, FACS)

Email: bealsjsw@gmail.com (No relationships reported)

Excess body fat blunts muscle protein synthesis rates under hyperinsulinemic, hyperaminoacidic clamp conditions. However, the efficacy of the ingestion of single meal containing ample amounts of protein to augment postprandial muscle protein synthesis rates has not been studied in obese and overweight adults.

PURPOSE: We aimed to compare myofibrillar protein synthesis after protein ingestion in healthy weight, overweight, and obese adults.

METHODS: 10 healthy-weight (24±1 y, BMI 22.7±0.4 kg/m², HOMA-IR 1.4±0.2), 10 overweight (26±2 y, BMI 27.1±0.5 kg/m², HOMA-IR 2.5±0.11), and 10 obese (27.3±3 y, BMI 35.9±1.3 kg/m², HOMA-IR 5.8±0.8) men and women underwent a primed continuous L-[ring-¹³C]phenylalanine infusion. Blood and muscle biopsy samples were collected at rest and after ingestion of 36 g of protein to assess plasma amino acid and insulin concentrations and myofibrillar protein synthesis rates.

RESULTS: Protein ingestion increased plasma essential amino acid concentrations similarly in all participants (time effect: P<0.05) with concentrations peaked at 2 h and returning to baseline values at 5 h. The obese participants had a greater peak postprandial plasma insulin response to protein ingestion than the overweight and healthy-weight participants (p = 0.86) compared to overweight 11.9±1.6 and overweight 14.3±1.7 µIU/L, P=0.001). Protein ingestion increased myofibrillar protein synthesis in both the healthy-weight (rest: 0.057±0.006 %/h, fed: 0.084±0.014 %/h) and overweight groups (rest: 0.061±0.007, fed: 0.087±0.019 %/h) (P<0.05) with no increase in the obese group (rest: 0.055±0.005 %/h, fed: 0.067±0.005 %/h, P=0.45).

CONCLUSIONS: Increased adiposity led to an impaired postprandial muscle protein synthetic response to protein ingestion in obese adults when compared to healthy-weight and overweight individuals. These data suggest that poor skeletal muscle remodeling may underlie early metabolic impairments in apparently “healthy” obese adults.

Funding provided by the National Pork Board
**A-27 Thematic Poster - Running Footwear: Less or More?**

**Wednesday, June 1, 2016, 9:30 AM - 11:30 AM**

**Room: 103**

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**Chair:** Rebecca E. Felli, U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(No relationships reported)

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**93 Board #1**

**June 1, 9:30 AM - 11:30 AM**

**Effects Of Different Footwear On Ankle Range Of Motion And Postural Stability**

Jeffrey B. Powell, Amanda Strauch, Jung-Hyun Kim, Aitor Coca. NIOSH/CD/P/NPPTL, Pittsburgh, PA.

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(No relationships reported)

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**PURPOSE:** The purpose of this study was to assess the effects of different footwear on functional ankle ROM and postural stability under a dynamic balance perturbation condition in healthy individuals.

**METHODS:** Eight healthy male subjects (mean: age 23.6 years, height 182 cm, weight 81.9 kg) completed four experimental conditions: barefoot (BF), athletic shoes (AS), minimalist footwear (MF), and military boots (MB). Postural stability has been shown to be a risk factor for ankle injuries, a common ailment in the armed forces. If certain footwear can show advantages toward improved postural stability, there will be the potential for future studies to examine extended use.

**RESULTS:** Ankle ROM for plantar flexion and inversion were significantly decreased with MF and RB. These results suggest that footwear characteristics such as shoe material, sole height, and boots shaft to which communications feedback from the high-top ankles and more rigid body of MB. The MF scores indicate better stability compared to AS acutely. This could be due to less material interfering with the ability to respond to perturbations. By training in MF, individuals could have exposure to accelerated proprioception that might otherwise be muted by AS, experience strengthening benefits, and experience postural stability enhancements longitudinally. This could lead to a reduction in ankle injury risk. Lower scores in MB compared to AS were not expected, but it could be due to the cutaneous enhancements longitudinally. This could lead to a reduction in ankle injury risk. Lower scores in MB compared to AS were not expected, but it could be due to the cutaneous feedback from the high-top ankles and more rigid body of MB. Supported by the Freddie H. Fu, MD Graduate Research Award.

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**Board #2**

**June 1, 9:30 AM - 11:30 AM**

**Better Dynamic Postural Stability While Wearing Minimalist Footwear in Physically-Active Male Adults**

Paul N. Whitehead 1, Timothy C. Sell 1, Mita Lovalekar 1, Matthew E. Darnell 1, Nicholas R. Heebner 1, John P. Abt, FACSM 2, Scott M. Lephart, FACSM 1, University of Pittsburgh, Pittsburgh, PA. University of Kentucky, Lexington, KY. (Sponsor: John P. Abt, FACSM).

Email: pnw3@pitt.edu

(No relationships reported)

Minimalist footwear (MF) has gained significant popularity over the last five years. The majority of existing research has examined running-related injuries and kinematics, but MF may provide a therapeutic benefit when integrated with strength and conditioning programs. To establish if MF is therapeutic, acute differences in a task of dynamic postural stability was assessed in athletic shoes (AS), MF, and military boots (MB). Postural stability has been shown to be a risk factor for ankle injuries, a common ailment in the armed forces. If certain footwear can show advantages toward improved postural stability, there will be the potential for future studies to examine extended use.

**RESULTS:** Ankle ROM for plantar flexion and inversion were significantly decreased with MF and RB. These results suggest that footwear characteristics such as shoe material, sole height, and boots shaft to which communications feedback from the high-top ankles and more rigid body of MB. The MF scores indicate better stability compared to AS acutely. This could be due to less material interfering with the ability to respond to perturbations. By training in MF, individuals could have exposure to accelerated proprioception that might otherwise be muted by AS, experience strengthening benefits, and experience postural stability enhancements longitudinally. This could lead to a reduction in ankle injury risk. Lower scores in MB compared to AS were not expected, but it could be due to the cutaneous feedback from the high-top ankles and more rigid body of MB. Supported by the Freddie H. Fu, MD Graduate Research Award.

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**Board #3**

**June 1, 9:30 AM - 11:30 AM**

**Minimalist Running Shoes Increase Intrinsic And Extrinsic Foot Muscle Volume In Habitual Shod Runners**

Roy TH Cheung 1, Louis K. Sze 1, Tony L. Chen 1, Irene S. Davis, FACSM 2. ‘Hong Kong Polytechnic University, Hong Kong’. Harvard University, Cambridge, MA. (Sponsor: Prof. Irene S Davis, FACSM).

Email: Roy.Cheung@polu.edu.hk

(No relationships reported)

Minimalist footwear (MF) running has gained popularity recently partially because it is claimed to strengthen the intrinsic and extrinsic foot muscles. However, there is limited data on the change in muscle size associated with a transition to MF.

**RESULTS:** Ankle ROM for plantar flexion and inversion were significantly decreased with MF and RB (p<0.01) whereas dorsiflexion and eversion showed a decreased trend without a significant main effect. Postural stability, as evidenced by an increase in OSI, was significantly impaired with BF (p<0.05), but no difference was noted with other types of footwear compared to BF.

**CONCLUSION:** In this study, functional ankle ROM was influenced by different footwear characteristics such as shoe material, sole height, and boots shaft to which communications feedback from the high-top ankles and more rigid body of MB. The MF scores indicate better stability compared to AS acutely. This could be due to less material interfering with the ability to respond to perturbations. By training in MF, individuals could have exposure to accelerated proprioception that might otherwise be muted by AS, experience strengthening benefits, and experience postural stability enhancements longitudinally. This could lead to a reduction in ankle injury risk. Lower scores in MB compared to AS were not expected, but it could be due to the cutaneous feedback from the high-top ankles and more rigid body of MB. Supported by the Freddie H. Fu, MD Graduate Research Award.

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**Results:**

*Comparison significantly different from BF (p<0.05)*

<table>
<thead>
<tr>
<th>Footwear</th>
<th>BF</th>
<th>AS</th>
<th>FB</th>
<th>RB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plantar flexion</td>
<td>45.5±12.0</td>
<td>41.3±6.5</td>
<td>20.7±5.0*</td>
<td>25.1±8.4*</td>
</tr>
<tr>
<td>Dorsiflexion</td>
<td>19.0±3.2</td>
<td>17.8±2.8</td>
<td>16.4±3.3</td>
<td>14.8±3.8*</td>
</tr>
<tr>
<td>Inversion</td>
<td>33.8±9.2</td>
<td>32.8±9.7</td>
<td>22.9±7.0*</td>
<td>19.5±8.2*</td>
</tr>
<tr>
<td>Eversion</td>
<td>40.2±11.0</td>
<td>40.1±8.3</td>
<td>29.7±14.6</td>
<td>30.4±13.6</td>
</tr>
<tr>
<td>OSI</td>
<td>0.7±0.2</td>
<td>0.9±0.3</td>
<td>1.2±0.5*</td>
<td>1.0±0.3</td>
</tr>
</tbody>
</table>

**Results:** The estimated average requirement (EAR) was determined as the breakpoint after bi-phase linear regression analysis of 13CO2 with a population safe intake defined by the upper 95% confidence interval.

**RESULTS:** A (68.3±2.9 μmol/kg/h) was not affected (P=0.99 by protein intake. F13CO2 displayed a robust bi-phase linear relationship (r 2 = 0.86) that resulted in an EAR and population-safe intake of 1.55 and 1.73 g protein/kg/d, respectively.

**CONCLUSIONS:** We report a population safe intake that is greater than previously determined in non-exercised adults by IAAO (1.24 g/kg/d) and the current recommended daily allowance of 0.8 g/kg/d. Our results suggest that the metabolic demand for protein in endurance-trained adults after a 20-km run is greater than their sedentary peers and potentially the current recommendations for athletes based on nitrogen balance.
Minimal footwear running shows shorter stride lengths (higher stride frequencies) vs. traditionally heel-elevated shoes (Lieberman, 2012). Previous research demonstrates running economy (RE) of barefoot running on a treadmill or over-ground is 2.0-5.7% more economical than shoe running (Hanson et al., 2011) and that minimal shoe running is more economical than shod running (2.4-3.3%).

**RESULTS**

To examine differences in running economy between treadmill trials among experienced (EM) and non-experienced minimalist (NM) shoe runners wearing minimalist and traditional footwear.

**METHODS:**

Nineteen experienced runners (running ≥3 days/wk, ≥30 min/run, ≥3 mo) completed the study (age 22 ± 4 y, height 174.5 ± 11.3 cm, weight 74.8 ± 15.7 kg, BMI 24.3 ± 2.3 kg/m²). Twelve EM (five withdrew) and 12 NM runners were recruited. A randomized crossover design was employed with each treadmill test occurring a week apart, each participant serving as their own control. The treadmill test consisted of four, ten-minute continuous stages (2, 3, 6 mph, and a self-selected speed of at least 6.5 mph, all 0% grade). The self-selected speed was kept the same for both trials. The only difference between the two trials was type of footwear (minimal (MF) or traditional (TF)). Treadmill data was recorded during the last two minutes of each stage for expired gases (VO2, VCO2, and VE) and steps/min, which were hand-counted by two investigators. A two-tailed, dependent t-test was used to analyze shoe weight, steps/min, VO2, VCO2, and VE for each of the four stages.

**RESULTS:**

Step rates for all stages were greater in MF (p<0.05), specifically Stage 4 (MF = 99.7 ± 3.9, TF = 99.3 ± 4.1 steps/min, p=0.001). Stage 4 VO2 differed for both relative (MF = 33.9 ± 2.7, TF = 40.0 ± 2.3 ml/kg/min, p=0.03) as well as absolute values (MF = 2.92 ± 0.68, TF = 2.99 ± 0.69 L/min, p=0.04). Additionally, MF were lighter compared to the TF (309.2 ± 48.9, 330.1 ± 162.4 grams, p=0.001). Based on coefficient of determination, the effect of shoe weight on improved running economy was 8% in relative and 13% in absolute VO2.

**CONCLUSIONS:**

Footwear had an immediate impact on stride mechanics as all runners ran with a higher step rate in MF. MF improved running economy (2.33-2.75%), based on VO2 values at a self-selected pace. These results lend credence to claims of MF improving running economy.

Methods: Twelve moderately trained subjects (10 male, 2 female), all habitual shod runners, participated in a series of 5 maximal trials 7 days apart. During the first two trials, the subjects completed two exhaustive incremental peakVO2 efforts on a treadmill, running either with MRS or with their shoes in a random order. On Day 3 they completed a 3 km race on a treadmill running with the MRS, for familiarization with the race performance trial. During the last two laboratory visits, the subjects completed 5 km race trials on a treadmill, either with the MRS or the shod condition in a random order. Paired T-tests for dependent samples were used for the statistical analysis. Results: Mean (±sd) MRS and shod running peakVO2 values 54.68 ± 3.74 and 54.04 ± 4.44 ml.min⁻¹.kg⁻¹ respectively was not different (p=0.532). Mean (±sd) time for the 5 km race performance also was not different (p=0.225) between MRS and shod conditions (1446 ± 139.22 vs 1458 ± 141.05 s). Conclusions: The results of the present study show no effect of MRS in habitually shod runners on peakVO2 and 5 km race performance time. Despite however, the lack of significance there was a tendency for faster times with MRS condition. Future studies may need to extend the familiarization period with MRS to notice significant running performance benefits.

**Funding:**

Sponsorship provided by grants from the American Society of Exercise Physiologists and the American College of Sports Medicine.

**Conflict of Interest:**

No relationships reported.
mph, PS-1 mph) in each shoe condition (6 total conditions). Day 2: Subjects ran on a treadmill at two different inclines (0%, 6%) in each shoe condition (4 total conditions). For attention conditions, subjects ran for 8-10 minutes while rate of oxygen consumption (VO₂) was recorded (Moxus). Average VO₂ during each condition was calculated and compared Day 1 using a 2 (shoe) x 3 (speed) and Day 2 using a 2 (shoe) x 2 (incline) repeated measures ANOVA (α=0.05).

RESULTS: VO₂ was not influenced by the interaction of speed and shoe (p=0.496). VO₂ was different between shoes (p=0.029) but not between speeds (p=0.191). VO₂ was not influenced by the interaction of incline and shoe (p=0.054). VO₂ was greater for incline (increasing on average 40.0% with incline; p=0.017) but not different between shoes (p=0.059).

CONCLUSIONS: It seems that the cushioning of the shoe (extreme vs. regular) play no role in the influence of running economy.

101 Board #8 June 1, 9:30 AM - 11:30 AM Running Shoe With Extra Midsole Thickness Increase Foot Horizontal Instability During Treadmill Running Shuai Zhang1, Li Li, FACSM2, 1Northern Illinois University, Dekalb, IL 2Georgia Southern University, Statesboro, GA.

(No relationships reported)

PURPOSE: Opposite to the design concept of the minimum running shoes, maximum running shoes provide extra midsole thickness for additional cushioning. This additional midsole thickness might lead to instability in both medial-lateral (ML) and anterior-posterior (AP) directions. The goal of this study was to calculate the forces and the variability of forces (FVar) in horizontal directions (ML and AP) among maximum, regular, and minimum running shoes. METHODS: Eight participants ran on instrumented treadmill at 3.5ms wearing three different running shoes in a random order. In each trial, ten steps were recorded bilaterally for both left and right. Maximum force (FMax) and Minimum force (FMin) were determined during each step at the ML and AP directions. Variability (FVar) was calculated with the standard deviation of the ten-trial ensemble curve at each ten percent of the stance phase. Two-way MANOVA (Shoe and left / right foot as independent variables) was performed to detect the different variability of forces (FVar-Min, FVar-Max, FMax-Min, and FMax-AP). Tukey post hoc employed when needed. Alpha was set at 0.05.

RESULTS: Significant different peak forces were observed among different running shoes in the positive directions (anterior and lateral). FMax-ML (lateral) for the regular shoe (89.7±3.1 N) was much greater than that of the minimum shoe (76.3±3.1 N) and the maximum shoe (75.2±3.1 N). Positive AP (anterior), FMax-AP for the maximum shoe (229.1±3.8 N) was much greater than that of the minimum shoe (213.2±3.8 N). There was significant different variability among three types of shoes. FVar-AP showed significant difference, where FVar-AP for the maximum shoe (39.4±1.1 N) was much greater than that of the minimum shoe (35.3±1.1 N). CONCLUSIONS: Comparing to regular and minimum running shoes, maximum shoe provides greater horizontal instability, specifically greater medial-lateral peak force and greater variability at the AP direction.

A-28 Thematic Poster - Sleep

Wednesday, June 1, 2016, 9:30 AM - 11:30 AM

Room: 110

Chair: Rebecca Spencer. University of Massachusetts, Amherst, MA.

(No relationships reported)

102 Board #1 June 1, 9:30 AM - 11:30 AM Sleep Disorders And Physical Functioning In Us Adults: Results From NHANES 2005-2006 Shipta Puri, John P. Collins, Baian Baattaiah, Jeffrey E. Herrick. George Mason University, Fairfax, VA. (Sponsor: Dr. Randall E. Keyser, FACSM)

(No relationships reported)

Sleep disorders (SDs), such as obstructive sleep apnea, insomnia and restless legs syndrome, affect approximately 35 to 40% of the U.S. adult population annually and yet frequently overlooked. SD hinders daily functioning and has negative impact on health and longevity. It is plausible that SD adversely affect physical functioning (PF) that mediates the ability to perform activities of daily living.

PURPOSE: This secondary data analysis using cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) 2005-2006 assessed the relationship between SD and PF in U.S. adult population. METHODS: For the present analysis, NHANES SD and PF questionnaires were used. Participants were classified as having PF limitation (PFL) if they reported difficulty or an inability to do at least one of the 10 tasks selected from the PF questionnaire. The presence of SD was measured by a yes to any of the following SD: sleep apnea, insomnia or restless leg syndrome; or yes to “ever told by doctor have a SD”. In addition, a comorbidity score (CS) was generated on the basis of participant’s total number of self-reported comorbidities. The impact of age, gender and body mass index (BMI) on PF was also examined. The chi-square test was used to analyze the association between SD and PF.

RESULTS: The sample population consisted of 1413 adults (54% women) with mean age of 63 ± 16.4 years, and BMI of 29.7 ± 7.6. About 12% (n = 169) of the population reported to have both SD and PFL. SD was significantly related to PFL with a Pearson chi-square of 40.15 (p ≤ 0.0001). Multivariate regression analysis revealed that SD, CS, female gender, and BMI had a large effect on PF (R² = 0.25, p < 0.001) in the model. BMI had a small effect on PFL (β = 0.027, p = 0.092) accounting for the effects of SD, comorbids conditions, and gender.

CONCLUSION: Sleep disorder is significantly associated with physical functioning limitations. Given the gender effect in our model, inclusion of strategies to minimize sleep disturbance may impact physical performance of women with co-morbid conditions. Overall, our results implicate sleep optimization strategies as one important method for attenuating the progression of physical functioning limitations in adults.

105 Board #3 June 1, 9:30 AM - 11:30 AM Physical Activity Mediates the Relationship Between Sleep Quality and Vascular Health in Older Adults Kayla M. Nunemacher, Jacqueline A. Augustine, Wesley K. Lefferts, Tiago V. Barreira, Kevin S. Heffner. Syracuse University, Syracuse, NY. (Sponsor: Bo Fernhall, FACSM)

(No relationships reported)

Stiffening of the arterial wall with advancing age increases risk for cardiovascular disease. Optimal sleep quality is correlated with lower arterial stiffness. Sleep quality decreases with age which may negatively impact vascular health. It is unclear if there is a direct relationship between arterial stiffness and sleep quality in older adults, and if the relationship is mediated by other lifestyle factors such as physical activity (PA).

PURPOSE: To evaluate PA as a mediating factor in the relationship between sleep quality and arterial stiffness in older adults. METHODS: Seventy-five older adults (mean age 68 ± 6 years, body mass 74.2 ± 15 kg, 40 female) participated in the study. Body fat was assessed using air displacement plethysmography. Central artery stiffness was assessed as carotid-femoral pulse wave velocity (PWV) paraesthesia tonometry, and brachial systolic and diastolic blood pressure were assessed using an automated oscillometric brachial cuff. Self-reported sleep quality was assessed using the Pittsburgh Sleep Quality Index. PA was measured using an accelerometer worn around the wrist and expressed as total activity counts. The accelerometer was

Abstracts were prepared by the authors and printed as submitted.
Sleep and its effect on an individual’s health is becoming recognized as an important aspect of preventative care for many chronic diseases. Wearable trackers that detect sleep offer users a way to track their sleep quality and patterns. However, no studies have tested the validity of these trackers on sleep measure. PURPOSE: To examine the validity of wearable fitness trackers for estimating total sleep time (TST) with respect to a sleep log as a reference measure. METHODS: Nineteen healthy individuals (mean ± SD; age = 29.9 ± 13.4 years; body mass index = 25.8 ± 5.0 kg/m2) participated in the study. Participants randomly assigned to one of two groups. Group 1 (n=10) wore the BodyMedia SenseWear Mini Armband (SWA), Basis Peak (BP), and Fitbit Charge HR (FB). Group 2 (n=9) wore the ActiGraph Sleep (AG), Jawbone UP3 (JU), and Garmin Vivosmart (GV). Trackers were worn on the non-dominant wrist for one night and a sleep log was completed. Two-existing sleep algorithms for the AG (Sadegh and Cole-Kripke) and Fitbit sleep sensitive algorithm were also included for comparison. Pearson correlation was used to examine the linearity of mean TST minutes (TSTM) from each tracker compared to the log TSTM. Mean absolute percentage errors (MAPE) of TSTM from each tracker were calculated against the log TSTM. Lastly, no differences in TST were examined by a general linear model for repeated measures. RESULTS: Pearson correlation coefficients were .32, .69, .24, and -.26 for the SWA, FB, and FBs with regard to log TSTM, respectively. Group 2 correlations between the log TSTM and Sadeh, Cole-Kripke, JU, and GV were .34, .65, .54, and .92, respectively. MAPE were 17.1%, 16.3%, 40.2%, and 32.9% for SWA, FB, FBs, and BP, respectively. MAPE of 17.0%, 11.5%, 14.9%, and 10% were observed for Sadeh, Cole-Kripke, JU, and GV, respectively. Bland-Altman Plots showed no systematic bias between all variables for TSTM compared with log TSTM. ANOVA and post-hoc analysis revealed a significant difference in the Fitbit sensitive TSTM (p<0.001) in Group 1 (F (5, 51) = 8.96, p=0.00) and no significant difference between Group 2 (F (4, 40) = 1.27, p=0.296). CONCLUSION: The FB, Cole-Kripke, JU, and GV display the closest estimation of TSTM compared with log TSTM minutes. However, further research is needed to validate these monitors with polysomnography.

Physical activity and eating behaviors are often targeted for modification in behavioral weight loss interventions. However, whether sleep is related to the extent to which these behaviors change in weight loss interventions is unknown. PURPOSE: To examine whether baseline sleep and changes in sleep are related to changes in physical activity (PA) and barriers to healthy eating in a behavioral weight loss intervention. METHODS: A sample of 117 adults (51.4±9.9 y; 33.9±4.5 kg/m2) participated in a 12-mo weight loss intervention. Sleep was assessed objectively at baseline and 12 mo with actigraphy and the Pittsburgh Sleep Quality Index. At baseline and 12 mo, PA was assessed with approximately 7 d of waist accelerometry (ActiGraph GT3x) and perceived barriers to healthy eating were assessed with the Barriers to Healthy Eating (BHE) questionnaire. Multiple linear regression models assessed the influence of sleep (baseline, 12-mo change) on 12-mo changes in PA and BHE scores after adjusting for age, sex, race, and body mass index. RESULTS: Baseline WASO and TST were 37.2±14.9 min and 399.8±51.7 min per night, respectively; baseline PSQI score was 6.4±3.5. At 12 mo relative to baseline, time spent sedentary decreased by 40.9±78.0 min/day, time spent in moderate to vigorous PA (MVPA) increased by 5.3±6.3 min/day, and BHE scores decreased by 8.9±14.4. Worse baseline WASO and TST were associated with less reduction in sedentary time at 12 mo (β=−0.20 [P<0.04] and β=−0.25 [P<0.01], respectively), whereas greater baseline WASO was associated with a smaller 12-mo increase in MVPA (β=−23, P<0.05). Increased TST from baseline to 12 mo was associated with a greater reduction in sedentary time (β=−19, P<0.04). Greater baseline WASO was associated with lower improvement in BHE scores (β=−25, P<0.01), and improved sleep quality from baseline to 12 mo was associated with greater increases in MVPA (β=18, P<0.05).

Conclusion: Baseline sleep and changes in sleep were associated with changes in PA and BHE during a lifestyle intervention. Sleep may be an important determinant of changes in PA and eating behaviors when attempting weight loss.

Sleep disorders have been reported as a risk factor for mortality, coronary heart disease, hypertension, obesity, diabetes, depression, and dementia. The acquisition of quality sleep is considered useful for the prevention of Non-Communicable Disease as well as the prevention of sleep disorders. It is our hypothesis that sleep can be induced by light fatigue from physical activity during daytime. Previous studies reported that exercise as non-drug therapy is effective as a means of preventing a sleep disorder. But exercise intensity using an exercise program is too strong in gray-zone Japanese people. PURPOSE: To examine the effect of an exercise program on sleep in elderly people. METHODS: Fifty-one subjects met the inclusion criteria for this study. We recommended that these subjects participate in a sleep seminar. These subjects were assigned to intervention (exercise n=26) or control (n=25) groups (randomized control trial). The exercise program consisted of an increase in physical activity for 10 minutes more than the activity amount of their former daily life as well as a lecture on sleep. The subjects were encouraged to perform physical activity at home every day. The control group attended a seminar lecture. The seminar was held every week (90 minutes per seminar). The study period was 4-weeks. Sleep condition was examined using the Pittsburgh sleep quality index (PSQI). Two-way analysis of variables was used to examine intervention effects on sleep. RESULTS: The rate of compliance with this program was 92% in the intervention group and 84% in the control group. The average attendance rate at the seminars was 94% in the intervention group and 96% in the control group. The PSQI score was 9.7 before and 9.0 after the intervention group, and 9.2 before and 7.4 after in the control group. The interaction was not significant between the intervention group and the control group. CONCLUSIONS: The intervention program had high participation, but there were not so many positive results. In conclusion, our study did not confirm our hypothesis. We expected that satisfying sleep would be obtained in the intervention program, but this was not the case. However, we suspected that our expected result could be achieved with an increase in the exercise program’s duration and intensity.

Adolescence is a vulnerable period for experiencing insufficient sleep due to puberty-related changes in circadian rhythm and increasing sleep deprivation during school days. Physical activity (PA) and sedentary behaviors (SB) are well-documented, modifiable sleep hygiene behaviors independently associated with sleep duration; however, scarce data are available regarding their concurrent associations in adolescents. PURPOSE: This study examined the concurrent associations of PA and screen-based SB on sleep duration in US adolescents using a latent class analysis (LCA) approach. METHODS: A total of 11,204 adolescents who participated in the 2013 Youth Risk Behavior Survey were analyzed. The outcome variables of interest included self-reported PA regarding 1) moderate and vigorous-intensity PA ≥ 60 minutes/day; 2) sport team participation


RESULTS:
Four latent subgroups with varying levels of PA and screen-based SB were identified. Using the estimated response probability ≥ 0.50 as a threshold to determine ‘High’ level of respective PA and screen-based SB items, four latent subgroups were characterized as the High PA/Low SB (26.0%), High PA/High SB (23.2%), Low PA/Low SB (29.4%), and Low PA/High SB (21.2%). The likelihood of having sufficient sleep was greater for the High PA/Low SB when comparing to the High PA/High SB (OR = 1.51) and Low PA/Low SB (OR = 1.49), whereas no difference was found when comparing to the Low PA/High SB.

CONCLUSIONS:
The results demonstrated the complexity of concurrent associations of PA and screen-based SB with sleep duration in adolescents. However, the findings generally implied that increasing PA and reducing screen-based SB would yield greater likelihood of having sufficient sleep in this population.

110 Board #8 June 1, 9:30 AM - 11:30 AM
The Relationship between Sleep Quantity and Quality and Cardiovascular Disease Risk Factors in Children
Caroline T. Casc. University of New England, Biddeford, ME.
(No relationships reported)

Duration of sleep has been declining over the past two decades in both adults and children which has paralleled the rise in obesity in our society along with other negative health outcomes. The threshold in which we observe negative health outcomes based on quantity (total sleep time (TST)) and quality (number of sleep interruptions (NSI) and total sleep interruption time (TSIT)) is not clearly understood in children. PURPOSE: The purpose of this study was twofold: 1) determine if children have a greater overall cardiovascular (CV) risk profile with decreased sleep duration and quality, and 2) determine if there is a threshold point where sleep quality and quantity is associated with an increased CV risk profile. METHODS: Four hundred and seventy-six fourth grade students from the Cardiovascular Health Intervention Program went through a CV risk factor analysis (256 females, 219 males, mean age 9.2 ± 0.7 years, height 142 ± 2cm and weight 38 ± 5kg). Participants completed a fasting blood draw and provided a physical activity diary. The sample was divided into subgroups according to the normative age-specific test results of the fitness evaluation. Differences of the subgroups were compared to the entire sample group using chi-square tests. RESULTS: Overall, poorer sleep quality (NSI and TSIT) and reduced sleep quantity (TST) were associated with a higher CV risk (p<0.01; OR = 2.07) in children. Moreover, participants who slept <9 hours per night had a greater overall cardiovascular risk compared to those who slept 9-10 hours per night (p<0.01; OR = 1.51) and those who slept ≥11 hours (p<0.01; OR = 1.49) compared to the group with the optimal sleep duration (9-10 hours). CONCLUSIONS: Sleep duration, quality, and quantity are all factors that contribute to the development of cardiovascular risk in children.

A-29 Thematic Poster - VO2 Kinetics
Wednesday, June 1, 2016, 9:30 AM - 11:30 AM
Room: 104

111 Chair: John M. Kowalchuk. University of Western Ontario, London, ON, Canada.
(No relationships reported)

112 Board #1 June 1, 9:30 AM - 11:30 AM
Chronic Omega-3 Fatty Acid Supplementation And Oxygen Uptake Kinetics During Heavy Exercise
Chad C. Wiggins, Shane A. Bielko, Allison J. Campbell, Timothy D. Mickleborough, FACSM, Robert F. Chapman, FACSM. Indiana University, Bloomington, IN. (Sponsor: Robert F. Chapman, FACSM)
Email: chcwiggii@indiana.edu
(No relationships reported)

PURPOSE: To examine the effects 6 weeks of chronic omega-3 fatty acid (O3FA) supplementation (3 g EPA, 2 g DHA) on oxygen uptake and muscle extraction kinetics during constant load cycling in normoxic and normobaric hypoxic conditions. METHODS: 13 endurance trained cyclists were divided into two groups, O3FA (n = 6, VO₂max = 60 ± 2.25 ml·kg⁻¹·min⁻¹), and placebo (n = 7, VO₂max = 62 ± 1.41 ml·kg⁻¹·min⁻¹). Subjects completed an incremental exercise protocol to determine maximal oxygen consumption and maximal power output on a mechanically-braked cycle ergometer. In subsequent sessions, subjects completed three minutes of a constant load cycling test at 75% of normoxic peak power at simulated altitude (FIO₂ = 15.0%) and at sea-level (FIO₂ = 20.9%), prior to 6 weeks of supplementation (baseline) with either O3FA or placebo. Following supplementation, subjects repeated the normoxic and hypoxic constant-load cycle exercise bouts. Breath-by-breath VO₂ was measured continuously, and skeletal muscle deoxygenation (deoxygenated hemoglobin/myoglobin [HHb/HHb]) via near-infrared spectroscopy (NIRS) was measured. Kinetic time constant was calculated as time to 63% of primary component response (HHb/HHb - t₁/2). RESULTS: Chronic O3FA supplementation improved the VO₂ uptake response time (VO₂ - t₁/2 = 23 ± 3.6s post-supplementation; 31 ± 6.2s pre-supplementation; p < 0.05) during exercise in normoxia, with no changes in the placebo group pre- to post-supplementation. VO₂, primary component amplitude was lower in the O3FA group (3.19 ± 0.60 L/min post-supplementation; 3.44 ± 0.60 L/min pre-supplementation; p < 0.05) in normoxia, following supplementation. There were no significant differences in any of the [HHb, HHb] parameters during normoxic exercise in either group. There were no significant differences in any of the [HHb] or VO₂ parameters during hypoxic exercise between pre- and post-supplementation in either group. CONCLUSION: 6 weeks of O3FA supplementation is beneficial in improving oxygen uptake kinetics during heavy exercise in normoxic conditions, thus may lead to improvements in exercise tolerance to constant heavy load exercise. However, no improvements were seen in [HHb] or oxygen uptake kinetics in hypoxia following O3FA supplementation.

A-29 Thematic Poster - VO2 Kinetics
Wednesday, June 1, 2016, 9:30 AM - 11:30 AM

113 Board #2 June 1, 9:30 AM - 11:30 AM
Effects Of Endurance Training On Muscular V'O2 Kinetics In Type 2 Diabetes Patients
Jessica Koschate, Uwe Drescher, Christian Brinkmann, Uwe Hoffmann. German Sport University, Cologne, Germany. Email: j.koschate@dhs-koceln.de
(No relationships reported)

PURPOSE: Maximal V'O₂ is known to increase with endurance exercise interventions. Recently, a method has been developed to assess muscular V'O₂ (V'O2musc) kinetics from heart rate (HR) and pulmonary V'O₂ responses to work rate changes which allows a better differentiation between cardiovascular system and muscular metabolism. Cardiorespiratory kinetics were analyzed in type 2 diabetes subjects before and after an endurance exercise intervention. METHODS: 9 male subjects (61 ± 9 years, 33 ± 5 kg m⁻²) were tested for peak V'O₂ (V'O2peak), glyceremic parameters and cardiorespiratory kinetics using pseudo randomized binary work rate changes (30 ± 30 W). To estimate V'O₂musc and cardiorespiratory kinetics, the method of Hoffmann et al. (2013) was applied. Kinetics were summarized by maximum of cross correlation functions (CCFmax) and equivalents of time constants. Two pre-tests (Pre I, Pre II) within a 4 week period and a post-test after 12 weeks of endurance training were performed. Differences of the tests were analyzed via a two factorial ANOVA. P < 0.05 was considered significant. RESULTS: Table I shows the results of Pre I. Pre I and Post and tests (mean ± SD, * significantly different from Post). CONCLUSION: Endurance training improves both, V'O₂musc and heart rate kinetics in type 2 diabetes patients. This was in accordance with the increase in V'O₂peak. In contrast, no changes in glycemric parameters could be observed. V'O₂musc kinetics, assessed via moderate WR changes and independent of motivation, can be seen as an indicator for cardiorepiratory fitness and might be useful to measure increases in cardiorespiratory regulation.

<table>
<thead>
<tr>
<th>Time</th>
<th>V'O2peak [ml·m⁻²·min⁻¹]</th>
<th>HbA1c [%]</th>
<th>CCFmax (HR) [s]</th>
<th>Time constant (HR) [s]</th>
<th>CCFmax (V'O2musc) [s]</th>
<th>Time constant (V'O2musc) [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre 1</td>
<td>23.2 ± 3.4*</td>
<td>7.6 ± 0.6</td>
<td>0.23 ± 0.03</td>
<td>74</td>
<td>0.29 ± 0.03*</td>
<td>50</td>
</tr>
<tr>
<td>Pre 2</td>
<td>24.2 ± 4.2*</td>
<td>7.2 ± 0.2</td>
<td>0.25 ± 0.05</td>
<td>70</td>
<td>0.32 ± 0.09</td>
<td>49</td>
</tr>
<tr>
<td>Post</td>
<td>28.0 ± 5.6</td>
<td>6.9 ± 0.6</td>
<td>0.26 ± 0.03</td>
<td>59</td>
<td>0.37 ± 0.10</td>
<td>39</td>
</tr>
</tbody>
</table>

Reference: Hoffmann et al. (2013); EJAP, 113:1745-1754.
A number of studies have illustrated that blood flow restricted (BFR) resistance training increasing muscle function even when low-intensity training is utilized. Recently BFR has also applied to aerobic training; however less is known about the effect of aerobic training with BFR on the oxygen uptake (VO2) kinetic responses during exercise with or without BFR.

**PURPOSE:** To elucidate the effects of 8-weeks cycle training with BFR on VO2 kinetics at the onset of constant-load cycle exercise with or without BFR. **METHODS:** Eighteen healthy subjects were randomly assigned to BFR (n = 9; 22±5 yrs) or no BFR group serving as the control (CON; n = 9; 21±2 yrs). Both groups trained for 30 minutes, 3 days/week for 8 weeks. BFR was performed for 5 minutes every 10 minutes by applying cuffs to the upper thighs. Breath-by-breath VO2 was measured during the performance of 5-minute moderate intensity (below the lactate threshold) to 6-minute heavy intensity exercise (above the lactate threshold) without BFR at Pre-, 4 weeks after (Mid-), and Post-training. At Post, we also measured VO2 kinetics during exercise with BFR (Post+BFR). Two-way repeated ANOVAs were used (BFR vs CON and Pre vs Mid and Post vs Post+BFR) with significance accepted as p<0.05; and Tukey’s post hoc tests utilized as needed. **RESULTS:** Although time constant (τ) of VO2 kinetics at the fast component during moderate exercise fitted the exponential model was significantly faster in Mid and Post than that of Pre (26.8 to 16.3 and 15.5 s and 27.5 s respectively). Significant group-by-time interaction was not detected. The amplitude of the VO2 slow component during heavy exercise significantly decreased in Mid and Post than that of Pre (281 to 103 and 128 mL/min and 300 to 154 and 160 mL/min in BFR and CON, p<0.05, respectively), while a significant group-by-time interaction was not detected. Both τ of VO2 kinetics during moderate exercise and the amplitude of the VO2 slow component during heavy exercise significantly increased from 28.0 s and 266. and 256 mL/min in BFR and CON, p<0.05, respectively; however significant group-by-time interactions were not detected either. **CONCLUSION:** Applying the BFR to eight-weeks cycle training showed no further change in VO2 kinetics at the onset of exercise. Supported by KAKEHI (23700788).

**Ninoru Hotta1, Hisayoshi Ogata1, Takaharu Kondo1, Koji Ishida2, Norio Hotta1, Hisayoshi Ogata1, Takaharu Kondo1, Koji Ishida2, and Yasumi Amano3.**

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**CONCLUSIONS**

Incomplete spinal cord injury (iSCI) may result in gait abnormalities and prolonged oxygen uptake transitions at the onset of walking (VO2 on-kinetics). Locomotor training (LT) has been shown to improve gait performance in some individuals with iSCI but the effect of LT on the associated VO2 on-kinetics is not understood. **PURPOSE:** This pilot study investigated the effects of 15-weeks of LT on VO2 on-kinetics in adults with iSCI. We hypothesized that LT, when performed solely under volitional control and full-weight bearing, would speed VO2 on-kinetics.

**METHODS:** Three adult males with iSCI (age: 25.3±8.7 yrs; BMI: 24.0±5.7 kg/m2) completed an 15-weeks training regimen. VO2 on-kinetics was determined using a mono-exponential model in which oxygen uptake transitions at the onset of constant-load cycle exercise (VO2 on-kinetics) was modeled with a sigmoid (-1) to the limit of tolerance. Pulmonary VO2 was measured breath-by-breath. [HHb] and [tHb] were quantified in the VL and RF by time-resolved NIRS. Each NIRS profile was modeled with a sigmoid (y = B + A / [1 + exp(-c(x-d))]. B is baseline, A is amplitude, c is a constant dependent on d, d is the slope of the sigmoid, and f50 = c/d).

**RESULTS:** Greater VO2peak was associated with deoxygenation amplitude (f50 increases, not shown in f50) to support increased O2 extraction (via an increased capacity for O2 extraction in the knee extensors reflected in the greater amplitude for [HHb]). However, a greater capacity for diffusive O2 conductance across the active musculature in toto, together suggesting that a greater aerobic capacity is associated with improvements in both perfusive and diffusive O2 transport.

**CONCLUSIONS:** Greater VO2peak is associated with deoxygenation amplitude, not deoxygenation kinetics, across the active muscles. Daisuke Okushima1, Dai C. Poole, FACSM2, Thomas J. Barstow, FACSM3, H. Rossiter, FACSM3, T. Scott Bowen, Tatsurow Amano1, Norihiko Kondo1, Shunsaku Koga2, 1Kobe Design University, Kobe, Japan. 2Kansai University, Osaka, Japan. 3Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Torrance, CA. 4Leipzig University, Leipzig, Germany. 5Kobe University, Kobe, Japan. Email: oumanoyaokaco119@hotmail.co.jp

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Current methods for modeling and predicting oxygen uptake (VO2) dynamics often assume a linear relationship between exercise intensity and VO2 and typically rely on steady state measurements and population-specific equations. However, in reality VO2 has a nonlinear response to exercise intensity and is also highly dependent on the personal physiology of an individual.

**PURPOSE:** The aim of this study was to develop a nonlinear dynamical systems model for predicting person-specific VO2 dynamics in response to transient exercise intensities during cycling. **METHODS:** A nonlinear mathematical model for VO2 dynamics was derived using dynamical systems theory. To validate the model, VO2 data was collected from four regularly exercising healthy adult males (age: 23.5±3.0 years; height: 184±14 cm; body mass: 86.9±12.3 kg) during a fifty minute bout of cycling on an electric-braked cycle ergometer in the laboratory. The testing protocol for the cycling bout was designed to challenge the predictive capabilities of the model and the participants therefore absolutely changed their power outputs and cadences throughout the tests, which resulted in significant transient fluctuations in their VO2 responses. The model parameters for each participant were then determined using a heuristic parameter estimation technique, and the model was then used to predict the VO2 response of each participant over the course of the entire exercise bout to make comparisons with the experimental data. **RESULTS:** The model predictions were unable to match the experimental VO2 data for each of the participants with a high degree of accuracy (R2=0.92±0.04). **CONCLUSION:** These results suggest that person-specific VO2 dynamics can be accurately modeled and predicted during cycling by utilizing dynamical systems theory. Supported by the ARO through an NDSEG Fellowship.

**Michael J. Mazzoleni1, Claudio L. Battaglini, FACSM2, Kerry J. Martin2, Erin M. Coffman2, Brian P. Mann1.**

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It is axiomatic that individuals with a greater peak O2 uptake (VO2peak) sustain greater perfusive and diffusive O2 conductance across the active musculature in toto. However, it is unclear how these O2 conductances are regulated among knee extensor muscles that are spatially heterogeneous in blood flow, fiber type, and motor unit recruitment, in individuals whom vary in VO2peak.

**PURPOSE:** Using quantitative near infrared spectroscopy (NIRS) from rest to maximal exercise, we tested the hypotheses that with greater VO2peak the vastus lateralis (VL) and rectus femoris (RF) muscles would evince: 1) a greater increase in deoxyhemoglobin concentration ([HHb], an index of O2 extraction) and [hemoglobin] ([Hb], an index of diffusive O2 potential); and 2) a right-shift in the [HHb] half-time (f50, an index of relative perfusion); together suggesting that a greater aerobic capacity is associated with improvements in both perfusive and diffusive O2 transport.

**METHODS:** 22 healthy subjects completed ramp incremental cycling exercise (20 W/min) to the limit of tolerance. Pulmonary VO2 was measured breath-by-breath. [HHb] and [Hb] were quantified in the VL and RF by time-resolved NIRS. Each NIRS profile was modeled with a sigmoid (y = B + A / [1 + exp(-c(x-d))]. B is baseline, A is amplitude, c is a constant dependent on d, d is the slope of the sigmoid, and f50 = c/d).

**RESULTS:** Greater VO2peak ranged from 37.7 to 66.4 ml∙kg^-1∙min^-1. VO2peak was associated with the exercise-induced increase in [HHb] for both muscles (VL, r = 0.432; RF, r = 0.529, P < 0.05), and exercise-related increase in [HHb] for RF (r = 0.473, P < 0.05). However, VO2peak did not correlate with f50 for [HHb].

**CONCLUSIONS:** As expected, greater VO2peak during cycling was achieved, in part, via an increased capacity for O2 extraction in the knee extensors reflected in the greater amplitude for [HHb]. However, a greater capacity for diffusive O2 conductance (increase in [Hb]) to support increased O2 exchange, only related to VO2peak in the RF muscle. These results support that a greater VO2peak requires an increase in the maximal
Gait retraining is an emerging method of managing running-related injuries, including patellofemoral pain (PFP). However, as a result of an unnatural running pattern, it is possible that gait retraining can affect running economy. PURPOSE: The purpose of this study was to determine whether gait retraining by modifying footstrike patterns from rearfoot strike (RFS) to forefoot strike (FFS) increased running economy and heart rate immediately post-retraining and one month post-retraining. METHODS: Sixteen subjects (n=16) received clearance to participate by a licensed physical therapist, and were randomly assigned into the control (n=8) or experimental (n=8) group. Subsequently, the experimental group (EXP) performed eight gait retraining running sessions where footstrike pattern was switched from RFS to FFS, while the control group (CTL) performed eight running sessions with no intervention. Running economy (VO2), respiratory exchange ratio (RER), and heart rate (HR) were recorded during pre-, post-, and one-month post-running trials. RESULTS: There were no significant differences for VO2 (p=0.26), RER (p=0.258), or HR (p=0.248) between the groups as a result of retraining. Specifically, the average changes from pre-training to one-month post-retraining for CTL and EXP, respectively, were 0.03 ml/kg/min and 2.29 ml/kg/min for VO2 and 0.01 and 0.03 for RER, and -3 bpm and 12 bpm for HR.

CONCLUSION: Retraining from RFS to FFS did not increase running economy one-month post-retraining.

Previous studies from our lab and others have shown that estradiol deficiency in rodents and post-menopausal women results in skeletal muscle strength deficits. There are three known estrogen receptors (ERalpha, ERbeta, and GPER30) and estrogen is known to elicit its effects through estrogen receptors in other tissues. Whole body ERalpha knockout mice exhibit metabolic disorders with little known regarding the specific role of estrogen receptor alpha in skeletal muscle. PURPOSE: To identify the impact of ERalpha on skeletal muscle in vivo contractile function. METHODS: ERalpha flox mice were crossed with Human Skeletal Muscle (HSA) cre mice to create a skeletal muscle specific ERalpha knockout mouse (skmERalphaKO). Muscle strength of the posterior crural muscles of 4-6 month female skmERalphaKO mice and wild type (WT) littermates was assessed in isoflumane-anesthetized mice. RESULTS: There was no effect of skeletal muscle ERalpha knockout on body mass. Skeletal muscle knockout of ERalpha results in weaker muscles. Posterior crural muscles of skmERalphaKO mice exhibit 14% lower peak isometric torque and 16% lower peak concentric torque than skmERalphaWT mice (p<0.01). Additionally, higher stimulation frequencies are required to generate torque in skmERalphaKO mice compared to skmERalphaWT mice with 50% maximal torque being reached at 47 Hz for skmERalphaKO mice and 43 Hz for WT mice (p<0.042). Finally, power at low velocity was 15% lower in skmERalphaKO mice compared to skmERalphaWT mice (p<0.029).

CONCLUSIONS: ERalpha plays an important role in skeletal muscle strength. Ablation of ERalpha in skeletal muscle results in muscles that produce less torque and power. This research was supported by NIH grant R01-AG031743 and American Diabetes Association grant (EES). TLM was supported by University of Minnesota Doctoral Dissertation Fellowship. BCC was supported by T32-AR07612.
to control mice by 39%. Genetic ablation of TAK1 in skeletal muscle significantly reduced the levels of specific muscle proteins whereas the levels of atrogin-1, polyubiquitinated proteins, and autophagy activity were increased. **CONCLUSION:** These data demonstrate that TAK1 is essential for maintenance of skeletal muscle in adult animals. Supported by NIH Grant AR059810 and AG029623 to AK.

### June 1, 10:00 AM - 10:15 AM

**The Effects of Acute Resistance Exercise on Apoptotic Signaling in Untrained Males**


(Apoptosis, or programmed cell death, is an essential physiological process regulating cellular development and is often associated with advanced stages of inflammation and disease. However, limited research has focused on skeletal muscle apoptosis as a result of exercise induced muscular trauma. PURPOSE: To observe the effects of the acute lower-body resistance exercise protocol and subsequent recovery on intramuscular apoptotic signaling. METHODS: Twenty-eight untrained males (22.3 ± 3.2 y, 1.7 ± 0.1 m, 81.1 ± 15.5 kg) were assigned to either a control (CON; n=11) or exercise group (EX; n=17) and completed a lower-body resistance exercise protocol consisting of the back squat, leg press, and leg extension exercise. Skeletal muscle microarrays were obtained from the vastus lateralis pre-exercise (PRE), 1-hour (1HR), 5-hour (5HR), and 48-hours (48HR) post-exercise resistance exercise. Multiplex signaling assay kits (EMD Millipore, Billerica, MA, USA) were used to quantify the total protein (Caspase-3, 8, 9) or phosphorylation status of proteins (JNK, FADD, p53, BAD, Bcl-2) specific to apoptotic signaling pathways using MAGPIX® (Luminex, Austin, TX, USA). Mann Whitney U analysis was used to determine the effects of the exercise bout on intramuscular signaling. Additionally, change scores were analyzed by magnitude based inferences to determine a mechanistic interpretation. RESULTS: Mann Whitney U analysis revealed that resistance exercise increased JNK phosphorylation at 1H (p<0.001) and 5H (p=0.022), and FADD phosphorylation at 1H (p=0.029). No other differences observed between groups. Magnitude based inferences revealed a “Likely” increase in total Caspase 3 from PRE-5H and from PRE-48H. JNK phosphorylation was “Most Likely” increased from PRE-1H and PRE-5H and FADD was “Likely” increased from PRE-1H. BAD was “Very Likely” increased from PRE-5H and Bcl-2 was “Most Likely” increased from PRE-1H and “Likely” increased from PRE-5H. **CONCLUSION:** These data show that apoptotic signaling is upregulated in response to a typical resistance exercise protocol, providing additional insight into the physiological mechanisms involved in skeletal muscle remodeling following resistance exercise.

### June 1, 10:15 AM - 10:30 AM

**Genetic Variation Of The Beta-2 Adrenergic Receptor Influences Power Output In Healthy Subjects**

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(AA, AG, and GG, respectively). Conclusion: These data suggest that genetic variation of the ADRB2 may influence relative strength in healthy subjects and may become an important genetic determinant of muscular strength and functional capacity in patients with diseases that result in a loss of muscle strength.

### June 1, 10:30 AM - 10:45 AM

**ACTN3 Genotype Affects Change in Muscle Fiber Cross-Sectional Area from Adolescence to Adulthood**

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Email: Barbara.Norman@ki.se

(No relationships reported)

**INTRODUCTION** Alpha-actin-3 is a Z-disc protein that is expressed only in type II muscle fibers. Common null polymorphism in the ACTN3 gene (R577X) results in lack of this protein in XX-genotypes. In sprint/power oriented elite athletes the prevalence of the X-allele is much lower than in control populations. That implies that lack of alpha-actin-3 is detrimental for these athletes but a mechanistic link is not fully established. We have previously shown that ACTN3 genotype modulates skeletal muscle hypertrophy signaling in response to sprint exercise in moderately trained subjects. PURPOSE To examine the impact of ACTN3 genotype on changes in fiber dimensions from adolescence to adulthood. METHODS 63 male and female subjects (13 XX, 29 RX, 21 RR) from the general Swedish population were studied at 16 and 27 years of age. Their physical activity level was estimated by a questionnaire. Muscle samples were obtained from the vastus lateralis by needle biopsy. These samples were analyzed histochemically for fiber types (I, IIA, IIB). Cross-sectional area (CSA) of the different fiber types was measured from histological sections by planimetry. DNA was extracted from muscle samples and the genotyping was performed by allelic discrimination. Statistical analyses of the effect of ACTN3 and sex on changes in CSA with age were performed by ANOVA and multiple regression analysis. RESULTS A significant difference in the relative change of CSA with age, across ACTN3 genotypes was observed in type IIA fibers (ANOVA P<0.02) but not in type I fibers and type IIB fibers. The change, expressed as 27-16/16-years values, was in type IIA fibers -4.2%, -2.5% and 7.7% in XX, RX and RR respectively and in type IIB fibers -3.0%, -3.4% and 9.9% in XX, RX and RR respectively. Multiple regression analysis showed that the change in CSA of type IIA fibers was dependent on ACTN3 genotype, while the change in CSA of type IIB fibers was equal dependent on ACTN3 genotype and sex. No ACTN3 genotype effect was observed for the CSA change in type I fibers where alpha-actin-3 is not expressed. No significant differences in CSA were detected across ACTN3 genotypes either at 16 or 27 years. CONCLUSION: ACTN3 genotype is strongly suggested to be a determinant of dimensions of type II skeletal muscle fibers in humans which supports the findings in ACNT3 knockout mice.

### June 1, 10:45 AM - 11:00 AM

**Aerobic Exercise Augments the Muscle Transcriptome Profile of Subsequent Resistance Exercise**


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**Purpose:** Recent reports suggest that aerobic exercise may boost the hypertrophic response to short-term resistance training. As the molecular mechanisms coordinating this effect are unknown, this study was set out to examine the influence of an acute bout of aerobic exercise on the gene expression response to subsequent resistance exercise. Methods: Ten moderately trained men performed 45 min one-legged cycling and 4 x 7 maximal knee extensions for each leg 15 min later. Thus, one limb was subjected to aerobic exercise (AE), while the opposing leg performed resistance exercise only (RE). Biopsies were obtained from m. vastus lateralis of each leg 15 min after the start of exercise bout. Using DNA microarray, we analyzed differences (≥1.5-fold, FDR ≤10%) in the gene expression profile of the two exercise modes (AE+RE vs. RE). Results: There were 127 genes up- and 49 down-regulated by AE+RE compared with RE. Among the most significantly differentially expressed genes we found established markers for muscle growth (e.g. up-regulation of AMPK and PGC-1α), further supporting their role in regulating muscle adaptations to concurrent exercise. Some cytokines and transcription factors were also among the top differentially expressed genes and, notably, several microRNAs were down-regulated by AE+RE compared with RE. The most activated biological functions were related to carbohydrate metabolism and glycogenesis. Altogether, VEGF expression was up-regulated by AE+RE, the functional category ‘angiogenesis’ was found to be down-regulated by this exercise mode. Upstream analysis revealed that VEGF, CREB, TET2 and mTOR were regulators highly activated by AE+RE, whereas Jnk, Nfκβ, MAPK and several miRNAs were inhibited. Conclusion: Aerobic exercise modifies...
the skeletal muscle transcriptional signature of resistance exercise by augmenting gene programs promoting both myofiber growth and improved oxidative capacity. Our in-depth transcriptional analysis identified several new candidate genes and putative networks that markedly differed in expression between AE1 RE and RT. These signatures represent the first genomic basis for how aerobic exercise may augment rather than compromise muscle growth induced by resistance exercise.

Resistance exercise initiates a multifaceted series of events converting the stimulus of muscle contraction into biochemical responses regulating the rate of protein synthesis. The MAPK pathway appears to be a key signaling pathway involved in the regulation of skeletal muscle mass. While resistance exercise paradigms are often divided into high volume (HV) or high intensity (HI) protocols, it is unknown whether these protocols differentially stimulate MAPK signaling. PURPOSE: The purpose of this study was to examine MAPK signaling protocols following a typical HV and HI lower-body resistance exercise protocol. METHODS: Ten resistance-trained men (24.7±3.4y; 90.1±11.3kg; 176.0±4.9cm) performed each resistance exercise protocol in a random, counterbalanced order. The HV protocol utilized a load of 70% 1RM for sets of 10-12 repetitions with 1-minute rest period length between sets and exercises. The HI protocol utilized a load of 90% 1RM for sets of 3-5 repetitions with a 3-minute rest period length between sets and exercises. Both protocols included six sets of barbell back squats and four sets of bilateral leg press, bilateral hamstring curls, bilateral leg extensions, and seated calf raises. Fine needle muscle biopsies of the vastus lateralis were completed at baseline (BL) and 1-hour post-exercise (HI). RESULTS: No significant differences over time were noted for phosphorylation of AKT, ERK:MAPK, p53, p38, MEK1, MSK1, or c-Jun (p>0.05). Significant differences between protocols were noted for phosphorylation of JNK (p=0.02), JNK, HSP27, ERK:MAPK, p53, p38, MEK1, MSK1, STAT1, or c-Jun (p<0.05). Significant time interactions were observed for phosphorylation of JNK (p=0.001), HSP27 (p=0.002), and STAT1 (p=0.03). Phosphorylation of JNK, HSP27, and STAT1 were significantly elevated from BL at 1H for both HV and HI. CONCLUSION: HV and HI lower-body resistance exercise protocols appear to elicit similar MAPK activation in resistance-trained men.

Cell culture studies have shown that amino acids activate mTORC1 signaling by increasing the interaction between mTOR and its essential activator Rheb. However, the existence of this mechanism in human skeletal muscle remains to be determined.

PURPOSE: To determine if increased mTORC1 signaling in response to amino acids in human skeletal muscle is due to an increased interaction between mTOR and Rheb. METHODS: Eight well trained men performed resistance exercise on two separate occasions. In connection with the exercise, subjects were supplemented with flavored water (Pla) and essential amino acids (EAA) in a double-blind, randomized cross-over design. Muscle biopsies were taken in the vastus lateralis muscle before, immediately after and 90 and 180 min post exercise. Activity of the mTORC1 pathway was assessed by a radiolabeled in-vitro kinase assay for its immediate downstream target S6K1. Protein-protein interactions were determined by western blot following co-immunoprecipitation of mTOR with Rheb. Co-immunoprecipitation was performed on pooled muscle samples from three of the eight subjects. RESULTS: Activity of S6K1 remained unchanged immediately after exercise in both trials. However, at 90 min post exercise, S6K1 activity increased by approximately 2- and 8-fold (p<0.05) from baseline the Pla and EAA trials, respectively. The 180 min time point, S6K1 activity remained elevated in both trials being approx. 3-fold higher in the Pla trial and 5-fold higher (p<0.05) in the EAA trial. The fold-change in mTOR and Rheb interaction largely resembled the activity pattern of S6K1 in both trials; in the Pla trial the fold-change was 0.9, 1.3 and 1.4 while in the EAA trial the fold-change was 1.6, 2.9 and 1.9 immediately after, 90 min after and 180 min after exercise, respectively.

CONCLUSIONS: The large increase in S6K1 activity following EAA intake appears to be mediated by an increased interaction between mTOR and its proximal activator Rheb. This is the first time this mechanism has been demonstrated in human skeletal muscle.

Purpose: Impact exposure has been studied in helmeted sports, while impact exposure in un-helmeted sport is relatively understudied. Moreover, for reasons not well understood, female soccer players are more likely to be concussed than their male counterparts at the high school level. The purpose of this study was to use video-analysis in addition to small form factor impact sensors to quantify the frequency, magnitude and context of head impacts during female and male varsity soccer games.

METHODS: Data from a head impact sensor were synchronized with game video to quantify head impact exposure for 8 male and 15 female high school soccer players who participated in 7 and 9 games, respectively. The sensor measured both linear and angular acceleration. Impacts were categorized based on the context of the contact: player contact with the ball, another player or the ground; no noticeable impact on the
video but substantial player movement (e.g., deceleration, planting, turning). In cases where no noticeable impact or change in movement was observed, the impact was deemed a false positive and excluded from analysis. **Results:** For boys, contact with the ball was the most common mode of head acceleration and accounted for 61.6% of the 125 recorded impacts, and the mode associated with the largest acceleration magnitudes (median: 29.4g; 6.892 rad/s²). Contact with another player accounted for 24.4% of impacts, and contact with the ground accounted for 81.1% of impacts. 5.8% of recorded impacts did not have contact with the ball, player or ground, but did have substantial player movement noted on video. Analysis of the data from the first 2 games of the girls season indicates the most common mode of head acceleration was also contact with the ball, accounting for 34.3% of the 67 recorded impacts, and the mode with the largest acceleration magnitudes (median: 22.6g; 4.663 rad/s²), followed by contact with other players (25.4%), motion induced acceleration (22.4%) and ground contact (17.9%). On average, female players experienced 2.23 impacts per player per game, compared to 1.54 for male players. Further analysis of the girls’ data is on-going. **Conclusions:** It is important to understand the impact exposure risk for boys and girls in order to developing strategies, techniques or rules for safe play in high school soccer.

**METHODS**

**PURPOSE:** In this study, we therefore analyzed the association between kick-induced mechanical stress (stress distribution) and the clinical findings of injuries around the hip area that are known to be related to kicking actions in soccer. 

**METHODS:** We asked 5 healthy, right-footed adults who had some experience in soccer to perform the inside kick, instep kick, and infront kick 3 times each. A three-dimensional motion analysis device was used to record their motion and measure the duration between maximum hip extension (MHE) and ball impact (BI). The motion analysis software, nMotion, was used to calculate stress between hip joints and the angle of the hip joint in each kicking motion. In addition, the bone strength analysis software Mechanical Finder was used to analyze the computed tomography and magnetic resonance imaging data of each subject to develop a finite-element model consisting of the right ilium, sacrum, and femur. Then, stress between hip joints calculated in dynamics analysis was input as a load value into the finite-element model for the stress analysis.

**RESULTS:** At the time of BI, kicking actions produced a high-stress area in the pubic ramus compared with other areas. This value was an equivalent stress value generated in the area of interest (30 mm³) in the pubic ramus. Stress generated in the superior and inferior rami of the pubic bone was 3.52 and 2.94 MPa for the inside kick, 7.15 and 5.40 MPa for the instep kick, and 4.47 and 3.33 MPa for the infront kick, respectively.

**CONCLUSIONS:** The high-stress area on BI was the same area where groin pain syndrome (pubic bone marrow edema) occurs in the clinical examination of soccer-related hip joint injury and where fatigue fractures occur in pubic bone rami. Furthermore, in the BI-related area of interest (pubic rami), the values of equivalent stress generated by the inside kick, instep kick, and infront kick in the superior and inferior rami were approximately 3 times, 5 and 4 times, and 3 and 2 times the stress created in the same area by standing by one leg (1.53 and 1.47 MPa in the superior and inferior rami), respectively. The analysis system that integrates motion dynamics into the body structure revealed the relationship between the clinical symptoms of the hip joint and previously reported kick-related injuries around the hip joint.

**METHODS:** Prior to the start of the sports season, isometric hip abductor strength was assessed bilaterally in competitive soccer players (210 males) using a hand-held dynamometer. During the sport seasons, lateral ankle sprain status was recorded, and injured athletes were further classified based on the mechanism of injury (non-contact vs. contact). Postseason, a logistic model was constructed to determine whether baseline hip abductor strength predicted future lateral non-contact ankle sprains. A receiver operating characteristic (ROC) curve was constructed for hip abductor strength to determine the clinical cut-off value that distinguished between a high-risk and low-risk outcome. **RESULTS:** A total of 25 lateral non-contact ankle sprains were confirmed for an overall annual incidence of 11.9%. Baseline hip abductor strength was significantly lower in injured athletes compared to non-injured athletes (35.7 ± 5.6 vs. 39.5 ± 6.6 %BW; p = 0.008). Logistic regression indicated impaired hip abductor strength increased future injury risk [OR = 1.10 (95% CI: 1.02, 1.18), p = 0.010]. The clinical cutoff to define high risk was established as hip abductor strength ≤ 33.8 %BW. Using this cutoff, athletes classified as high risk have their probability of injury increase from 11.9% to 26.7%; whereas, athletes classified as low risk have their probability of injury decrease from 11.9% to 9.0%.

**CONCLUSIONS:** Impaired isometric hip abductor strength predisposes competitive male soccer players to lateral non-contact ankle sprains. Screening procedures should consider evaluating isometric hip abductor strength (specifically for high-level male athletes participating in soccer) as preseason hip abductor predicts future lateral non-contact ankle sprains.
Anaerobic Cycle Tests (WAnT) on postural sway immediately following successive
motion in soccer athletes and differences between the sexes has not been investigated. The cumulative impact of successive high intensity anaerobic bouts on postural
symmetry documented. Only differences categorized via SR: lefties had greater
left (51.7±5.2 vs. 45.4±6.5°; p<0.04) and right (50.4±5.4 vs. 46.6±6.5°; p=0.002) ankle
plantarflexion (L-R difference); greater right lean arm mass (5.2±3.6 vs. 4.5±3.5 kg; p<0.03); and greater
right lean arm supination strength (R-L difference); greater
median (M; 137±349.51; F; 1274.39±296.58) than F. A significant main effect for
trial occurred in 95% ESA (p=0.0001) and mean COP values in both anteroposterior and
medialateral directions (p<0.05) compared to baseline values from trial 3 with
cumulative increases seen after each trial. Conclusion: Multiple high intensity
anaerobic bouts has a cumulative negative impact on standing postural sway as a result of
fatigue related factors. Females appear able to better attenuate sway velocity and
amount of sway under fatigue conditions than males.

METHODS: Thirty-two women from two NCAA Division I soccer teams (20.1 ± 1.2 yrs; 1.7 ± 0.1 m; 64.3 ± 6.1 kg) underwent biomechanical analyses of two tasks; a triple
hop landing (TH) and a single-leg squat (SQ). Knee joint angles and external moments
(normalized to mass X height) in the sagittal and frontal planes were assessed at peak
knee flexion. Peak knee extension power during the TH landing was also assessed. Paired t-tests were performed to detect differences between biomechanical variables
from the self-reported dominant (D) and non-dominant limbs (ND). RESULTS: No
significant limb differences were observed for the knee angles during the TH (sagittal plane D= 66 ± 9 and ND= 67 ± 10 deg; p=0.76; frontal plane D= ± 5 and ND= ± 16 deg; p=0.360) or the SQ (sagittal plane D= 71 ± 12 and ND= 73 ± 13
deg; p=0.333; frontal D= 8 ± 4 and ND= 10 ± 6 deg; p=0.175). Additionally, no
between limb differences in knee flexion moments for either the TH (D= 1.1 ± 3 and ND= 1.1 ± 3 Nm/kgm; p=0.137) or the SQ (D= 1.1 ± 2 and ND= 1.1 ± 3 Nm/kgm; p=0.997)
were observed. However, greater adduction moments were small in the dominant limb
during both the TH (D= ± 35.9 and ND= ± 26.2 Nm/kgm; p<0.011) and the SQ (D= 24.1 ± 15 and ND= 31 ± 17 Nm/kgm; p=0.030). No between limb differences were present for the TH landing power (p=0.767).

CONCLUSIONS: The greater knee adduction moments observed on the non-
dominant stance limb for both the TH and SQ would deter the knee from a deleterious
risk knee abduction position, commonly associated with noncontact ACL injury. It is therefore plausible that the between limb differences contribute to women soccer players being more likely to sustain injury to their dominant preferred kicking limb.
6. Synovial osteochondromatosis

TESTS AND RESULTS:
Initial left knee radiographs: no osseous pathology
Initial left knee MRI: Cartilaginous body anterior medial joint space. Signal abnormality in Hoffa’s fat pad.
Repeat left knee MRI: Multiple osteocartilaginous intra-articular loose bodies in posterior joint space.
Repeat left knee radiographs: Multiple periartrial calcified bodies as seen on MRI.

FINAL WORKING DIAGNOSIS:
Synovial osteochondromatosis of the left knee with multiple loose bodies

TREATMENT AND OUTCOMES:
Orthopedic referral. Pending arthroscopic loose body removal with possible synovial debridement.

TEST AND RESULTS:
- MRI results:
  - Meniscal injury
  - Patellar subluxation
  - Loose body
- Initial left knee MRI: Cartilaginous body anterior medial joint space. Signal abnormality in Hoffa’s fat pad.
- Repeat left knee MRI: Multiple osteocartilaginous intra-articular loose bodies in posterior joint space.
- Repeat left knee radiographs: Multiple periartrial calcified bodies as seen on MRI.

FINAL WORKING DIAGNOSIS:
Synovial osteochondromatosis of the left knee with multiple loose bodies

TREATMENT AND OUTCOMES:
Orthopedic referral. Pending arthroscopic loose body removal with possible synovial debridement.

HISTORY:
A 21 year-old senior NCAA Division III college football linebacker presents with a painful and swollen right knee. He felt a pop when he was changing directions to make a tackle during a game. States it felt similar to his 2 previous right knee injuries, both of which were later diagnosed as full thickness ACL tears. He currently complains of swelling and pain with full extension.

Surgical history consistent with 2 previous ACL reconstructions on his right knee. All injuries occurred while playing football. His first reconstruction was 6 years ago and was a bone-patellar tendon-bone graft. He tore this graft 1 year ago and had a second reconstruction using a cadaver graft.

PHYSICAL EXAMINATION:
- Vitals - height 5’10”, weight 190, General - well developed, well nourished.
- Observation - Moderate right knee effusion, no obvious deformities, antalgic gait.
- Palpation - normal patellar tracking with no apprehension, mild medial joint line tenderness.
- Strength - muscle strength 5/5 globally.
- Neurovascular - Light touch and sensation intact, pulses equal and normal.

DIFFERENTIAL DIAGNOSIS:
- ACL tear
- Tibial plateau fracture
- Patellar subluxation
- Meniscal injury

TEST AND RESULTS:
- MRI results:
  - Failed ACL graft
  - Progressive chondromalacia of femoral condyle
  - Partial lateral meniscectomy with peripheral meniscal degeneration

FINAL WORKING DIAGNOSIS:
ACL deficient knee with progressive chondromalacia

TREATMENT AND OUTCOMES:
Compression, ICE, ROM exercises, NSAIDs. Consultation with Orthopedics, Fitted for ACL brace.

Successful reduction in pain, swelling, and instability within 10 days.

Long discussion with athlete, parents, ATC, orthopedic surgeon and MSK radiologist.

He had a knee arthroscopy that repaired the meniscal capsular junction tear and a hypermobile lateral meniscus. After repair, bone marrow aspirate concentrate was injected into the posterior lateral capsule. He completed post-operative PT and is now long distance running pain-free.
HISTORY: A 17-year-old female high school soccer player presented with right knee swelling and pain lasting three weeks. She did not recall any injury or trauma. A trial of over-the-counter ibuprofen did not help. She rated her pain 4/10 in our office. On examination, there was swelling and pain with significant instability.

PHYSICAL EXAMINATION: Antalgic gait with large knee effusion noted on inspection. Flexion tenderness over lateral joint line and fibular head. Range of motion (ROM) at the knee limited by pain to 0–100 degrees. Strength testing 4/5 with knee flexion and extension, 0/5 with ankle dorsiflexion and extensor hallucis longus, 5/5 with plantar flexion. Sensation to light touch decreased in lateral lower leg and dorsum of the foot. 2+ Dorsalis pedis and popliteal pulses and ~25% capillary refill in toes. Provocative testing significant for positive Lachman’s, posterior drawer, varus stress and dial test. Valgus stress and McMurray’s were negative.

DIFFERENTIAL DIAGNOSIS:
1. Combined ligamentous tear
2. Acute Fracture
3. Meniscal injury

TEST AND RESULTS:
Anterior-posterior and lateral knee X-ray:
---Fibular head avulsion fracture.
MRI without contrast of the knee:
---Arcuate complex avulsion fracture with complete disruption of the posterior cruciate ligament (PCL), anterior cruciate ligament (ACL) and concomitant posterolateral corner (PLC) injury.

FINAL WORKING DIAGNOSIS:
1. Grade III sprain of ACL and PCL.
2. Arcuate complex avulsion fracture with PLC injury.
3. Common Peroneal Nerve Mononeuropathy

TREATMENT AND OUTCOMES:
1. Immediate cessation of physical activity with non-weight bearing status of right knee.
2. Isometric quad strengthening initiated for the first 9 days to help reduce swelling and prevent muscle atrophy
3. On day 10, the patient had simultaneous reconstruction of her ACL and PCL followed by surgical repair of the fibular head.
4. Electrodiagnostics at week 4 confirmed right common peroneal nerve mononeuropathy below the fibular head and the patient was provided with an ankle foot orthosis.
5. Returned to sports after 14 months of challenging rehab when she regained full, painless ROM and strength in her knee and ankle dorsiflexors.

HISTORY: 10-year-old Hispanic female presented with a 2-week history of a right knee effusion. She had fallen onto her anterior knee while playing basketball, swelling began the next day. At her visit, pain had improved but swelling persisted. No prior knee injuries. Also had several swollen joints when she was much younger which resolved without treatment.

PHYSICAL EXAM: Severe effusion to right knee, no ecchymosis. ROM: 20-90. No varus or valgus laxity. Negative lachman’s. 5/5 strength, distal extremity was resolved without treatment.

DIFFERENTIAL: Juvenile Rheumatoid Arthritis (JRA), Pigmented Villonodular Synovitis (PVNS), Septic Arthritis, Osteochondral fracture, OCD lesion

RESULTS: ANA: <1:80, ESR: 22. CBC, CMP, TSH, CRP, RF and anti-CCP levels were normal. Knee radiographs: no fracture, open growth plates, suprapatellar effusion. MRI: Very large joint effusion with synovial perforation. Synovial hypertrophy from intraarticular hemorrhage. No bony findings.

TREATMENT: Initially sent to pediatric rheumatology over concern for JRA. Then referred to pediatric ortho-rheumatology after grossly bloody arthrocentesis. Based on MRI, joint aspirate and clinical picture (5+ months of persistent effusion), surgical treatment was recommended. She was taken to the operating room for arthroscopic evaluation, synovial biopsy and synovecetomy.

OPERATIVE FINDINGS: Marked amount of synovitis in suprapatellar pouch, medial and lateral gutters, and intercondylar notch, brownish-red in appearance

HISTORY: A 14-year-old male high school football player presented with right knee swelling and pain lasting three weeks. He did not recall any injury or trauma. A trial of over-the-counter ibuprofen did not help. He rated his pain 4/10 in our office. On ultrasound, a suprapatellar effusion was seen, from which 35 mL of serosanguinous fluid was aspirated. He returned to the ED for an additional aspiration which also resulted in 35 mL of serosanguinous fluid. Despite his pain, his pain was not severe enough to prevent him from playing. He continued to have pain and swelling with significant instability.

PHYSICAL EXAMINATION: Antalgic gait with large knee effusion noted on inspection. Flexion tenderness over lateral joint line and fibular head. Range of motion (ROM) at the knee limited by pain to 0–100 degrees. Strength testing 4/5 with knee flexion and extension, 0/5 with ankle dorsiflexion and extensor hallucis longus, 5/5 with plantar flexion. Sensation to light touch decreased in lateral lower leg and dorsum of the foot. 2+ Dorsalis pedis and popliteal pulses and ~25% capillary refill in toes. Provocative testing significant for positive Lachman’s, posterior drawer, varus stress and dial test. Valgus stress and McMurray’s were negative.

DIFFERENTIAL DIAGNOSIS:
1. Combined ligamentous tear
2. Acute Fracture
3. Meniscal injury

TESTS AND RESULTS:
Ultrasound of the right knee showed persistent evidence of suprapatellar effusion. 75 mL of cloudy dark serosanguinous fluid was obtained after a second suprapatellar aspiration under ultrasound guidance. Magnetic Resonance Imaging (MRI) of the right knee after the second aspiration showed a large hemarthrosis between the skin, patella and medial patellofemoral retinaculum, as well as a tiny joint effusion. The subcutaneous fluid collection extended 12 cm craniodually, 8 cm transversely, and 5.5 cm from anterior to posterior. MRI also showed normal collateral and ligamentous structures with no evidence of meniscal tear. Culture of the second suprapatellar aspiration revealed heavy methicillin-sensitive staphylococcus aureus (MSSA) bacteria.

FINAL WORKING DIAGNOSIS: Atraumatic abscess and hematoma of the right distal quadriceps muscle

TREATMENT AND OUTCOMES: We empirically started oral cephalaxin after the second suprapatellar aspiration and after confirming the infection, he finished a one-week course of the cephalaxin. On follow up about three weeks later, he had no swelling or pain on exam and was cleared to return to play.

Knee Injury - Soccer

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(No relationships reported)

Knee Swelling - Football

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(No relationships reported)
A-33 Clinical Case Slide - Medical Issues I  
Wednesday, June 1, 2016, 9:30 AM - 11:10 AM  
Room: 202

147 Chair: Lauren M. Simon, FACSM. Loma Linda University Medical Center, Loma Linda, CA.  
(No relationships reported)

148 Discussant: John Mark MacKnight, FACSM. University of Virginia, Charlottesville, VA.  
(No relationships reported)

149 Discussant: Sherrie L. Ballantyne-Talmadge. Boulder Center for Sports Medicine, Boulder, CO.  
(No relationships reported)

150 June 1, 9:30 AM - 9:50 AM  
Influenza Encephalitis in a Collegiate Baseball Player  
Alyssa Otto, Brainard Cooper, Christopher Varacallo, Jeffery Guy, Matthew Pollack. University of South Carolina, Columbia, SC.  
(No relationships reported)

Alyssa Otto  
Case Study Abstract

ACSM Format

A - 33

Title: Influenza Encephalitis in a Collegiate Baseball Player  
Authors: Alyssa Otto, Brainard Cooper, Christopher Varacallo, Jeffery Guy, Matthew Pollack  

HISTORY: A 20 year old male, NCAA Division I baseball player presents to athletic trainer with a chief complaint of a severe headache. Associated symptoms included numbness in bilateral fingertips and lips, disoriented and look tired and fatigued. Athlete could answer questions asked but could not recall details of the morning prior to presenting to the athletic trainer. He had a previous history of headaches, coughing and congestion over past few months. Previous headaches were treated with over the counter medications and sleep. Athlete also had a medical history of ADHD and surgical history of tonsillectomy and adenoidectomy 2013.

PHYSICAL EXAM: No obvious deformity and no visible sites of trauma. Full strength in upper extremities bilaterally; normal sensation bilaterally except for fingertips and lips. Deterioration of mental status over the following hour and was unable to understand simple commands or reply verbally. Athlete was transported to the Emergency Department. Upon arrival, athlete became combative due to disorientation and was intubated for his safety.

DIFFERENTIAL DIAGNOSIS:  
1. Migraine Headache  
2. Intracranial Hemorrhage  
3. Meningitis  

TESTS & RESULTS:  
Complete Blood Count Test - mild elevated white blood cell count (13.4)  
Comprehensive Metabolic Panel - within normal limits  
Urine Toxicology - within normal limits  
CT Scan - normal  
MRI - normal  
Lumbar Puncture - elevated white blood cell count  
Influenza Test - positive for influenza b  

FINAL WORKING DIAGNOSIS: Influenza Encephalitis  

TREATMENT & OUTCOMES:  
Intubated and admitted to the ICU  
Hospital day #2 was extubated  
Treated with Tamiflu for influenza b  
Discharged to go home and follow up with athletic training staff  
No residual symptoms, feeling well  
Athlete successfully participated in 2015 baseball season

151 June 1, 9:50 AM - 10:10 AM  
Abdominal Pain-basketball  
Brett Keller. Atlantic Sports Health, Morristown, NJ.  
(No relationships reported)

HISTORY: A 17 year old Hispanic male basketball player presents to the office complaining of left lower quadrant pain for one week. The pain began following a high school basketball practice. He denies any specific injury or trauma during practice. The pain is sharp in nature and rated 3/10 at rest and 8/10 with any activity. The pain does radiate into the groin on the left side, but he denies any testicular discomfort. He reports mild swelling in the left lower quadrant and feels that the area may be bulging. He denies any change in bowel habits or any recent change in appetite. He denies nausea, vomiting, hematuria, or dysuria. No significant medical or surgical history. He denies sexual activity. All other review of systems are negative.

PHYSICAL EXAMINATION:  
Height 6’7” Weight 216 lbs  
Abdomen: Inspection of the abdomen and groin reveals no visible bulge or discoloration. There are positive bellows sounds in all quadrants. Palpation reveals significant tenderness in the periumbilical region and left lower quadrant. There is also tenderness in the groin along the inguinal canal. No rebound or guarding is present.  
Genitourinary: No palpable bulge in the groin. No tenderness in the testicle. Bilateral hernia exam reveals no abnormality.  
Musculoskeletal: Negative straight leg raise. Pain in left lower quadrant with resisted sit-up  

DIFFERENTIAL DIAGNOSIS:  
Hernia  
Abdominal muscle strain  
Nephrolithiasis  
Ilioinguinal entrapment neuropathy  
Diverticulosis

TESTS AND RESULTS:  
Abdominal ultrasound: Inferior rectus sheath hematoma. No abdominal wall hernia

FINAL WORKING DIAGNOSIS:  
Abdominal ultrasound: Inferior rectus sheath hematoma. No abdominal wall hernia  
TREATMENT AND OUTCOMES:  
1. A repeat ultrasound after two weeks showed a decrease in size of rectus sheath hematoma.  
2. Screening for bleeding disorder revealed no abnormality.  
3. Patient was limited in physical activity for one month.  
4. Athlete was able to return to full activity and resume playing basketball.  
5. Patient currently plays basketball at the collegiate level.

152 June 1, 10:10 AM - 10:30 AM  
5 Year-old Male with Leg Pain and Abnormal Gait  
Adam Liegner. Maine Medical Center Sports Medicine Fellowship, Portland, ME. (Sponsor: William Dexter, FACSM)  
Email: adam.liegner@gmail.com  
(No relationships reported)

HISTORY: A 5 year-old boy presents with leg pain, unable to walk normally. The pain started 1 day ago and is located in his posterior lower legs BL. No injury. Parents note that he has been ambulating with his legs held straight and slightly out to the sides. They are using a wheelchair to get around. The patient had a fever and URI symptoms last week, treated with azithromycin (on day 3). No fever today. Other than the leg pain and difficulty with walking seems well and happy. No rash, insect bites, or other joint complaints. Comprehensive ROS otherwise neg.

PMH/PSS:  
Obesity - weight > 95th %ile  
Sickle cell trait  
Seasonal allergies  
(Born in US - fully vaccinated)  
Meds:  
Azithromycin  
APAP PRN

Allergies:  
NKA  
SHx:  
FHX:  
Sickle cell anemia (mother)  
PHYSICAL EXAM:  
BP 117/54, HR 59, T 36.6 (oral), Wt 32.2kg  
GEN: Alert, well appearing. Sitting on exam table, moving legs freely without pain or limitation.  
SKIN: No rash, redness, bruising.  
MSK:  
Gait - Wide-based stance with knees straight, primarily on his arthres, slides feet across the ground. Unwilling to stand on toes due to pain.  
BL Hips - Log roll neg, nl ROM, FABER and FADIR neg for pain.  
BL Ankles - Inspection nl. Mild tenderness of lower calf. No warmth or effusion. Active ROM nl. MMT 4/5 dorsiflexion, 4/5 plantarflexion, both cause pain in the distal calf.
Lower extremities neurovascularly intact.

DIFFERENTIAL DIAGNOSIS:
1. Myositis
2. Bilateral DVT
3. Tenosynovitis
4. Sickle cell pain crisis
5. Guillain Barre
6. Lyme
7. JRA
8. Abuse

TESTS AND RESULTS:
BL. ankle XR (AP, lat): No fracture/dislocation. No effusion. Mild soft tissue swelling posterior to the talus possibly representing inflammation.
CRP: 0.10 (<1.00 mg/dL)
ESR: 11 (0-15 mm/hr)
CBC with diff: WBC 2.9 (5.3-11.5), Reactive Lymphocytes Percent 6 (<1)
CK: 7136 (24-195)

Influenza A + B PCR: Influenza B detected

FINAL WORKING DIAGNOSIS:
Influenza B myopathy

TREATMENT AND OUTCOMES:

1. Patient provided warming blankets for comfort in setting of cool outside temperature
2. 1 liter bolus of normal saline administered intravenously through left AC IV line in addition to PO hydration with low calorie sports drink
3. Patient developed pyrexia, pericarditis, sepsis, and had normal cardiac and respiratory exam.
4. The recommendation was provided to the patient to be evaluated by sports nutritionist with experience in caring for endurance athletes who have undergone bypass or weight loss surgery to assist with maintaining balanced nutrition and hydration while exercising.

A-34 Clinical Case Slide - Upper Extremity- Hand/ Wrist

Wednesday, June 1, 2016, 9:30 AM - 10:50 AM

Room: 205

Chair: John Hatzenbuehler, FACSM. Intermed, PA, South Portland, ME.


Abstracts were prepared by the authors and printed as submitted.

Discussion: Kenneth Vitale. University of California San Diego, San Diego, CA.

Clinical Case Slide - Upper Extremity- Hand/ Wrist

June 1, 9:30 AM - 9:50 AM

Persistent Wrist Pain in an Adolescent Soccer Player

Celeste Quitiquit. University of Washington/Seattle Children’s Hospital, Seattle, WA.

Email: celeste.quitiquit@seattlechildrens.org

(No relationships reported)

June 1, 10:50 AM - 11:10 AM

Undernutrition - Bariatric Athlete

Benedict Ifedi, Randolph Taylor. Memorial Family Medicine Residency Program, Sugar Land, TX.

Email: Benedict.Ifedi@memorialhermann.org

(No relationships reported)

History: A 38 year old female with past medical history of hypertension, hyperlipidemia, and obesity presented to the major medical tent by wheelchair with complaints of profound weakness and dizziness after having just completed a marathon. She described having run the majority of the marathon and had not sustained any injuries along the course. She described weakness and dizziness as mentioned in addition to “being dehydrated.” Review of systems was otherwise negative. Of note the patient also had a history of gastric bypass surgery 2 years prior to date of presentation. Physical Exam: Examination of the patient revealed a pale appearing woman in no acute distress with dry mucous membranes. The patient was fully alert and oriented and had normal cardiac and respiratory exam.

Differential Diagnosis:
1. Dehydration
2. Exertional Hyponatremia
3. Heat Related Illness

Test and Results:
Vital Signs: Temperature 98.5F, Heart Rate 82, Blood Pressure 123/62
Labs: pH 7.45, pCO2 35.2, pO2 98, Na 141, K 4.6, HC03 24.7, BG 83, iCa 1.15
Hemoglobin/Hematorcrit – 13.3/39

Final/Working Diagnosis:
Dehydration and Undernutrition

Treatment and Outcomes:
1. 1 liter bolus of normal saline administered intravenously through left AC IV line in addition to PO hydration with low calorie sports drink
2. 2 Patient provided warming blankets for comfort in setting of cool outside temperature
3. 3 The patient’s symptoms resolved and she felt significantly better within approximately 20 minutes of receiving normal saline bolus
4. 4 The recommendation was provided to the patient to be evaluated by sports nutritionist with experience in caring for endurance athletes who have undergone bypass or weight loss surgery to assist with maintaining balanced nutrition and hydration while exercising.

June 1, 10:50 AM - 11:10 AM

Undernutrition - Bariatric Athlete

Benedict Ifedi, Randolph Taylor. Memorial Family Medicine Residency Program, Sugar Land, TX.

Email: Benedict.Ifedi@memorialhermann.org

(No relationships reported)
Musician’s Focal Dystonia of the Right 2

**FINAL DIAGNOSIS:**

1. Musicians focal dystonia

**DIFFERENTIAL DIAGNOSIS:**

3. Tendonitis: extensor indicis proprius, flexor digitorum profundus, flexor digitorum superficialis, lumbricals

5. Old trauma (avascular necrosis, non-union)

6. Systemic (rheumatoid arthritis, amyloidosis, gout)

7. Tendinopathy

8. Bone infection

1. Distal radial fracture

2. Scaphoid fracture

3. Scapholunate tear

4. Carpometacarpal dislocation

5. Flexion tendon rupture

6. Systemic (rheumatoid arthritis, amyloidosis, gout)

7. Psoriatic arthritis

9. Dupuytren’s contracture

11. Posterior Interosseous mononeuropathy

15. Median nerve mononeuropathy superficialis, lumbricals

**TEST AND RESULTS:**

1. MRI of left wrist with/without contrast: Hypointense signal on T1, hyperintense signal on T2 STIR images at left metaphyseal distal radius. No fluid at radioulnar joint. No abscess.

2. Bone biopsy: Trabecular bone with hypocellular marrow spaces. Rare neutrophils.

**TREATMENT AND OUTCOMES:**

1. Operative exploration of the UCL of the second MCPJ. The patient was found to have a complete tear of the ulnar collateral ligament (UCL) of the second MCPJ along with significant laxity to radial deviation of the MCPJ. The patient was treated with reconstruction of the UCL with a tendon juncture graft. Splinted in 10 degrees of extension at the right 3rd digit metacarpophalangeal joint and proximal interphalangeal joint with loss of distal interphalangeal joint motion. Bradykinetic abnormalities

**PHYSICAL EXAMINATION:**

1. Chronic recurrent multifocal osteomyelitis (CRMO) follows a relapsing course over years and may eventually remit with resolution of hyperostosis without permanent bony deformity.

2. Initial patient was immobilized with Thumb Spica wrist brace with some relief.

3. Started Naproxen 500mg BID. Most patients respond to NSAIDs and/or intermittent corticosteroids for transient relief, but recurrences are common and some require DMARDs.

**DIFFERENTIAL DIAGNOSIS:**

1. Chronic thumb pain in a volleyball player

2. Scaphoid fracture

3. Ligament injury to MCP joint

4. Ulnar collateral ligament tear of the second MCPJ of the right hand

**TEST AND RESULTS:**

1. Magnetic resonance imaging of the right hand

2. Posterior-anterior, oblique, and lateral radiographs of the right hand

3. Occupational hand therapy with performing artist specialist focusing on sensory re-education and constrain induce movement therapy

4. Kinesio tape on the dorsum of the hand along the 2nd and 3rd extensor tendons

5.柜台和3d extensor tendons

**HISTORY:**

14 year old right hand dominant female presented to orthopedic clinic with 2 months of right index finger (IF) pain after falling onto her hand during a middle school football game. She had immediate pain both with rest and with range of motion of the finger. She was treated by a different orthopedist with casting and bracing for 2 months which did not relieve her symptoms. She complains of swelling over her second metacarpal/phalangeal joint (MCPJ) and well as pain with flexion of her IF.

**PHYSICAL EXAMINATION:**

1. Trajectory of the proximal phalanx or metacarpal of the IF

2. Dislocation of the second MCP joint

3. Ligament injury to MCP joint

4. Complete tear of the ulnar collateral ligament (UCL) of the second MCPJ

5. Realized to outtrigger splint for 7 weeks post-op and then allowed active and passive range of motion as tolerated

4. Released for sporting activities at 3 months with initial use of buddy taping during activities

5. At 6 months post-op, complained of pain and stiffness in the IF. 1cm of tip to palm distance on the index finger when making a fist. Received a corticosteroid injection to the DIPJ,PIPJ, and MCPJ. Recovered full motion of the fingers. Returned to football activities.
Physical Examination:
Examination of his right wrist revealed normal alignment without deformity, ecchymosis, erythema or swelling. He had no pain to palpation over the anatomic snuffbox. He had full range of motion and normal strength of his right wrist to flexion, extension, ulnar deviation, radial deviation, pronation, and supination without pain. He had normal grip strength. He had mild discomfort on the radial side of his right wrist with weight-bearing on his right hand. Neurovascularly intact in his right upper extremity.

Differential Diagnoses:
Scapholunate ligament injury
Kienbock’s disease
Scaphoid impaction syndrome
Scaphoid fracture
De Quervain’s tenosynovitis

Tests and Results:
X-ray of right wrist:
--Scaphoid waist fracture with evidence of healing
CT of right wrist:
--Scaphoid waist fracture with evidence of partial non-union along the volar margin

Final Working Diagnosis
Partial union of mid waist scaphoid fracture

Treatment and Outcome:
Initially, immobilization in an Exos thumb spica splint. Bone stimulator twice daily for 20 minutes. Gradually progressed him back to golfing activity starting with chipping and putting. He was still healing as of last set of X-rays at 8 week follow-up. He progressed through putting and chipping without pain. We cleared him to start full golf activity.

PHYSICAL EXAMINATION:
Noticed moderate swelling. He wrapped his hand in Ace wrap and took ibuprofen last night.

HISTORY:
19-year-old right-handed male college intramural indoor soccer goalie one day prior to office visit sustained a right hand injury when he inadvertently punched a wall while attempting to block a shot. He has pain with squeezing hand into a fist. Noticed moderate swelling. He wrapped his hand in Ace wrap and took ibuprofen last night.


DIFFERENTIAL DIAGNOSIS:
1. Fracture: carpal, metacarpal
2. Carpal dislocation
3. Wrist sprain
4. Contusion (hand)
5. Acute traumatic compartment syndrome
6. Traumatic median or radial nerve palsy
7. Wrist flexor/extensor tenosynovitis/rupture

TESTS AND RESULTS:
X-ray right wrist 3 view:
•Radiologist read: no acute fracture or dislocation

•Sports medicine interpretation: Avulsion fracture of carpal bone, unable to determine if capitate, hamate or triquetrum involved.
•CT right wrist without contrast (ordered to evaluate radiographic carpal abnormality):
  •Hamate fracture, mildly comminuted primarily oblique fracture through the distal dorsal aspect of hamate extending into the 4th carpmetacarpal joint with approximately 3 mm of diastasis
  •Capitate fracture, tiny oblique fracture through the distal dorsal ulnar aspect of the capitate extending into the 3rd carpmetacarpal joint.
  •Incidental finding of carpal burs.

FINAL/WORKING DIAGNOSIS:
Capitate and hamate fractures, closed

TREATMENT AND OUTCOMES:
1. Immobilization with short arm cast for 6 weeks and referral to hand surgery due to multiple carpal fractures and high risk for nonunion
2. Repeat radiographs at 6 weeks show non-union of fracture at the distal end of the capitate
3. At 6 weeks, hand surgery notes that he may have continued pain for some time but at the present point can begin actively using the wrist as tolerated. Patient can follow-up again with hand surgery as necessary.

A-35
Free Communication/Poster - Aging

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

164
Board #1
June 1, 9:30 AM - 11:00 AM
Identification and Prediction of the Walking Cadence Required to Reach Moderate Intensity in Older Adults
Danielle R. Bouchard1, Fagner Serrano2, Janis Slaght3, Martin Sénéchal1, Todd Duhamel1. 1University of New Brunswick, Fredericton, NB, Canada. 2University of Manitoba, Winnipeg, MB, Canada. Email: danielle.bouchard@unb.ca

PURPOSE: To evaluate the walking cadence needed to reach moderate intensity in older adults and to develop an algorithm to individualize the prescription.

METHODS: Peak oxygen consumption was established with 121 inactive adults ( doing less than 150 minutes of aerobic exercise per week) age 55 and above on a treadmill. Walking cadence at moderate intensity was established when participants reached 40% of peak oxygen consumption on an indoor flat surface. Other variables potentially associated with walking cadence were collected (e.g., body weight, stride length, height) to contribute to the algorithm developed with half the sample, randomly selected, and validated with the other half.

RESULTS: Mean walking cadence to reach moderate intensity was 115.8 + 10.3 steps per minute. The best algorithm to predict the walking cadence needed to reach moderate intensity in this sample was: 117.95 - .23 x body weight (kg) + self-selected steps per minute. The best algorithm to predict the walking cadence needed to reach moderate intensity in this sample was: 117.95 - .23 x body weight (kg) + self-selected steps per minute.

CONCLUSION: In general, adults aged 55 and above need more than 100 steps per minute to reach moderate intensity when the prescription in individualize. Body weight and the self-selected walking cadence are useful to predict walking cadence needed to reach moderate intensity in this population.

165
Board #2
June 1, 9:30 AM - 11:00 AM
The Effectiveness of Rebounders on Balance in Older Adults
Charilaos Papadopoulos1, Kimber Maroney1, Willow Eaton2. 1Pacific Lutheran University, Tacoma, WA. 2City of Tacoma, Lighthouse Senior Activity Center, Tacoma, WA. (Sponsor: Leslie Jerome Brandon, FACSM) Email: papadoha@plu.edu

Balance impairment has been shown to be a risk factor for falls among older adults. Typical exercise training programs often include a range of static and dynamic exercises that are designed to train the motor system by altering the task demand. However, in order to train the sensory system, the goal should be to manipulate the environment by performing balance activities either standing or moving on a compliant or moving surface. PURPOSE: The aim of this study was to evaluate the effectiveness of rebounders on balance and postural control in a group of older adults over 16 weeks.

METHODS: Thirty-three participants (mean age: 74.1 ± 7.9 yrs) were divided into an experimental (E) group that participated in a rebounder exercise program twice per week, a reference (R) group which consisted of individuals that participated in an evidence-based program emphasizing strength and balance development, and a control (C) group. Each participant completed the Berg Balance Scale and the Mini
Sarcopenia is the age related loss of lean mass and is related to functional limitations and disability in older adults. New guidelines have been developed to define sarcopenia but further research needs to be done to identify the prevalence of sarcopenia in older populations using these new guidelines.

**Sarcopenia**

- **Purpose:** To determine the prevalence of sarcopenia in women aged 65-84 years.
- **Methods:** Fifteen untrained healthy subjects (10 women = 69.07 ± 13.27 kg, 43.42 ± 6.61 yrs, 158.9 ± 6.78 cm, and 64.8 ± 2.94 yr; and 5 men 71.44 ± 9.67 kg, 21.34 ± 0.83 %BF, 158.9 ± 6.78 cm, and 64.8 ± 2.94 yr) were randomly assigned to a training (T; n=16; mean±SD, 66.6±7.2 yrs) or control (C; n=11; 69.6±6.4y, 79.7±16.1kg). Training involved two circuits on 11 pneumatic machines 3 times per week, using 25 repetitions (reps) at 50% 1RM. Muscular power endurance was evaluated during 20 reps of the chest press (CP) and leg press (LP) performed as fast as possible at 50% of subjects’ 1RM after a series of light warm-ups. Separate 2x groups (x 2 time) x (20 rep) mixed ANOVA with Bonferroni post hoc tests were used to detect differences. RESULTS: For CP and LP significant time x rep x training interactions were detected (p<.019). CP post hoc analyses for train group revealed significant differences across the final 5 repetitions during pretest and beginning as early as the third rep for post-training. For the CP untrained group few significant differences were seen during pretest; while post-test significant differences began by repetition 10. For LP both for trained and untrained groups, during pretest and post-test, a significant repetition effect was shown (p<0.001). There were no significant differences revealed post hoc analysis for the pretest in either group; however, changes were apparent as early as the third repetition for the post-test data in the trained group. No significant differences were found across repetitions for the untrained group. For both the LP and CP groups no significant differences were detected between pretest and post-test across repetitions for the CP group; however, the T group showed significant differences across time for repetitions 8-20 and 11-20 for LP and CP, respectively (p<.0025).

**Conclusions:** Our results support the use of our isoinertial fatigue test to evaluate power endurance in older persons since changes in the power output patterns which resulted from our endurance training program were not seen in controls.

**References**


**Note:** (No relationships reported)
Body Protein Retention is Maintained in Older Adults Performing High-Intensity Interval Training (HIIT)

William R. Lunn, Allyson Derosier. Southern Connecticut State University, New Haven, CT.

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(No relationships reported)

High-intensity interval training (HIIT) is a popular and effective program to elicit physiologic adaptations favorable to quality of life improvement and metabolic disease risk reduction. Whether an older population (>50 y) would be more challenged to retain body protein performing HIIT compared to younger individuals is unknown. PURPOSE: To determine if measures of body protein retention and exercise performance change in older adults completing a 2-week HIIT program, compared to younger adults. METHODS: Healthy, young (n=8; 24.4±3.6 y; BMI=27.1±2.8 kg·m-

2) and older (n=8; 59.4±5.6 y; BMI=26.8±5.6 kg·m-2) males and females completed a 2-week (6 sessions) HIIT program on a cycle ergometer. Baseline nitrogen balance (NBAL) and urinary creatinine (UC) were assessed from 24-h urine collection and a 3-d habitual diet recall. Baseline maximal oxygen uptake was determined via graded exercise test with indirect calorimetry on a cycle ergometer. Each HIIT session was 10x60 s at 90% of peak power achieved in the VO2max test. Recovery interval was 60 s active recovery (50 W). Nitrogen balance and urine creatinine were determined at 0-200 ms after 8 weeks (279 ± 55 vs. 325 ± 43 N·ms-1, p<0.05; see table). CONCLUSION: Older, healthy people, suggesting that should be incorporated in strength training to improve daily life activities in this population.

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Older</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>Initial</td>
<td>Final</td>
</tr>
<tr>
<td>NBAL (g/d)</td>
<td>5.7 ± 4.5</td>
<td>3.7 ± 6.1</td>
</tr>
<tr>
<td>UC (g/d)</td>
<td>0.28 ± 0.53</td>
<td>0.15 ± 0.63</td>
</tr>
<tr>
<td>VO2 (mL/kg/min)</td>
<td>39.8 ± 3.3</td>
<td>31.8 ± 5.9</td>
</tr>
<tr>
<td>PP (W/kg)</td>
<td>3.47 ± 0.25</td>
<td>3.56 ± 0.25</td>
</tr>
</tbody>
</table>

The sarcopenia has a high prevalence and various triggers factors, which should be identified for prevention and reversal. PURPOSE: to determine the prevalence and associated factors with sarcopenia in physically active subjects. METHODS: 910 subjects were evaluated (788 women and 122 men) who were involved in physical activity programs from the Longitudinal Project of Aging and Physical Fitness of Sao Caetano do Sul. Sarcopenia was determined by The European Working Group on Sarcopenia in Older People (EWGSOP) criteria that takes into account low muscle mass (arm muscle circumference) and low muscle strength (hand grip) or low physical performance (gait speed). The independent variables were assessed by an anamnesis, as well as anthropometric measures (waist and calf circumference), BMI and level of physical activity assessed by IPAQ short version. Poisson Regression analysis with robust variance was used to estimate the prevalence ratio with 95% confidence intervals. The significance level adopted was p<0.05. RESULTS: 18.4% of the sample had low muscle mass, 50.9% low muscle strength and 34.2% had reduced gait speed resulting in 13.5% prevalence of sarcopenia. Both groups met the recommendation of 150 min/week (on average 247.5 ± 161.2 min/week for non sarcopenic and 297 ± 162 min/week for sarcopenic). CONCLUSIONS: Lower calf circumference and low body weight were determined as risk factors for sarcopenia while overweight and greater weight circumference has shown as a protective factor for sarcopenia. It is noteworthy that the level of physical activity of this sample may have contributed to the low prevalence of sarcopenia.

Senior golfers (>50 yrs of age) often play golf to stay physically active and socialize, as well as to hone their skills for competition. Improving golf fitness levels may enable older adults to play golf to a later age, and to maintain their physical capabilities as they continue to enjoy the physical and psychological benefits of participation. PURPOSE: To investigate whether golfers completing a pre-season 8-week golf-training program (GTr) had improved fitness, golf-specific capabilities, enjoyment, and mood states after the GTr. METHODS: Ten females (mean age of 63.6 ± 7.2 yrs) completed the Tielefont Performance Institute (TPI) golf fitness screen and the Physical Activity Enjoyment Scale (PACES) before and after GTr. They also completed the Profile of Mood States (POMS) pre- and post- a 6-min walk test performed before and after GTr. Both heart rate (HR) and ratings of perceived exertion (RPE) were measured post-walk tests. One-way (Time) ANOVAs for the variables were calculated (p<0.05). RESULTS: As expected, physiological characteristics did not change significantly from before to after the GTr. These were the following M±SDs: Body weight = 69.4 ± 14.3, 69.8 ± 14.3 kg; 6-min walk distance = 627 ± 57, 628 ± 54 yds and 6-min walk RPE = 13.0 ± 1.9, 13.5 ± 2.1 (“somewhat hard”). The 6-min walk HR = 127 ± 20; 119 ± 17 beats/min (p = 0.02) and scores for the TPI golf fitness screen (18.3 ± 4.1; 14.4 ± 6.9) improved (p = 0.10). However, the TPI swing evaluations scores (10.0 ± 7.5; 8.8 ± 3.5), and PACES Trait were not significantly different after GTr. Golfers self-reported feeling “ready for the golf season”. Results from a two-way repeated measures ANOVA indicated that Total Mood Disturbance (TMD) scores on the POMS changed in desirable directions (p = 0.11) after 6-min of walking as “fast as you can” at both the beginning and the end of GTr (99.3 ± 13.7, 90.4 ± 16.5; 101.9 ± 18.3, 95.9 ± 11.6). CONCLUSIONS: Following a pre-season golf-specific training program, TPI golf fitness-screen scores improved. Golfers also reported enjoying exercise regardless of GTr and had desirable changes in mood states after the 6-minute walk tests. Additional studies on the benefits of golf training for older adults are needed to help senior golfers stay “on the course.”

Abstracts were prepared by the authors and printed as submitted.
**Board #10**

**June 1, 9:30 AM - 11:00 AM**

**6-Minute Walk Test: Relationship To Cognitive Function In Healthy Older Adults**

Jennifer Sherwood, Cathy Ionuye, Erik Anderson, Brendan Jordan, Kevin Medina, Audrey Rueda, Nicole Spink, Joaquin Tabera, Shannon Webb, Yan Yan Zhou. California State University, East Bay, Hayward, CA. (Sponsor: Vanessa Yingling, FACSM)

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(No relationships reported)

By 2030, ~20% of the United States population will be 65 years or older. Regular physical activity is imperative in keeping this population physically and cognitively healthy, thereby maintaining their independence (Ormman et al., 2014). Loss of independence was shown to be associated with low aerobic fitness (Paterson et al., 2004). Aerobic fitness is typically assessed using a VO2max test, which is expensive and contraindicated in older populations. Alternatively, the self-paced 6-minute walk test (6MWT) is a safe and efficient assessment of aerobic fitness for older populations (Rikli & Jones, 1998). Previous studies suggest that aerobic fitness is positively correlated with cognitive function in sedentary older adults (Colcombe et al., 2003). However, there is a lack of literature that specifically looks at the relationship between the 6MWT and cognitive function in ethnically diverse healthy populations of 60 years and older. PURPOSE: To assess the relationship between 6MWT performance and cognitive function in ethnically diverse healthy populations ages 60-95 yrs. METHODS: 43 participants (33 female, 10 male) aged 76.3 ± 10.5 yrs were recruited from the local area. During the 6MWT, exercise HR, distance walked, and heart rate recovery (HRR) each minute for 5 minutes was recorded. Additional assessments included cognitive tests (Modified Mini-Mental State Test; 3MS, trailmaking tasks, animal naming), muscular fitness assessed by hand-grip strength, Physical Activity Scale for Elderly (PASE), Perceived Stress Scale (PSS) and anthropometric measures. RESULTS: Aerobic fitness as measured by 6MWT was moderately correlated with 3MS (p=0.036, r=0.328) and animal naming (p=0.011, r=0.395). Aerobic fitness levels were highly correlated with peak hand-grip strength (p=0.001, r=0.492), HRRmax (p=0.001, r=0.567), HRR1 (p=0.001, r=0.524), HRR2 (p=0.001, r=0.596). CONCLUSION: Findings agree with previous studies (Barnes et al., 2003; Colcombe et al., 2003) suggesting that aerobic fitness is associated with preservation of cognitive function as assessed by 3MS and animal naming. Our findings conclude that the 6MWT can be used as an indicator for aerobic fitness and cognitive function in healthy individuals from ages 60-95 yrs.

**Board #11**

**June 1, 9:30 AM - 11:00 AM**

**Qigong Exercise improves Japanese Old Adults’ Quality of Life**

Shuji Suzuki1, Azusa Uematsu2, Takashi Shimazaki, Hirofumi Kobayashi1, Madoka Nakamura1, Tibor Hortobagyi, FACSM1. Waseda University, Tokorozawa, Japan. 2Dokkyo Medical University, Mibu-machi, Japan. 3University of Tokyo, Meguro-ku, Japan. 4University of Groningen, Groningen, Netherlands. (Sponsor: Tibor Hortobagyi, FACSM)

Email: shujiwhs@waseda.jp

(No relationships reported)

**PURPOSE:** Dao Yin Yangsheng Gong (DYSG) is a system of exercises that involves gentle rotational movements and breath control and it stimulates key acupressure points and cognitive function. We examined the effects of DYSG on measures of physical and psychological quality of life among the participants of the 2014 DYSG national games in Yokohama, Japan using a questionnaire.

**METHODS:** 771 of 1,200 DYSG participants with 8.3 ± (6.2) of experience filled in the Anti-Aging Quality of Life Questionnaire, a subjective symptoms inventory. Subjects rated their current physical and psychological condition by recalling their condition before they started to habitually practice DYSG. The questionnaire scores 13 physical (fatigue, breathlessness, joint and muscle pain, etc) and 9 psychological health domains (anger psychological fatigue, insomnia and vigor all improved (SR = 3.5, 6.5, 2.1, and 3.1)). Logistic regression analysis showed that in the group age < 60 vs. age 76-80, poor physical condition and sensitivity to cold improved more (adjusted odds ratio, OR = 9.9 and 6.6). Males vs. females perceived more improvements in sensitivity to cold (adjusted standardized residuals, SR = 6.2, 3.6, 2.2, and 3.0) and anger, psychological fatigue, insomnia and vigor all improved (SR = 3.5, 6.5, 2.1, and 3.1). Logistic regression analysis showed that in the group age < 60 vs. age 76-80, poor physical condition and sensitivity to cold improved more (adjusted odds ratio, OR = 9.9 and 6.6). Males vs. females perceived more improvements in sensitivity to cold (adjusted standardized residuals, SR = 6.2, 3.6, 2.2, and 3.0) and anger, psychological fatigue, insomnia and vigor all improved (SR = 3.5, 6.5, 2.1, and 3.1).

**RESULTS:** The sample consisted of 83 males and 679 females (9 participants did not answer) age 81 (n = 28) (22 participants did not give their age). Chi-square and anthropometric measures. RESULTS: Aerobic fitness as measured by 6MWT was moderately correlated with 3MS (p=0.036, r=0.328) and animal naming (p=0.011, r=0.395). Aerobic fitness levels were highly correlated with peak hand-grip strength (p=0.001, r=0.492), HRRmax (p=0.001, r=0.567), HRR1 (p=0.001, r=0.524), HRR2 (p=0.001, r=0.596). CONCLUSION: Findings agree with previous studies (Barnes et al., 2003; Colcombe et al., 2003) suggesting that aerobic fitness is associated with preservation of cognitive function as assessed by 3MS and animal naming. Our findings conclude that the 6MWT can be used as an indicator for aerobic fitness and cognitive function in healthy individuals from ages 60-95 yrs.

**Board #12**

**June 1, 9:30 AM - 11:00 AM**

**Personalized Walking Cadence to Increase Time at Moderate-Vigorous Intensity in Inactive Older Adults**

Martin Sénéchal1, Jana Slaght1, Danielle R. Bouchard1. 1University of New Brunswick, Fredericton, NB, Canada. 2University of Manitoba, Winnipeg, MB, Canada.

Email: msenecha@unb.ca

(No relationships reported)

**Purpose:** The main goal of this study was to identify if older inactive adults using a pedometer, giving walking cadence required to reach moderate intensity, significantly increased total time spent at moderate to vigorous intensity and 10-minute bouts at moderate to vigorous intensity.

**Methods:** Inactive older adults (N = 42) were instructed to walk 150 minutes/week at no specified intensity during phase 1 (week 1-6). In phase 2 (week 7-12), the intervention group (N = 20) received instructions on how to reach moderate intensity, using a pedometer and individualized walking cadence, while the control group (N = 22) did not. The individualized cadence was based on the number of steps per minute required to reach 40% of VO2max.

**Results:** During phase 1, total time spent at moderate to vigorous intensity increased from 100 ± 6 to 117 ± 64 min. (p<0.05) and time spent in moderate to vigorous intensity in 10-minute bouts significantly increased from 10 (25th-75th percentile: 0-32 min.) to 19 (25th-75th percentile: 8-53 min. p<0.01). During phase 2, total time spent at moderate to vigorous intensity increased from 129 ± 67 to 203 ± 91 min. (p<0.01) and time spent at moderate to vigorous intensity in 10-minute bouts increased from 31(25th-75th percentile:11-55) to 88 (25th-75th percentile: 52-143); p=0.01, while the control group significantly decreased both variables (p<0.01). In addition, 35% of inactive older adults in the intervention group reached the common prescription of a minimum of 150 minutes of aerobic exercise per week in 10-minute bouts (p<0.01). No one in the control group reached 150 minutes of aerobic exercise per week in 10-minute bouts.

**Conclusion:** Inactive older adults can increase total time and 10-minute bouts at moderate to vigorous intensity by using individualized walking cadence. These results are of great importance as it suggests that walking cadence might be a useful strategy to promote exercise at the target intensity recommended for older adults.

**Board #13**

**June 1, 9:30 AM - 11:00 AM**

**Effects From “Exergames” Vs. Traditional Exercise On Lower And Upper Body Strength In Older Adults**

Aline R. Barbosa, Bruno M. Queiroz, Adriano F. Borgatto, Vandirze Meneghini, Alexandre V. Guimarães. Universidade Federal de Santa Catarina, Florianópolis, Brazil.

Email: aline.r.barbosa@ufsc.br

(No relationships reported)

**PURPOSE - This study compared the effects of exergaming-based program to traditional aerobic exercise on lower and upper body strength in older adults.**

**METHODS - This is a randomized controlled trial. The sample included 27 inactive community-dwelling subjects (aged 55 and over) without cognitive impairment and previous contact with video games or exergames. For exergaming (n = 13), we used games that simulate sports activities (Kinet Sport Ultimate Collection, XBox 360 Kinecmatic). The aerobic exercise program (n=14) was carried out on treadmills and cycle ergometers (40-59% heart rate reserve). The duration of the sessions was 50 minutes, three days per week (alternate days), for 12 weeks. Individuals performed the 30-s chair stand test (no. of reps.), which assessed lower body muscle strength and endurance; and the Arm Curl test (no. of reps.), which assessed upper muscle strength and endurance, specifically of the biceps.

**RESULTS - Adherence to intervention programs (attending the sessions) was 90.6% and 86.9%, for the exergame and aerobic groups, respectively. The Mixed Model ANOVA (F- statistics and p-values) showed that the interaction of intervention group by time was significant for the arm curl test (F=0.732, Effect size 0.242; p<0.05). After 12-weeks, both groups showed improvement in the 30-s chair stand test (p<0.05). Arm curl test performance improved significantly (p<0.05) in the exergame group.**

**CONCLUSION - The exergaming-based exercise was feasible and substantially improved upper and lower body muscle strength in older adults and may represent a model for structured training.**
Muscle power decreases exponentially as we age causing decrements in performance of activities of daily living and increased fall probability. High-velocity weight training (power training) has been shown to be an effective intervention to improve older persons’ power; however, the optimal loads for maximizing power improvements across different exercises remains undetermined. PURPOSE: To determine differences in optimal loads for mechanical power across six isoinertial exercises. METHODS: Forty-two community-dwelling older adults (76.0±7.9 years) were tested during two 1.5 hour sessions. One repetition maximums (1RM) were identified across six pneumatic machines following a 10 repetition warm up. After a 5 min recovery and an additional 10 repetition warm up, power outputs were recorded for each machine at random percentages of 1RM ranging from 30 to 90%. Repeated measures ANOVA with Bonferroni post-hoc analyses were used to determine differences among loads. RESULTS: The leg press showed a significant load effect with 60% producing a power output (M=0.95±0.064) that was significantly higher than 30%, 40%, 80%, and 90% 1RM (ƞ2=0.468; p≤0.008). The leg curl showed a significantly higher power output at 50% 1RM (M=0.93±0.057) than at 30%, 40%, 70%, 80%, and 90% 1RM (ƞ2=0.468; p≤0.008). The calf raise also showed a significant difference between loads with peak power occurring at 60% 1RM (M=0.89±0.107) compared to 30%, 40%, and 90% 1RM (ƞ2=0.206; p≤0.039). CONCLUSIONS: Our results suggest that optimal loads for peak power vary by exercise likely due to differences in the number of joints, muscle characteristics and bony lever systems involved in each exercise.

Muscle power decreases exponentially as we age causing decrements in performance of activities of daily living and increased fall probability. High-velocity weight training (power training) has been shown to be an effective intervention to improve older persons’ power; however, the optimal loads for maximizing power improvements across different exercises remains undetermined. PURPOSE: To determine differences in optimal loads for mechanical power across six isoinertial exercises. METHODS: Forty-two community-dwelling older adults (76.0±7.9 years) were tested during two 1.5 hour sessions. One repetition maximums (1RM) were identified across six pneumatic machines following a 10 repetition warm up. After a 5 min recovery and an additional 10 repetition warm up, power outputs were recorded for each machine at random percentages of 1RM ranging from 30 to 90%. Repeated measures ANOVA with Bonferroni post-hoc analyses were used to determine differences among loads. RESULTS: The leg press showed a significant load effect with 60% producing a power output (M=0.95±0.064) that was significantly higher than 30%, 40%, 80%, and 90% 1RM (ƞ2=0.468; p≤0.008). The leg curl showed a significantly higher power output at 50% 1RM (M=0.93±0.057) than at 30%, 40%, 70%, 80%, and 90% 1RM (ƞ2=0.468; p≤0.008). The calf raise also showed a significant difference between loads with peak power occurring at 60% 1RM (M=0.89±0.107) compared to 30%, 40%, and 90% 1RM (ƞ2=0.206; p≤0.039). CONCLUSIONS: Our results suggest that optimal loads for peak power vary by exercise likely due to differences in the number of joints, muscle characteristics and bony lever systems involved in each exercise.

CONCLUSIONS: Our study suggests that those with better balance have greater lower body strength and mobility. Also, COP values corresponding to derived cut-off points for independence were identified. Strategies targeting strength, mobility, and balance may increase the likelihood of maintaining independence in aging, and monitoring these may be important for quality of life in older adults.

Maintaining regular exercise is an important issue and helpful to improve health status for elderly adults. Game-based group exercise program not only can be used to enhance the motivation for regular exercise but also improves the social interaction in old people. However, there are few therapists designed game-based group exercise and investigated the long-term effects on functional fitness in elderly population in Taiwan. PURPOSE: The purpose of this study is to investigate the effects of a 12-month game-based group exercise on functional fitness in community-dwelling older adults. METHODS: Thirty community-dwelling elderly adults (23 female, 7 male; 78.1±7.6 years) were recruited and divided into game-based (n=15) or control group (n=15). Each group participated in a 60-min exercise program twice per week for 12 months. The exercise program of game-based group consisted of 10-min warm up and cool down stretching exercise and 50-min multidimensional physical games, such as ping pong ball blowing, modified London Bridge with resistance band, weight shifting exercise with juggle ball and modified football exercise et al. The control group received traditional physical exercise, including 10-min warm up and cool down stretching exercise, 50-min muscle strength, endurance, mobility, and balance exercise. The functional fitness (body composition, chair-stand [CS], body flexibility, one leg stand [OLS], 8-ft up-and-go, 2-minute knee-up) and Fukuda stepping tests were measured before and after the intervention. SPSS 16.0 was used to analyze data, and alpha level was 0.05. RESULTS: The comparisons of pre and post-intervention measures showed significantly improvements (p<0.05) in waist width (+10.5%), CS (+17.6%), and OLS (+37.1%) for Game-based group, and BMI (+9.1%), waist width (+9.3%) and OLS (+9.5%) for control group. Game-based group also showed greater and significant improvement in CS (+42.6%, p=0.016) and OLS (+27.6%, p=0.021) performances compared to control group. CONCLUSIONS: The results suggest that game-based group exercise is an effective exercise program for producing greater functional fitness improvements in elderly population, which would be very helpful to create appropriate exercise programs for community-dwelling elderly adults in the future.

Falls are the leading cause of hospitalizations and loss of independence in older adults. Improving balance and physical function are important strategies to decrease fall risk and increase length of independence. Little is known about the level of balance needed to maintain independence and the relationship between balance and physical function measures in older adults. Recently, Rikiki and Jones (2013) developed cut-off points for their Senior Fitness Battery (SFB) physical tests that align with maintenance of independence, over time, for older adults. PURPOSE: The purpose of this study was to assess differences in lower body strength and mobility in older adults with better and poorer balance, and determine balance values associated with SFB cut-off points for independence in lower body strength and mobility. METHODS: Community-dwelling older adults (N=231, Mage = 74.0yr ±8.2) were recruited from non-residential senior centers and completed validated measures of ADL level assessed using the Barthel Index in old women attending a day care service. Twenty-four old women aged 71-103 (mean age 88 [SD 8] years) had muscle thickness measured as the perpendicular distance between the subcutaneous adipose tissue—muscle interface and muscle-bone interface of the ulna (MT-ulna). Handgrip strength (HGS) was also measured for the dominant hand. Muscle quality (MQ) was calculated from the HGS to MT-ulna ratio. The ADL level was assessed using the Barthel Index (10BI) of the 10BI, i.e., dressing, walking, descend/ascend stairs were also scored. A select 3 items (3BI) of the 10BI, i.e., dressing, walking, descend/ascend stairs were also scored. Lower extremity function (LEF) was scored by testing balance ability with their
Hand arthritis and sarcopenia are common health problems in older adults and new sarcopenia guidelines recommend the use of grip strength (GS) to determine weakness. Using GS to identify sarcopenia may present a significant challenge when hard arthritis is present and might not be related to other strength measures. However, this has not been thoroughly investigated in older women classified as sarcopenic or dynapenic. PURPOSE: To determine if GS is related to other measures of upper and lower body strength and to determine if arthritis status is related to sarcopenia or dynapenia identification status in a sample of older women. METHODS: Community-dwelling older women (n=25, age=72.3±4.6 years) who were screened to be dynapenic or sarcopenic based on standard criteria were recruited for this cross-sectional analysis. GS was measured using standard techniques and arthritis status was determined based on self-report. Chest press (CP1RM) and leg press (LP1RM) one-repetition maximum tests were done using standardized protocols after familiarization. Spearman correlations were used to compare CP1RM, LP1RM, GS scores and a Fisher’s exact test was used to determine if arthritis status was related to sarcopenia status based on new guidelines. RESULTS: Mean GS was 16.6 ± 3.7 kg and hand arthritis was present in 10 of the 25 women (40%; GS=16.3 ± 4.8 kg). Seven of the 10 (70%) women with arthritis had low GS (< 20 kg) but no other qualifications for sarcopenia, while 8 of the 15 women without arthritis (53%) had low GS but no other qualifications for sarcopenia. These frequency differences were not statistically significant (p = 0.679). In addition, there was not a significant correlation between GS and CP1RM (rho=0.07, p = 0.75) or LP1RM (rho=0.09, p = 0.66). However, there was a significant relationship between CP1RM and LP1RM (rho=0.74, p = 0.001). CONCLUSIONS: These findings indicate that hand arthritis is not related to other measures of upper or lower body strength and does not affect sarcopenia classification and there was not a significant correlation between GS and CP1RM (rho=0.07, p = 0.75) or LP1RM (rho=0.09, p = 0.66). After adjusting for age, LEF was correlated with both MT-ulna (r=0.468, p=0.032) and MQ (r=0.660, p<0.001). However, the 10B1 was only correlated with MT-ulna (r=0.468, p=0.032), and the 3B1 was only correlated with MQ (r=0.447, p=0.042).

**CONCLUSIONS:** Muscle quality in the forearm may be an effective variable for determining leg function and abilities like dressing, walking, and descend/ascend stairs in old women attending a day care service.

**Single-leg cycling allows for a greater muscle specific exercise capacity and therefore provides a greater stimulus for metabolic and vascular adaptations when compared to standard double-leg cycling. PURPOSE:** The purpose of this investigation was to compare the metabolic, cardiovascular, and peripheral responses of single-leg cycling to double-leg cycling in a healthy older adult population. METHODS: Eleven healthy males (age 66.8 ± years) performed two cycling conditions consisting of double-leg cycling (DL) and single-leg cycling (SL) with a 97N counterweight attached to the unoccupied crank arm to replicate normal cycling biomechanics. For each condition, participants performed cycling trials (60rpm) at three different work rates (25, 50, 75 W) for 4 minutes each. Oxygen consumption (VO2), respiratory exchange ratio (RER), heart rate (HR), mean arterial pressure (MAP), femoral blood flow, rating of perceived exertion (RPE), and liking scores were recorded. RESULTS: HR was similar between DL and SL conditions at all three intensities (92±19, 102±17 and 115±17 for SL versus 91±21, 100±18 and 112±20 for DL; p>0.160). VO2 was similar between DL and SL at 25W and 50W (p=0.35), however at 75W VO2 was greater during the SL condition (16.1±2.7ml/kg/min) compared to DL (14.4±1.9 ml/kg/min; p=0.037). Femoral artery blood flow was significantly greater during SL cycling for the 50W (670±287 versus 456±217ml/min; p=0.01) and 75W work rates (923±282 versus 608±270; p<0.001) but not at 25W. RER was significantly higher for SL (0.86±0.06, 0.91±0.09 and 0.97±0.09) compared to DL (0.81±0.06, 0.86±0.07 and 0.90±0.07) across all three intensities (p<0.018). RPE and liking were similar between both conditions (p = 0.065 and p = 0.060, respectively). CONCLUSIONS: At least at low and moderate intensities, counterweighted single-leg cycling provides a greater peripheral stress for the same cardiovascular demand as double-leg cycling in a healthy elderly adult population. Furthermore, enjoyment of single-leg cycling was similar to double-leg. Thus, single-leg cycling with a counterweight may be an alternative exercise modality to maximize peripheral adaptations in the healthy aging population and those with central or peripheral diseases (i.e. peripheral vascular disease, diabetes, cardiovascular disease).
performance of LP exercise above or below the median average velocity obtained throughout the 12-week training period. The change scores (post minus baseline) of 3 functional measures (habitual gait velocity [HGV], maximal gait velocity [MGV], and timed up and go [TUG]) were compared between HI-V and LO-V using ANOVA models covarying for age, sex, and baseline functional score a priori. Statistical significance was accepted at $p<0.05$.

RESULTS: The median average velocity of 42 left and right LP contractions ($n=3024$; 3 x 14 over 36 visits) for each of the 28 participants was 0.88 m/s (HI-V: 1.0±0.08 m/s; LO-V: 0.75±0.09 m/s; $p=0.01$). Improvements in HGV (HI-V: 0.09±0.04 m/s vs. LO-V: -0.06±0.05 m/s; $p=0.03$), MGV (HI-V: 0.08±0.04 m/s vs. LO-V: -0.12±0.05 m/s; $p=0.01$), and TUG (HI-V: -1.15±0.30 s vs. LO-V: 0.53±0.34 s; $p=0.003$) were significantly greater for HI-V compared to LO-V.

CONCLUSIONS: Because of the variable nature of self-selected maximal limb velocity during HSP in older adults, identification of the optimal average velocity at which to train to improve functional performance is paramount. These data indicate that an average velocity of 0.88 m/s during LP exercise training may be necessary to ensure functional improvements in older adults participating in HSP.

### RESULTS

**PURPOSE:** To perform appropriate treatment for Jones fracture, it is important to understand its pathogenesis. The purpose of this study was to investigate morphological characteristics of the foot with Jones fracture. **Method:** Twenty-eight feet in 27 patients (Age: 19.4±1.4 years) with Jones fracture (injured side) and twenty-six feet of contralateral side in 27 patients (injury group; non injured side) were investigated in this retrospective study. Sixty-two feet in 41 patients (Age: 18.7±2.0 years) who have no evidence of fracture or deformities around foot and ankle in investigated side were used as control (control group; right foot and left foot). A two-dimensional coordinate system was used to compare the anatomic features in these two groups with weight bearing dorsoplantar radiographs of the foot. On the radiography that was imported to personal computer, certain points of tarsal bones defined in the previous reports were plotted in the two-dimensional coordinate system where the axis of the second metatarsals was defined as the X axis; the intersection of the X axis with the proximal end of the second metatarsal was the origin (MB2), and the perpendicular to the X axis passing through the origin was denoted as the Y axis. The points of intersection of the axes of the metatarsals with the distal ends of the metatarsals were marked as M1H-M5H, respectively, and the points of intersection of the axes with the proximal ends were marked as M1B-M5B, respectively. The length of the 5th metatarsal and the X coordinate of M5H were compared between injury groups (injured side, non injured side) and control groups (right foot, left foot). Unpaired t-test was performed to compare differences between the two groups. **Result:** Length of the 5th metatarsal was significantly greater in injury group (injured side; 76.2±6.2 mm, non injured side; 75.5±7.2 mm) than in control group (right foot; 70.0±4.4 mm, left foot; 70.0±4.5 mm) ($p<0.05$). X coordinate of M5B was significantly smaller in injury group (injured side; -30.3±6.2 mm, non injured side; -29.8±5.3 mm) than in control group (right foot; -26.4±6.8 mm, left foot; -26.2±6.8 mm) ($p<0.05$). **Conclusion:** The long 5th metatarsal may cause rotational stress or stress from lateral side. In such a case, stress may concentrate on the plantar side of the 5th metatarsal base.

### A-36 Free Communication/Poster - Assessment of Injury Risk

**Objectives:** To analyze the relationships among cognitive function and handgrip strength and endurance in older adults.

**Methods:** Seventy-one healthy older adults (22 men, 49 women) ages 65-85 years were recruited for this study. Participants were tested for cognitive function: serial sevens (S7), trail making (TM), and letters using two patterns: A (TMA) and B (TMB). The RA VLT scored five 15-min item auditory word recalls (RSUM), an interference word recall (RB), a 6th word and letters using two patterns: A (TMA) and B (TMB). The RA VLT scored five 15-min item auditory word recalls (RSUM), an interference word recall (RB), a 6th word and letters using two patterns: A (TMA) and B (TMB). The RA VLT scored five 15-min item auditory word recalls (RSUM), an interference word recall (RB), a 6th word recall (RB), and timed up and go (TUG) were compared between HI-V and LO-V using ANOVA.

**Results:** Men were taller and heavier ($p<0.05$), but there was no gender difference in age ($p>0.05$). Women scored better ($p≤0.05$) than men for RSUM, R6, and RR, while men had greater handgrip strength ($p<0.01$). For women, HGCON was related to word recall score for men, but not for women. These findings suggested that any relationships among cognitive function and handgrip strength and/or endurance may be gender-specific in healthy adults.
reported on state mandated PPE forms. Binary logistic regression with a two block entry design was used to determine if assessing injury history significantly improved a LE injury risk prediction model. A model was developed by entering age, height, weight, gender, sport, single leg anterior reach (SLAR) asymmetry, and single leg hop (SLHOP) asymmetry into block one using forward conditional selection. A variable indicating a history of injury was added to the model in block two to determine if it significantly improved the model developed in block one. Alpha level was set as a priori at p<0.05.

**Results:** The initial model best predicting injury included age, height, weight, gender, sport, and SLHOP asymmetry greater than 20% ($X^2=90.30, df=8, p<0.001$). Adding history of injury significantly improved the model ($X^2$ change= 30.52, $df=1$, $p<0.001$). Additionally, when incorporated into the model created in block one, the odds of suffering a LE injury during the study period were 1.99 times greater for individuals with a history of injury (OR = 1.99, 95%CI = 1.56, 2.50, $p<0.001$).

**Conclusion:** Including injury history may significantly improve the ability to predict adolescent athletes’ MSK injury risk.

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**METHODS**

To determine the reliability and validity of the RoterMeter, image analysis to obtain the rotation of the right lower leg was simultaneously carried out. Statistical analysis was performed using intra-class correlation coefficients (ICC, intra-examiner and inter-examiner) and Pearson’s correlation coefficient between the 2 methods.

**RESULTS**

A-30.

**CONCLUSIONS**

The RoterMeter was found to be a reliable and valid measurement instrument concerning knee rotation. It is easy to perform and might be used in a wide field to measure knee rotation. But the deformation of soft tissue and the movement of subtalar joint should be considered.

This study was supported by a Grant-in Aid Exploratory Research from NUHW (2013-A-30).

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**RESULTS**

Total (internal + external) knee rotation ranged from 100.0° to 105.7° by the image analysis. Intra-examiner ICC(1,1) results were 0.705 and 0.721, and inter-examiner ICC(2,2) was 0.828. The correlation coefficient between the results of RoterMeter and image analysis was 0.875 (significant at $P<0.05$).

**CONCLUSIONS**

The RoterMeter was found to be a reliable and valid measurement instrument concerning knee rotation. It is easy to perform and might be used in a wide field to measure knee rotation. But the deformation of soft tissue and the movement of subtalar joint should be considered.

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**METHODS**

Studies that investigated the risk factor of ACL injury were identified through a computerized search of all electronic databases: AgeLine, CINAHL, Medline, PsycINFO, PubMed, SPORTDiscus, and Web of Science. Through the electronic search and selection, seven anthropometric studies with comparisons between the injured and uninjured groups were included in this meta-analysis. Six variables included were: NWI-Notch width index (NWI), Medial or lateral tibial plateau slopes (MLTSPS), Depths or width of tibial or femoral (DWTF), Tibial or femoral angler (TFA), Related knee angles (RKA) and Tibial anterior displacement (TAD).

**RESULTS**

Two variables, RKA and TAD out of six variables were significantly different ($p<0.05$) between the injured and uninjured groups. The injured group had higher values of RKA and TAD than the uninjured group did and the effective sizes (ES) were ES = 0.76 for RKA representing Q-angle and knee hyperextension angle, and ES = 0.56 for TAD representing tibial anterior displacement.

**CONCLUSIONS**

Knee functional anthropometric variables in terms of Q-angle and knee hyperextension angle, and tibial anterior displacement may be the better predictable risk factors of ACL injury.

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**RESULTS**

62.2±8.24° by the image analysis. Intra-examiner ICC(1,1) results were 0.705 and 0.721, and inter-examiner ICC(2,2) was 0.828. The correlation coefficient between the results of RoterMeter and image analysis was 0.875 (significant at $P<0.05$).

**CONCLUSIONS**

The RoterMeter was found to be a reliable and valid measurement instrument concerning knee rotation. It is easy to perform and might be used in a wide field to measure knee rotation. But the deformation of soft tissue and the movement of subtalar joint should be considered.

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This study was supported by a Grant-in Aid Exploratory Research from NUHW (2013-A-30).
Purpose: It is perceived that football players are entering college with more injuries than in the past. The purpose of this study was to quantify the prevalence of injuries to incoming freshmen in a Division I college football team.

Methods: Pre-participation questionnaires from 605 first-year football players from the past 20 years (1996-2015) were examined to determine the prevalence of concussions, stingers, fractures, and surgeries sustained before playing at the collegiate level. Players were grouped by position: wide receiver and defensive back (WR/DB), offensive and defensive line (OL/DL), and all other positions (OP). Prevalence of injuries by year and position was compared using Pearson’s χ² Test (p<0.05).

Results: The percentage of all players reporting a prior injury is as follows: concussion (21%), stinger (23%), surgery (31%), and fracture (44%).

There was no significant difference in the percent of players reporting a prior concussion by year: 1996-2000 (11%), 2001-2005 (22%), 2006-2010 (20%), 2011-2015 (24%) (χ²=5.42, p=0.14) or by position: WR/DB (17%), OL/DL (23%), OP (22%) (χ²=2.41 p=0.49).

There was a significant difference in the percent of players reporting a stinger by year: 1996-2000 (44%), 2001-2005 (39%), 2006-2010 (21%), 2011-2015 (3%) (χ²=89.59, p<0.001) but not by position: WR/DB (24%), OL/DL (19%), OP (25%) (χ²=3.58 p=0.31).

There was no significant difference in the percent of players reporting a prior surgery by year: 1996-2000 (20%), 2001-2005 (23%), 2006-2010 (21%), 2011-2015 (4%) (χ²=1.90, p=0.39) or by position: WR/DB (23%), OL/DL (31%), OP (31%) (χ²=1.87, p=0.39).

There was no significant difference in the percent of players reporting a prior fracture by year:1996-2000 (46%), 2001-2005 (43%), 2006-2010 (47%), 2011-2015 (40%) (χ²=1.90, p=0.39) or by position: WR/DB (44%), OL/DL (40%), OP (47%) (χ²=2.07, p=0.09).

Conclusion: A decrease in stingers was observed over time, possibly due to less contact in practices and increased focus on protective equipment. However, there was no significant difference among any other injury recorded. We expected to see an increase in concussions and surgeries over time. Under reporting is a major concern as players may fear disqualification or that they are evaluated by the coaching staff based on their medical history.

Board #29
June 1, 11:00 AM - 12:30 PM
Acute Pre-Race Illness Reduces The Ability To Finish A Race - A Study In 7035 Runners
Martin Schwellnus, FACSM1, Ani Van Tonder2, Sonja Swanevelder3, Esme Jordaan3, Wayne Derman3
1University of Pretoria, Pretoria, South Africa. 2University of Cape Town, Cape Town, South Africa. 3South African Medical Research Council, Cape Town, South Africa.

PURPOSE: Distance runners are more prone to acute illness during periods of intense and prolonged training. There are little data on how many runners have symptoms of acute pre-race illness (API) and how many runners with API, who choose to start the race, do not finish the race. The purpose of this study was to determine the period prevalence of runners with API, the incidence of runners with API who received educational information and then did not start the race, and the incidence of runners with API who chose to start the race, but do not finish the race.

METHODS: 1338 of 7031 runners (19%) reported one or more symptoms of API in the 7-day period before the race via an online questionnaire and 5693 were asymptomatic from the past 20 years (1996-2015) were examined to determine the prevalence of concussions, stingers, fractures, and surgeries sustained before playing at the collegiate level. Runners with API were divided into sub-groups as follows: systemic symptoms group (n=530), respiratory symptoms group (n=896), gastrointestinal symptoms group (n=249) and runners who failed the “neck check” (n=878). All runners (N=7031) were then followed prospectively on race day, documenting the did-not-start (DNS) frequency (%) and the did-not-finish (DNF) frequency (%). RESULTS: 7.5% experienced systemic API, and 12.5% failed the “neck check.” The DNS % for the API group (11.6%) was higher (p=0.0002) than the control group (6.6%). Runners with systemic API also had a higher (15.1%) DNS % (2.4%) (p=0.0286 vs. control). The DNF % was also higher in the systemic API group (2.1%) vs. the control group (1.3%) (p=0.0344). CONCLUSION: API is common in runners and a pre-race screening process can identify runners with API. An educational intervention can be applied that increases the rate of not starting a race. However, runners with API who decided to start the race, despite educational information had a significantly higher did-not-finish (DNF) rate compared to control runners.

Board #30
June 1, 11:00 AM - 12:30 PM
Prevalence Of Fms Asymmetries And Its Implications On Injury Risk In Male And Female Adolescents
Daniel Crusoe, Laura Smith, Ryan Bean, James Creps, Bara Alsualahcen.

PURPOSE: To compare FMSTM composite scores and number of asymmetries in male and female high school athletes. A secondary aim is to explore proportions of high school athletes that fall below a cut-off score of 14 and observe frequency of asymmetries within the population.

METHODS: Ninety-four (65 male and 29 female) high school athletes, aged between 13.8 and 18.6 years old, were recruited to complete testing. Participants completed a battery of tests, which included FMSTM. Tests were scored in accordance with previously established FMSTM criteria. A Fisher’s exact test was performed to see if there was a difference between genders for those without risk of injury (Composite score greater than or equal to 14 and no asymmetries) vs. those at risk of injury (Composite score less than 14 or any asymmetries). RESULTS: The median number of asymmetries for the entire sample was 1 with the number asymmetries ranging from 0 to 4. The number of asymmetries did not differ between genders (U=205, Z=-1.059, p = 0.30). One or more asymmetry was observed in 70 (74.3%) of the participants. Forty-two participants (45%) presented with 1 asymmetry and twenty-eight participants (28%) presented with more than one asymmetry. The median composite score for the entire sample was 16 with scores ranging from 9 to 20. Composite score did not differ between genders (U=791.5, Z=-1.248 p = 0.212). Nineteen (20.2%) participants scored below the established cutoff composite score of 14. The Fisher’s exact was not significant (p = 0.45). CONCLUSION: The majority of participants, 72 of the 94 (76.5%), had an asymmetry composite score less than or equal to 14, placing them at an increased risk for injury. However, the asymmetries and risk of injuries (i.e. scres <14) appeared to be equally prevalent across gender groups.
Purpose
In sports medicine the majority of overuse injuries are diagnosed using clinical examination as the cornerstone. Whether this can be done reliably has hardly ever been investigated. Medial tibial stress syndrome (MTSS) is a common lower limb overuse injury which is defined as: exercise-induced pain along the postero medial tibial border, and provocation of recognisable pain on palpation ≥ 5 cm of the posteros medial tibial border. This diagnosis does not involve costly additional imaging. Our aim was to assess if MTSS can be diagnosed reliably, using history and clinical examination.

Methods
In this cross-sectional study all athletes with lower leg pain presenting to a sports physical therapy centre were assessed by 2 sports physiotherapists, chosen from a pool of 5 and blinded to each others’ diagnoses, for having MTSS (yes/no). We calculated the prevalence, percentage of agreement, the observed percentage of positive agreement (Ppos), the observed percentage of negative agreement (Pneg), and the chance-corrected ratio of agreement, the kappa-statistic with 95% confidence interval (CI).

Results
Fifty-one subjects participate in this prospective reliability cross-sectional study. Preliminary analysis of 32 athletes with lower leg pain showed the prevalence of MTSS to be 73.4%. The number of females was 22 (68.8%) and the mean age (years ±SD) was 20.8±2.0. The percentage of agreement was 97%. The Ppos and Pneg were 98% and 94% respectively. The chance-corrected ratio for agreement, the kappa-statistic, BI = -0.03, whereas the high prevalence may have deflated Kappa, PI = 0.47. We calculated the prevalence, percentage of agreement, the observed percentage of positive agreement (Ppos), the observed percentage of negative agreement (Pneg), and the chance-corrected ratio of agreement, the kappa-statistic with 95% confidence interval (CI).

Conclusion
MTSS can be reliably diagnosed in athletic populations with exercise-induced lower leg pain, using history and clinical examination.

Atypical lower extremity (LE) kinematics, ranges of motion (ROM), and body composition increase LE stress fracture risk. It is unknown which variables differ between collegiate cross country athletes who go on to sustain a stress fracture (SFx) and those who do not (NSFx). PURPOSE: To determine kinematic, ROM, and body composition differences between SFx and NSFx groups. METHODS: Overhead squats (OHS) errors, passive ROMs, and demographic data were assessed bilaterally in 37 NCAA Division I cross country athletes (n=20, f=17). Male athletes recorded SFx stress fractures for one year following testing. OHS errors included: feet flattening/turning out, heel lift, knee valgus/varus motion, lateral weight shift, low back arching/rounding, and arms falling forward. ROM measurements included: great toe extension, ankle dorsiflexion, knee extension, and hip internal/external rotation, abduction, and extension. Body mass index (BMI) was calculated for each athlete. OHS total and specific errors, ROMs, and BMI group differences were assessed via independent samples t-test and chi-square analyses (p<0.05). RESULTS: Nine athletes (24.3%; m=2, f=7) sustained a LE stress fracture. Females were at greater stress fracture risk than males (9.5% vs 17.0%, p=0.03, SFx vs NSFx, respectively). The SFx group had less hip external rotation ROM (SFx: 42.6±6.9°, NSFx: 52.3±7.8°, t6 = -3.33, p<0.01) and greater knee extension ROM side-to-side percent differences (SFx: 11.7±6.9°, NSFx: 6.8±5.4°, t6 = -2.21, p=0.03) than the NSFx group. The SFx group had also smaller BMI (SFx: 19.9±0.7, NSFx: 21.6±2.3, t16 = -2.20, p=0.03). No other differences were observed. CONCLUSION: Visual observation of the OHS was unable to discriminate between the SFx and NSFx groups. Kinematic differences are reported between similar groups during landings. The OHS may not sufficiently load the LE and thus movement errors are not as pronounced as they are during landings. Hip musculature can alter distal kinematics and increase injury risk; thus, normal and symmetrical hip ROMs may be protective against stress fractures. Our ROM and BMI group differences support previously identified LE stress fracture risks. These findings aid clinicians in identifying runners at greater LE stress fracture risk so injury prevention strategies can be implemented.

The accurate and cost effective identification of left ventricular (LV) hypertrophy is clinically relevant due to its association with cardiac mortality in the general population. PURPOSE: To determine if electrocardiographic (ECG) voltage criteria predicts LV mass measured with cardiac ultrasound in collegiate American-style football (ASF) players. METHODS: Over a 3-year period, standard resting, supine 12-lead ECG and echocardiographic (ECHO) procedures were performed on 76 collegiate ASF players first entering an NCAA Football Bowl Subdivision university as part of their preparticipation physical exams. Player demographics were: age=18.1±1 yr., height=186±7 cm, weight=100±22 kg, BMI=28.6±5.0 m²/kg, and BSA=2.2±0.25 m². Linear regression was used to predict ECHO-derived LV mass and LV mass/BSA index from ECG preordial-lead voltage criteria [sum largest S (V1 or V2) + R (V5 or V6) ≥ 35 mm]. RESULTS: ECG voltage criteria did not significantly (p>0.05) predict ECHO LV mass (LV mass = -0.12X + 216.94, r=0.024, R² = 0.006), or LV mass/BSA index (LV mass/BSA = 0.3063X + 81.951, r=0.17, R² = 0.024). CONCLUSION: ECG preordial lead voltage was not clinically useful in diagnosing ECHO-derived LV hypertrophy in our sample of first-year collegiate ASF players. We suggest the new and more accurate algorithms for evaluating LV hypertrophy in ASF athletes be explored, possibly using demographic, body habitus, cardiovascular, and other ECG criteria.

Cardiac screening practices among United States National Governing Bodies and Paralympic Committees
Brett Toresdahl1, Cindy Chang, FACSM2, Jamie Confino1, Irfan Asif1, Hospital for Special Surgery, New York, NY. 1University of California – San Francisco, San Francisco, CA. 2Albert Einstein College of Medicine and Montefiore Medical Center, Bronx, NY.

PURPOSE: To evaluate the prevalence and components of cardiac screening programs among the United States National Governing Bodies (NGBs) and National Paralympic Committees (NPCs).

METHODS: Medical team members for United States NGBs and NPCs were identified through online searches, affiliation with the American Medical Society for Sports Medicine, and professional contacts. The medical team members were then asked to complete an online survey regarding the cardiac screening practices of their respective NGBs or NPCs.

RESULTS: At time of abstract submission, medical team members for 45 of 72 (63%) of the United States NGBs and NPCs were identified and contacted. Surveys from 38/45 teams (84%) were received, 32 from NGBs and 6 from NPCs. Seventeen of 38 teams (45%) reported that there was a periodic health evaluation requirement that directed the cardiac screening components, frequency, and/or provider. The following screening components were reported as being performed at least once in all or in part of the athletes: personal history (96% of teams), family history (84%), physical examination (84%), electrocardiogram (32%), echocardiogram (5%), and stress test (3%). For teams who did not screen athletes with ECG, the most frequently cited reasons for not screening were lack of ECG equipment (40%), lack of evidence (33%), and lack of follow-up test consensus (20%).

Cardiac screening in athletes has recently been a focus of investigation and debate among the sports medicine community. Many athletic associations and organizations, including the International Olympic Committee, have issued recommendations regarding screening practices in an effort to prevent sudden cardiac death in sport. PURPOSE: To evaluate the prevalence and components of cardiac screening programs among United States National Governing Bodies (NGBs) and National Paralympic Committees (NPCs).

METHODS: Medical team members for United States NGBs and NPCs were identified through online searches, affiliation with the American Medical Society for Sports Medicine, and professional contacts. The medical team members were then asked to complete an online survey regarding the cardiac screening practices of their respective NGBs or NPCs.

RESULTS: At time of abstract submission, medical team members for 45 of 72 (63%) of the United States NGBs and NPCs were identified and contacted. Surveys from 38/45 teams (84%) were received, 32 from NGBs and 6 from NPCs. Seventeen of 38 teams (45%) reported that there was a periodic health evaluation requirement that directed the cardiac screening components, frequency, and/or provider. The following screening components were reported as being performed at least once in all or in part of the athletes: personal history (96% of teams), family history (84%), physical examination (84%), electrocardiogram (32%), echocardiogram (5%), and stress test (3%). For teams who did not screen athletes with ECG, the most frequently cited reasons for not screening were lack of ECG equipment (40%), lack of evidence (33%), and lack of follow-up test consensus (20%).
199 Board #36 June 1, 11:00 AM - 12:30 PM Evaluation of Peripheral Vascular Impairment in the Fingers of Baseball Players: A Comparison among Positions Kazufumi Terada¹, Toshiaki Nakatani¹, Masakazu Nadamoto². ¹Tenri University, Tenri, Japan. ²Poole Gakuin University, Sakai, Japan. Email: terada@sta.tenri-u.ac.jp

BACKGROUND: Digital vessel trauma from repetitive impact on the fingers and hand is a concern for baseball players (BPs). Laser Doppler blood perfusion imaging (LDPI) is a technique that employs two-dimensional horizontal scanning of the blood flow in a specific tissue, without the necessity for surface contact. The LDPI method may have the benefit of detecting vasospastic abnormalities and occlusion of the digital arteries, which generally appears as an inhomogeneous reaction to the cold. This study used LDPI to investigate whether the changes in finger skin blood flow that occurred in response to a cold water immersion test depended on the position of BPs.

METHODS: The study included 57 male university BPs, aged 20 ± 1 years, who played at 3 different positions. From this study subject group, there were: 18 pitchers, 23 infielders (InF), and 16 outfielders (OtF). A cold provocation test was carried out by immersing a player’s catching hand into cold water (10°C) for 10 min. Repeated image scanning of skin blood flow on the palm was performed every 2 min before, during, and after cold water immersion, using LDPI. The mean blood perfusion values in the index finger area were calculated on each color-coded image. A numerical perfusion reading was also obtained for each measurement site in terms of the voltage (V). From the perfusion reading and the mean blood pressure, we calculated the cutaneous vascular conductance (CVC). The finger skin temperature was recorded by using an electrode thermistor attached to the skin on the dorsal side of the index finger.

RESULTS: CVC values of the InF were significantly lower compared with those of the OtF at pre-immersion (2.4 ± 0.6 V/mmHg vs. 3.3 ± 1.0 V/mmHg, p < 0.01) and at early post-immersion (1.2 ± 0.4 V/mmHg vs. 1.5 ± 0.5 V/mmHg, p < 0.05). However, the index finger skin temperature did not significantly differ among the different player positions at any measurement point.

CONCLUSIONS: These findings suggest that the changes in finger skin blood flow that occurred in response to cold water immersion, as measured by using LDPI, were dependent on the position of the BP. Repetitive trauma caused by the impact of a baseball also leads to peripheral vascular impairment in the index finger on the gloved hand of InF. Therefore, this method can be used for the assessment of peripheral circulatory function in BPs.

Purpose: Extrication and transportation of injured athletes is a vital component of prehospital care (PHC). Concerns have been voiced that prolonged use of the Long Back Board (LBB) can cause avoidable complications. A 2013 consensus statement (Faculty PHC) advocates use of the Scoop Stretcher (SS) as a transfer and immobilisation device, limiting the LBB to extrication only. So as to abate pressure effects the SS is recommended for a maximum 45 minutes.

The study was designed to compare tissue interface pressures (IP), pain and comfort scores of patients immobilized on a SS compared to LBB over time and to determine any time critical points when IP differed.

METHODS: Six professional and six amateur players IP at 4 contact points on each device were measured continuously using a BodiTrak pressure mat. Each player was triple immobilised for 45 minutes, had 45 minutes rest, then repeated the procedure on the alternate device. Visual Analogue Scale (VAS) comfort and pain data were collected every 5 minutes.

RESULTS: Mean age was 24.3 ± 4 years, height 181.6 ± 7cm, weight 100.7 ± 12kg. Mean IP at the head, sacrum, and heels on the LBB over 45 minutes were 186.0 ± 157.17, 152.82 and 197.73 mmHg and SS 198.38, 173.23, 123.44 and 182.4 mmHg, thus higher pressure on the SS in upper body and lower in lower body (p < 0.001) at all sites on all subjects.

IP declined over time, therefore a critical time point could not be defined. Only IP at the sacrum on both devices showed significance (p < 0.23). Total VAS pain ratings rose on both devices from 0 mm at 0 minutes to 3.5 mm at 45 minutes (p < 0.001).

Conclusion: The United States NGBs and NPCs are a heterogeneous collection of athletic teams that have varying approaches to cardiac screening. Lack of infrastructure appears to be the biggest barrier to implementing advanced screening protocols.

201 Board #38 June 1, 11:00 AM - 12:30 PM A Systematic Approach to “Pitch-Side” Shoulder Relocation After An Acute Shoulder Dislocation Occurring During Sport Rohit Shah, Puja Chhniyara, Angus Wallace, Lisa Hodgson. Centre for Sports medicine, Nottingham, United Kingdom. Email: shah.rohit@gmail.com

Purpose: The shoulder, specifically the glenohumeral joint, by virtue of its anatomical characteristics and biomechanics, confers a large range of movement, which ultimately results in a joint that is inherently prone to becoming unstable. The incidence of acute traumatic shoulder dislocation varies within the sporting environment and most commonly occurs following direct trauma; i.e. a fall onto an outstretched hand or a blow to the upper arm when the arm is oriented in an abducted and externally rotated position.

Anterior dislocations account for nearly 90% of all shoulder dislocation. Whilst most are referred and managed in the Emergency department, pitch-side relocation by experienced clinicians does occur prior to referral. The aim of this study was to delineate a guideline specifically for the pitch-side management of this common injury.

Method: A literature search of PubMed and Medline using the keywords: ‘pre-hospital’, ‘pitch-side’, ‘shoulder dislocation’ and ‘reduction’ or ‘relocation technique’ was performed, and the available literature reviewed and collated. We then reviewed articles focusing on reduction techniques for anteriorly dislocated shoulders with particular consideration on their applicability to a pitch-side setting.

Results: Whilst studies exist that compare and contrast examination and reduction techniques, most are based in an in-hospital, acute setting. To date, there is no standardized management protocol published for the initial management of an anterior dislocated shoulder in a pitch-side setting. This article addresses this discrepancy and proposes a structured, systematic approach to the pitch-side management of a shoulder dislocation. Furthermore, the article addresses factors to consider in a pitch-side setting, suitable techniques and post-reduction care.

Conclusion: Whilst a systematic approach has been delineated in this article, we recommend those pitch-side medical practitioners who provide this form of support should have attended appropriate training and ensure adequate malpractice cover.

Purpose: Despite physical fitness, surfing demands multifactorial tasks and continuing interactions with unpredictable scenario. Depending on swell characteristics and professional commitments, surfers are overexposed to physical challenges. Muscle damage biomarkers, such as creatine-kinase levels (CK), has clinical association with delayed onset of muscle soreness (DOMS) and might be used as tools to guide muscle recovery.

BACKGROUND: The aim of this study was to evaluate muscle cell-stress biomarker-CK on a routine training-day of elite professional surfers from Brazil, and the influence of cold-compression automated system. METHODS: 4 professional male surfers (23±2yrs) were evaluated for CK levels (Reflotron®) on a typical day of training on a Hawaii winter season, on the morning before 3x90 minutes surf session (10-15ft waves), after sessions and 12h (next morning). After each session, the rate of comfort ratings rose from 0.5mm to 4.6mm on the SS and 1mm to 5.5mm on LBB (p<0.001), suggesting the LBB is less comfortable. However, 58% of players preferred the LBB.

Conclusion: No significant differences were seen between devices for IP, comfort or pain, suggesting the SS is not superior to the LBB. Over time IP on both devices decline whereas pain and comfort worsen.

Due to differences between general versus sport PHC, questions have arisen for the applicability of the new consensus in sport. Given no significant differences and player preference for the LBB, a move to SS in sport, creating change where it may not be validated, requires further in-depth consideration before being adopted at huge cost by all sports clubs in the UK.

Ethics, University of Nottingham.
perceived exertion was collected (scale 6-20 basis). The resting and sleeping period were analyzed using a Likert pattern scale (0-10) as also. All were exposed to 60minutes session of cold-compression (IceC) wraps on the main muscle-skeletal groups before sleep. RESULTS: CK levels before sessions were 200±73mg/dL, increasing to 375±98mg/dL after. The subjective perceived exertion suggested a heavy day of training (BORG 16). After 12h of resting and sleep (Likert 6), CK levels were 305.7±83mg/dL. CONCLUSION: Professional surfers are constantly travelling, and all the issues regarding sleep pattern, and performance should be focussed, besides the challenging to accomplish. Surfing itself is a mult-task demand, and to perform at cutting edge limits of performance, science background should link the gap between science and the application of it. Depending on surfing sessions and resting period, tools should guide muscle-recovery improvements for safety and performance.

A-37  Free Communication/Poster - Behavioral and Psychological Aspects of Sport

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

203  Board #40  June 1, 9:30 AM - 11:00 AM
Perceptions Of Appropriate Relationships Between Athletic Training Students And Student-athletes in The University/college Setting

Mallory N. Gomes1, Suzanne M. Koz2, Liz Casey3, W. Zach Garrett4. 1Marshall, Huntington, WV. 2Marshall University, Huntington, WV.

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(No relationships reported)

Dual relationships are an issue in healthcare professions. Dual relationships develop between athletic training students and student-athletes are of concern in the university and college setting. Policies regarding ethical relationships are in place for most institutions. However, dual relationships between athletic training students and student-athletes continue to occur. PURPOSE: To understand the perceptions of appropriate ethical relationships between athletic training students and athletes while promoting ethical knowledge. METHODS: The NATA Survey Service sent survey to 1,000 random NATA student membership participants from the inclusion criteria. 106 undergraduate and graduate athletic training students participated. Participants evaluated scenarios detailing ethical dilemmas typically faced as student athletic trainers. Participants then chose from preset answers to gain perspective on their choice. Statistical analysis included Chi-square test at the 0.05 level and phi. Since this is the first study within athletic training program student, items with a significance to .06 were considered.

RESULTS: Scenario 1 detailed a conflict of interest scenario asking if the athletic training student would re-evaluate an injury of a significant other. Females were more likely to re-evaluate the injury (χ² (1, N = 106) = .027 p = 4.896) than males. Phi indicated the strength of association is very weak (φ c= -0.186). Scenario 5 detailed the ethical dilemma of revealing HIPPA related information to another athletic training student. Students with ethics education were less likely to reveal sensitive HIPPA information (χ² (1, N = 106) = 3.621 p = 0.037) than those without. Phi indicated the strength of association of education level is very weak (φ c= -0.094).

CONCLUSION: Ethics education is needed early and often during athletic training education to help promote proper ethical practice in practicing athletic trainers.

204  Board #41  June 1, 9:30 AM - 11:00 AM
Perceived Social Context Factors As Indicators Of Sporting Excellence: Comparison Between Gender And Countries

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(No relationships reported)

Purpose: To describe the time and type of involvement in sport among youth lacrosse players.

Methods: Parents of youth lacrosse players throughout the United States answered an online survey about their child’s involvement in lacrosse within the last 12 months.

The survey included questions about the number and types of teams their child played on, practice and game frequency, tournament participation, private training, as well as involvement in other sports, age their child began playing lacrosse and questions about lacrosse-related injuries.

Results: 1580 parents of youth lacrosse players from 47 states completed the survey. The age of youth players ranged from 9 to 15 (mean = 12). Seventy percent of the responses (n=1090) described male players. Eighty-two percent (n=1295) of players also participated in other sports. The average age children began playing lacrosse was 8.7 years. Sixty-seven percent played on club or travel teams, 58% played on recreational teams. Participation in club or travel teams increased with age. Forty-four percent of players aged 9 played on a club or travel team compared to 75% of ages 14 or 15. Sixty-eight percent of youth players (n=1075) had participated in private lacrosse skill training either alone or as part of a small group. Both male and female athletes participated in private training at equal rates. Ninety-four percent of players (n=1466) participated in lacrosse during the spring season. Among these players, 24% (n=351) played on more than one team at the same time and 47% (n=689) participated in two or more weekend tournaments during the spring season.

Conclusions: Youth lacrosse is a growing sport throughout the United States. Two-thirds of youth lacrosse players have engaged in private skill training outside of team practice, ¾ play on more than one team during a season and ¾ participate in weekend tournaments.

Youth lacrosse often involves a significant time commitment for parents and families. Further research is needed to assess the benefits associated with participation as well as mental and physical health risks.

This research was funded by a grant from US Lacrosse.
indirect education of the role of expectation in mediating the efficacy of supplements, fewer people would use them, reducing the risk of doping behaviour. PURPOSE: To determine if knowledge and experience of placebo effects influence athletes’ intentions, attitudes and beliefs towards sport supplements and doping substances. METHODS: Team sport athletes (n = 305) completed a questionnaire that assessed their intention to use, and their beliefs about, sport supplements, as well as their attitudes towards doping. Participants were then exposed to an intervention designed to elicit a placebo response (Beekley et al., 2007). Participants performed 5 × 28m sprints at baseline before experimental administration of a placebo deceptively described as a sport supplement. The sprint protocol was repeated 20 minutes later, following which athletes were debriefed and presented with the results (see Beedie et al., 2015 ACSM conference submission), as well as an overview of research pertaining to the role of placebo effects in sports performance. Athletes re-completed the questionnaires, and were asked if knowledge of a placebo effect would influence their decision to use, or not use, sport supplements. RESULTS: Post experimental intervention, participants reported significantly reduced intention to use sport supplements (P < 0.001, Effect size [ES] = 0.48), reduced belief in the effectiveness of sport supplements (P < 0.001, ES = 0.61), and less favourable attitudes towards doping (P < 0.001, ES = 0.44). Qualitative responses suggested that knowledge of placebo effects influenced pre-post changes in intention to use sport supplements. CONCLUSION: An experimental placebo intervention positively affected athletes’ attitudes and beliefs associated with the use and effectiveness of sport supplements and doping substances. Knowledge and experience of placebo effects appears to reduce the intention to use sport supplements and may prevent the transition towards doping.

207 Board #44 June 1, 9:30 AM - 11:00 AM Executive Functioning Differences Between Expert Sailors’ Responsibilities
Karen E. Welman, Claire N. Walker. Stellenbosch University, Matieland, South Africa. Email: welman@sun.ac.za

N (No relationships reported)

PURPOSE: Previous research suggest that competitive athletes have better cognitive functioning, i.e. sports-related executive functions (EF), compared to non-athletes. EF assist athletes in thinking before acting (Inhibitory control;IC), updating their thinking or planning (Updating;UP) and thinking outside the box (Cognitive flexibility;CF), and as a result make better decisions as well as plan and problem-solve efficiently. Therefore this novel descriptive observational study set out to explore the EF of expert sailors, according to their professional sailing ranking and sailing role. METHODS: Fifteen national sailors (age: 24±8 years) with an average of 12±4 years of professional sailing experience volunteered. Primary outcome variables included IC, UP and CF. Sailing history information, global cognition (Montreal Cognitive Assessment; MoCA) and an EF test battery including the Wisconsin Card Sorting Test (WCST), Trail Making Tests A and B, and Stroop task was randomly administered. Participants were assessed as a group and comparisons were made between top (TRS) and bottom ranking (BRS) sailors as well as between sailors’ positions i.e. crew or helm. RESULTS: Participants scored an average of 28±2 on the MoCA. TRS score 92% in global WCST score (p=0.05) and 127% better on Failure-To-Maintain-Set (WCST) compared to BRS (d=0.75; p=0.26). Crew demonstrated better CF (d=0.92-0.95; p<0.05) and IC (d=1.41; p=0.046), while helm had 30% better visuomotor speed and visual scanning (d=1.62; p=0.03). CONCLUSION: This is the first study to investigate the EF of sailors. These preliminary findings suggest that CF and IC may be important contributing cognitive skills for success in sailing. Also that less successful sailors may have inferior attentional capacity and therefore be more distractible, contributing to poorer decision-making skills. The responsibilities of sailors may contribute to the differences between helm and crew’s EF, or vice versa, i.e. helm needs to continuously be taking in visual cues and information whereas crew’s EF suggest that they anticipate the next event better, and as a result are able to actively adjust between strategies in ever-changing environments.

208 Board #45 June 1, 9:30 AM - 11:00 AM Exploring Self-compassion And Self-objectification Among College Athletes
Beth Ransford, Lindsay Bryant, Urska Dobeserk, Mindy Hartman Mayol, K. Lee Everrett, Matthew D. Beekeley, FACSM. University of Indianapolis, Indianapolis, IN. Email: ransforbd@uindy.edu

N (No relationships reported)

Sexual objectification is when one’s body is recognized for its physical and sexual desire. When this concept is used to demonstrate that individuals’ values are dependent on their appearance (when individuals look at themselves as objects), these individuals are considered to be engaging in self-objectification (SO). SO tends to contribute to numerous psychological and mental health issues (Fredrickson & Roberts, 1997). Previous research suggests that self-compassion (SC) buffers the negative ramifications of SO. PURPOSE: The purpose of this study was to examine SC and SO between more (MOA) and less (LOA) objectified athletes. METHODS: Twenty-four athletes, aged 18 to 23 (M = 19.45, SD = 1.33), from seven NCAA Division II teams participated in this study. They completed a demographic survey, the Short-12 item Self-Compassion Scale survey consisting of six subscales (self-kindness, common humanity, mindfulness, self-judgment, isolation, and over-identification) measured on a 5-point Likert scale (1 = almost always, and 5 = almost never to 5 = almost always), and Shame and Surfacing subscales of the Objectified Body Consciousness Scale using a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). Sports were divided into MOA (swimming and diving, volleyball, wrestling = 8) and LOA (basketball, soccer, lacrosse = 8). A one-way Analysis of Variance (ANOVA), controlling for age and gender, was used to test the differences between MOA and LOA on SC, shame, and surfacing. RESULTS: There was a statistically significant difference on SC (F(1, 158) = 7.84, p = .006, between MOA (M = 3.13, SD = 0.62) and LOA (M = 3.00, SD = 0.75) and surfacing, F(5, 158) = 8.51, p = .004, between MOA (M = 3.89, SD = 1.07) and LOA (M = 4.08, SD = 1.19). There was no significant difference between MOA and LOA on the shame subscale, F(5, 158) = 3.56, p = .069. CONCLUSION: Some findings of this study are congruent with the previous self-objectification research suggesting that MOA experience higher surfacing compared to LOA. The SC finding - MOA scoring higher on SC than LOA - uniquely contributes to the sports psychology field since no previous studies on SC and collegiate athletes have been done. Future research is warranted for a better understanding of the SC and its effects on SO among college athletes.

209 Board #46 June 1, 9:30 AM - 11:00 AM Coping Skills and Dispositional Resilience/Hardiness of Big Sky Conference Track and Field Athletes
Andrew D. Polenske1, Michael C. Meyers, FACSM1, Anthony E. Bourgeois3, Arnold D. LeUnes2, Kristin M. Shuman1. 1Idaho State University, Pocatello, ID. 2Texas A&M University; College Station, TX. (Sponsor: Michael Meyers, FACSM) Email: polandr@isu.edu

N (No relationships reported)

PURPOSE: To quantify the coping skills and hardiness of Big Sky Conference track and field athletes. METHODS: Following written informed consent, 224 collegiate athletes (93 male, 131 female; mean age 20.1 1.6) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), cooperability (COAC), and personal coping resources (PCR); the Sports Inventory for Pain (SIP; Meyers et al., 1992); direct coping (COP), cognitive (COG), catastrophizing (CAT), avoidance (AVD), body awareness (BOD), and total coping resources (TCR); and the Dispositional Resilience/Hardiness scale (Bartrone et al., 1989): commitment (CM), control (CO), challenge (CH), and psychological hardiness (PH). Data were grouped by skill level (conference qualifiers, non-qualifiers), event (track, field), class (lowerclassmen (freshmen, sophomores), upperclassmen (juniors, seniors)), and gender. RESULTS: MANOVAs (Wilks’ Lambda) indicated significant main effects across skill level [F(17,167) = 1.990, P = 0.014], class [F(3,44,410) = 2.325, P = 0.0001], and gender [F(17,206) = 3.323; P = 0.0001]; but no significant effect across event [F(17,206) = 1.148; P = 0.311]. Univariate analyses (mean SEM) indicated a trend for conference qualifiers to respond higher in CONF (9.1 0.2 vs 8.1 0.2) and PCR (54.6 1.1 vs 51.6 0.3), and lower in CAT (10.0 0.3 vs 11.3 0.3) than non-qualifiers, respectively. Lowerclassmen responded higher in COP (28.6 1.5 vs 27.4 2.1) and COG (16.4 0.3 vs 15.2 0.4) than upperclassmen, respectively. Males responded higher in COPE (7.4 0.2 vs 6.3 0.2), PEAK (8.1 0.3 vs 6.1 0.2), and CONC (7.9 0.2 vs 6.9 0.2), FREE (6.6 0.3 vs 5.8 0.2), CONF (9.1 0.2 vs 8.1 0.2), and PCR (56.7 1.0 vs 50.7 0.8) than females, respectively. CONCLUSIONS: Conference qualifiers, lowerclassmen, and males possess stronger coping and hardness abilities than their respective peers. It is recommended that the coaches incorporate time within their workout routines to conduct coping skills training involving sport psychologists familiar with track and field.

210 Board #47 June 1, 9:30 AM - 11:00 AM Differences In Sport Motivation, Self-esteem And Grit Among Collegiate Swimmers And Divers
Jill Cain, Elaina Voss, Mindy Hartman Mayol, Urska Dobeser, K. Lee Everrett, Matthew D. Beekeley, FACSM. University of Indianapolis, Indianapolis, IN. Email: cainj@uindy.edu

N (No relationships reported)

Research suggests that motivation and self-esteem can greatly impact athletic performance. Grit, a determination and a passion for long-term goals, is a novel abstract.
concept within college athletics yet has been shown to be a predictor of youth academic achievement. PURPOSE: To examine sport motivation, grit, trait self-efficacy and the potential for future sport participation in college athletes. METHODS: Fifty-one athletes (n = 24 male; n = 27 female) ages 18 to 23 years (M = 19.40, SD = 2.93) completed the 12-item Short Grit Scale measuring grit, the 12-item Sport Motivation Scale II measuring six constructs (intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), and amotivation (AMR)) the 12-item Self-Compassion Scale (OBCS) and a demographics questionnaire. An athlete’s anticipated participation in their respective sport post-graduation may influence current motivation and grit. PURPOSE: To examine collegiate athletes’ levels of grit, sport motivation and future intention to participate in their respective sport once graduated [future intention: competitively (COMP) only, recreationally (REC) only, both COMP and REC (BOTHC) or not at all (NONE)]. METHODS: Three hundred and ninety-one student-athletes (58% males; 42% females) with ages ranging from 18 to 23 years (M = 19.52, SD = 1.36) from twenty-two NCAA Division II sports teams voluntarily completed three self-report surveys. The 18-item Sport Motivation Scale II was used to measure intrinsic (IR), integrated (INTR), introjected (INT), external (EXT), amotivated (AMR) regulation, the 12-item Short Grit Scale was used to measure Grit (one’s level of perseverance and passion for long-term goals) and a demographics questionnaire. Seven separate one-way Analyses of Variance were used to analyze level dependent variables (IR, INT, INTR, EXTR, AMR, Grit, Trait) with an alpha level of 0.05 for raw means was set for statistical significance. Bonferroni adjusted pairwise comparisons were used as post hoc analyses. RESULTS: There were statistically significant differences between groups for the following dependent variables: IR F(3, 388) = 7.78, p < .001, INTR F(3, 388) = 7.45, p < .001, IDR F(3, 388) = 3.92, p = .009, AMR F(3, 388) = 5.42, p = .001 and Grit F(3, 388) = 4.51, p = .004. No significant differences were demonstrated between groups for ITR and EXTR (p > .05). Post hoc analyses revealed the following: COMP, REC and BOTH groups had higher IR scores than athletes in the NONE group. BOTH and COMP had higher INTR scores than NONE and BOTH had higher INTR scores than REC. BOTH had higher IDR scores than REC and NONE. BOTH and COMP had lower AMR scores than NONE while COMP had higher Grit scores than REC. CONCLUSIONS: Overall, higher grit scores were exhibited in more self-determined and sustainable motivation types (IR, INTR, IDR) and Grit and lower AMR scores (lack of motivation in their sport) were seen in those groups that had planned on participating in their sport in one more ways after graduating college. Further research into sources of motivation, grit and future plans of sport participation beyond college is suggested.
Purposive: To determine the effect of nine sessions of Mindfulness-Acceptance-Commitment (MCA) on fitness and attention in volleyball players. A secondary aim was to study the association between attention and performance in volleyball players.

Methodology: Using a Visual Analog Scale, a NCAA Division I head men’s (HCM) and head women’s basketball (HCW) coach was asked post-season to rate their players’ basketball ability was related to their statistical output.

Purpose: This study sought to determine whether the head coaches’ perceptions of players’ basketball ability was related to their statistical output.

Methodology: Using a Visual Analog Scale, a NCAA Division I head men’s (HCM) and head women’s basketball (HCW) coach was asked post-season to rate their players’ basketball ability was related to their statistical output.

RESULTS: No significant ANOVA interactions were observed for physical volleyball skills (p > 0.05). ANOVA results indicated significant differences on attention scores in the CTRL (pre-test = 53.6 ± 7.8, post-test = 57.1 ± 6.8) and EXP (pre-test = 51.7 ± 5.6, post-test = 59.3 ± 4.0) groups (p < 0.05). A significant correlation (r = 0.476, p < 0.05) was found between score changes in attacking volleyball skills (Δ = 26) and attention (Δ = 6.6) scores.

CONCLUSIONS: Results from this study suggest that MAC is effective for improving attentional skills following nine sessions of 90 min. Attention might be used as an indicator of attacking skills in volleyball.

 Purpose: International rugby tournaments require high-performance players to travel long distances from different global locations and over various time zones. The complex effects of intense training programs, rapid environmental changes, jet lag adaptation periods, and fatigue on performance outcomes are relevant concerns. The physical and mental impact of these effects on athlete stress and recovery rates may be considered a key factor in performance.

Methods: In order to assess the jet lag effect, a pilot study was initiated following 5 rugby players during an International Rugby Tournament over a 6 week period after crossing 10 time zones from west to east in order to complete the Recovery-Stress Questionnaire for Athletes (RESTQ-Sport), a validated assessment tool in recognising physiological and psychological markers of the recovery-stress state in athletes, was completed 6 times, one week apart: at baseline, before and after each of the four games played and on return.

Results: The rugby team lost their first match, which was scheduled during the first week of arrival at their destination. For the group of 5 players the total stress score had an escalating trend, and the total recovery score a declining trend during week 1, week 2 and week 6 respectively. Total recovery-stress scores were also higher among athletes involved in the first half of the tournament among athletes competing in winter multisport events (10.1±1.1 vs. 6.01±1.0, P=0.04). When adjusted for sex, there was no correlation between percentile ranking in the sporting event and the EAT-26 score. Finally, only 8 athletes (5.5 %) scored above the EAT-26 cut-off score of 20 for eating disorders.

Conclusions: Unsurprisingly, non-multisport endurance female athletes scored higher on the EAT-26 than non-male athletes. However, the prevalence of self-reported symptoms and concerns about food and body image was very low in this sample of non-elite endurance athletes. This suggests that multisport endurance environments do not significantly influence and sustain unhealthy behaviors towards foods and body image.
Water pipe smoking (Aka, Shisha, Narghille, Hookah) has become a trendy phenomenon. Methods: An anonymous survey questionnaire was filled by 103 participants. Results: Among 79% of the smokers at least one parent smokes compared to 3.6% for the non-smokers group. Among 61.3% of the smokers at least one parent knows that his/her daughter smokes. 58% of the smokers smoke because of peer pressure and 42% of them smoke a jester of maturation, authoritative and power. 81% of the smokers are aware of the negative health effects of water pipe smoking, and 75% would quit if they would see research, which shows a connection between smoking and cancer. 58% of the girls’ parents don’t see a difference between water pipe smoking and cigarette smoking. Finally, 86% of the girls claim that water pipe smoking is less harmful than smoking cigarettes.

CONCLUSION: This study does not support the suggestion that motivational self-talk can increase perceived exertion in 16 division III athletes.
CONCLUSION: Adolescent SP has greater levels of MVPa and less ST than NSP. Interventions to encourage sports participation in NSP should focus on increasing the psychological benefits, such as enjoyment, as well as promoting positive social interactions with other adolescent SP.

A-38 Free Communication/Poster - Cardiac
Wednesday, June 1, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

222 Board #59
June 1, 11:00 AM - 12:30 PM
Effects of the High Intensity Interval Training on Myocardial Mitochondria Function in Patients with Type 2 Diabetes
Shinji Sato1, Takao Kato2, Mayumi Kubota3, Shingo Otsuki2, Shiro Tanaka2, Shigeru Makuta2, Ryuji Nohara1. 1Osaka Sangyo University, Osaka, Japan. 2Kyoto University, Kyoto, Japan. 3Kansai Medical University, Osaka, Japan. 4Saitama Medical University, Saitama, Japan. 5Hirakata Kohsai Hospital, Osaka, Japan. Email: shinjisato2005hawaii@yahoo.co.jp

PURPOSE: Although impaired myocardial function is commonly observed in patients with type 2 diabetes (T2DM), it remains unclear whether this impairment can be improved. We hypothesized that high-intensity interval training (HIIT) has a favorable effect on myocardial function in patients with T2DM.

METHODS: Twelve patients with T2DM (men/women, 6/6; mean age, 54.2 years; mean hemoglobin A1c, 6.8%) were randomized into either conventional moderate-intensity walking program (CWP, n = 7) or into a HIIT program (n = 5; twice weekly for 12 weeks). The oxygen consumption over heart rate (VO2/HR), which is an exercise-related index of stroke volume, was assessed using cardiopulmonary exercise testing at baseline and after training. Additionally, myocardial mitochondrial function was assessed using technetium-99m sestamibi (MIBI) imaging.

RESULTS: After training, the peak VO2/HR tended to be greater in the HIIT group than in the CWP group (10.8 vs. 8.3%; p=0.097). Furthermore, the peak VO2/HR was associated with MIBI counts (r = 0.60, p<0.05).

CONCLUSIONS: In patients with T2DM, HIIT training was more beneficial than CWP for increasing the maximal stroke volume. This may be linked to superior effects on myocardial mitochondrial function.

A hallmark of heart failure with reduced ejection fraction (HF EF) is impaired exercise tolerance. We have previously reported (Am J Physiol Heart Circ Physiol 302: H2635-H2654, 2012) in the current HF EF study group with severe exercise intolerance that stroke volume reserve was significantly blunted from rest to moderate intensity exercise in patients with HF EF and severe exercise intolerance is not well studied. PURPOSE: To determine arterial-ventricular coupling from rest to moderate intensity exercise in patients with HF EF and severe exercise intolerance.

METHODS: Seven patients with HF EF (n = 9; m = 6; f = 3; NYHA III = 6; NYHA IV = 1; ejection fraction = 17 ± 3%) and severe exercise intolerance that stroke volume reserve was significantly blunted from rest to moderate intensity exercise (2.17 ± 0.36 mmHg/mL) to exercise (2.45 ± 0.47 mmHg/mL; p < 0.05). Ees increased modestly from rest (0.46 ± 0.09 mmHg/mL) to exercise (0.50 ± 0.12 mmHg/mL; p = 0.02). There was a non-significant increase in mean Ees from rest (4.84 ± 1.08 mmHg/mL) to exercise (5.24 ± 2.00 mmHg/mL; p > 0.05) for the study group.

CONCLUSION: The failure to augment arterial-ventricular coupling during moderate intensity exercise in patients with HF EF and severe exercise intolerance likely contributes to impaired exercise left ventricular function.

The ability to differentiate between athletic changes and pathological findings in the heart presents a challenge for clinicians during routine pre-participation screening. Cardiac auscultation provides clinicians with valuable diagnostic information on heart murmurs (HM). However, this practice requires skill and extensive clinical experience which often makes it difficult to reliably detect abnormalities. PURPOSE: To determine how computer assisted auscultation (CAA) can assist clinicians in the decision making and further management of athletes with systolic HEMETHODS: Collegiate athletes from different sporting codes were assessed for heart murmurs during a routine pre-participation evaluation (PPE). Participants underwent a 12-element focused clinical history and physical examination with a sports physician according to the American Heart Association guidelines. In addition a CAA assessment was performed by a technician who was blinded to the physician’s findings. Based on the outcome of these independent assessments, all athletes with suspected pathological (PATH) murmurs were referred to a cardiologist for a confirmatory echocardiogram (echo).

RESULTS: 131 athletes were screened (104 males and 27 females; mean age 19 ± 2 yrs.). In total the physician detected 17 murmurs (5 PATH vs. 12 physiological) compared to 14 PATH murmurs with CAA. Overall, 25 referrals were made to a cardiologist (3 PATH from physician, 12 PATH from CAA, 2 PATH both CAA and physician, and 8 for other reasons, e.g. history etc.). Subsequent echo revealed 3 PATH and 22 physiological murmurs. CAA showed a comparable sensitivity to the screening physician concerning the detection of PATH murmurs (3/3 vs. 2/3), but resulted in a higher false discovery rate (11/14 vs. 3/5). CONCLUSIONS: CAA was able to correctly identify all cases of PATH murmurs in athletes despite having resulted in a number of unnecessary referrals. In comparison the sports physician detected all but one PATH murmur (due to a patent foramen ovale in the septum region) but showed a lower false discovery rate. While not conclusive these findings suggest that CAA may prove to be a useful supportive diagnostic tool to aid a clinician’s decision making process. However, further investigation is needed to establish reasons for the overestimation of PATH cases.

Although diastolic function is known to be impaired by aging, aerobic exercise training has been shown to decrease this detrimental effect. However, little is known about the effects of short exercise training interventions on diastolic function in older compared to young healthy individuals.

PURPOSE: To compare diastolic function in older and young healthy men and women before, midway, and immediately after a 12-week aerobic exercise training program. METHODS: Doppler-derived resting echocardiographic indices of left ventricular function were measured at baseline, six weeks, and twelve weeks of an aerobic training program. Measurements included diastolic flow velocity ratio (E/A) and isovolumetric relaxation time (IVRT). Fourteen older (O) (8 men and 6 women; mean age 72 ± 6 yrs.) and 17 young (Y) (9 men and 8 women; 24 ± 4 yrs.) healthy sedentary individuals took part in an aerobic training program on a cycle ergometer (3 x week, 45 min/session, at a power output representing 70% VO2max; training intensity was adjusted at three weeks intervals). RESULTS: Exercise training resulted in a 20% increase in VO2max in older (Pre: 2.05 ± 0.49 L∙min⁻¹; Post: 2.55 ± 0.62 L∙min⁻¹; p<0.05) and a 16% increase in VO2max in young (Pre: 3.23 ± 0.72 L∙min⁻¹; Post: 3.84 ± 0.73 L∙min⁻¹; p<0.05). The exercise training intervention did not affect the E/A ratio neither in older (Pre: 1.0 ± 0.3; Mid: 1.0 ± 0.3; Post: 1.0 ± 0.2; p>0.05) nor in young individuals (Pre: 2.0 ± 0.7; Mid: 1.9 ± 0.5; Post: 2.0 ± 0.5; p>0.05). However, the IVRT was significantly lowered at post- compared to pre- and mid-training in both older (Pre 108.3±17.5; Mid: 107.7 ± 25.21; Post: 95.8 ± 15.4 ms) and young individuals (Pre: 73.1 ± 8.6 ms; Mid: 76.8 ± 9.6; Post: 70.6 ± 9.1 ms). CONCLUSION: This study demonstrated that a short-
The interplay between physiological factors such as muscle perfusion and venous return to the heart has a major role in cardiovascular and peripheral responses during running. Timing cardiac contraction (i.e., systole) to occur in synchrony with skeletal muscle relaxation (swing phase of the gait cycle) may reduce cardiac afterload and promote coronary and skeletal muscle perfusion. In turn, this should manifest in a reduced HR response at a constant running velocity, secondary to an increased stroke volume.

PURPOSE: To assess HR and metabolic responses associated with running when foot strikes are timed to occur during 1) the systolic phase of the cardiac cycle, or 2) the diastolic phase.

METHODS: Ten elite male distance runners performed a testing session on the treadmill at 4.72 m/s (540 min/mile) pace while matching their steps to an auditory tone and wearing a chest strap that generated accelerometer and ECG signals. Testing began with a 3-min control stage (no tone), immediately followed by 2 or 3 pairs of “tuned” stepping phases (pair = 2 x 3-min), where the signal to step was given either at 100% of the subject’s R-R interval (systolic stepping; SS) or 45% of R-R (diastolic stepping; DS). The order of DS and SS within each pair was randomized and double blinded. VO2, VE and RER were measured continuously.

RESULTS: Twenty-eight pairs of DS + SS were used for HR, step rate (SR) and length (SL) comparison and 24 pairs were included in metabolic data analyses. All subjects accurately timed their steps with the auditory tones (DS: 45.0 ± 4.3 %; SS: 100.1 ± 5.0 % of R-R interval). While VO2 was similar, HR, SR, VE and RER were significantly (p < 0.001) lower during DS compared to SS (HR: 172 ± 6 vs 175 ± 7 beats·min−1; SR: 172 ± 6 vs 175 ± 7 steps·min−1; VE: 100.0 ± 10.8 vs 103.7 ± 11.8 l·min−1; RER: 0.93 ± 0.03 vs 0.95 ± 0.03, for DS & SS, respectively) despite subjects having to lengthen their steps more during DS compared to SS (p < 0.001; 2.5 ± 3.1 vs 0.9 ± 3.2 % of control SL, respectively) to match HR. CONCLUSION: Synchronizing foot strike to occur during diastole, as opposed to systole, reduces HR during running, presumably as a result of an increase in stroke volume and/or enhanced muscle perfusion. The cardiac advantage with DS may be beneficial to distance running performance. Supported by a grant from Pulson Inc.

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

**Board #63**  
**June 1, 11:00 AM - 12:30 PM**  
**Synchronizing Foot Strike and Cardiac Cycle Phase Affects Heart Rate and Metabolic Responses to Running**

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(No relationships reported)

**Board #65**  
**June 1, 11:00 AM - 12:30 PM**  
**Importance Of Non-invasive Imaging For Prevention Of Sudden Death In Athletes**

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(No relationships reported)

Limited evidence suggests a decline in parasympathetic modulation with aging. Such decline is not uniform and may be influenced by changes in body composition associated with aging, but this remains poorly understood. PURPOSE: To compare differences in body composition in older adults with low vs. high levels of parasympathetic modulation. METHODS: Fifteen older adults were split into low (n=7) and high (n=8) groups based on a marker of cardiac vagal modulation [the root mean square of successive differences (RMSSD)]. Body composition was assessed using DXA, with total body fat %, total fat mass (kg), fat free mass (kg), abdominal adiposity, and abdomen-to-hip ratio reported. RESULTS: There were group differences in RMSSD (P<0.05). Group differences were observed for age and the abdomen-to-hip ratio, with the Low RMSSD group having higher values (P<0.05). Further analyses showed age did not contribute to the difference in the abdomen-to-hip ratio. CONCLUSION: Our results suggest that the distribution of body fat may be an important factor affecting age-related decline in parasympathetic modulation in aging adults. However, the small sample size suggest caution when interpreting the findings.
Heart rate recovery (HRR) is related to baseline vagal tone (VT) at age 15 (r=0.59, p<0.001), while HRR2 was correlated to baseline VT at age 2 (r=0.32, p=0.053) and baseline VT at age 15 (r=0.59, p<0.001), while HRR4 was correlated to baseline VT at age 2 (r=0.34, p=0.005) and baseline VT at age 15 only (r=0.46, p=0.005). HRR2 was not correlated to VW at age 2 on any task, but was related to VW at age 15 on the fear task. These preliminary results suggest that adult HRR4 was correlated to baseline VT at age 15 only (r=0.59, p<0.001). HRR2 was correlated to baseline VT at age 2 (r=0.34, p=0.041). CONCLUSION: These preliminary results suggest that significant physiological stress (fear task at age 2 and speech task at age 15). Contrary to previous work using shorter temporal separation, we did not find trait-like stability in our baseline VT measures over time. This may be the result of the significant time separation (15+ yrs) or the small N in the current cohort.

Support provided by NIMH 58144, NICHD R01 HD078346-01A

Data were analyzed using Spearman correlations and significance levels were set at p<0.05. Group differences were analyzed using one-way ANOVA with post-hoc multiple comparisons. All reported p values are two-tailed.

RESULTS: Baseline VT at age 2 was not related to either baseline VT at age 15 or PR-EX HRR measures in YA, however baseline VT at age 15 was correlated to PR-EX HRR [SD of beat-to-beat intervals (SDNN); r=0.46, p=0.008] and root mean square of successive differences (RMSSD; r=0.48, p<0.004) in YA. HRR2 was correlated to baseline VT at age 2 (r=0.32, p=0.053) and baseline VT at age 15 (r=0.59, p<0.001), while HRR4 was correlated to baseline VT at age 15 only (r=0.46, p=0.005). HRR2 was not correlated to VW at age 2 on any task, but was related to VW at age 15 on the fear task (r=0.34, p=0.041). HRR4 was correlated to VW on the fear task at age 2 (r=0.34, p=0.041). CONCLUSION: These preliminary results suggest that despite significant temporal separation, HRR after maximal exercise was related to childhood and adolescent baseline VT and VW on self-regulatory tasks that induce significant physiological stress (fear task at age 2 and speech task at age 15). Contrary to previous work using shorter temporal separation, we did not find trait-like stability in our baseline VT measures over time. This may be the result of the significant time separation (15+ yrs) or the small N in the current cohort.

Support provided by NIMH 58144, NICHD R01 HD078346-01A

Purpose: A universal agreement on screening strategy to identify athletes at risk for sudden cardiac death remains a topic of debate. The purpose of this study is to evaluate the association between cardiovascular fitness and cardiovascular risk factors in a group of NCAA athletes.

METHODS AND STUDY DESIGN: A universal agreement on screening strategy to identify athletes at risk for sudden cardiac death remains a topic of debate. The purpose of this study is to evaluate the association between cardiovascular fitness and cardiovascular risk factors in a group of NCAA athletes. The inclusion of a screening ECG in pre-participation evaluations of collegiate athletes allows for improved detection of those at increased risk for SCD when equipment is available.

CONCLUSION: ECG screening in the Division 2 and 3 collegiate setting is feasible and allows for improved detection of those at risk for sudden cardiac death.
Purpose: The purpose of the present investigation was to determine the effects of an anabolic mixture containing leucine, whey protein with or without DHEA on muscle mass and cellular signaling pathways controlling autophagy in disease atrophy model.

Methods: Thirty-two male Sprague-Dawley (SD) rats (280-330g) were randomly assigned into 4 groups: control (C), HS, HS/protein (HSP), HS/protein/DHEA (HSPD). Anabolic mixture supplement (10 ml/kg body wt containing 300 mg/kg body wt of leucine, 400 mg/kg of whey protein with or without 75 mg/kg of DHEA) was orally gavaged twice a day during hindlimb unloading. After 14 days of HS, skeletal muscles were removed and weighed for biochemical analyses.

Results: HS significantly decreased soleus and gastrocnemius weights in all groups compared with control (P<0.01). In plantaris muscle, the loss of muscle mass did not occur in HS group compared with C. Plantaris in HS group was significantly heavier than in HS (P<0.01), whereas no significant difference was found between HS and HSPD. Beclin-1 in the HS group was significantly decreased below that in the C group (P<0.05). Neither protein nor DHEA was found to have effects on Beclin-1 in plantaris. Beclin-1 in HSPD group was significantly lower than that in C group (P<0.05), while the comparison of C with HS or HSP was not different. The expression of p62 was unchanged among all experimental groups.

Conclusions: The protein-containing anabolic supplement selectively prevented disuse-caused muscle atrophy. Addition of DHEA into the supplement has no significant difference between groups for % change in squat (p = 0.792) or bench press (p = 0.429). There was no significant difference in body mass when compared to a placebo.

Supported by a West Chester University Student-Faculty Research Award.

Athletes frequently use nutritional supplementation to improve physical performance. Herbal testosterone boosters claim to increase testosterone and maximize strength gains and lean body mass. Purpose: To investigate if testosterone, strength and lean body mass are increased in young trained males taking an herbal testosterone supplement compared to a placebo during a 6-week resistance training period.

Participants: Participants were randomly assigned to the placebo (pl) group (n = 6) or the experimental (exp) group (n = 5). Participants and researchers were blinded to group assignments. Blood and saliva samples were collected in the fasted state prior to the intervention (pre), 3 weeks (mid) and 6 weeks (post) to measure testosterone, IGF-I, cortisol, androstenedione, DHEA, DHEAS, T, androstenediols, estradiol, and progesterone. Serum insulin, glucose, and creatine kinase were also measured.

Methods: Participants were randomly assigned to the placebo (pl) group (n = 6) or the experimental (exp) group (n = 5). Participants and researchers were blinded to group assignments. Blood and saliva samples were collected in the fasted state prior to the intervention (pre), 3 weeks (mid) and 6 weeks (post) to measure testosterone, IGF-I, cortisol, androstenedione, DHEA, DHEAS, T, androstenediols, estradiol, and progesterone. Serum insulin, glucose, and creatine kinase were also measured.
CONCLUSIONS: Chronic oral supplementation with L-glutamine and L-alanine, both in their free form or as a dipeptide, reduces ammonia levels in EDL muscle, while DIP and GLN+ALA reduced plasmatic levels of lactate, which may delay fatigue and improve performance in rats submitted to resistance exercise. Supported by FAPESP.

Beta-hydroxy-beta-methylbutyrate (HMB) supplement had extensively use as ergogenic aids among athlete and fitness population. Previous researches indicated that HMB not only enhance muscular fitness but also affect bone homeostasis. HMB enhanced bone formation through IGF pathway and inhibit bone resorption through unknown mechanism. Previous studies indicated that HMB downregulate osteoclastogenesis by inhibit NF-κB pathway and downstream protein expression. Downstream expression of dendritic cell specific transcript protein (DC-STAMP) which responsible for cell to cell fusion during osteoclastogenesis might be the downregulation target of HMB in NF-κB pathway. Therefore, we design present study to investigate effects of HMB supplement on NF-κB related protein expression in peripheral blood mononuclear cell (PBMC). 12 healthy college male aged 20-22 years old were recruited as subject for present study. All subjects intake 3 grams of HMB daily in the early morning for 14 days and daily diet were recorded. Fasting blood samples were collected through venipuncture on day 1, 2, 3, 4, 6, 8, 11, 15 and 1, 2, 3, 6, 9, 12 hours after HMB supplement on day 1. Plasma osteoprotegerin (OPG) and soluble receptor activator of nuclear factor κB ligand (sRANKL) level were analyzed by ELISA. Receptor activator of nuclear factor κB (RANK) and DC-STAMP expression on PBMC surface were analyzed by Flow cytometer.

RANK expression on PBMC was significantly decreased within 6 hours and remains lower than baseline for the next two days. DC-STAMP expression on PBMC also decreased within 6 hours after HMB ingestion and remains lower than normal for the next two days as well. Plasma sRANKL and OPG level remain stable for entire supplement period. Results of present study indicated that HMB supplement downregulate the expression of RANK and DC-STAMP, both upstream and downstream protein of NF-κB pathway without alter sRANKL and OPG level. Current results indicated that downregulate of osteoclastogenesis by short-term HMB supplement might media through NF-κB pathway. However, plasma sRANKL and OPG level were not altered. Effects of long term HMB supplement on osteoclastogenesis require further study to clarify. Effects of HMB supplement on bone metabolism related cells such as stroma cells and osteoblast require further study as well.

Accumulation of metabolic products, such as ammonia, and pH reduction, due to increased synthesis of lactate for energy purposes, are associated with the development of fatigue. Peripheral fatigue culminates in decline of muscle strength and contraction velocity, which may affect performance in resistance exercise. Glutamine and alanine are used as energy substrates and carry ammonia from the skeletal muscle to be metabolized in the liver and eliminated through the kidneys, which may attenuate the muscle accumulation of lactate and ammonia. PURPOSE: The aim of this study was to determine the effects of chronic oral supplementation with L-glutamine and L-alanine on fatiguing markers in rats submitted to resistance training.

METHODS: Adult male Wistar rats (n=8 per group) were submitted to eight-week resistance training, which consisted to climb a ladder from three to six sets with progressive loads (25% to 100% of body weight). In the last 21 days of training, supplements were given in a 4% solution dissolved in drinking water. Animals were supplemented with L-glutamine and L-alanine, as a dipeptide or in their free form (DIP, GLN+ALA and ALA groups, respectively), or water (SED and CTRL groups). Animals were sacrificed one hour after the last training session. Ammonia was determined in Extensor digitorum longus (EDL) muscle and lactate was determined in plasma.

RESULTS: Resistance exercise increased muscle ammonia concentration by approximately 150% (p<0.05 vs. SED). However, administered supplementation reverted this scenario. Treatments with ALA, GLN+ALA and DIP reduced muscle ammonia levels by 55, 57 and 58%, respectively, compared to CTRL group (p<0.05). Lactate was reduced in plasma of control rats (p<0.05 vs. SED) and treatments containing L-glutamine improved this effect. Supplements with DIP and GLN+ALA reduced plasmatic levels of lactate by 43 and 44%, respectively, compared to CTRL group (p<0.05).

PURPOSE: The intake of whey protein is highly effective for accelerating muscle protein synthesis. Many studies have revealed that a rapid absorption rate and the leucine-rich amino-acid composition of whey protein contribute to the acceleration of muscle protein synthesis. Whey protein hydrolysates (WPH) have amino-acid composition identical to intact whey protein isolate (WPI) and are absorbed more rapidly than WPI. Our hypothesis was that WPH is a more potent accelerator for muscle protein synthesis than WPI. The aim of the present study was to compare the effects of WPH on muscle protein synthesis with WPI.

METHODS: Male Sprague-Dawley (SD) rats swam for 2 h. Immediately after exercise, WPI was administered to the rats as a single dose (amounts of protein were 2.0 g/kg BW). Phe-D, was injected via the tail vein 15 min before euthanasia for the measurement of the protein fractional synthesis rate (FSR). Rats were euthanized at designated postprandial time points (30, 60, 90 or 120 min) and triceps muscle samples were collected (n = 7-9/time point). FSR were measured to find the point time at which FSR became highest.

Abstracts were prepared by the authors and printed as submitted.
Subsequently, another group of male SD rats swam for 2 h. Immediately after exercise, WPI, WPI or deionized water (control, n = 8) was administered to the rats as a single dose amounts of protein were 0.5 or 2.0 g/kg BW, n = 8) treatment/dose). PF-2 was injected via the tail vein 15 min before euthanasia. At the time point that the first study revealed postprandial FSR became highest, rats were anesthetized and their triceps muscles were excised to measure FSR. RESULTS: Postprandial FSR became highest at 60 min after WPI was administered (2.68±0.25, 3.68±0.19, 4.62±0.28, 4.91±0.21 and 3.99±0.19% day for 0, 30, 60, 90 and 120 min). 60 min after administration, WPI had significantly higher (p < 0.05) FSR compared to control at a dose of either 0.5 or 2.0 g/kg BW (5.21±0.22, 5.22±0.18 and 3.74/±0.24% day for 0.5, 2.0 g/kg BW and control, respectively). However, WPI had significantly higher (p < 0.05) FSR compared to control only at a dose of 2.0 g/kg BW (4.51±0.10 and 5.09±0.20 for 0.5 and 2.0 g/kg BW). WPI had significantly higher (p < 0.05) FSR compared to WPI at 0.5 g/kg BW. CONCLUSIONS: Whey protein hydrolysates stimulate muscle protein synthesis at lower doses compared to intact whey protein.

**Board #78**

**June 1, 9:30 AM - 11:00 AM**

**Combined Oral Intake of GABA with Whey Protein Improves Lean Mass in Resistance-Trained Men**

Maya Sakashita1, Utano Nakamura1, Isafumi Maru1, Seiyu Harada1, Jeong Won Kim2, Nouchi Horie2, Mujo Kim2, Yasushiro Yokoyama1, Satoshi Fujita1. 1Pharma Foods International CO., LTD., Kyoto, Japan. 2Mitsubishi Corporation, Tokyo, Japan. 3Ritsumeikan University, Shiga, Japan. Email: m-sakashita@pharmafoods.co.jp (No relationships reported)

**Purpose:** To examine the effect of oral administration of GABA combined with whey protein on muscle hypertrophy during progressive resistance training in men.

**Methods:** Twenty-six healthy male volunteers (26-48 yrs) were divided into one of two groups: whey protein (WP) group ingesting 10g of whey protein, whey protein + GABA (WP+G) group ingesting 10g of whey protein and 100 mg of GABA every two groups; whey protein (WP) group ingesting 10g of whey protein, or whey protein + GABA (WP+G) group ingesting 10g of whey protein and 100 mg of GABA every day for 12 weeks. Both groups were subjected to a resistance training twice a week in which they performed three sets of 12 repetitions at 60% of one-repetition maximum on the following exercises: leg press, leg extension, leg curl, chest press and pull down. Body composition was assessed by dual-energy X-ray absorptiometry at baseline and 12wk after the training period. Resting plasma GH concentration was assessed at baseline, 4, 8 and 12 wk.

**Results:** In WP+G group, plasma GH level in resting state was significantly different at 4 and 8wk compared with week 0 (689 ± 203, 661 ± 199 vs. 264 ± 93 pg/mL, p<0.05 respectively). On the other hand, plasma GH level in WP group was significantly different at 4 and 8wk compared with week 0 (689 ± 203, 661 ± 199 vs. 264 ± 93 pg/mL, p<0.05). After 12 wk, change in whole body lean mass was significantly higher in WP+G group compared to that in WP group (1340 ± 465 vs. 146 ± 218 g, p<0.05).

**Conclusions:** Gamma aminobutyric acid (GABA) is one of the amino acids and is an inhibitory neurotransmitter. Oral administration GABA reportedly elevates resting serum growth hormone (GH) concentrations. GH is an important regulator of body composition including muscle protein synthesis, although the effect of GABA on muscle anabolism is unclear. On the other hand, it is well known that ingestion of protein after exercise stimulates protein synthesis in skeletal muscles. In addition to post-exercise protein supplementation, the ingestion of GABA may have additive effect in training-induced muscle hypertrophy.

**Board #79**

**June 1, 9:30 AM - 11:00 AM**

**Effects of Multiple Carbohydrates and Protein on Time Trial Performance in Trained Cyclists**

Anthony Wolfe1, Sallec Brandt1, Josh Aponte2, Isaac Krause1, Rachel Masivson1, Lisa Ferguson-Stegall1. 1Hamlune University, St. Paul, MN. 2North Hennepin Community College, Brooklyn Park, MN. (Sponsor: John L. Ivy, FACSFM) (No relationships reported)

Ingestion of multiple carbohydrate (CHO) types (e.g., dextrose+fructose) during exercise can increase CHO oxidation rates compared to ingesting a single CHO (e.g., dextrose), and may improve endurance performance. It has been reported that adding protein to a multiple-CHO beverage increased cycling time to exhaustion compared to a single CHO beverage alone. However, it is unclear whether the improved performance was due to the multiple CHOs or the addition of protein. PURPOSE: This study aimed to determine whether the addition of 1.2% protein to a 3% multiple-CHO beverage improved performance and muscle strength recovery in 2 same-day time trials compared to an isocaloric multiple CHO-only beverage. METHODS: 12 cyclists (39.9±11.8 y, VO2max 53.7±6.9 ml/kg/min) performed 3 trials, a familiarization trial and 2 randomly ordered, double-blinded experimental trials. Each trial consisted of a pre-trial leg strength measurement, 40km time trial (TT), 30 min recovery, 10km TT, and post-trial leg strength testing. Subjects ingested 275 ml of a multiple-CHO (MCO) or multiple-CHO+protein (MCP) beverage at 7 time points during the protocol. Blood glucose, lactate, heart rate (HR) and rating of perceived exertion (RPE) were measured. Leg strength was assessed using a custom Isometric Leg Strength System. Continuous variables were analyzed with paired t-tests. Repeated measures were analyzed with repeated measures ANOVA. RESULTS: No significant differences were found between MCO and MCP in 40km TT time (82.3±2.6 vs 82.8±2.8 min, respectively, p=0.32) and power output (233.3±16.0 vs 231.6±16.7 W, p=0.55) nor in 10km time (24.4±0.9 vs 24.5±1.1 min, p=0.61) or power output (238.2±16.7 vs 237.3±17.7 W, p=0.83). No differences were found in leg strength recovery (pre-post trial) as well (p=0.62). Blood glucose, lactate, HR, and RPE were also not different between treatments. CONCLUSION: While addition of protein to CHO has been shown to improve TTE, it may not be beneficial in shorter race events. We speculate that in this study, exercise time and intensity were not great enough to deplete glycogen stores or cause muscle damage. Differences in experimental design likely explain the conflicting findings among studies.

**Board #80**

**June 1, 9:30 AM - 11:00 AM**

**Null Effect Of Dhea-s On Muscle Strength And Serving Performance In Young Women**

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**Purpose:** To determine whether oral DHEA supplementation can increase muscle strength and motor performance.

**Methods:** A randomized placebo-controlled crossover study was conducted among 10 young women (aged 20.2) with a washout period of one month. DHEA (25 mg per day) or Placebo was orally provided one day before assessments.

**Results:** DHEA supplementation significantly increased plasma DHEA-S level from 0.9 to 1.5 microgram/mL. However, no significant change in average hip isokinetic strength, tennis serving accuracy, and ball serving speed. DHEA supplementation did not affect total mood disturbance and blood pressure among participants. Interestingly, monthly variations in hip muscle strength and ball serving speed decreased during DHEA trial.

**Conclusions:** Despite an existing relationship between plasma DHEA-S and motor performance, we fail to find significant changes in motor performance and mood state with DHEA supplementation.

**Board #81**

**June 1, 9:30 AM - 11:00 AM**

**Effect Of 24 Weeks β-alanine Supplementation On High-intensity Cycling**

Bryan Saunders1, Vitor de Salles Painelli2, Vinicius Eira Silva1, Luana Farias de Oliveira1, Rafael Pires da Silva1, Craig Sale1, Roger Charles Harris3, Hamilton Roschel4, Guilherme Giannini Artioli1, Bruno Gualano1. 1University of Sao Paulo, Sao Paulo, Brazil. 2York University, Toronto, United Kingdom. 3Yuniversity Trent University, Nottingham, United Kingdom. 4University Md, Newmarket, United Kingdom. Email: dbryanSaunders@outlook.com (No relationships reported)

β-alanine supplementation over 4-10 weeks has consistently been shown to improve high-intensity cycling capacity (CCT110%) by 12-16% (Hill et al., 2007; Sale et al., 2011; Danaher et al., 2014). However, there is no evidence as to whether further improvements occur when supplementation is prolonged. PURPOSE: To determine the effects of 24 weeks of β-alanine supplementation on high-intensity cycling capacity.

**Methods:** Twenty-five recreationally active males (age 27 ± 4 y, height 1.74 ± 0.08 m, body mass 78.8 ± 11.5 kg) were supplemented with 6.4 g day-1 of sustained release β-alanine (N=16; CarnoSynTM, NAI, USA) or placebo (N=9; maltodextrin, NAI, USA) over a 24-week period. Every 4 weeks (Week 0, 4, 8, 12, 16, 20 and 24) participants performed the CCT110% with, time-to-exhaustion (TTE) recorded as the outcome measure. Data were analysed using mixed model ANOVA, magnitude based inferences (MBI) and effect sizes (ES).

**Results:** There was a main effect of supplement on TTE (P=0.048), although there was no interaction effect (P=0.07). TTE was improved with β-alanine at all time points (Week 4: +5.0%; Week 8: -2.2%; Week 12: +4.4%; Week 16: +8.1%; Week 20: +11.1%; Week 24: +9.0%) while changes in placebo were minimal (Week 4: +1.8%; Week 8: +1.2%; Week 12: -1.3%; Week 16: +0.1%; Week 20: -7.1%; Week 24: -2.3%).
CONCLUSIONS: Twenty-four weeks of β-alanine supplementation improved CCT110%, likely due to increases in muscle carnosine concentration and subsequent increases in muscle buffering capacity during exercise.

<table>
<thead>
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<th>Likelihood of a substantial improvement in TTE (%)</th>
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<td>MBI</td>
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**Board #83 June 1, 9:30 AM - 11:00 AM**

**Antioxidants and Recovery from Exercise Induced Muscle Damage**

Kara A. Stone¹, Jennifer Case², Stephen Burns², Michael Godard². ¹North Dakota State University, Fargo, ND. ²University of Central Missouri, Warrensburg, MO.

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(No relationships reported)

**PURPOSE:** To examine the effect of short term (12 days) antioxidant supplementation on performance and metabolic related symptoms of exercise induced muscle damage (EIMD) in female participants.

**METHODS:** Ten non-resistance trained females underwent 12 days of supplementation (one capsule, two times per day) with antioxidants and 1” flour-filled placebo capsules in a randomized, cross-over design, including a two-week wash-out. To induce muscle damage, subjects performed an eccentric leg press protocol (130% of predicted one repetition maximum (RM), 4 sets, 12 repetitions). Assessment variables included: range of motion (ROM), resting blood lactate, leg press 5-RM, Wingate power output, fatigability index, anaerobic capacity, and perceived muscle soreness (MS). Assessments occurred prior to supplementation, immediately after exercise protocol, 48 and 96 hours post-exercise.

**RESULTS:** An increase in perceived MS (5.0 ± 1.49 vs. 3.3 ± 1.64 arbitrary units, p = 0.038) and a decrease in anaerobic capacity (4.76 ± 1.05 vs. 4.05 ± 1.08 W/kg, p = 0.038) were observed immediately after and 48 hours post-eccentric exercise compared to baseline, respectively. Resting blood lactate was also significantly higher during antioxidant supplementation at 48 hours post-exercise (2.0 ± 0.7 vs. 1.6 ± 0.4 mmol/L, p=0.015). However, there were no significant changes (p>0.05) in ROM, muscular strength, power output, or MS between trials over the 96 hours following the eccentric protocol.

**CONCLUSIONS:** Though an increase in MS and a decrease in anaerobic power indicate the presence of EIMD, short term antioxidant supplementation had no effect on performance related symptoms of EIMD in untrained females. However, an increase in resting blood lactate indicated an influence of antioxidants on resting energy metabolism.

**Board #84 June 1, 9:30 AM - 11:00 AM**

**Effects Of A Pre-exercise Supplement On Anaerobic Power And Blood Lactate In Males And Females**

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(No relationships reported)

Pre-workout supplements claim to enhance athletic performance, but these claims have not been evaluated in the context of repeated anaerobic power tests in males and females. Supplements often contain numerous 48 hours post-eccentric exercise compared to placebo. To examine the effect of a supplement containing only creatine (CRE) with a supplement containing creatine, beta-alanine, amino acids, caffeine, and B-vitamins (MULT) on maximal anaerobic power, fatigue, and blood lactate accumulation in males and females. It was hypothesized that MULT would be associated with greater anaerobic power, reduced fatigability, and reduced blood lactate levels compared to CRE, with both supplements greater than placebo (PL). METHODS: Male and female subjects (n=20) performed two 30 second Wingate anaerobic tests separated by a 5 minute rest period, 20 minutes after consuming PL, CRE, or MULT in a repeated measures, blinded design. Fatigue index was quantified as relative power drop over the duration of the test. Blood lactate levels were measured before test 1 and after tests 1 and 2. RESULTS: Peak anaerobic power was not different among all conditions for test 1 or 2 (average for all conditions were 11.5±0.5 and 11.3±0.5 W/kg for males, 9.0±1.1 and 8.8±1.2 W/kg for females). Fatigue index was similar for test 1 and 2 and was not different among conditions or genders. Respective test 1 fatigue index values for males and females were 40.5±2.7% and 37.7±5.2% for MULT, 43.1±7.7% and 41.3±4.4% for CRE, and 43.8±2.8% and 40.8±2.6% for PL. In both genders, increases in lactate from post-test 1 to post-test 2 were not different among conditions. Increases in lactate from pre-test 1 to post-test 2 were also not different among conditions or genders with changes in MULT (8.6±0.8 and 8.4±1.2 mmol/L), CR (10.9±1.0 and 7.7±1.0 mmol/L) and PL (10.8±1.3 and 7.2±1.1 mmol/L) for males and females, respectively. CONCLUSION: Results suggest that MULT or CRE do not significantly increase peak anaerobic power, reduce fatigability or buffer increases in lactate with repeated anaerobic power tests compared to PL.
The Effects of N-Acetylcysteine on Repeated Sprint Performance in College-Aged Recreationally Active Men and Women

Emily J. Sauers, Elizabeth F. Klinger, Chad A. Witmer, Matthew R. Miltenberger, Shala E. Davis, FACSM. East Stroudsburg University, East Stroudsburg, PA (Sponsor: Shala Davis, FACSM)

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(No relationships reported)

The accumulation of reactive free radicals will lead to oxidative stress which can cause oxidative damage to biomolecular such as protein, lipid, and DNA. It also can induce injury to tissues or organs and is one of the reasons for fatigue. Therefore, supplementing with antioxidants has been considered to have an important role in reducing the degree of fatigue caused by free radical and oxidative stress.

PURPOSE: Glutathione (GSH) possesses a significant antioxidant effect and reduces oxidative stress. However, GSH like other natural anti-oxidants is limited by poor stability, short half-life in vivo, low bioavailability, and is easily degraded by proteolytic or gastrointestinal enzymes. Therefore, using nanomaterials as an efficient delivery system for antioxidants can solve these problems and improve clinical therapy. METHODS: Glutathione (GSH) nanoparticles were successfully intercalated into layered double hydroxides (LDH) nanoparticles and characterized by X-ray powder diffraction and transmission electron microscopy. The in vitro cytotoxicity assays was studied by MTT test. The in vivo anti-fatigue effect was examined by animal assay. Sixty mice were randomly divided into six groups with ten mice each: two control groups, two GSH treatment groups and two GSH-LDH treatment groups. The forced swimming test was conducted on the last day and corresponding biochemical parameters were measured. RESULTS: The in vitro cytotoxicity assays indicated that GSH-LDH antioxidant system had no significant cytotoxic effect or obvious toxicity to normal cells. It also prolonged the forced swimming time of the mice by 25% and 41% compared to GSH and control groups, respectively. It had an obvious effect on decreasing the blood urea nitrogen and blood lactic acid, while increasing muscle and hepatic glycogen levels. CONCLUSION: GSH-LDH might be used as a novel antioxidant and anti-fatigue sports nutritional supplement. Future work will focus on the study of antioxidant and anti-fatigue mechanisms at the molecular level.

This work was financially supported by the National Natural Science Foundation of China (Grant No 31100855, 31401019)

Guainodiacid acid (GAA) is a natural precursor of creatine, and an experimental dietary additive. Recent studies have shown that dietary GAA enhances serum levels of GAA and creatine in humans. However, the effects of supplemental GAA on creatine utilization in tissues with high energy requirements (such as muscle and brain) are poorly described. PURPOSE: To examine the effects of four-week oral GAA administration on creatine levels in human skeletal muscle. METHODS: Four healthy men (age 24.8 ± 3.9 years, weight 73.5 ± 9.5 kg, height 173.5 ± 5.3 cm) participated in this open-label, repeated-measure pilot case study. The participants were assigned to receive 3.0 grams per day of oral GAA for 4 weeks, and were evaluated at baseline, and following 4-weeks of ingestion. The primary endpoint of GAA efficacy was the change in total creatine levels in the right vastus medialis muscle as determined by MTT test. The in vivo anti-fatigue effect was examined by animal assay. Sixty mice were randomly divided into six groups with ten mice each: two control groups, two GSH treatment groups and two GSH-LDH treatment groups. The forced swimming test was conducted on the last day and corresponding biochemical parameters were measured. RESULTS: The in vitro cytotoxicity assays indicated that GSH-LDH antioxidant system had no significant cytotoxic effect or obvious toxicity to normal cells. It also prolonged the forced swimming time of the mice by 25% and 41% compared to GSH and control groups, respectively. It had an obvious effect on decreasing the blood urea nitrogen and blood lactic acid, while increasing muscle and hepatic glycogen levels. CONCLUSION: GSH-LDH might be used as a novel antioxidant and anti-fatigue sports nutritional supplement. Future work will focus on the study of antioxidant and anti-fatigue mechanisms at the molecular level.

This work was financially supported by the National Natural Science Foundation of China (Grant No 31100855, 31401019)
Muscular endurance is now considered a major neuromuscular factor associated with independence and fall reduction. **PURPOSE:** To determine the effects of sustained-release beta-alanine supplementation alone or in combination with a resistance training program on muscular endurance and activities of daily living (ADL) in older adults. **METHODS:** Subjects were randomly assigned to one of four groups for a 12-week intervention: 3.2g/day of maltodextrin placebo with no resistance training, 3.2g/day beta-alanine with no resistance training, 3.2g/day maltodextrin placebo with resistance training, or 3.2g/day beta-alanine with resistance training. Before and after the 12-week intervention, subjects’ anthropometric measures were taken; and they were tested using the Physical Functional Performance Test (1-PFP test), the Senior Fitness Test (SFT) and upper and lower body strength and endurance. Upper and lower body strength and endurance tests included one-repetition maximum (1RM) and 20 repetitions as fast as possible at 50% 1RM, respectively, using pneumatic muscle endurance tests included one-repetition maximum (1RM) and 20 repetitions as fast as possible at 50% 1RM, respectively, using pneumatic resistance equipment. **RESULTS:** Overall, we observed no significant within or between group alterations for any biomarkers associated with glucose; blood lipids including total cholesterol, LDL, triglycerides; kidney enzymes including creatinine and blood urea nitrogen (BUN); muscle enzymes such as lactate dehydrogenase (LDH) and creatine kinase (CK); and liver enzymes such as alkaline phosphatase (ALP), alanine aminotransferase (ALT), and aspartate aminotransferase (AST) function throughout the study (all p ≥ 0.05). **CONCLUSION:** The ingestion of the supplement examined in this study showed no adverse effects on blood lipids or hepatic and muscle enzyme function, with respective responses being similar to treatment with a PLA treatment condition. These findings are in agreement with other studies testing similar ingredients and longer studies appear to be safe to perform on performance related outcomes.

The production of reactive oxygen species (ROS) during exercise is one signal for training-induced mitochondrial biogenesis. Previous studies have shown that antioxidant supplementation blunts mitochondrial adaptations to exercise training via suppression of ROS production. **PURPOSE:** To determine the effects of mitochondria-targeted antioxidant (mtAO) supplementation on mitochondrial adaptations to chronic exercise training. **METHODS:** Young (22 ± 3 yr), healthy men (n = 19) were randomized to receive either mtAO (n = 9) or placebo (n = 10). Participants performed cycle training for 3 weeks at 70-70% of maximal oxygen uptake (VO2max). VO2max and an in vivo assessment of mitochondrial oxidative capacity were assessed before and after training. Mitochondrial oxidative capacity was assessed via post-exercise recovery kinetics of muscle oxygen consumption using near infrared spectroscopy (NIRS) in the vastus lateralis (VL) muscle. **RESULTS:** Exercise training increased VO2max (baseline: 40.1 ± 4.8 ml/kg/min; after training: 42.8 ± 3.9 ml/kg/min, main effect: p < 0.001), but no differences were detected between treatment groups (training × treatment: p = 0.29). Similarly, exercise training increased mitochondrial oxidative capacity rate constants (baseline: 1.8 ± 0.3 min-1; after training: 2.2 ± 0.5 min-1, main effect: p < 0.002), with no differences between treatment groups (training × treatment: p = 0.39). **CONCLUSIONS:** Mitochondria-targeted antioxidant supplementation does not alter mitochondrial adaptations to endurance exercise training. Further, our data indicate that three weeks of cycle training enhances mitochondrial oxidative capacity in the VL, as measured by NIRS.
Data from animal studies indicate that mitochondria-targeted antioxidant administration preserves age-related endothelial function by reducing oxidative stress. However, antioxidant administration during training attenuates some health benefits of endurance training (e.g., insulin sensitivity). It is not known whether antioxidant supplementation during exercise training impacts adaptations in human circulating vascular cells. PURPOSE: To examine the effect of mitochondria-targeted antioxidant (mtAO) supplementation on endurance exercise training-induced adaptations in different circulating angiogenic cell (CAC) subpopulations.

METHODS: Twenty men (22 ± 3 yr) performed three weeks of aerobic cycle training, 50%-70% maximal oxygen uptake for 45-60 min, with and without mtAO supplementation (n = 10/group). A blood draw and measures of body composition were obtained before and after training. Blood samples were analyzed by flow cytometry for concentrations of endothelial progenitor cells (CD34+/VEGFR2+), angiogenic endothelial cells (CD62E+), angiogenic monocytes (CD14+/CD31+), T-cells (CD3+), and angiogenic T-cells (CD3+/CD1+). RESULTS: Placebo and mtAO groups did not differ in any study outcomes before or after training (all P > 0.05). Thus, main effects of endurance training are reported. Percent body fat and fat mass decreased by 4% and 1%, respectively (P < 0.05). Training induced 88%, 69%, and 21% increases in CD34+/VEGFR2+, CD62E+, and CD14+/CD31+ CACs, respectively. CONCLUSIONS: These findings indicate that mtAO supplementation does not affect training-induced adaptations of different CAC populations in young healthy men. Importantly, our data demonstrate for the first time that short-term cycle training enhances CD34+/VEGFR2+, CD62E+, and CD14+/CD31+ CACs.

Title: Effect of aerobic pre-exercise carbohydrate supplementation on salivary cortisol concentrations
Authors: Matthew Kleven, Ben Besch, and Paul Mellick, Ph.D. University of St. Thomas, St. Paul, MN. (No relationships reported)

Cortisol works to preserve plasma glucose through four primary mechanisms. These mechanisms include the mobilization of amino acids, mobilization of free fatty acids, initiating gluconeogenesis, and blocking plasma glucose entry into cells. Sparing plasma glucose is absolutely essential, especially during exercise, for the functioning of our central nervous system because it is the primary fuel source for the brain. PURPOSE: This study aimed to discover whether increasing blood glucose through carbohydrate supplementation is an effective way to diminish cortisol secretions in response to long-duration high-intensity exercise. METHODS: For two sessions, 12 recreationally active college females (age = 20 ± 1.35 yrs; Ht = 167.8 ± 4.27 cm; Wt = 64.90 ± 8.14 kg; BF = 25.79 ± 5.13%) participated in this study. Day one subjects used Bod Pod to determine body composition. VO2 max was also assessed via cycle ergometer. With at least 48 hours of rest, day two subjects either ingested a carbohydrate supplement (1 g sugar/kg of body weight), or placebo drink containing no sugar. Thirty minutes after ingestion, subjects began exercising on a stationary cycle maintaining 76% heart rate max (3.5 BPM) for 60 minutes. Blood glucose and salivary cortisol measurements were taken immediately before beginning exercise (pre), immediately after exercise (post), 30 minutes post exercise (30P), and 60 minutes post exercise (60P). RESULTS: The results comparing placebo and treatment blood glucose levels showed significance at the pre time point (p = 0.002). There was no significant difference in cortisol levels at any time point. However, the change in cortisol concentrations were statistically significant from post-exercise to pre-exercise (p = 0.027) and 60 min post exercise to pre-exercise (p = 0.043). CONCLUSION: Carbohydrate supplementation prior to high-intensity exercise was able to significantly decrease cortisol levels compared to the placebo. Performing aerobic exercise can return elevated blood glucose levels back to normal immediately after (p = 0.378) and will remain there 60 minutes post (p = 0.601).

Title: Effect of 5-Hour Energy Shot® on Motor Control Tasks in Sleep-Deprived College-Aged Individuals
Authors: Brandon J. Schrom, Philip J. Buckenmeyer, Larissa J. True, Stephen P. Yang, Jeffrey A. Bauer, Nicole J. Lindel, Ayden J. Wilbur, Joseph W. O’Haire. SUNY Cortland, Cortland, NY. (No relationships reported)

Energy drinks are a common choice when seeking feelings of alertness or trying to improve performance. One popular energy drink is the 5-Hour Energy Shot®. The maker claims that one feels awake and alert for hours while also improving work and/or exercise performance. Published research supporting such claims is lacking, particularly with fine motor tasks. PURPOSE: To determine if ingesting one 5-Hour Energy Shot® compared to a placebo causes measurable improvement in an anticipation timing or pursuit rotor task in sleep-deprived participants. METHODS: Nine (6 males, 3 females), college-aged (20.6 ± 0.98 yrs; 1.7 ± 0.08 m in ht; 74.0 ± 10.18 kg in wt), volunteers participated in a double-blind, cross-over, placebo-based study. The participants were tested in a pre-sleep-deprived state and a sleep-deprived condition while performing specific motor tasks. In the sleep-deprived state, subjects ingested either a randomly assigned non-caffinated placebo (PL) (59 ml, 5 kca1s) or the 5-Hour Energy Shot® (SHES) (59 ml, 4 kca1s). Subsequently, data were collected at 5 consecutive time intervals (30 min, 1 hr, 2.5 hr, 3.5 hr, and 4.5 hr) after ingesting the drink. A two-way repeated measures ANOVA was run to determine the effect of treatment (placebo vs 5-hr energy) and time on reaction/anticipation time, as measured by a Bassin anticipation timer. Anticipation time score was measured as absolute error. A two-way repeated measures ANOVA was also run to determine the effect of time and treatment (placebo vs 5-hr energy) on time-on-target (sec), as assessed by a rotary pursuit. Significance was established at p < 0.05. RESULTS: There was no statistically significant two-way interaction between treatment and time for the anticipation time or pursuit rotor task. However, for the SHES trials, absolute error decreased significantly by ±0.046 sec from the initial rested trial to the final sleep-deprived trial, a difference that was statistically significant, F(5, 40) = 3.158, p = .017, partial n2 = .283. CONCLUSION: When compared to a placebo, 5-Hour Energy Shot® did not
The use of energy drinks among athletes has risen greatly. A recent survey found that 89% of varsity athletes and 82% of recreational athletes use energy drinks. The number of U.S. emergency department visits involving energy drinks doubled over the last 5 years. Underlying reasons for these visits have yet to be fully elucidated. However, reviews of patient health complications have highlighted adverse cardiovascular events after ingestion of energy drinks. Caffeine is known to moderately increase blood pressure and heart rate; however, the other ingredients in these beverages other than caffeine may also be contributing to adverse effects. PURPOSE: To determine the effect of three different energy drinks on cardiovascular and performance measures during economy trials.

METHODS: Fifteen college adults completed five trials on five separate days with at least one day recovery between trials. The first trial consisted of a graded treadmill protocol to determine VO2max. The four remaining trials each subject was required to blindly ingest one of three energy drinks or a placebo drink one hour prior to their exercise. Next, each subject completed 15 minutes of treadmill exercise at a speed consistent with 70% of their VO2max. The trials were conducted in a counterbalanced order. HR, BP, VO2, and RPE were recorded during the treadmill exercise trials. Means for dependent measures were compared using repeated measures ANOVA at alpha of 0.05.

RESULTS: Fifteen minute systolic blood pressure readings were found to be significantly lower in the placebo trials (156.93 ± 15.50) in relation to the three energy drink trials (163.87 ± 13.30, 166.47 ± 13.71 and 165.00 ± 15.23). There were no significant differences in diastolic blood pressure and heart rate. There were also no significant differences in VO2 or RPE measures between placebo and the three energy drinks. CONCLUSION: Ingestion of energy drinks prior to performance demonstrated no increase in performance measures (VO2 or RPE) during 15 minutes of treadmill exercise trials. The findings show no performance benefits under the conditions of this study. However, there does appear to be a significant increase in systolic blood pressure. It is unknown if the small significant increase in systolic blood pressure (8.18 mmHg) impacts health.

Study was funded by NIH KBRIR grant.
Acute caffeine ingestion is considered effective in improving endurance capacity. Caffeine may also improve cognitive function and mood. However, current knowledge about the effects of caffeine is based on the findings of studies which mainly have been conducted in temperate environmental conditions and on male subjects, whereas some physiological and mood effects of caffeine have been shown to differ between sexes.

**Purpose:** The aim of this study was to compare physical and cognitive performance effects of caffeine in young women and men during constant-load treadmill walk to exhaustion in the heat.

**Methods:** Thirteen male (age 24.9±4.1 yr, height 1.83±0.06 m, body mass 78.8±7.9 kg, VO2peak 51.7±2.7 ml·kg⁻¹·min⁻¹) and ten female (age 22.5±2.0 yr, height 1.67±0.05 m, body mass 61.0±5.4 kg, VO2peak 45.6±4.0 ml·kg⁻¹·min⁻¹) physically active students completed two constant-load walks (60% VO2peak) on a treadmill until volitional exhaustion in a climatic chamber (air temperature 42°C and relative humidity 20%) after caffeine (CAF) and placebo (wheat flour; PLC) ingestion in a double-blind, randomly assigned, crossover manner. Both CAF and PLC were administered in gelatin capsules in 2 doses: 60 min (4 mg/kg) and immediately (2 mg/kg) prior to exercise.

**Results:** Walking time to exhaustion was 82:15 min and 76:11 min (p<0.05) in females and 83:17 min and 82:14 min (p<0.05) in males in PLC and CAF trial, respectively. CAF compared to PLC increased (p<0.05) heart rate and blood lactate concentration in both males and females, but had no impact (p>0.05) on changes in rectal and mean weighted skin temperature during walk to exhaustion. CAF had no impact (p>0.05) on changes in mood, short-term memory and working memory during exercise in either gender, however, CAF compared to PLC decreased (p<0.05) ratings of perceived exertion and fatigue in males, but not in females. In females, but not in males, stronger belief that they had administered CAF associated with shorter time to exhaustion.

**Conclusion:** In both males and females, caffeine has no impact on endurance capacity, cognitive performance or mood under hot environmental conditions.

Supported by the Estonian Ministry of Education and Research, institutional research funding IUT 20-58.
Mood state and rise in positive mood state, indicating an overall improvement in mood state parameters were reduced by 41% (26 ± 4 V AS) and 39% (27 ± 5 V AS), while RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also influencing by the American ephedra herbal blend, with a dramatic fall in negative mood state and caffeine consumption.

Muscle soreness is commonly experienced following prolonged endurance exercise. Caffeine can reduce muscle pain during exercise. However, the effects of caffeine on perceived muscle soreness (RPMS) and perceived lower extremity functionality (LEF) following the completion of a 100-mile endurance cycling event.

Comparison to Control (109 ± 2 mmHg), average SBP was 10% (120 ± 2 mmHg) and 11% (121 ± 4 mmHg) higher after ingestion of a single-serving (SS) or double-serving (DS) of the herbal supplement (p < 0.05). Similarly, compared to Control (73 ± 2 mmHg), average DBP was also elevated 11% (81 ± 3 mmHg) and 14% (83 ± 3 mmHg) after SS and DS, respectively. In contrast, average HR was 5% lower in both supplement interventions (64 ± 5 bpm Control vs. 61 ± 2 bpm in SS and DS). RVP was 3% (150 ± 30 kcal) and 5% (152 ± 123 kcal) higher in SS and DS, respectively compared to Control (145 ± 32 kcal). Compared to Control (44 ± 9 VS) negative mood state parameters were reduced by 41% (26 ± 4 VS) and 39% (27 ± 5 VS), while positive mood state (35 ± 7 VS) was improved by 100% (70 ± 4 VS) and 71% (60 ± 9 VS) in SS and DS, respectively (p < 0.05). CONCLUSION: These findings indicate that, at two different intake levels, this American ephedra herbal blend supplement moderately increased average blood pressure and reduced heart rate within normal healthy ranges. Such changes in blood pressure are consistent in magnitude and time course with previous trials of coffee and caffeine consumption. RMR was slightly elevated 3–5% by the herbal blend, also consistent with previous research on the thermogenic effects of green tea consumption.

Male cyclists comprised a 140-min endurance cycling event, performed on a cycle ergometer, using a computerised game simulation, followed by a performance-feedback concealed, double-blind, slow-ramp test to exhaustion (0.33 W s⁻¹). Carbohydrate comprising 0.5:1.0 ratio of fructose:maltodextrin was ingested every 20 min via commercial beverage, gel, bar, or a mix of all 3, each providing 80 g h⁻¹ carbohydrate. Fluid was ingested every 20 min to total 705 ml h⁻¹, with water taken with gel and bar, and a dilute carbohydrate beverage with mix. Perceived exertion, muscle fatigue, and gastrointestinal discomfort were recorded on 0–100 point Likert scales 10 min following each feed. Data interpretation was by magnitude-based inference; threshold important change to peak power was 2%.

RESULTS: Performance peak power was 371, 375, and 371 W (between-subject SD 11%) for carbohydrate drink, gel, bars, and mix respectively. The impairment (-4.2%; 99% CI -10.9, 2.9) following bar ingestion relative to gel was substantial (81.2% likely harmful; 0.8% very unlikely beneficial), but the other contrasts were not clearly different. Bars produced likely small standardized (sample SD) increases in nausea, stomach fullness, abdominal cramps, exercise exertion and tiredness, relative to gels and drink; mix also increased nausea and stomach fullness, relative to gels.

CONCLUSION: Ingesting carbohydrates alone in the solid carbohydrate format of sports bars likely impairs peak power, relative to ingestion of carbohydrate in beverages, gels or in bar-gel-drink combination. The bar effects were associated with higher gut discomfort and perceived exertion. Supported by an internal project grant.

Habitual endurance training may be associated with mild airway inﬂammation and subsequent deterioration in lung function. It has been shown that PCSO-524™ (Lyprinol®/Omega-9®), a supplement extracted from the New Zealand green-lipped mussel (Perna canaliculus) comprising of up to 90 essential fatty acids, can moderate airway inﬂammation in humans with asthma, and in a murine-model of allergic airway disease. PURPOSE: To determine whether supplementation with PCSO-524™ (Lyprinol®/Omega-9®) can improve pulmonary and respiratory pulmonary and respiratory muscle function in non-asthmatic elite runners. METHODS: 16 male, non-asthmatic elite runners participated in the study. Participants completed baseline resting pulmonary and respiratory muscle function testing, then were randomly assigned to either a treatment (PCS0-524™; 1 capsule contains 50 mg n-3 polynaturated fatty acids and 100 mg olive oil, n=8) or placebo (1 capsule contains 100 mg olive oil, n=8) group. During the supplementation period, subjects ingested 8 capsules of either treatment or placebo per day for 12 weeks. Following baseline testing, pulmonary and respiratory muscle function was assessed every two weeks throughout the 12 week supplementation period. RESULTS: Significant between-subjects main effects were not observed in forced vital capacity (FVC), forced expiratory volume in 1-second (FEV₁), forced expiratory flow from 25-75% of lung volume (PEF 25-75%), peak expiratory flow (PEF), maximal voluntary ventilation (MVV), maximal inspiratory mouth pressure (Plimax), maximal expiratory mouth pressure (PEFmax), lung diffusion capacity (DlCO), and closing capacity (DlCO).
Carbohydrate (CHO) mouth rinsing without ingestion of the solution has been shown to improve endurance exercise performance. It has also been shown to attenuate the decline of maximal voluntary strength (MVC) following fatigue exercise. **PURPOSE:** The purpose of this study was to determine the effect of CHO mouth rinse on MVC and motor-unit recruitment following fatigue exercise. **METHODS:** Ten recreationally trained adults (3 males, 7 females) participated in a double-blind, cross-over study. MVC of the dominant knee extensors was assessed and MVC were incorporated in training and competition. Athletes either consumed caffeine (5 mg·kg⁻¹) or placebo in pill form. After a sixty-minute waiting period athletes performed three squat jumps and three countermovement jumps while standing on a force platform. **RESULTS:** Our data indicates that caffeine (5 mg·kg⁻¹) enhances vertical jump performance in Division I collegiate athletes competing in sports involving maximal-intensity ballistic tasks. It appears that the physical mechanism of enhancement is increased rate of force development and/or peak force production during jumping. The importance of rate of force development and peak force production during the performance of maximal-intensity ballistic tasks is well known. Thus, our data suggest that the ergogenic effects of caffeine may transfer to other ballistic tasks involving the lower-body musculature in collegiate athletes. Caffeine may be effective to enhance the quality of maximal-intent ballistic tasks during training and competition.

**CONCLUSIONS:**

Caffeine ingestion elicits a variety of physiological effects that may be beneficial to maximal-intensity exercise performance, though its effectiveness and physical mechanism of action enhancing ballistic task performance are unclear.

**REFERENCES:**

- Bost, J. S., Fitzgerald, L. P., Bloms, M. W. S., Short, J. R., Whitehead, R. F. M., FACSM. University of North Dakota, Grand Forks, ND. (No relationships reported)
and RTR (53 ± 199 vs. 602±262 Nm/sec) were also slowed following fatigue (~60%); p<0.001), but did not recover to baseline levels following 5 minutes of recovery (p=0.04)

**CONCLUSIONS:** A carbohydrate mouth-rinse had no effect on electrically evoked torque and skeletal muscle contractile properties following fatiguing exercise. This finding suggests any effect of carbohydrate mouth rinsing is likely mediated by “central” mechanisms rather than a direct effect on skeletal muscle.

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**Board #113**

**June 1, 11:00 AM - 12:30 PM**

**The Effects of Caffeine and Exhaustive Exercise on Manipulative Dexterity**

Edward J. Ryan¹, Emily J. Ryan¹, Andres E. Carrillo¹, John Gunstad¹, Ellen L. Glickman, FACSM², *Chatham University, Pittsburgh, PA.* ¹*West Virginia University, Morgantown, WV.* ²*Kent State University, Kent, OH.

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(No relationships reported)

Research has demonstrated that caffeine and exhaustive exercise may impact performance on cognitive and fine motor tasks. **PURPOSE:** The purpose of the present study was to determine if caffeine administered at different time points influenced manipulative dexterity following exhaustive exercise. **METHODS:** Eight healthy, physically active (50 ± 5ml·kg⁻¹·min⁻¹), younger (25 ± 5 years) males participated in five separate laboratory sessions. During the first visit, subjects underwent a graded exercise test on a Lode cycle ergometer to determine maximal oxygen consumption (VO2max) and were allotted time to practice the grooved pegboard task. For each of the next four visits, 3 pieces of chewing gum [caffeine (CAFF) or placebo (PLA)] were administered at 3 time points, 120 min pre exercise, 60 min pre exercise, and 5 min pre exercise. In 3 of the 4 experimental trials, CAFF was administered at one of the three time points and PLA at the other two time points. During the control trial, PLA gum was administered at all three time points. The order in which participants completed the experimental trials was randomized. Following time allotted for gum administration, and a standard warm-up, participants cycled at 75% VO2max (constant Wattage) for 15 min then completed a 7 kg·kg⁻¹·min⁻¹ performance ride. The grooved pegboard task was completed at baseline (Pre) and immediately following the performance ride (Post). Time (sec) to complete the pegboard task was utilized as an indicator of manipulative dexterity. **RESULTS:** Data were analyzed using a 4 (treatment) by 2 (time) analysis of variance (ANOVA). The ANOVA demonstrated a main effect of time (p = 0.047) for improvements in time to complete the pegboard task (Pre = 57.9 ± 0.9s, Post = 54.3 ± 1.4s). No main effect of treatment (p = 0.292) or treatment by time interaction (p = 0.239) was observed. CONCLUSION: These data suggest that manipulative dexterity improved following exhaustive cycling with and without caffeine. Further work in this area is warranted.

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**Board #114**

**June 1, 9:30 AM - 11:00 AM**

**Inverse Association Between Muscular Fitness And Clustered Score Of Inflammatory Biomarkers In Portuguese Adolescents: Labmed Physical Activity Study**

Cesar Agostinis, Rute Santos, Carla Moreira, José Oliveira Santos, Andre Fernandes, Luís Lopes, Sandra Abreu, Jorge Mata. *University of Porto, Porto, Portugal.*

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(No relationships reported)

**PURPOSE:** The aim of this study was to measure the physical activity in boys and girls from section 21, quintile 5 pre-primary and primary schools in a small rural South African town and compare findings to the recommended international physical activity levels. **METHOD:** Seventy-eight rural children, representing Caucasian and black African children, divided in three age groups, were issued a piece-electric pedometer for seven complete days. Pedometer data analysed included total steps, aerobic steps, aerobic walking time, calories and distance. Steps per day were compared to international levels. Correlation statistics examined the association between physical activity and adiposity. **RESULTS:** There was a statistically significant difference in activity levels of boys in the age groups 9-11 and 12-14 years compared to girls in the same age, with boys being more active than girls (p=0.003 and 0.042 respectively). Although girls’ physical activity levels tend to decrease with age, their aerobic activity levels increase with age. Rural children investigated in this study have physical activity levels far lower than the recommended international normative levels. No correlation was found between physical activity and adiposity. **CONCLUSION:** The pedometer data indicated that gender and age influence the activity of children. This group of rural children’s physical activity is far less than international normative levels. Boys aged 9 - 11 were the most active group, while girls aged 12-14 years old were the most active aerobic in this study. The authors concluded that, in order to increase physical activity, the age group 9 to 11 may be the ideal age to focus on for gender specific intervention programs.

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**Board #115**

**June 1, 9:30 AM - 11:00 AM**

**Does Physical Activity Levels in South African Children Compare to Recommended Levels set by International Standards?**


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(No relationships reported)

Physical activity plays an integral role in the normal physical, mental, social and cognitive development of children. One of the leading risk factors for childhood obesity and early onset non communicable diseases in low- and middle-income countries, such as South Africa. **PURPOSE:** The aim of this study was to measure the physical activity in boys and girls from section 21, quintile 5 pre-primary and primary schools in a small rural South African town and compare findings to the recommended international physical activity levels. **METHOD:** Seventy-eight rural children, representing Caucasian and black African children, divided in three age groups, were issued a piece-electric pedometer for seven complete days. Pedometer data analysed included total steps, aerobic steps, aerobic walking time, calories and distance. Steps per day were compared to international levels. Correlation statistics examined the association between physical activity and adiposity. **RESULTS:** There was a statistically significant difference in activity levels of boys in the age groups 9-11 and 12-14 years compared to girls in the same age, with boys being more active than girls (p=0.003 and 0.042 respectively). Although girls’ physical activity levels tend to decrease with age, their aerobic activity levels increase with age. Rural children investigated in this study have physical activity levels far lower than the recommended international normative levels. No correlation was found between physical activity and adiposity. **CONCLUSION:** The pedometer data indicated that gender and age influence the activity of children. This group of rural children’s physical activity is far less than international normative levels. Boys aged 9 - 11 were the most active group, while girls aged 12-14 years old were the most active aerobic in this study. The authors concluded that, in order to increase physical activity, the age group 9 to 11 may be the ideal age to focus on for gender specific intervention programs.

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**Board #116**

**June 1, 9:30 AM - 11:00 AM**

**The Association Of PA And Sedentary Behavior With Cardiometabolic Risk Factors In Chinese Children Aged 8-15**

Yajun Chen¹, Lu Ma², Stehen H.S. Wong, FACSM³, Fenghua Sun¹.¹*Sun Yat-sen University, Guangzhou, China.* ²*The Chinese University of Hong Kong, Hong Kong, China.* ³*Hong Kong Institute of Education, Hong Kong, China.* (Sponsor: Stephen Wong Heang-Sang, FACSM)

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(No relationships reported)

**PURPOSE:** This study explored associations between physical activity, sedentary behavior and cardiovascular risk factors in Chinese children. **METHODS:** 269 participants aged 9-11 years were enrolled. Physical activity and sedentary behavior were self-reported by 7-Day Physical Activity Questionnaire. Cardiovascular indicators included waist circumference, fasting glucose, lipids and blood pressure. Associations between activity levels and cardiovascular risk factors were examined using ANCOVA, partial correlations and multiple linear regressions with adjustment for covariates: age, sex and Body Mass Index.
RESULTS: Results showed that the MVPA energy expenditure and time of secondary students were significantly higher than those of primary students (Primary: 378.8±50.9 kcal/d and 78.3±12.4 min/d; secondary: 499.8±64.2 kcal/d and 91.7±20.4 min/d). The secondary school students spent more time on sedentary behaviors than primary school students (275.8±30.7 min/d vs. 192.7±19.8 min/d). The prevalence of screen time ≥ 2 h for secondary and primary school students was 11% and 6.7%, respectively. The total energy expenditure, MVPA time and TV time were significantly related to HLD-C and waist circumference. In multiple linear regression, energy expenditure and MVPA time were associated with better levels of several cardiovascular risk factors adjusting for sedentary time and covariates. Sedentary time were significantly positively related with several indicators (β coefficients: waist circumference: 0.066, fasting glucose: 0.213, systolic blood pressure: 0.155, diastolic blood pressure: 0.193) adjusting for MVPA time and covariates. Further analyses showed that TV time was positively correlated with diastolic blood pressure (β coefficient: 0.109, P < 0.05) adjusting for MVPA time and sedentary behaviors time. CONCLUSIONS: In this urban Chinese school students’ population, the total physical activity and MVPA time have positive influences on better cardiovascular risk factors, and we should also notice the negative influence of physical activity intensities on certain cardiovascular risk factors. Overall sedentary behavior time and TV time has negative influence on cardiovascular health.

Few data are available regarding the impact of structured exercise on quality of life (QOL) measures in middle-aged and older women. PURPOSE: To evaluate QOL cardiovascular efficiency and anthropometric measures at baseline and following a 6-month structured exercise intervention in women at risk for cardiovascular disease (CVD). METHODS: Women ≥ 18 years without known CVD with ≥ 1 risk factor were enrolled in a 6-month structured exercise intervention. Participants exercised under direct supervision of cardiac nurses and exercise physiologists ≥ 3 days per week for ≥ 30 min/session for 6-months. Exercise intensity approximated 60–85% of the maximal heart rate (HR). Rating of perceived exertion (RPE; 6–20 category scale) was used as an adjunctive intensity modulator, adjusting workloads to achieve 11-14 (“fairly light” to “somewhat hard”) ratings. Pre- versus post-conditioning QOL assessments (depression [PHQ-9], anxiety [STAI-S]), sedentary behavior (<100 CPM). Self-regulation was measured with a questionnaire based on Social Cognitive Theory (reinforcements, social support, goal setting, self-monitoring, time management, and relapse prevention). RESULTS: The results showed a reduction in time spent in sedentary behavior per day (600.2 ± 50.5 - 530.4 ± 101.4) and an improvement in self-regulation (95.6 ± 26.3 - 130.6 ± 24.2) after the intervention. A simple linear regression showed that a better self-regulation process for physical activity predicts a reduction in time spent in sedentary behavior. R² (1.18) = 3.86, p = .032. Changes in self-regulation accounted for 17.7% of the explained variability on changes in sedentary behavior. Conclusion: Self-regulation predicts positive changes in sedentary behavior and should be a focus for reducing sedentary time.

Board #120 June 1, 9:30 AM - 11:00 AM
Elder-friendly Approaches To The Surgical Environment: Bedside Reconditioning For Functional Improvements
Alyssa McComb, Margaret McNeely, Rachel Khadaroo.
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(No relationships reported)

Current hospital procedures are based around cautious exercise prescriptions, especially in the frail elderly and geriatric population. While activity restrictions are made for patient safety, there is currently no consensus on the level of restriction necessary or what activities should be restricted in the frail surgical patient. Exercise is a key component to a healthy lifestyle and is recognized in its role in managing symptoms and reducing the functional decline in aging. Therefore, it should be administered as a component of the treatment plan in order to reduce the muscular atrophy that occurs under the stress of surgery and hospitalization in the elderly. PURPOSE: To compare the functional status of elderly abdominal surgery patients post surgery and to determine how a regularly performed reconditioning program will affect the functional decline associated with bed rest. METHODS: 30 patients over the

Board #118 June 1, 9:30 AM - 11:00 AM
Self-regulation And Its Relationship With Sedentary Behavior After A Structured Exercise Program In Young Women
Mynor G. Rodriguez-Hernandez, James McDonald, David D. Pascoe, FACSM, Danielle D. Wadsworth. Auburn University, Auburn, AL (Sponsor: David D. Pascoe, FACSM)
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Sedentary behavior is related to many diseases and global mortality. Therefore, it is important to determine the effect of exercise interventions on sedentary behavior as well as psychological variables associated with sedentary behavior. Purpose: To examine the relationship between self-regulation for physical activity and sedentary behavior in young women after a structured exercise program. Methods: 20 women (M Age = 25 ± 4.5) participated in a 10-week exercise intervention, consisting of 30 sessions of a high intensity interval treadmill protocol and resistance training. Sedentary behavior was measured before and after the intervention, with an Actigraph accelerometer GT3X. Validated cut points were used to determine time spent in sedentary behavior (<100 CPM). Self-regulation was measured with a questionnaire based on Social Cognitive Theory (reinforcements, social support, goal setting, self-monitoring, time management, and relapse prevention). Results: The results showed a reduction in time spent in sedentary behavior per day (600.2 ± 50.5 - 530.4 ± 101.4) and an improvement in self-regulation (95.6 ± 26.3 - 130.6 ± 24.2) after the intervention. A simple linear regression showed that a better self-regulation process for physical activity predicts a reduction in time spent in sedentary behavior. R² (1.18) = 3.86, p = .032. Changes in self-regulation accounted for 17.7% of the explained variability on changes in sedentary behavior. Conclusion: Self-regulation predicts positive changes in sedentary behavior and should be a focus for reducing sedentary time.
The methods section typically includes a detailed description of the study design, participants, interventions, and outcomes measured. It may also include a discussion of the statistical analyses used to interpret the results. For example:

**Methods:**

The study included a total of 300 participants, divided into three groups: young adults (aged 18-30), middle-aged adults (aged 40-65), and older adults (aged 65 and older). Participants were randomly assigned to one of four treatment groups: a control group, a physical activity group, a psychological intervention group, and a combined group. The intervention group received a 12-week program consisting of a physical activity component and a psychological intervention component. The control group received no intervention.

**Results:**

Participants in the intervention group showed significant improvements in physical activity levels compared to the control group. The physical activity group reported an average increase of 30 minutes of moderate activity per day, while the control group showed no significant change. The psychological intervention group reported a significant reduction in depression symptoms compared to the control group. The combined group showed the greatest improvements, with significant increases in physical activity and reductions in depression symptoms.

**Conclusions:**

The study demonstrates the effectiveness of a combined physical activity and psychological intervention for improving physical activity levels and reducing depression symptoms in older adults. Further research is needed to determine the long-term effects of this intervention.
The Antihypertensive Benefits of Tai Chi Exercise among Older Adults: A Meta-Analysis

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(no relationships reported)

Tai Chi exercise training elicits changes in resting blood pressure (BP) ranging from -13 to +5 mmHg in the English literature. Reasons for the variability in the BP response are not clear. PURPOSE: This meta-analysis investigated the efficacy of Tai Chi as antihypertensive therapy and attempted to identify moderators of the BP response to Tai Chi. METHODS: Electronic databases were searched to identify trials that: 1) involved a Tai Chi intervention and control group; 2) measured pre- and post-intervention BP; 3) enrolled adult subjects (≥19yr) without severe debilitating diseases (e.g., Parkinson’s disease); and 4) were published in English. Study quality was assessed with an augmented Downs and Black checklist. Heterogeneity was evaluated using Cochran’s Q and the I2 statistic, a standardized measure of homogeneity that ranges from 0%-100% (i.e., low to high). All analyses followed random-effects assumptions. RESULTS: 18 studies of moderate methodological quality study homogeneity (57.7±11.1% of items on the SPPB: diastolic BP [DBP]: 137.0±11.3/81±2.4±7.9mmHg). Tai Chi was performed for 58.3±4.5min/session for 3.2±1.6 sessions/wk for 20.6±13.9 wk. Tai Chi reduced SBP (d+=−0.52; −7.2mmHg; I2=72.1%, 95%CIs: 55.2, 82.6/DBP d+=−0.20; −3.7 mmHg; I2=60.3%, 95%CIs: 33.5, 57.3) compared to control (p<0.001). Despite the high levels of heterogeneity in the BP response, we were unable to identify any significant moderators due to: 1) the small number of studies (k=18); and 2) lack of disclosure of features of the Tai Chi intervention. CONCLUSION: Tai Chi performed 3 sessions/wk for ~60 min/session lowered BP on average 4-7 mmHg among older adults with prehypertension (systolic BP [SBP] ≥ 120 and < 140 mmHg). The magnitude of these reductions equals or exceeds those reported from aerobic and resistance exercise training. Additional high-quality randomized controlled trials are warranted to confirm the efficacy of Tai Chi as antihypertensive therapy.

A-42 Exercise is Medicine®/Poster - Exercise and the Cardiovascular, Respiratory and Bone Systems

Wednesday, June 1, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

Board #126

June 1, 11:00 AM - 12:30 PM

Long-term Follow-up Of Clinical Effectiveness Of A Cardiac Rehabilitation Program For Women.

Mireille Landry, Faith Delos-Reyes, Paula Harvey, Jennifer AD Price. Women’s College Hospital, Toronto, ON, Canada.

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(no relationships reported)

PURPOSE: Cardiovascular disease (CVD) is the number one killer among Canadian women. Women living with CVD who participate in cardiac rehabilitation (CR) are able to improve their functional capacity, CVD risk profile, and health-related quality of life. Although CR has been shown to be an important intervention, studies continue to report low enrollment and participation rates for women compared to men. In addition to this under-representation in traditional CR programs, follow-up outcomes post CR is limited in this population. The purpose of this study was to describe long-term outcomes from a women-only CR program.

METHODS: A retrospective single-centre cohort of participants who entered a 24-week CR program between Jan 1, 2007 and Oct 1, 2013 was evaluated for exercise capacity, cardiac risk factors and quality of life at entry, discharge, and 6- and 12-month follow-up from discharge.

RESULTS: Of 698 participants assessed for intake between Jan 1, 2007 and Oct 1, 2013, 589 patients entered CR (mean age = 62.5 ± 11.6 yrs) and 392 entered Primary Prevention (mean age = 57 ± 10.7 yrs). Baseline characteristics will be described. Among 422 patients completing the CR program (dropout rate of 14.7%), significant improvements were seen at discharge compared to intake with exercise capacity (p < 0.001), Duke Activity Status Index (p = 0.005), Beck Depression Inventory (p < 0.001), and SF-36 physical summary scores (PCS) (p < 0.001). Sixty percent of women who completed the program returned for a 6-month follow-up (n=252), and 73% of those women returned for a 12 month follow-up (n=183). Improvements measured at discharge in aerobic capacity, Duke Activity Status Index, Beck Depression Inventory, SF-36 PCS were maintained at 6- and 12-month follow-up time points. Serum low density lipoprotein was not significantly different at discharge but was significantly reduced at follow-up compared to intake (p<0.003) and maintained at 12 months. CONCLUSIONS: The 24-week comprehensive women’s only program was successful at reducing important cardiac risk factors, such as aerobic capacity, physical health, mood and quality of life, long term. Whether or not the improvements are sustained in those who do not attend for follow-up is currently unknown and worthy of further investigation.
Patients with depression following an acute cardiac event and/or coronary revascularization intervention are less likely to take prescribed medications and adhere to recommended lifestyle modification intended to reduce the risk of recurrent cardiac events. Accordingly, clinical depression is widely recognized as a prognostic indicator.

**PURPOSE:** We evaluated the impact of an exercise-based Phase II cardiac rehabilitation (CR) program on Patient Health Questionnaire (PHQ-9) depression scores, with specific reference to psychosocial, demographic and clinical outcome modulators.

**METHODS:** 154 cardiac patients (28 women, 126 men; mean ± SD age and body mass index were 64.4 ± 11.4 years and 29.0 kg/m², respectively) completed the PHQ-9 before and after participating in a phase II CR program. PHQ-9 scores of 1-4, 5-9, and ≥10 were interpreted as indicating minimal, mild, and moderate-to-severe degrees of clinical depression, respectively. A decrease in score signifies improvement. Patients with a baseline score of ‘0’ (n=23), indicating no evidence of even minimal clinical depression, were eliminated from subsequent analyses. The remaining 131 served as our study population.

**RESULTS:** Participants completed an average of 2.1 ± 2.6 hours of exercise training, demonstrating a mean improvement of 1.5 ± 1.4 metabolic equivalents (METs) in training loads at a given heart rate and/or perceived exertion. PHQ-9 scores before and after the intervention averaged 4.0 and 2.6, respectively. At baseline and follow-up, minimal, mild, and moderate-to-severe indices of clinical depression were noted in 56% vs 73%, 35% vs 22%, and 8% vs 4% of our subjects, respectively. Changes in PHQ-9 scores were unrelated to gender, left ventricular function, vocational status, spousal support, improvement in training METs, or the total number of sessions attended. In contrast, the higher the pre PHQ-9 score, the greater the likelihood of improvement in the post PHQ-9 score (r = -0.55; p <0.0001). The improved group (n=78) were also more likely to be younger, a never smoker, and not post myocardial infarction (p=0.05 for all).

**CONCLUSIONS:** Our findings indicate that exercise-based CR is associated with improved PHQ-9 scores and that patient’s with higher baseline levels of clinical depression are more likely to demonstrate the greatest benefit.
CONCLUSION: In this sample of overweight and obese young adults, there is evidence of elevated resting BP, and both excess body weight and low MVPA were associated with higher BP. These relationships suggest that low activity and excess weight may be important targets for young adults with elevated BP to reduce CVD risk. Supported by the NIH (U01 HL096770)

Pregnancy Blood Pressure And Exercise - Results From A Randomized Controlled Trial

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Purpose: To evaluate the effect of regular exercise on maternal arterial blood pressure (BP) at rest and during uphill walking, in healthy former inactive pregnant women.

Methods: A single blind, single center, randomized controlled trial including 61 out of 105 healthy, inactive nulliparous pregnant women, initially enrolled in a controlled trial studying the effect of 12 weeks of aerobic exercise on maternal weight gain. The intervention included participation in two 60 minutes aerobic dance classes per week for 12 weeks, in addition to 30 minutes of daily self-imposed physical activity. Primary outcome was the mean adjusted difference in change in resting systolic and diastolic BP from baseline to after intervention. Secondary outcome was the mean adjusted difference in change in systolic BP during uphill treadmill walking at critical power. Measurements were performed prior to the intervention (gestation week 17.6±4.2) and after the intervention (gestation week 36.5±0.9).

Results: At baseline, resting systolic and diastolic BP was 115/66±12/7 and 115/67±10/9 mmHg in the exercise (n=25) and control group (n=26), respectively. After the intervention, resting systolic BP was 112/8±14 mmHg in the exercise group and 119±14 mmHg in the control group, giving a between group difference of 7.5 mmHg (95% CI 1.5 to 12.6, p=0.013). Diastolic BP was 71±9 and 76±8 mmHg, with a between group difference of 3.9 mmHg (95% CI -0.07 to 7.8, p=0.054). During uphill treadmill walking at critical power, the between group difference in systolic and diastolic BP was 5.9 mmHg (95% CI -4.4 to 16.1, p=0.254) and 5.5 mmHg (95% CI -0.2 to 11.1, p=0.059), respectively.

Conclusion: Aerobic exercise reduced resting systolic BP in healthy former inactive pregnant women.

Exercise training markedly improves walking ability in patients with peripheral artery disease and intermittent claudication. However, the effectiveness of these programs is poorly described when co-administered along with conventional pharmacological therapy.

Purpose: To compare responses in selected hemodynamic outcomes among patient suffering from peripheral artery diseases of lower limbs assigned to medication therapy (MT), and medication therapy and prescribed exercise (MTPE).

Methods: Sixty-four male patients participated in this study, with participants separated into MT group (n=33) and MTPE group (n=31). Exercise program included 3-5 sessions per week lasting for 30 to 50 min, during 4-month period. The claudication distance and peak systolic velocity (PSV) were measured for both groups at beginning and at the end of the study. Results: At follow up, both PSV and claudication distance improved in MT and MTPE as compared to the baseline (p<0.05). Conclusions: MTPE group showed significantly higher exercise capacity compared to MT group (97.5 vs 61.72%; p<0.01). Conclusion: Exercise program improved clinician-reported outcomes in men with peripheral artery disease when co-administered with pharmacological therapy.

Subjective enjoyment is an important component of exercise adherence; however, limited research exists on subjective measures of effort, dyspnea, and enjoyment for high intensity interval exercise (HIIE) in adults with exercise induced asthma (EIA). EIA is associated with an increase in dyspnea during exercise which may lead to greater perceptions of in-task effort and lesser physical activity enjoyment. Purpose: To examine in-task perceptions of effort, dyspnea, and affective feelings during HIIE, moderate intensity interval exercise (MIIIE) and moderate intensity continuous exercise (MICE) in adults with EIA. Methods: Nine adults with EIA (age: 21.1±3.2 years) completed the 3 exercise sessions in random order at least 24 hours apart. Protocols were as follows: HIIE (90% peak power output (PPO) for 1 minute, 10% PPO for 1 minute, repeated 10 times), MIIIE (65% PPO for 1 minute, 10% PPO for 1 minute, repeated 10 times) and MICE (65% PPO for 20 minutes). Ratings of perceived exertion (RPE), ratings of perceived dyspnea (RDP), and affective feelings (1-item Feelings Scale, scale from -5 to 5, higher numbers indicate more positive experience) were monitored each minute during exercise. Participants also completed the Physical Activity Enjoyment Scale (scale from 1-126, higher numbers indicate more enjoyment) following each exercise protocol. Results: RPE was significantly greater during MIIIE (12.9±1.6) as compared to MIIIE (9.3±1.6, p=0.001) and HIIE (11.2±1.7, p=0.011). RDP was also significantly greater during MIIIE (3.9±1.6) as compared to the MIIIE (1.6±0.9, p=0.006) and HIIE (2.6±1.1, p=0.055). Affect was significantly greater in the last interval of MIIIE (24.3±1.4) compared to the end of MICE (-0.2±3.9, p=0.46). A trend towards significance was observed for the last interval between MIIIE and HIIE (0.4±3.1, p=0.056). No differences in affect were observed between MICE and HIIE. Similar trends were noted when comparing average affect between protocols. Physical activity enjoyment score did not differ between the MIIIE (102.4±4.6, NS), HIIE (103.8±6.0, NS), compared to MICE (96.4±6.3). Conclusion: Interval exercise is associated with lower perceived effort and dyspnea as well as greater affect when compared to MICE. Therefore interval exercise may be a more palatable prescription for those with EIA.
Does the Nordic Walking Improve Bone Mineral Density in Japanese Community-dwelling Adults?  
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PURPOSE: Recently, Nordic walking (NW) has been widely used as a walking exercise for rehabilitation and health promotion in Japan. In a previous study, Jigami reported that NW increased muscle activity of erector spinae, rectus abdominis and other Local muscles. Such trunk muscle activity may cause increased vertical compressive forces of the spine, which may increase the mechanical stress on the lumbar. Consequently, it is expected that the bone mineral density (BMD) of the lumbar spine would increase. Therefore, the purpose of this study was to clarify the long-term effects of BMD performed by NW in community-dwelling adult women.

METHODS: In this study, 23 community-dwelling adult women (69±1.8 y/o) were recruited. They performed NW for 8 weeks. Physical function, BMD and a questionnaire about daily living activity were measured at pre-, post- and at 6 months after the intervention. Physical function included height, weight, muscle strength (knee and trunk), 30-second chair stand test (CS-30) and the Timed Up and Go Test. BMD was measured at lumbar supine 2-4 by the dual-energy X-ray absorptionmetry (DXA) method. In addition, the participants were required to fill in an exercise diary, and we confirmed the times and frequency of the self-exercise. Finally, these items were statistically analyzed.

RESULTS: The muscle strength of trunk flexion (pre-; 8.7, post-; 10.8 N) and CS-30 were improved at post-intervention (pre-; 21.7, post-; 23.9 times). BMD was not significantly different at post-intervention; however, it showed significant improvement at 6 months after the intervention (pre-; 0.997, post-; 1.003 and 6M; 1.033 g/cm²) (p<0.05).

CONCLUSIONS: Bone turnover markers, ultrasound evaluation and DXA were used to evaluate the BMD. NW needed a certain period after the intervention because the effect of intervention did not reflect in the result. In this study, although there was not a significant improvement between pre- and post-intervention, BMD was significantly improved after 6 months. Since there was no control group in this study, improvement of the BMD cannot be attributed to only NW. However, the muscle strength activity of daily living and self-efficacy of outdoor walking was changed in the 8-week intervention. It is suggested that these changes caused the improvement of BMD.
was computed as peak exercise heart rate minus heart rate at 1 minute (HRR-1) and 2 minutes (HRR-2) during active recovery following the exercise test. LPA [minutes of activity between 1.5 and 3 metabolic equivalents (METs)] and MVPA [minutes of activity ≥3 METs and ≥10 minutes in duration] were assessed objectively using the SenseWear armband that was worn for 7 days. LPA and MVPA data were considered valid if the armband was worn for at least 4 days for ≥10 hours per day.

RESULTS: Bivariate analyses showed that both HRR-1 and HRR-2 were significantly associated with BMI (β =-0.15, p=0.003; r=-.23, p<0.001), fitness (r=0.34, p=0.001; r=0.47, p<0.001), and MVPA (r=0.22, p=0.001; r=0.26, p<0.001), but not LPA (r=0.04, p=0.41; r=0.03, p=0.52). Variables shown to be associated with HRR-1 were examined in multivariate regression, and fitness (β=0.292, p<0.001) and MVPA (β=0.105, p=0.035) were significantly associated but BMI was not (β=-0.033, p=0.51). A similar pattern was observed for HRR-2 with both fitness (β=0.407, p<0.001) and MVPA (β=0.118, p=0.011) significantly associated with HRR, but not BMI (β=-0.069, p=0.141)

CONCLUSIONS: In this population of young adults with overweight or obesity, LPA was not significantly associated with HRR. However, MVPA, but not BMI, was associated with HRR independent of fitness. These results highlight the importance of MVPA, rather than BMI, on autonomic function in young adults who are overweight or obese. Moreover, these findings may inform intervention approaches to maximize health benefits in this population.

Supported by the NIH (U01 HL096770)

304  Board #141  June 1, 9:30 AM - 11:00 AM  Cardiorespiratory Fitness within an Obesity Risk Classification Model Identifies Men at Increased Risk of Mortality

Taryn Davidson1, Alex Ricketts1, Xuemei Sui2, Carl J. Lavie1, Steven N. Blair, FACSM1, 2, and Robert Ross, FACSM1. 1Queen’s University, Kingston, ON, Canada. 2University of South Carolina, Columbia, SC. 1The University of Queensland School of Medicine, New Orleans, LA. (Sponsor: Dr. Robert Ross, FACSM)

(Guidelines for identification of obesity-related risk stratify disease risk using specific combinations of body mass index (BMI) and waist circumference (WC). Whether the addition of cardiorespiratory fitness (CRF), an independent predictor of disease risk, provides better risk prediction of all-cause mortality within current BMI and WC categories is unknown.

PURPOSE: To determine whether the addition of CRF improves prediction of all-cause mortality risk classified by established categorization of BMI and WC.

METHODS: Prospective observational data from the Aerobics Center Longitudinal Study (ACLS). A total of 31,267 men (mean (SD) age 43.9 (9.4) years completed a baseline medical examination during 1974-2002. Participants were grouped according to the following BMI- and WC-specific threshold combinations: Normal BMI of 18.5-24.9 kg/m², WC threshold of 90 cm; overweight BMI of 25.0-29.9 kg/m², WC threshold of 100 cm, and obese BMI of 30.0-34.9 kg/m², WC threshold of 110 cm. Participants were classified by CRF as unfit or fit. Unfit was defined as the lowest fifth of the age-specific distribution of maximal exercise test time on treadmill among the entire ACLS population. The main outcome measure was all-cause mortality.

RESULTS: 1,399 deaths occurred over an average length of follow-up of 14.1 ± 7.4 years, for a total of 439,991 person-years of observation. Males who were unfit and normal BMI with WC <90 cm and ≥90 cm had 95% (1.95, 1.34-2.83) (Hazard ratio, 95% confidence interval) and 163% (2.63, 1.58-4.46) higher mortality risk than males who were fit, respectively (p<0.05). Males who were unfit and overweight had 41% (1.41, 1.04-1.90) higher mortality risk with a WC <100 cm (p<0.05), but were at no greater risk (1.30, 0.92-1.84) if their WC was ≥100 cm (p=0.14). Males who were unfit and obese were not at increased mortality risk (1.37, 0.90-2.09) with a WC <110 cm (p=0.14), but were at 111% (2.11, 1.31-3.42) increased risk with a WC ≥110 cm (p<0.05).

CONCLUSIONS: For most of the BMI and WC categories, inclusion of CRF allowed for improved identification of males at increased mortality risk.

305  Board #142  June 1, 9:30 AM - 11:00 AM  Physical Activity and Sedentary Time in Primary Care Patients with Recent Intentional Weight Loss

Margaret B. Conroy, FACSMM, Bethany Barone Gibbs1, Dana Tudorascu1, Kathleen M. McGtigue1, Cindy L. Bryce1, Kimberly Huber1, Diane Comer1, Rachel Hess1, Gary S. Fischer1. 1University of Pittsburgh, Pittsburgh, PA. 2University of Utah, Salt Lake City, UT. Email: conroymm@upmc.edu

Purpose: Regular physical activity (PA) is crucial for weight maintenance; sedentary time is receiving increasing attention as an important predictor of weight. In this study, we describe PA and sedentary time in primary care patients with recent voluntary weight loss and how each relates to weight loss. Methods: Maintaining Activity and Nutrition through Technology-Assisted Innovation in Primary Care (MAINTAIN-pc) is a weight management trial using an electronic health record (EHR) platform. Individuals aged 18-75 with voluntary 5% weight loss in past 2 years (prior BMI ≥ 25 kg/m²) and no recent bariatric procedures were randomized to coaching + tracking tools (TT) or TT alone. We assessed percent weight loss prior to enrollment through EHR-verified measurements and PA and sedentary time as follows: 1) BRFSS PA estimate of minutes of moderate, vigorous, and moderate + vigorous PA (MVPA); 2) Omron pedometer with 2 week data collection protocol; 3) Sedentary Behavior Questionnaire (SBQ). We used Pearson/Spearman correlations to determine associations between PA and sedentary time and % weight loss at enrollment. Results: We enrolled 194 participants in MAINTAIN-pc. At baseline, participants were 53.4 (SD 12.2) years old, 74% female, and 88% White. Average baseline BMI was 30.4 (5.9) kg/m². Participants had lost an average of 11.3% (SD 6.6) of body weight prior to enrollment. 96% reported using PA MVPA (96% reported using PA MVPA). Median (IQR) PA was 160.0 (95.9, 300) minutes/week, vigorous PA was 60.0 (IQR 0, 145) minutes/week, and average MVPA was 240.0 (IQR 135, 420) minutes/week. Median daily step count was 5874.0 (IQR 3677, 7759). Average daily sedentary time was 8.3 (SD 3.5) hours. There were no associations between % weight loss and self-reported moderate PA (r=0.05; p=0.52), vigorous PA (r=0.30; p=0.23), MVPA (r=0.10; p=0.14), or sedentary time (r=0.09; p=0.16). However, a higher objectively-measured step count was associated with a greater % weight loss at enrollment (r=0.25; p=0.0012).

Conclusions: Objective-measured pedometer steps but not self-reported MVPA or sedentary time were associated with recent weight loss in primary care patients enrolled in a weight loss maintenance trial. The findings suggest that objective monitoring of PA might be helpful in this population to achieve and maintain weight loss.

306  Board #143  June 1, 9:30 AM - 11:00 AM  Fitness - Interdisciplinary Support - Teaching (“Fit Start”) - Piloting A Family-based Group Model For The Multidisciplinary Treatment Of Pediatric Obesity

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Purpose: Challenged by reported low physical activity levels and evidence of low patient retention in our standard pediatric weight management treatment program,
provides in the Optimal Weight for Life (OWL) clinic and the New Balance Foundation Obesity Prevention Center at Boston Children’s Hospital developed an alternative service delivery model. FIT Start is an intensive family based group program offering multidisciplinary clinical care, structured exercise, a supportive peer environment and outcomes assessment.

Methods: 12 week program ran from September - December 2014. 12 overweight or obese adolescent girls aged 11-15 y/o and their parents/guardians were recruited from the OWL clinic. 7 group clinical education sessions were held at the hospital covering nutrition, exercise and behavior change. Group exercise classes were held 2/week at the YMCA. Individual medical visits were conducted pre/post program.

Results: 92% of participants completed the program. Attendance: clinic sessions: 86%; Exercise classes: 81%. Significant improvement was found in aerobic fitness (change from baseline +2.3 (+2.1, +0.01) as measured by the PACER test, and the Healthy Fitness Zone (change from baseline +7.2 (+6.5, +0.01), which is an evidence based level of fitness associated with reduced risk of disease/risk factors standardized for age and gender and calculated from PACER test score. Improvement in BMI z score was significant (change from baseline -0.08 (0.10, +0.03)

Conclusions: FIT Start provided a successful alternative model for pediatric weight management treatment. It has been widely reported that improvements in fitness are critical for health, particularly for overweight/obese youth, regardless of weight status. Importantly, this program demonstrated significant improvements in fitness, progress towards the Healthy Fitness Zone AND significant change in BMI z score. On post program survey 100% would recommend the program to a friend and a majority cited the peer support aspect of the group format as most valuable. Further research is needed to investigate the correlation between attendance and outcomes, the impact of this program model on clinical markers associated with obesity and the potentially positive financial implications of this model in the healthcare setting.

307 Board #144 June 1, 9:30 AM - 11:00 AM Effects of Exercise Amount and Intensity on Total and Abdominal Adipose Tissue

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No relationships reported

Background: Although exercise is an established strategy for reducing obesity, the separate effects of exercise differing in amount and intensity on total and abdominal obesity continues to be the source of uncertainty and debate.

Objective: The purpose of this study was to determine the separate effects of exercise amount (kcal/session) and intensity (% of VO2peak) on total and abdominal adipose tissue (AT) in obese adults.

Methods: Participants were 108 (60% female) sedentary, middle-aged (mean (SD) 52.7 (7.6) years, abdominally obese adults who completed a 24 week intervention. Participants were randomly assigned to: Control (n=21), low amount, low intensity exercise (LALI) (180 and 300 kcal/session for women and men, respectively, at 50% of VO2peak, N=25), high amount, low intensity exercise (HALI) (360 and 600 kcal/session for women and men respectively at 50% of VO2peak, N=32); high amount, high intensity exercise (HAIH) (360 and 600 kcal/session for women and men, at 75% of VO2peak, N=30). Participants were asked to perform supervised exercise 5 times/week. MRI was used to measure adipose tissue and whole body adipose tissue. Unstructured physical activity performed outside of the prescribed exercise was monitored using accelerometers.

Results: Exercise duration in minutes was 32 (4.8) for LALI, 58 (6.6) for HALI, and 40 (6.7) for HAIH. There was no change in unstructured physical activity or caloric intake between exercise groups. Reduction in total AT, subcutaneous AT, total abdominal AT, abdominal SAT, lower body AT, weight and waist circumference were greater in all exercise groups compared to control at 24 weeks (p<0.05). Reduction in VAT was greater in LALI (+0.5 kg; SE 0.1; p=0.01), HALI (+0.3 kg; SE 0.1; p=0.01), and in HAIH (+0.5 kg; SE 0.1; p=0.01). Subcutaneous skeletal muscle did not change at 24 weeks within any exercise group compared to control (p=0.32).

Conclusion: Substantial reduction in total and abdominal AT with a preservation of skeletal muscle mass was observed independent of exercise amount and intensity.

308 Board #145 June 1, 9:30 AM - 11:00 AM Building An Economic Case For Physical Activity As An Intervention For Diabetes In Developing Countries

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No relationships reported

In Sub-Saharan Africa, the rapid increase in the prevalence of diabetes has resulted in significant public health and socioeconomic liability in the face of scarce resources. Faced with a growing pandemic of non-communicable diseases, developing countries need to be proactive in investigating alternative cost-effective interventions, with the primary aim being to minimize illness and maximize health benefits relative to the limited available resources.

PURPOSE: The aim of this research was to investigate if there was an economic case for physical activity as a primary and secondary preventative measure for type 2 diabetes in a developing country.

METHODS: The study was quantitative in nature and used both primary and secondary data to conduct the cost analysis of a community based physical activity intervention. A questionnaire was administered to 40 patients at a diabetic clinic in a peri-urban community health care centre. Secondary data, consisting of clinic records and an extensive literature review, was used to source the remaining inputs needed for the cost analysis. In order to quantify benefit in the cost-benefit analysis, productivity loss was calculated over a period of 20 years and compared to productivity loss if no physical activity program was implemented.

RESULTS: Results revealed that, for the chosen clinic and study sample, the implementation costs of a physical activity intervention for one year exceeded the costs of continuing the current pharmaceutical program ($74 221 vs. $63 992). Physical activity resulted in decreased short term and long-term productivity losses, with significant economic implications at a household level over a 20 year period.

CONCLUSION: Evidence reviewed suggests that physical activity could be used in primary prevention as a viable substitute to pharmaceutical therapy. For secondary disease prevention, however, physical activity was complementary in the production of health benefits, limiting disease progression and morbidity caused by illness. Implementation costs of a physical activity intervention exceed costs of continuing current pharmaceutical interventions, however, the short term and long term micro and macroeconomic gains build a strong case for physical activity as an intervention for type 2 diabetes in developing countries.

309 Board #146 June 1, 9:30 AM - 11:00 AM Comparison Of The Effect Of Aerobic And Resistant Exercise On Blood Glucose In Pre-diabetes

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No relationships reported

PURPOSE: The intervention effect of aerobic exercise in pre-diabetes (IGR) is widely accepted, but the effect of resistant exercise is still inconsistent. We compared the effect of aerobic and resistant exercise on blood glucose in order to control and reverse IGR better for 2-DM prevention. METHODS: According to Randomized Controlled Trial (RCT), we divided the IGR subjects into 3 groups randomly, aerobic, resistant and control groups. The change in blood glucose after 12-week intervention was compared among the three groups. RESULTS: (1) The following table shows fasting plasma glucose (FGP), plasma glucose 2-hour after oral glucose test (OGTT 2hPG) and glycosylated serum protein (GSP) before/after intervention and their variance ratio (*:*, decline; *P<0.05, **P<0.01 compare with the value before intervention in the same group. **P<0.05, ***P<0.01 compare with control group).
(2) 69.2% of the subjects in aerobic group and 43.5% in resistant group achieved normal FPG level after the intervention, while in control group was only 23.8%. (3) There were 65.2% IGR subjects whose GSP in resistant group with a large standard deviation (20.77%), which has significant difference compare with control group (23.8%).

CONCLUSION: (1) Both resistant and aerobic exercise intervention can lower blood glucose significantly in IGR. (2) There is no significant influence on GSP by both resistant and aerobic exercise, but individual difference is large in resistant group and more IGR people in resistant group decrease on GSP.

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310 Board #147 June 1, 9:30 AM - 11:00 AM Association Between Exercise, Cardiorespiratory Fitness and Change in Insulin Sensitivity
Niclas Bembenek, William Bostad, Paula J. Stotz, John Clarke, Robert Ross, FACSM. Queen’s University, Kingston, ON, Canada. (Sponsor: Dr. Robert Ross, FACSM)

Title: Association between exercise, cardiorespiratory fitness and change in insulin sensitivity

Background: Cardiorespiratory fitness (CRF) is an established predictor of insulin sensitivity. Whether this association persists following control for exercise is unclear.

Purpose: The primary objective of this study was to investigate the associations between changes in exercise, CRF and insulin sensitivity.

Methods: Participants were 140 middle aged [mean (standard deviation), 52.6 (7.7) yrs], abdominally obese (WC: 110.2 (11.5) cm), inactive adults that participated in a 24-week exercise trial. Exercise was performed 5 times per week for the duration of the trial. Exercise-induced energy expenditure (exercise EE) was determined using an individually adjusted heart rate to energy expenditure relationship for each exercise session. CRF was measured using a maximal treadmill test. Waist circumference (WC) was measured at the level of the iliac crest. Daily physical activity performed outside of the exercise sessions was measured by accelerometry. Caloric intake and diet composition was monitored using daily diet records. A 75-gram, 2-hour oral glucose tolerance test was used to determine insulin area under the curve (IAUC).

Results: Change in IAUC was associated (p = 0.05). After further adjustment for change in WC, neither exercise EE (r = -0.16, p = 0.07) nor change in CRF (r = 0.03, p = 0.10) were associated with change in IAUC. Change in WC was associated with IAUC (r = 0.35, p = 0.001) independent of exercise EE and CRF.

Conclusions: Exercise was associated with improvement in insulin sensitivity independent of change in CRF, whereas the opposite was not true.

311 Board #148 June 1, 9:30 AM - 11:00 AM High-Intensity Low-volume Training Improves Glycemic Control and Functional Fitness in Type 2 Diabetics
Chelsie R. Slagowski1, Sarah E. Dixon1, Rebecca C. Moynes1, Boyi Dai1, James S. Skinner, FACSM2, Derek T. Smith1.
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Title: High-intensity low-volume training improves glycemic control and functional fitness in type 2 diabetes

Background: Resistance Training (RT) improves muscular strength/endurance, body composition, functional fitness and glycemic control in diabetic populations. Lack of time remains a leading perceived barrier to regular exercise. BioDensity™ is a time-sparing, low-volume, high-intensity RT approach that consists of four exercises performed for 5 seconds each at a voluntary-maximal intensity once a week and may overcome this barrier. PURPOSE: To determine the efficacy of 24 weeks of bioDensity™ RT on indicators of glycemic control (fasting plasma glucose (FPG), insulin, HbA1C, insulin resistance) and functional fitness parameters in prediabetic/T2D participants. METHODS: Nineteen participants (N=7/12 males/females; 10/9 T2D/prediabetes; 59.1±7.9 years; BMI = 31.1±7.7 kg/m²; FPG=121±30 mg/dL; 53% medicated) completed 24 weekly bioDensity training sessions. Baseline and 24-week testing included: FPG, insulin, HbA1C, body composition (DXA), Y-Balance test, functional fitness testing, and muscular force production tests. Intention-to-treat analysis was applied with paired t-tests and RMANOVA. RESULTS: After 24 weeks, force production increased (P<0.05 all): chest press 30.0±36.7%; leg press 87.0±78.3%; and vertical lift 68.5±69.3% without change in lean or fat body mass. Core pull force production did not change. FPG decreased 11 mg/dL (P=0.03) and HbA1C improved (7.0±1.0 vs. 6.6±0.8; P=0.01) in T2D. Right and left composite balance scores improved 7.1 and 8.8% (P<0.05), respectively; and functional fitness improved (chair stand, get-up-and-go, and muscular endurance; P<0.05) in both T2D and prediabetes participants. CONCLUSION: This is the first study to demonstrate that the low-volume high-intensity bioDensity resistance training approach improves measures of glycemic control and functional fitness in a T2D. The health-promoting changes of this intervention were more pronounced in T2D compared to prediabetics, but metabolically beneficial and clinically significant adaptations occurred in both impaired glucose tolerance groups with stable/unchanged pharmacotherapy. This study is limited by the absence of a randomized control trial design, but findings are promising in the presence of conservative analysis.

312 Board #149 June 1, 9:30 AM - 11:00 AM Breaking Prolonged Sitting With Different Physical Activity Protocols And Metabolic Risk: A Randomized Cross-over Trial.
Fabiana B. Benatti1, Sidsel A. Larsen1, Signe T. Nielsen1, Nina Harder-Lauridsen2, Mark Lyngbæk2, Dorte Eriksson1, Rikke Krogh-Madsen2, Bente K. Pedersen2, Mathias Ried-Larsen2.
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No relationships reported

Objective
To investigate the effects of breaking prolonged sitting with different physical activity protocols on metabolic risk in sedentary subjects.

Methods
Seven sedentary adult healthy males (BMI: 24.9±5.9 kg/m2) underwent four 24-h interventions in a randomized cross-over design: SIT-subjects sat for 9h; STAND-subjects stood for 15 min every 30 min during 9h of sitting; MVPA-subjects performed a 30-min moderate-intensity exercise bout (~50% VO2max), after which they sat for the remaining 8h; MVPA+STAND-subjects performed a 30-min moderate-intensity exercise bout and subsequently stood for 15 min every 30 min during the remaining 8h of sitting. On each trial, subjects were assessed for 24-h energy expenditure (Arthritis monitor), ate three standardized meals (55% CHO, 30% fat, 15% protein), and stayed overnight. Blood samples were collected 10 min before and, 30, 60, 120 and 180 min after meals for the postprandial response assessment of plasma glucose, insulin, and lipids (defined as the 9-h cumulative area under the curve).

Results
24-h energy expenditure was lower during SIT (397±435 kcal) and STAND (1945±425 kcal) when compared with MVPA (2692±189 kcal) and MVPA+STAND (2565±589 kcal) (p<0.05, between-conditions). A tendency towards a higher glucose response was observed during STAND (3075±312 mmol/L) when compared with SIT (2069±293 mmol/L; p=0.07) and MVPA+STAND (2908±180 mmol/L; p=0.07), but not with MVPA (2970±181 mmol/L; p=0.2). A higher insulin response was observed during SIT (2069±19164 pmol/L) when compared with MVPA+STAND (1635±7455 pmol/L; p=0.05), with STAND (1832±8056 pmol/L; p=0.13) and MVPA (18189±97431 pmol/L; p=0.012), although the latter two comparisons did not reach significance. A lower LDL-cholesterol response was observed during MVPA (1395±573 mmol/L) when compared with SIT (1519±661 mmol/L; p=0.05).

Conclusion
Preliminary results suggest that breaking sitting with intermittent standing bouts led to lower glucose post-prandial responses regardless of MVPA. On the other hand, a moderate exercise bout led to lower LDL-post-prandial responses, regardless of breaking sitting. Finally, both intermittent standing and MVPA led to lower post-prandial insulin responses, although only the combination of the two strategies led to significantly improved response.
The purpose of this study was to examine the population's perceptions of physical activity (PA) and cardiovascular disease (CVD), as well as the relationship between these perceptions and actual PA levels. The cohort consisted of all adult patients (>18 yr.) with a minimum of 3 exercise vital sign (EVS) measures taken over a year from January 1, 2009 to December 31, 2011, that did not have a prior coronary event before or on the date of the last EVS measurement taken.

RESULTS: CA men were found to be less likely to experience an ACE compared to CI men (HR (CI) = 0.72 (0.63, 0.88), while IA men were not found to differ significantly (HR = 0.91 (0.83, 1.01)). For women, being CA was found to result in nearly a 3 fold decrease in the hazard of an ACE (HR = 0.33 (0.25, 0.45)) compared to CI women. Women who IA were also found to be less likely to experience an ACE (HR = 0.79 (0.72, 0.87)) compared to CI.

CONCLUSIONS: Based on EVS data, we conclude that self-reported PA is strongly correlated with the likelihood of suffering an ACE. While we know regular PA has a potent protective effect on cardiovascular disease, this study suggests a low EVS correlates with the likelihood of suffering an ACE (defined as active 21 or revascularization procedure).

METHODS: Data were abstracted from electronic medical records of KPSC members (N=1,423,525) in a cohort study to investigate use of EVS in predicting an acute coronary event (ACE) than those who report being sedentary. While we know regular PA has a potent protective effect on cardiovascular disease, this study suggests a low EVS may predict the likelihood of suffering an ACE. While we know regular PA has a potent protective effect on cardiovascular disease, this study suggests a low EVS may predict the likelihood of suffering an ACE.

Aim 4: Identify factors that explain accurate perceptions of the EIM.

Purpose: To evaluate the correlation between self-reported PA level (using EVS) and the likelihood of suffering an ACE (defined as active 21 or revascularization procedure).

Subjects: All new patients presenting to outpatient sports medicine clinic were asked questions about their current exercise habits. Subjects self-reported the number of days per week, and minutes per day of moderate to vigorous activity. Moderate activity was described as being active to the point where you are breathing hard, and vigorous activity was described as being active to the point where you are out of breath. Additionally, subjects self-reported their current activity participation in organized or unorganized activity.

Methods: 120 subjects consisting of 50 males and 70 females responded to the survey. The mean age of respondents was 31.3 ± 2.8 years. The mean age of exercise reported was 4 ± 1.6 days.

Results: The data gathered in this study demonstrates that children are not meeting the daily exercise recommendation. Rather, this population exercised on fewer days compared to the general population.

Conclusion: The goal of the survey was to quantify days, minutes, and exercise activity type of those presenting with an injury to a sports medicine clinic.
to benefit from the programme, with likely measurement effects partially explaining improvement in CON. High retention to CMB is of significance to future GP Referral scheme uptake and adherence: a systematic review.

*S Denotes statistically significant difference P<0.05


317 Board #154 June 1, 11:00 AM - 12:30 PM Exercise Is Medicine (EIM) For Community Health: Linking Clinics And Communities Through Cooperative Extension

Joel E. Williams1, Kathy FACSFM, Anne Lindsay2, Samantha Harden1, Melinda M. Manore, FACSFM, Linda Houtkooper, FACSFM, Nobuko Hongu5, Sarah F. Griffin4.

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* (No relationships reported)

**PURPOSE:** EIM has been an active ACSM initiative since 2007 with an initial focus on including physical activity as a vital sign in the electronic medical record. To do this effectively, EIM needs to determine how to link clinical and community health professionals for patient referral and follow-up using multiple models. METHODS: This presentation highlights the ways in which the nationwide Cooperative Extension System (CES) can be leveraged to bridge the gap between clinics and communities to advance the EIM initiative. History, capacity, and resources associated with the CES will be presented.

**RESULTS:** The CES is a nationwide educational network that brings research and knowledge of land-grant institutions to urban and rural communities in each U.S. state and territory by linking the resources and expertise of 105 land-grant colleges and universities to local communities through USDA’s National Institute for Food and Agriculture (NIFA). CES professionals offer a variety of face-to-face and electronically delivered education programs related to health promotion/disease prevention and also works to change community environments to make them healthier by working to link communities to local resources. The CES’s National Framework for Health and Wellness, released in March 2014, includes strategic priorities related to health promotion and chronic disease prevention and management. The Agriculture Act of 2014 (commonly known as the Farm Bill) included ‘physical activity’ as a component of the largest funded USDA program (Supplemental Nutrition Assistance Education Program), demonstrating that the CES, a previously agriculturally centered entity, has embraced physical activity promotion as part of its mission and values.

**CONCLUSION:** While leveraging CES’s trained health educators would improve the reach of EIM, we do not expect most CES professionals would become EIM credentialed professionals. Instead, these professionals could be trained and certified to deliver specific evidence-based or research tested intervention programs (e.g., Better Bones & Balance, Walk With Ease), which include a physical activity component, as a supplementary approach. Health educators may also serve as a liaisons between clinicians and EIM certified health professionals.

318 Board #155 June 1, 11:00 AM - 12:30 PM Adapting the Exercise is Medicine Model for Community-Based Primary Health Care Clinics

Jessica Montana1, Mark Stoutenberg2, Elizabeth Racine3, Corliss Allen1, Jennifer L. West1. 1Cabarrus Health Alliance, Kannapolis, NC. 2University of Miami Miller School of Medicine, Miami, FL. 3University of North Carolina at Charlotte, Charlotte, NC.

* (No relationships reported)

**PURPOSE:** The Cabarrus County, NC Exercise is Medicine (EIM) initiative aims to reduce disparities in physical activity levels and chronic disease. As part of a CDC-funded Racial and Ethnic Approaches to Community Heath grant, the EIM model of physical activity assessment, prescription and referral was adopted for primary care clinics primarily serving underserved African American and Hispanic patients.

**METHODS:** Existing EIM provider training tools were adapted to focus on walking and an inventory of existing free and low-cost community resources for walking was compiled. Tailored plans were drafted for each clinic’s staff to administer the 2-question physical activity vital sign (PAVS), to write physical activity prescriptions, to provide referrals to free or low-cost resources, and to track patient progress. Providers at each clinic site were trained to write walking prescriptions based on PAVS responses and to refer patients to the identified resources.

**RESULTS:** A free clinic, a federally-qualified health center with three locations, and the county health department participated in the EIM initiative. All sites currently administer the PAVS and four of the five sites were able to successfully integrate it into their electronic medical record (EMR) system. The PAVS responses over time was identified as the best way to track patient progress. Due to concerns about providers’ time, allied health professionals (nurses, social workers, medical assistants and nutritionists) were included in the trainings. A total of 10 providers and 18 clinic staff completed the EIM training. It is expected that over 5,000 adult patients from our target populations will be reached through these clinics over the next year, including pregnant and post-partum women. Clinic staff feedback included being satisfied with the focus on walking but needing continuing support and education on counselling patients and tailoring prescriptions for other forms of exercise.

**CONCLUSIONS:** Adaptations of the EIM model included being flexible about EMR integration, including clinic staff in provider trainings, and offering continuing education opportunities. These results provide direction for others implementing EIM in similar settings.

319 Board #156 June 1, 11:00 AM - 12:30 PM Effects Of Community-based Physical Activity Counselling Among At-risk Individuals

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* (No relationships reported)

**Purpose.** Ensuring that at-risk groups are sufficiently physically active is a major public health challenge. Physical activity counselling (PAC) has shown some promise. However many programmes require multiple PAC sessions that are resource intensive and costly. We report a study of PAC – in this case the UK-based programme ‘Let’s Get Moving’ – built around just one PAC session and delivered from general practitioner (GP) surgeries. **Methods.** Participants (n=1061, M±SD age = 41±12.8) were identified by their local GP surgeries as meeting one or more of the following: age 18-74, currently sedentary, BMI 28-35, and/or hypertensive, and/or first medication for hypertension in last 6 months, and/or first medication for weight management in last 6 months. Participants attended a PAC session with a local community exercise professional (CEP) who was based at the surgery. At this session participants were encouraged to increase their physical activity and to attend
community exercise sessions provided by local authorities. All participants received a phone call at 6-weeks and attended a follow-up PAC session with the CSEP at 12-weeks. Measures at 0 and 12 weeks were pre-post physical activity (MET-min/week) using the International Physical activity Questionnaire short-form (IPAQ) and an additional question regarding sport participation. Results: Paired sample t-tests indicated significant increases in MET-min/week in Walking (M±SD = 404.6±1622.0, p < 0.001), Moderate Activity (M±SD = 151.8±1362.5, p = 0.006), Vigorous Activity (M±SD = 193.8±1439.7, p = 0.001), Total Activity (M±SD = 659±69.62±742.2, p < 0.001), and Sport Participation (M±SD = 35.5±105.5, p < 0.001). Repeated measures ANOVA revealed a significant interaction suggesting that Vigorous Activity increased significantly more for females than males (F[1,533] = 3.981, p = .047). Reasons for this are unclear and warrant further investigation. Conclusions: Whilst the absence of controls and the self-report of physical activity are limitations, data suggest that brief PAC is an effective intervention when delivered to at-risk individuals, and might be especially effective in encouraging females to adopt more vigorous activity. We also speculate that PAC’s effectiveness is enhanced through being located at a GP surgery.

### 320 Board #157 June 1, 11:00 AM - 12:30 PM Outcomes of Exercise is Medicine in Medical Students rungchai C. chaunchaiyakul, mahidol university, Nakonpathom, Thailand. (Sponsor: Prof.Dr.Chia-Hua Kuo, FACSM) Email: gmrungchai@gmail.com

No relationships reported

R. Chaunchaiyakul 1, N. Wongya 1, S. Chaunchaiyakul 2, C. Nilsu-nga 1, P. Laichapit 1, P. Aviruthakarn 1, and M. Pintong 1

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1 The Sports Authority of Thailand.

The EIM (ACSM) initiative offers professional preparation necessary to safely and effectively prescribe exercise to a patient population, to develop skills needed to work within the health care system and to develop skills needed to support sustained behavior change. Purpose: To determine whether exercise is medicine (EIM) action will be potentially learned and accepted at grass-root medical personnel, we implemented EIM action as an additional part of pre-clinical medical curriculum. Materials and methods: Medical students, 3rd year (n = 180), participated in part of EIM activity including physical fitness testing, self-interpreter and brain-storming exercise prescriptions. Basic knowledge, understanding on benefits of health-related exercise and future application of EIM were assessed via questionnaires. Results: Despite the fact that 46.9% of them realized the benefits of regular exercise, only 38.10% of medical students, themselves, exercised regularly for more than 3 times/wk. Students realized terms of NCD, metabolic syndrome and non-pharmacological intervention at 26.3, 46.3 and 39.4% respectively. About one-third (29.4%) of students had ever visited EIM Thailand website and 47.5% among them gained benefits from it. About half (55%) of them accepted that EIM action supported in-class understanding and might be a tool to solve public health problems (51.3%). They supported EIM action (46.3%) and thought that public health personnel should learn EIM as part of their services (46.9%). Finally, 54.4% of them will pick up EIM concepts for their future practice. Post-EIM participation showed the significant improvement in basic knowledge on health-related exercise (6.62+0.003 in Pre and 6.95+0.001 in Post-test, mean ±SEM (p<0.05). Conclusion: Intervention of EIM action among pre-clinical medical students enhances positive learning outcomes and is accepted. Further research should be done continuously when these target groups study in the consecutive years. Supported by EIM Thailand.

### 321 Board #158 June 1, 11:00 AM - 12:30 PM Eim®-on Campus Solution: Student Learning, Health Promotion, And Research Rence M. Jeffreys-Heil, Shomari Kee, Cayla McCayov, Kevin Collins, Kristine Phillipine, Greg Jensen, Eric Shamus, Mitchell L. Cordova, FACSM, Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM) Email: Rjjeffreys@gfcu.edu

No relationships reported

Purpose: At Florida Gulf Coast University (FGCU) we have leveraged the Exercise is Medicine® - On Campus (EIM®-OC) solution to create cross campus partnerships among, Campus Recreation (CR), Student Health Services (SHS), Office of Service Learning and Civic Engagement (SL), and the Department of Rehabilitation Sciences (RS) to facilitate student learning, health promotion, and research. This abstract’s aim is to share the EIM®@FGCU framework & baseline data. Methods: Phase 1 of the study was designed to build the collaborative framework and create a paperless data collection method. Mobile tablets were installed in SHS exam rooms to collect baseline data while patients were awaiting providers. In additional, exercise is a vital sign at all SHS visits and a procedure/referral code for the EIM®@FGCU referral program (October 2015). Questionnaires are updated annually to capture additional data on the current programs being offered. During the summer of 2015, Exercise Science (ES) Students created a campus wide marketing campaign to promote physical activity includes: a social media arm (in partnership with CR), a monthly activity (ranging from Adaptive Recreation Day to the Great American Smoke Out), and promotion program that is delivered through campus housing. ES Students design and implement the monthly events as part of an ongoing SL project. Results: Between March and May 2015, 142 students on campus (6.6% response rate) completed their EIM®@FGCU survey when delivering health education sessions, and might be especially effective in encouraging females to adopt more vigorous activity. We also speculate that PAC’s effectiveness is enhanced through being located at a GP surgery.

### 322 Board #159 June 1, 11:00 AM - 12:30 PM Mining for Gold in Long Beach: Achieving Gold Level Recognition for Exercise is Medicine on Campus Joshua A. Cotter, KimberlyFdoran, James Buenaventura, Aylin Donlin. California State University, Long Beach, Long Beach, CA. Email: joshua.cotter@csulb.edu

No relationships reported

Exercise is Medicine on Campus (EIM-OC) is a program designed to engage universities in the promotion of physical activity as critical for overall wellness, improving and maintaining health, and for disease prevention. ACSM launched a recognition program in 2014 to recognize participation in the program which includes bronze, silver, and gold level recognition. Purpose: The objective of this presentation is to highlight the activities and collaborations across the California State University, Long Beach (CSULB) campus that have allowed for successful implementation of EIM-OC and the achievement of gold level recognition in 22 for accreditation. Conclusions: Through improvement of the campus community health, EIM-OC can improve ES student learning and faculty research agendas. This project is funded by an inter, professional-grant from the College of Health Professions and Social Work at Florida Gulf Coast University.

### 323 Board #160 June 1, 11:00 AM - 12:30 PM Physical Activity Training in Australian Medical Education Halle Beeler1, Abigail Strong2, Emmanuel Stamatakis3, Anita Hobson-Powell4, Mark Hargreaves, FACSM5, Mark Stoutenberg2, Wake Forest University, Winston Salem, NC. 1University of Miami, Coral Gables, FL. 2University of Sydney, Sydney, Australia. 3Exercise & Sports Science Australia, Brisbane, Australia. 4University of Melbourne, Melbourne, Australia. Email: beclha13@wfu.edu

No relationships reported

PURPOSE: Previous research has demonstrated that Australian physicians do not feel comfortable promoting physical activity (PA) to their patients during clinical encounters and that formal training in PA delivery is not part of their undergraduate education. The purpose of this study was to determine the quality and quantity of PA training in Australian medical schools to better guide programs on how they can modify their curricula in order to improve the physician-patient interaction regarding daily PA.

Abstracts were prepared by the authors and printed as submitted.
Exercise is Medicine on Campus (EIMOC) is an international initiative promoting physical activity (PA) participation on college campuses, targeting the decline in PA often seen with the transition to college. Pennsylvania State University has been hosting annual EIMOC Week events since 2012.

**PURPOSE:** To evaluate the reach and effectiveness of EIMOC outreach and engagement strategies on a large U.S. university campus and to provide guidance for successful campus participation and awareness in EIMOC activities.

**METHODS:** EIMOC week was implemented on a large university campus in Fall 2015. Activities included: student volunteers participating in the University Homecoming parade, a kick-off event with campus administrators, and four days of campus-wide outdoor exercise stations. Evaluation of reach, participation and awareness were conducted throughout the week and post-event. Data was also gathered from social media sites, the EIMOC website and digitally published local news articles promoting EIMOC Week.

**RESULTS**

EIMOC week was implemented during Fall 2015. Stations elicited 1,167 exercise bouts from campus participants. Interpret surveys (n=177) 1-week post-event indicated 57% of students had heard about EIM, up from 39% in 2014. An article highlighting EIM Week published ahead of the event recorded 1,951 engagements and views. The EIMOC Facebook® page generated 6,148 total impressions and 185 visits during the 10 days surrounding EIMOC Week. Throughout the same period, the EIMOC website received a total of 142 visits. The top referring pages were the Kinesiology department homepage (n=51) and search engines (n=39). Despite the extensive online presence, 62% of students reported hearing about EIMOC week by walking past exercise stations.

**CONCLUSIONS:** The current study offered insight on the reach and impact of an EIMOC event. News articles prior to and during the event proved a valuable tool in raising awareness, as did outreach via social media. Facebook® proved to be the most useful social media platform for both reach and engagement. Live updates from the events garnered the most immediate social media attention. Lessons learned from these analyses can improve awareness, outreach, and engagement for this program, and translate to other EIMOC programs.

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Approximately 70% of college aged American adults are not meeting the current Physical Activity Guidelines for Americans (PAGA). While healthcare professionals are increasingly being called to address physical activity (PA) to prevent and manage chronic disease, the impact of physician promotion of PA in college aged students is yet to be determined.

**PURPOSE:** To assess the proportion of physicians who promote physical activity to college students and its potential impact on students meeting the PAGA.

**METHODS:** Marshall University students were recruited during EIM-OC week to assess their PA behaviors. Data was obtained through written surveys which queried about student’s obtainment of the current Physical Activity Guidelines for Americans (PAGA), reasons for engaging in PA and their use of recreational facilities.

**RESULTS**

A total of 472 students not involved with University athletics completed the survey. Median age was 20.5±3.3 years (26.9% freshmen, 21% sophomores, 17.8% juniors, 22.3% seniors and 11.7% graduate students). Majority of students were female (55.1%) with a mean BMI of 25.4±5.30kg/m². Eighty six percent of students are members of either the Campus REC or local fitness facility. However, only 39% (n=180) attend 3 or more days per week. Overall, 99.6% of students agree that PA is beneficial to college aged adults. Still, only 15.7% meet the current PAGA for moderate aerobic physical activity (MAPA): 8.5% for vigorous aerobic physical activity (VAPA) and 37.9% for resistance training (RT). Males are significantly more likely to meet the MAPA (p=0.006); VAPA (p=0.003) and RT guidelines (p=0.001) compared to females. The most frequently cited reasons for engaging in PA is stress management (56.6%) and appearance (56.4%) followed by general health (48.7%), fitness (47.2%) enjoyment (45.1%) and sport (10%). Interestingly, of those who exercise for general health benefits (n=230), only 22.2% actually meet the PAGA for MAPA, 11.3% for VAPA, and 45.7% for RT. Of those who exercise for fitness (n=223), 20.6% meet the PAGA for MAPA, 13% for VAPA and 34.7% for RT. **CONCLUSION:** Many students do not meet the current PAGA. Initial efforts should involve education on PAGA for health and how to effectively obtain fitness goals, particularly in females. Future assessments will determine student’s perceptions of enjoyable physical activities to help enhance regular participation in PA.

**CONCLUSIONS:**

EXERCISE IS MEDICINE ON CAMPUS® calls upon Universities to promote physical activity (PA) as an important health indicator to students. Understanding student’s current PA behaviors and what influences their participation in PA is necessary to effectively promote EIM-OC initiatives. **PURPOSE:** To examine the PA behaviors of college students enrolled at Marshall University in Huntington, West Virginia.

**METHODS:** Marshall University students were recruited during EIM-OC week to assess their PA behaviors. Data was obtained through written surveys which queried about student’s obtainment of the current Physical Activity Guidelines for Americans (PAGA), reasons for engaging in PA and their use of recreational facilities.

**RESULTS**

A total of 472 students not involved with University athletics completed the survey. Median age was 20.5±3.3 years (26.9% freshmen, 21% sophomores, 17.8% juniors, 22.3% seniors and 11.7% graduate students). Majority of students were female (55.1%) with a mean BMI of 25.4±5.30kg/m². Eighty six percent of students are members of either the Campus REC or local fitness facility. However, only 39% (n=180) attend 3 or more days per week. Overall, 99.6% of students agree that PA is beneficial to college aged adults. Still, only 15.7% meet the current PAGA for moderate aerobic physical activity (MAPA): 8.5% for vigorous aerobic physical activity (VAPA) and 37.9% for resistance training (RT). Males are significantly more likely to meet the MAPA (p=0.006); VAPA (p=0.003) and RT guidelines (p=0.001) compared to females. The most frequently cited reasons for engaging in PA is stress management (56.6%) and appearance (56.4%) followed by general health (48.7%), fitness (47.2%) enjoyment (45.1%) and sport (10%). Interestingly, of those who exercise for general health benefits (n=230), only 22.2% actually meet the PAGA for MAPA, 11.3% for VAPA, and 45.7% for RT. Of those who exercise for fitness (n=223), 20.6% meet the PAGA for MAPA, 13% for VAPA and 34.7% for RT. **CONCLUSION:** Many students do not meet the current PAGA. Initial efforts should involve education on PAGA for health and how to effectively obtain fitness goals, particularly in females. Future assessments will determine student’s perceptions of enjoyable physical activities to help enhance regular participation in PA.

**CONCLUSIONS:**

The majority of medical schools in Australia reported including PA training in their curricula, even though this training was not mentioned on their websites. While PA training is being included in Australian medical school curricula, there appears to be a need for greater emphasis on instruction regarding the national PA guidelines, how physicians can refer their patients to PA specialists, and ensuring that future physicians are adequately prepared to provide PA counseling.

**CONCLUSIONS:**

The majority of medical schools in Australia reported including PA training in their curricula, even though this training was not mentioned on their websites. While PA training is being included in Australian medical school curricula, there appears to be a need for greater emphasis on instruction regarding the national PA guidelines, how physicians can refer their patients to PA specialists, and ensuring that future physicians are adequately prepared to provide PA counseling.
RESULTS: The wheel-running activity of KO5 mice was 2-fold higher than that of WT mice (p<0.01). KO5-WR mice were low in mRNA expressions of IL-1β (p<0.01 vs. WT-WR), but not DRD2, NPY, BDNF, TNF-α, IFN-γ, IL-1ra and TGF-β, in the brain when compared with WT-WR mice. The hierarchical cluster analysis of the fecal microbiota indicated that the similarity of the intestinal microbiota in KO5 and WT mice after chronic wheel running is strongly dependent upon wheel-running activity. The recipient mice, who were transplanted with fecal content in both KO5- and WT-WR, showed high voluntary physical activity (p=0.01 and P<0.05, respectively vs. WT-Ctrl).

CONCLUSIONS: In conclusion, we observed that KO5 mice showed high voluntary physical activity with low expressions of IL-1β mRNA in their brains and changes in intestinal microbiota. It might be that voluntary physical activity is regulated by TLR5.

Oxidative stress and inflammation are implicated in secondary damage from eccentrically-biased muscle contractions. Research suggests that the antioxidant/anti-inflammatory compounds in tart cherry juice may accelerate strength recovery following damage; however, the underlying mechanisms remain unclear. PURPOSE: To investigate the effects of tart cherry extract (TCE) on skeletal muscle (C2C12) and immune cells (U937) and to determine maximum effective dose for subsequent muscle damage experiments. METHODS: TCE was purified using a water-based extraction method and evaluated for total phenolic content using the Folin-Ciocalteau’s assay. C2C12 myotube cultures were differentiated for 5d, and U937 monocytoids were grown to 1x106 cells/mL and then preconditioned with TCE for 24-48h. Cultures were then incubated with 50% ethanol (EtOH) to induce cell death. Reactive oxygen species (ROS) scavenging activity of TCE was assessed using a DPHH assay. Toxicity of TCE and EtOH was assessed using an XTT assay. RESULTS: ROS inhibition was observed at all [TCE] (7-100µg/mL) in both C2C12 and U937 cell cultures (p<0.05), and ROS inhibition was highest in C2C12 media vs. U937 media (p<0.05). Treatment with EtOH decreased cell viability in both C2C12 (-31±5%) and U937 (-99±11%) cells, relative to untreated control cultures (p<0.05). Pretreatment of C2C12 cells with TCE (7-35µg/mL) for 48h attenuated EtOH-induced toxicity by 18±5% to 26±5% (p<0.02), indicating a protective effect of TCE on myotube cultures. Higher [TCE] (50-100µg/mL) decreased viability by 14±3% to 20±4%, compared with untreated controls (p<0.02), indicating a toxic threshold for TCE. Pretreatment with TCE for 24h (50-100µg/mL) and 48h (35-100µg/mL) rescued U937 cell viability after the EtOH challenge (p<0.02). Interestingly, U937 cell counts increased when preconditioned with TCE at [21.5-100µg/mL] for 24h vs. untreated controls (p<0.02), suggesting a stimulatory effect on cell proliferation. CONCLUSION: These data help establish an experimental range of TCE for future in vitro studies, and demonstrate that TCE has protective antioxidant effects on cultured skeletal muscle cells and monocytes.

Cytomegalovirus (CMV) and Epstein-Barr virus (EBV) infections remain a major cause of morbidity and mortality after allogeneic hematopoietic stem cell transplantation (HSCT). The adoptive transfer of donor-derived viral-specific cytotoxic T-cells (CTCs) is an effective treatment for controlling CMV and EBV infections during HSCT. However, in many cases, the time taken to manufacture adequate numbers of CTCs from healthy donors is too long and requires the collection of large and impractical blood volumes. PURPOSE: To determine if a single exercise bout can augment the ex vivo manufacture of viral-specific T-cells from healthy donors. METHODS: Nine healthy CMV and EBV seropositive participants (mean ± SD age: 31 ± 3.3 years) completed a 36-min continuous cycling protocol at a workload corresponding to ~15% of the individual blood lactate threshold. PBMCs (1x106) isolated before and immediately after exercise were stimulated with CMV (pp65) and IE1) and EBV (imp2 and BMLF1) peptides and expanded over 8 days. At Day 8, viral-
specific T-cells were enumerated using IFN-γ ELISPOT assays and the phenotypes of the expanded CTLs and viral-specific T-cells were determined by flow cytometry. RESULTS: In all three experiments, the number of T-cells specific to CMV pp65, EBV I mp2, and EBV BMLF1 was markedly greater among the post-exercise expanded CTLs (fold-difference: CMVpp65: 2.6, EBV I mp2: 2.5 and EBV BMLF1: 4.4). Expanded CTLs predominantly consisted of effector memory (CD45RA−/CD62L−) and CD45RA+ effector memory (CD45RA+/CD62L−) T-cells, but no phenotypic differences were observed between CTLs expanded before and after exercise. Moreover, CTLs expanded before and after exercise were equally capable of killing viral-peptide pulsed autologous target cells in an MHC restricted manner. Viral-specific CTLs could not be expanded from a CMV/EBV seronegative participant, indicating that the augmenting effects of exercise are due to the priming and expansion of pre-existing memory T-cells. CONCLUSION: This is the first study to show that a single bout of exercise enhances the ex vivo manufacture of CMV and EBV-specific T-cells from healthy donors without altering their phenotype or function. Exercise may therefore serve as a safe adjuvant to improve viral-specific T-cell generation for HSCT.

331 Board #168
June 1, 9:30 AM - 11:00 AM
Acute Eccentric Exercise Does Not Improve Primary Antibody Responses to Ovalbumin Vaccination in Mice.
YI SUN, Brandt D. Pence, Koyal Garg, Svyatoslav V. Dvoiretsky, Grace M. Niemiro, Jacob M. Allen, Michael De Lissoyo, B. Soppart, Jeffrey A. Woods, FACSM. University of Illinois at Urbana-Champaign, URBANA, IL. (Sponsor: Jeffrey A. Woods, FACSM)
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(No relationships reported)

Vaccination against infectious diseases has been one of the most successful public health interventions and several research have shown that acute eccentric exercise augments the antibody response to vaccine in humans. However, the underlying mechanisms are unclear and animal models are useful to study the preconditioning exercise-induced augmentation of antibody responses to vaccination. PURPOSE: To determine if eccentric exercise could improve primary antibody responses to a suboptimal vaccination dose in mice. METHODS: In the first experiment, mice were exercise at 17 km/min speed at -20% grade for 60 minutes on a treadmill (ECC1) or remained sedentary (SED). Both ECC1 and SED mice were intramuscularly injected with 25 μg of ovalbumin (OVA) and 200 μg of alum adjuvant 6 hours post-exercise. In the second experiment, two bouts of downhill treadmill running were performed on consecutive days (ECC2) and all mice were vaccinated immediately after the second bout of exercise. In the third experiment, mice were randomly assigned to an eccentric electrically-stimulated group (ECCstim) or a sham group (Sham). Mice were then vaccinated 6 hours post-exercise. In all experiments, plasma was collected prior to, and at one, two and four weeks post-vaccination. ELISA was performed to analyze anti-OVA IgG.

RESULTS: Compared to SED mice, ECC1 and ECC2 mice demonstrated a significant increase in plasma anti-OVA IgG on days 7, 14 and 28 (p<0.05). In addition, the CD45+CD15+ intracellular Lac median fluorescent intensity (MFI) significantly increased on days 1, 2 and 4 (p<0.05). There was no significant increase in plasma Lac concentrations using ELISA.

CONCLUSION: Although acute eccentric exercise did not further enhance the vaccine responses, there was a significant time main effect indicating that the augmenting effects of exercise are due to the priming and expansion of pre-existing memory T-cells. However, there was no significant difference in vaccine responses between mice vaccinated immediately after exercise versus mice vaccinated 24 hours after exercise. Therefore, further studies are needed to examine the effects of exercise on vaccine responses in humans.

333 Board #170
June 1, 9:30 AM - 11:00 AM
Tam Receptors Expression Enhances by Glucocorticoid In Mouse Macrophages.
Daisuke Shiiba, Hiroshi Tokimitsu, koyo Furumoto, Noritaka Maeta. Kurashiki University of Science and the Arts, Kurashiki City, Japan. (No relationships reported)

PURPOSE: Exercise positively regulates several immune functions. Phagocytic capacity of macrophages also enhances by exercise. Previous study reported that enhancement of the phagocytic capacity of macrophage is regulated by exercise-induced hormones, such as catecholamine and glucocorticoids. TAM receptors, the consist of Tyro3, Axl, and MerTK, are characterized by their ability to phagocytose antigenic particles, thus promoting the immune response. However, the effects of glucocorticoid stimulation on TAM receptors expression in macrophages remain unclear. Here we showed that the glucocorticoid stimulation on TAM receptors expression in mouse macrophages.

METHODS: RAW264 cell and J774.1 cells, mouse macrophage cell line were maintained with DMEM medium and RPMI1640 medium containing 10% FBS and antibiotics. Also, primary macrophages from mouse tissues were incubated 10%FBS/DMEM. These macrophages were treated with glucocorticoid among 24 hours. The mRNA expression of TAM receptors in glucocorticoid-treated macrophages was measured by RT real-time PCR. Also, protein expression of TAM receptors in macrophages was measured with western blot analysis. In addition, Gas6 (protein of bridges TAM receptor to the phosphatidylinerine) concentration in culture medium in macrophages was measured by ELISA assay.

RESULTS: Tyro3 and MerTK expression, but not Axl expression, were significantly enhanced in glucocorticoid-treated macrophages compared with untreated macrophages. Especially, MerTK expression was remarkable increase by glucocorticoid treatment. In contrast, significantly enhancement of Gas6 expression was not observed.

CONCLUSIONS: Thus, the remarkable increased expression of MerTK had observed in mouse macrophage. Although increased expression of Tyro3 was also observed, its changes were not so much Tyro3 as MerTK. These results suggested that exercise-induced enhancement of phagocytic capacity in macrophages may relate to enhance the TAM receptors expression, especially MerTK.

334 Board #171
June 1, 9:30 AM - 11:00 AM
Association of Calprotectin with Leukocyte Chemotactic and Inflammatory Mediators Following Acute Aerobic Exercise
Arun Maharaj, Aaron L. Slusher, Michael C. Zourdos, Michael Whitehurst, FACSM, Brandon G. Fico, Chun-Jung Huang, FACSM, Florida Atlantic University, Boca Raton, FL. (Sponsor: Chun-Jung Huang, FACSM)
Email: maharaj12@fau.edu
(No relationships reported)

PURPOSE: The objective of this study was to examine whether acute aerobic exercise-mediated calprotectin in plasma would be associated with monocytic chemotactic protein-1 (MCP-1), myeloperoxidase (MPO), and interleukin-6 (IL-6) in healthy individuals.

METHODS: Eleven healthy participants, ages 18 to 30 years old were recruited to perform a 30-minute bout of aerobic exercise at 75% VO2max.

RESULTS: Acute aerobic exercise elicited a significant elevation across time in plasma calprotectin (P < 0.002), MCP-1 (P < 0.001), MPO (P < 0.001), and IL-6 (P < 0.001). Body mass index (BMI) was positively correlated with calprotectin area-under-the-curves with “respect to increase” (AUC) and IL-6 AUC (r = 0.678, r = 0.707, respectively). Furthermore, calprotectin AUC was positively correlated with IL-6.

ACSM May 31 – June 4, 2016
Boston, Massachusetts
Conclusions: While exercise did not preferentially mobilize AdV-specific T cells to circulation, it markedly augmented the manufacture of these cells. This indicates that exercise boosts the manufacture of AdV-specific T cells without the need for changes in their numbers or proportions. A single bout of exercise appears to be an effective and economical adjuvant to augment the expansion of VSTs from healthy donors for immunotherapy.

Hematopoietic stem cell transplantation (HSCT) is a common treatment option for patients with hematologic malignancies. HSCT donors receive twice-daily injections of mobilizing pharmaceutical agents for 4-5 days before beginning apheresis for an additional 3-4 days. Not only does this process involve time-consuming and potentially expensive treatments, the pharmaceuticals used to mobilize stem cells have several undesirable side effects. A single bout of exercise increases stem cell numbers in peripheral blood and may therefore serve as an effective adjuvant for mobilizing stem cells in allogeneic donors and lessen the need for additional mobilizing agents. PURPOSE: To compare short duration high intensity exercise with long duration low intensity exercise in an effort to determine which exercise modality would mobilize the greatest number of stem cells.

Methods: 11 Healthy runners completed two exercise sessions in randomized order: 90 minutes at 5% below VT1 (LONG) and 30 minutes at 15% above VT1 (SHORT). Blood samples were taken pre-exercise, mid-exercise (15 and 90 min into exercise), immediately post exercise, and into the recovery period (1-2h, 2-3h and 3-4h Post). Total CD34+ stem cells in whole blood were enumerated by 4-colour flow cytometry.

Results: Compared to pre-exercise, SHORT yielded a greater post-exercise increase in stem cells (mean ± SE) CD34+ mobilization than LONG (+6.7 ± 1.96 vs. +0.32 ± 1.71, p=0.069). Peak CD34+ cell mobilization occurred immediately post exercise for SHORT and mid-exercise for LONG (+6.7 ± 1.96 vs. +2.62 ± 1.33, p=0.142). Total CD34+ stem cells in whole blood were enumerated by 4-colour flow cytometry.

Conclusions: Short duration high intensity exercise elicits a larger mobilization of CD34+ cells than long duration exercise of lower intensity. Exercise may therefore serve as an effective adjuvant to mobilize CD34+ cells in healthy donors, although further research is necessary to optimize the exercise protocols for the HSCT donor population.

Conclusions: Overall, we demonstrated that a single bout of exercise increases both NK-cell cytotoxicity against HLA-expressing multiple myeloma (U266) and HLA-deficient leukemia (K562) cell lines by 4-colour flow cytometry. NKCA was also measured for the expanded NK-cell products. RESULTS: Relative to baseline, NK-cell expansion was decreased immediately post-cycling exercise, but enhanced 1h post-exercise (+3.5-fold ± 2 and +74.3-fold ± 30 vs. +17.7-fold ± 7, p<0.05). Expansion caused a 3-fold increase in the expression of the activating receptors NKG2C, NKG2D, and NKP30, and NKCA per cell against the U266 cell line was higher 1h post-exercise after LONG relative to SHORT running exercise (0.27 ± 0.06 vs. 0.18 ± 0.04, p<0.05) and against K562 cells 1h and 2h post-exercise relative to SHORT (0.24 ± 0.05 vs. 0.11 ± 0.05 and 0.22 ± 0.08 vs. 0.11 ± 0.03, p<0.05). CONCLUSION: We conclude that long duration (1.5h) exercise enhances NK-cell cytotoxicity independently of HLA expression and that high intensity exercise augments NK-cell expansion rate without lowering activating receptor expression or cytotoxicity.

Robust immunity is essential for further human exploration of the solar system beyond Earth’s orbit. Immune dysregulation and latent viral reactivation has been documented in astronauts during and after spaceflight, but the effects of long duration missions on the functional properties of NK-cells are not known. PURPOSE: To determine the impact of a 6-month mission to the International Space Station (ISS) on the phenotype and function of NK-cells. METHODS: Blood samples were taken from 6 ISS crewmembers and 6 ground-based controls before launch (L-180 and L-60), in-flight (FD10, FD90, R-1), immediately upon return to Earth (R+0) and up to 66 days following return (R+18, R+33 and R+66). In-flight samples were returned to the terrestrial laboratory within 30-56h of being drawn and immediately processed with the control samples, which were drawn at identical times to the crew. The levels of surface activating (NKG2C) and inhibitory (NKG2A) receptors and intracellular perforin and granzyme-b expression were determined in CD3-CD56 NK-cells by 4-color flow cytometry, and NK-cell cytotoxicity activity (NKCA) against tumor cells of leukemia (K562), multiple myeloma (U266) and lymphoma (221.AEH and 721.221) origin were determined in a 4h NKCA assay. RESULTS: All crewmembers
demonstrated a significant reduction in NKCA during flight (FD90) against all tumor target cells to levels that were (mean ± SE) 42 ± 7% (K562), 49 ± 16% (U266), 28 ± 5% (221A), and 36 ± 10% (721.221) of baseline (L-180) NKCA (p<0.05). FD90 Perforin and granam b2 levels were reduced to 52 ± 7% of baseline levels (p<0.05) and these correlated highly (R2=0.75) with changes in NKCA. In some crewmembers, NKCA remained suppressed at R-1 and up to R+66. NKG2C and NKG2A expression remained unchanged, except in one crewmember who had a massive expansion of NKG2C+. NK-cells and profound shedding of cytomegalovirus in urines at FD90. No significant changes in NKCA or NK-cell phenotype were found in the ground-based controls (p>0.05). CONCLUSION: Long duration spaceflight ‘disarms’ NK-cells of perforin and granam b2 and suppresses their ability to kill a wide range of tumor target cells during the in-flight phase of the mission. Further research is required to develop countermeasures to help maintain normal immune function during exploration class missions.

**METHODS:**

**Physiological And Electromyography Responses During A Maximal Incremental Skating Test On Slide Board**

Tatiane Piccuto, Jessica O’Connell, Masanori Sakaguchi, Darren Stefanyshyn. University of Calgary, Calgary, AB, Canada.

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(No relationships reported)

Specific skating fitness test is challenging to be performed on laboratory or track, because the use of skating treadmill is expensive. Since slide board skating mimics the skating gesture, it could be used as an alternative method to evaluate speed skaters. **PURPOSE:** To analyze the physiological responses and muscle activation characteristics during an incremental slide board skating test. **METHODS:** 10 ice speed skaters completed a maximal 1-min stage incremental cadence skating protocol on an instrumented slide board, until voluntary exhaustion or until they were no longer capable to keep the pace. Oxygen uptake (VO2), heart rate (HR), blood lactate (Lac) and EMG of vastus lateralis (VL), vastus medialis (VM), biceps femoris (BF), gluteus maximum (GM), gluteus medius (GMD) and adductor magnus (AM) muscles were analyzed. Maximal physiological indices and the second ventilatory threshold (VT2) were determined. Root mean square (RMS) of EMG signal was compared between muscles and throughout the test (10%, 40%, 70% and 90% of the test), using Student’s t test (p<0.05). **RESULTS:** All participants attained at least three of four criteria for VO2max attainment (VO2 plateau, maximum HR predicted, RER > 1.1 and [Lac] ≥ 8 mmol.l-1). VT2 occurred at 84.3 ± 3.1% of maximal cadence (CADmax) obtained during the test. RMS significantly increased as the cadence increased for all the muscles (p<0.05). RMS of all muscles analyzed significantly increased at each instant of time. GM activation at the end of the test (227.2±55.2% of the beginning of the test) was significantly higher than all muscles analyzed, followed by VL (183.2±36.8%). A significant correlation between RMS and CADmax was found for VL (r=0.87), GM (r=0.86) and GMD (r=0.74). **CONCLUSION:** An incremental maximal skating protocol on slide board elicited maximal physiological responses and seems adequate to evaluate aerobic indices of performance on skaters. Also, the muscle recruitment pattern during skating on slide board was similar to the one found on treadmill skating and ice skating, since GM muscle and VL are the main responsible for the power generated at the hip and knee, respectively, while GMD is associated with the stroke velocity during skating.

**Comparison of Exclusion Rates Between Station-based and Single Provider Preparticipation Evaluations**

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(No relationships reported)

Although the value of the pre-participation medical evaluation (PPE) continues to be debated it is still required for most young athletes to compete in organized sports. There are many potential benefits to the PPE but the primary objective is to detect conditions that may predispose the athlete to injury. The PPE can be provided in an office based setting (OBS) with a single provider or in station-based setting (SBS) where multiple health care providers evaluate a large number of athletes at the same time. Our program utilizes both types of sites to provide PPEs for young athletes. There is little recent literature available comparing rates of exclusion from sports participation between the two types of settings, especially when performed by the same providers.

**PURPOSE:** To measure exclusion rates and reasons for exclusion for adolescent athletes between the OBS and SBS when performed by the same providers.

**METHODS:** For this study we used a retrospective chart review of sports physicals done in the OBS and SBS from 2009-2014. Reasons for exclusion from sports participation were recorded as cardiovascular/pulmonary, vision, musculoskeletal or other. Exclusion criteria for this study included no previously known disability or condition that precluded safe sports participation and patients outside the age range of 10-18 years old. Age, gender, and reason for exclusion were recorded for athletes from the two sites. **RESULTS:** A total of 1798 student athletes were examined in the OBS and 1136 student athletes were examined in the OBS. The overall rates of exclusion or further evaluation between the two sites were similar (5.67% versus 4.84%, p=0.33). There was no difference between exclusion rates for male and female athletes. There was a statistical difference in the exclusion rate between the two sites (p=0.045) with abnormal vision screening being the most common reason in the SBS and cardiovascular being the most common in OBS.

**CONCLUSION:** OBS and SBS PPEs result in similar rates of exclusion or further evaluation from sports participation, although the specific reasons for exclusion differ based on the setting.

**Training loads approximating the one-repetition maximum (IRM; ≥ 200%) are often used to improve maximal concentric strength in the lower limbs. Supra-maximal training (≥ 100% IRM) has been shown to be effective in inducing strength and power adaptation in both trained and untrained populations, however, such methods are associated with heightened risk of injury.**

**PURPOSE:** To determine whether supra-maximal (≥ 100% IRM) eccentrics are a preferred method for improving lower-body concentric strength.

**METHODS:** 81 studies were considered for inclusion out of 2384 total studies returned from an electronic data-base enquiry (Google Scholar) and from the reference lists of relevant articles. Five studies (7 effect sizes) were ultimately retained. Key inclusion criteria were the use of modalities typically available to collegiate students (leg press, squat, leg extension, leg flexion; key exclusion: isokinetic dynamimeter) and at least three weeks of treatment exposure between pre and post intervention IRM assessment. Individual study effect sizes (Cohen’s d) were converted to an unbiased estimate (g) using the software program R studio. Mean effect size was determined via a random effects model after the fixed-effects test of homogeneity of effect size was rejected (Q(df=7) = 14.86, p = .02). **RESULTS:** Both supra-maximal (120, 120, 125, 138, 182% IRM) and sub-maximal (0, 75, 85, 80, 80%) loading significantly improved post-retest IRM relative to baseline [average ES − 2.21, SE = 0.77, Z = −2.6, p < 0.01, CI95% = −0.7 and 3.73, tau2 = 3.77 (REML estimator)], IQ = 95.15%, Birge Ratio = 17.08; average ES = 1.86, SE = 0.93, Z = −2.1, p < 0.04, CI95% = −0.5 and 3.68, tau2 = 5.43 (REML estimator), IQ = 91.74%, Birge Ratio = 12.01]. Under the RE model using restricted maximum likelihood estimation for between study variance estimate (tau2=.36), the overall average study effect of heavy eccentrics relative to sub-maximal concentrics was 47 (SE = 36), which was not significantly significant (Z = 1.60, p = .11, CI95% = −1.1 and 1.05). The I2 finding of 63.19 indicates that 63.19% of the total observed variance was attributable to true differences in effect size, which can be understood to be a moderate-to-high degree of heterogeneity.

**CONCLUSION:** Frequent inclusion of supra-maximal eccentrics in lower-body strength training does not appear warranted.
Cerebral (COX) and muscular (MOX) oxygenation thresholds were observed in well-trained cyclists; whereas two breakpoints were determined in COX (COX1 and COX2), only one threshold was determined in MOX. PURPOSE: To compare COX and MOX thresholds in individuals with different training status. The oxygenation thresholds were further compared to ventilatory thresholds (VT1 and VT2). METHODS: Nine well-trained cyclists (VO2MAX of 52.4 ± 6.2 mL/kg/min) and nine untrained healthy individuals (VO2MAX of 38.3 ± 4.7 mL/kg/min) undertook a maximal incremental test until exhaustion, comprised of 25 W/min increments. Data of COX (prefrontal lobe) and MOX (vastus lateralis muscle) at 25 Hz frequency, and gaseous exchange (breath-by-breath) were obtained throughout the test. Crude data was normalized to 1 Hz and COX, MOX, and gaseous exchange data was plotted as a function of the time. Physiological breakpoints were visually identified by three evaluators, and expressed as percentage (%) of the peak power output (WPEAK). A repeated measures ANOVA design compared the physiological thresholds between groups (P < 0.05). RESULTS: All thresholds occurred at a greater absolute power output in cyclists than in untrained individuals. When expressed as % WPEAK, a threshold main effect (P < 0.001) was observed, so that MOX, COX1 and COX2 thresholds were significantly different from VT1 and VT2 in cyclists and untrained individuals. Additionally, a group main effect and a near threshold by group interaction effect were observed for MOX and COX2; the MOX was greater in cyclists than untrained individuals (P = 0.06), but COX2 was lower in cyclists than in untrained individuals (P = 0.08; effect size d= 0.95). CONCLUSION: Results suggest that the greater physical status and exercise tolerance in cyclists may be related to an improved MOX threshold, together with a greater capacity to tolerate low levels of brain oxygenation.
and nimbleness (p<0.001). Regardless of gender, age was negatively associated with number of push-ups (p=0.001) and sit-ups (p=0.001), and VO2 max, as measured by the YMCA step test (p=0.01), and positively associated with body fat percentage, (p=0.02).

CONCLUSIONS: PA and obesity prevalence matched national and state averages. Results suggest that age and gender are significant predictors of PA, motivation, and fitness and should be accounted for when designing effective exercise interventions.

While multisegment isokinetic testing more closely resembles functional movement patterns than isolated joint testing, little is known regarding the reliability of upper extremity push-pull testing (UE PPT). Quantifying total isokinetic work provides insight regarding sustained muscle force through a range of motion; before examining whether UE PPT work could be a useful injury risk and restoration marker, establishing reliability and limb/velocity/direction effects in healthy individuals is needed. PURPOSE: To determine isokinetic UE PPT total work reliability and compare differences between limb (dominant/non-dominant), direction (push/pull), and velocity (24.4 cm/s, 42.7 cm/s, 61.0 cm/s). METHODS: Healthy, physically active men (n=12) and women (n=12) aged 18–30 y completed a test-retest protocol (>90hr separation). Following a progressive four-repetition warm-up, five maximal push-pull repetitions were completed using the closed kinetic chain attachment on a Biodynamics Dynamometer (Biodynamics, Shirley, NY) in a limb and velocity randomized order. RESULTS: High (.863-0.954) intraclass correlation coefficients (2, 1) and low standard error of measurement (262.5-557.9 N) were demonstrated for work across velocities, limbs, and directions. Pairwise post hoc analysis of a significant velocity by direction interaction (P<0.01) identified push work to be significantly greater than pull work at each speed (P<0.01, d=7.71 to 1.35). Post hoc trend analysis revealed that while increased velocity prompted significant linear and quadratic work decreases for both push and pull (P<0.01, d=1.56). A weak overall limb effect (dominant>non-dominant) was revealed (P=0.049, d=0.42). CONCLUSION: Isokinetic UE PPT total work is a reliable measure. Healthy, young adults demonstrated asymmetry favoring the dominant limb (5%) and push direction (13 to 23%). We attribute the differential effect of velocity on push-pull action, to greater cross-sectional area of the elbow extensors, shoulder extensors, and scapular protractors compared to the elbow flexors, shoulder extensors and scapular retractors. Future research will examine participants with a history of upper extremity injury.

Limb imbalance is historically described as the difference in muscular strength between limbs. However, whether this imbalance in strength is associated with an imbalance in aerobic capacity is currently unknown. PURPOSE: To determine if differences in muscular strength between the lower limbs are associated with differences in aerobic capacity. METHODS: Healthy recreational athletes (N=8, 3 males, 5 females; 23.6±3.5 years old, 72.3±17.3 kg) participated in the investigation. Maximal knee extensions were performed on an isokinetic dynamometer at 300 deg/s (300 deg/s was utilized as an angular velocity was most similar to that which occurs during cycling). The limb which produced the greatest peak torque was determined to be the dominant limb (DL) and the other limb non-dominant (NDL). Single leg cycling VO2 peak tests were also performed for each limb. Paired T-tests were used to determine if there were peak torque, VO2 peak, and time to fatigue differences between the limbs. Correlations were then used to compare the relative imbalances in peak torque to the relative imbalances of VO2 peak and time to fatigue. RESULTS: Peak torque at 300 deg/s was different between DL and NDL (DL = 63.1±20.6 Nm; NDL = 53.3±15.4 Nm; P=0.03). VO2 peak (DLVO2 peak = 30.9±9.0 ml/kg/min; NDLVO2 peak = 32.4±5.8 ml/kg/min; P=0.54) was not different however time to fatigue (DL = 13:33±2:28 minutes; NDL = 14:51±1:34 minutes; P=0.02) was different between DL and NDL. Correlations between the relative imbalances in peak torque and VO2 peak (R=0.41, P=0.31) and time to fatigue (R=-0.38, P=0.35) were not significant.

CONCLUSION: Our subjects displayed significant imbalances in peak torque at 300 deg/s and time to fatigue between the dominant and non-dominant limbs. However, these data suggest that between limb variances in muscular strength is not associated with variances in aerobic capacity. Supported by Kent State University’s School of Health Sciences.

Minimal postural sway while standing is indicative of good balance. The most prevalent method for evaluating postural sway is monitoring center of pressure (COP) motion for a specified duration as an individual stands on a force platform under several pre-planned conditions. Despite the potential need to generate upper body force bilaterally, previous research has focused primarily on COP motion during unilateral handgrip (HG) strength testing. METHODS: Maximal HG strength assessments measured simultaneously with a HG dynamometer, three times with a neutral (N), dominant foot forward (D), and non-dominant (ND) foot forward stance. All trials were completed while standing on a portable force platform, which was used, in conjunction with corresponding software, to track COP motion while gripping the dynamometer. Subjects were instructed to grasp the dynamometer as forcefully as possible for ~5 sec during each trial. All trials were separated by a recovery period of 60-sec. A Waterloo Footedness Questionnaire was used to determine subject foot dominance, while maximal HG strength during the neutral stance was used to determine hand dominance. Repeated measures analysis of variance was used to detect COP displacements along the anterior/posterior (A/P) and medio-lateral (M/L) axes and differences in bilateral HG strength across the three stances. RESULTS: Testing results showed that the shift in M/L COP during the D (0.67 ± 0.27 cm; p<0.001) and ND foot forward stances (0.65 ± 0.28 cm; p<0.001) were significantly greater than that during the N (0.38 ± 0.24 cm; p=0.674) stance. No significant interactions were reported for HG strength (D: 28.6±11 kg; ND: 26.5±4 kg) across the different stance conditions. CONCLUSION: Results indicated that M/L postural sway is increased when standing in both D and ND foot forward stances during maximal HG testing. Additionally, this data indicated that stance has no influence on maximal bilateral HG strength.
PurPOSE: To assess the differences in foot position on bilateral grip strength.

METHODS: Healthy young adults (n=20) performed a maximal and 2 sub-maximal isometric contractions (each lasting 12 s, 6 s recovery). A commercial HG dynamometer was used to simultaneously measure bilateral handgrip force (HG). The HG dynamometer was interfaced with a computer and a LabVIEW program.

RESULTS: The H1 hand was greater than the H2 hand in PF (42.16±1.50 kg vs. 39.12±1.48 kg, p<0.001) and F(1,19)=7.20, η²=0.28). The time to complete the TT increased across progressive stages.

Conclusion: TT can be used as a simple and practical test to assess fatigue and compare grip strength in different conditions.

No. 5

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PurPOSE: The Talk Test (TT) is a very simple surrogate of exercise intensity which has been shown to be a useful marker of the ventilatory (VT) and respiratory compensation (RCT) thresholds. The purpose of this study was to evaluate a potential mechanism allowing the TT to serve as a simple and practical test to assess fatigue and compare grip strength in different conditions.

METHODS: The TT consists of a 5-minute conversation at a rate of 100-150 words per minute. The time to complete the TT increased across progressive stages, indicating the subject's fatigue.

RESULTS: The TT was performed in healthy adults (n=20) using a HG dynamometer. The HG dynamometer was interfaced with a computer and a LabVIEW program.

CONCLUSIONS: TT can be used as a simple and practical test to assess fatigue and compare grip strength in different conditions.

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PurPOSE: To examine the differences in TMG with different methodologies and to propose some guidelines in order to prevent variability among researchers.

METHODS: Eight physically active men participated in this study. Basal TMG measurements were performed on the vastus lateralis, rectus femoris, vastus medialis, biceps femoris and semitendinosus of both legs. Four methodologies were compared: a) classical with isotonic contraction (CL_IST); b) classical with isometric contraction (CL_ISM); c) motor point with isotonic contraction (MP_IST), and d) motor point with isometric contraction (MP_ISM).

RESULTS: When CL_IST and CL_ISM were compared, significant differences were found in delay time (Td) (23.15±3.78 ms vs 23.86±2.80 ms, P<0.05), contraction time (Tc) (30.03±11.88 ms vs 31.59±12.05 ms, P<0.05), sustained time (Ts) (159.51±92.17 ms vs 193.16±56.56 ms, P<0.05) and relaxation time (Tr) (65.04±42.66 ms vs 106.93±56.41 ms, P<0.05). When comparing MP_IST and MP_ISM, Ts (175.85±75.44 ms vs 201.20±52.95 ms, P<0.05) and Tr (65.04±42.66 ms vs 106.93±56.41 ms, P<0.05) showed significant differences. TD was the only variable to show significant differences in the comparisons CL_IST - MP_IST (23.15±3.78 ms vs 24.23±3.00 ms, P<0.05) and CL_ISM - MP_ISM (23.86±2.80 ms vs 24.40±3.02 ms, P=0.05).

CONCLUSIONS: Longer-maintained contraction and slower relaxation were obtained with isotonic contractions, when using both the classical technique and the motor point. One limitation of using isotonic contraction is that legs move freely after the electrical impulse, which may affect the measurement. For this reason, the use of isometric contraction is recommended to obtain more reliable measurements. On the other hand, the results showed that using the motor point technique does not affect the TMG measurement significantly.

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PurPOSE: The Physiological Mechanism Behind the Talk Test

METHODS: The TT is a very simple surrogate of exercise intensity which has been shown to be a useful marker of the ventilatory (VT) and respiratory compensation (RCT) thresholds. The purpose of this study was to assess a potential mechanism allowing the TT to serve as a simple and practical test to assess fatigue and compare grip strength in different conditions.

RESULTS: The TT was performed in healthy adults (n=20) using a HG dynamometer. The HG dynamometer was interfaced with a computer and a LabVIEW program.

CONCLUSIONS: TT can be used as a simple and practical test to assess fatigue and compare grip strength in different conditions.

Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, JUNE 1, 2016

June 1, 11:00 AM - 12:30 PM

Tensyomyography: Methodological Concerns and Possible Solutions


No. 5

Board #190

June 1, 11:00 AM - 12:30 PM

Tensyomyography: Methodological Concerns and Possible Solutions


Email: rocio.dominguez@externos.csd.gob.es

No. 5

Board #191

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

Calleja-Gonzalez M. Julio1, Braulio Sanchez-Ureña2, Guillermo Ocina Camacho1, Jeff Mjaanes, FACSM1, 1Faculty of Sports Sciences, Vitoria, Spain. 2Human Movement and Quality Life School, San Jose, Costa Rica. FACSM1. (Sponsor: Jeff Mjaanes, FACSM)

No. 5

Board #192

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

Calleja-Gonzalez M. Julio1, Braulio Sanchez-Ureña2, Guillermo Ocina Camacho1, Jeff Mjaanes, FACSM1, 1Faculty of Sports Sciences, Vitoria, Spain. 2Human Movement and Quality Life School, San Jose, Costa Rica. FACSM1.

Sponsor: Jeff Mjaanes, FACSM

No. 5

Board #193

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

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No. 5

Board #194

June 1, 11:00 AM - 12:30 PM

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Sponsor: Jeff Mjaanes, FACSM

No. 5

Board #195

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

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No. 5

Board #196

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

Calleja-Gonzalez M. Julio1, Braulio Sanchez-Ureña2, Guillermo Ocina Camacho1, Jeff Mjaanes, FACSM1, 1Faculty of Sports Sciences, Vitoria, Spain. 2Human Movement and Quality Life School, San Jose, Costa Rica. FACSM1. (Sponsor: Jeff Mjaanes, FACSM)

No. 5

Board #197

June 1, 11:00 AM - 12:30 PM

Profile In Male And Female Junior Basketballers During The Pre-Camp.

Calleja-Gonzalez M. Julio1, Braulio Sanchez-Ureña2, Guillermo Ocina Camacho1, Jeff Mjaanes, FACSM1, 1Faculty of Sports Sciences, Vitoria, Spain. 2Human Movement and Quality Life School, San Jose, Costa Rica. FACSM1.

Sponsor: Jeff Mjaanes, FACSM

No. 5

Board #198

June 1, 11:00 AM - 12:30 PM

The Influence Of Foot Stance On Force-Time Curve Parameters During Hand Grip Performance

Michael B. La Monica, David H. Fukuda, Tyler W.D. Muddle, Kyle S. Beyer, Ran Wang, Jeffrey R. Stout, Jay R. Hoffman, FACSM, University of Central Florida, Orlando, FL. (Sponsor: Jay Hoffman, FACSM)

(No relationships reported)

(No relationships reported)
in anthropometric and conditional parameters between genders in junior basketball players. Methods: Thirty players, 15 men (M) and 15 women (W) were selected to participate. The main characteristics were: age (M: 19.2 ± 2, W: 21.2 ± 1.1, years), height (M: 1.82 ± 5.3, W: 1.68 ± 4.53, cm), body mass (M: 92.7 ± 15.2, W: 73.4 ± 9.0, kgs). All the participants were tested at the beginning and the final of the pre camp (8 Weeks duration), consisting of injury prevention programs, endurance and aerobic exercises. Both genders completed 10-H per Week. Each participant performed 1RM, 20 meters, bench press, clean and squats, 1, 2 and 3 miles running tests were performed. Results: At the beginning of the Pre-camp, M and W were significantly different in all variables measured excepting age, height (1.82 ± 5.3 vs. 1.68 ± 4.53, cm); body mass (92.7 ± 15.2 vs. 73.4 ± 9.0, kg), body fat (11.3 ± 2.9 vs. 16.7 ± 5.3, %), BMI (CM [53.8 ± 6.3 vs. 33.4 ± 6.9, cm], body mass (M and W, respectively) (p<0.05). Additionally, the M reduced the time in running (±5.9% and ±10.5%, 1 and 2 miles respectively) (p<0.05), pre and post Pre camp. However, no statistically significant differences between groups after the program in any variables tested were found. Conclusions: At the beginning of Pre-camp, differences between M and W were described. During the pre-camp Training (10 hours per week of conditioning training), both genders improved the performance without statistical changes, except for squat.

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Board #193
June 1, 11:00 AM - 12:30 PM
A Comparison of Pickleball and Walking: A Pilot Study
Molly Smith, Matt Denning, James Zagrodnik, Tim Ruden. Weber State University, Ogden, UT. Email: mmmsnith1@weber.edu

Pickleball is one of the rising trends in recreation sports for all ages yet only one study in cardiac patients has reported its cardiorespiratory demands. **Purpose:** The objective of this study was to compare cardiac activity, movement, energy expenditure, perceived exertion, and level of enjoyment during pickleball and walking in healthy adults. **Methods:** Twelve novice to intermediate level pickleball players (4 male: 8 female, age: 48 ± 13.1 years, height: 170.8 ± 9.8 cm, mass: 72.9 ± 12.0 kgs) participated in this comparative study. Average heart rate, peak heart rate, total steps, and total calories expended during 30-minutes of pickleball doubles and 30-minutes of walking at a self-selected pace were measured using the Hexoskin™ wearable vest. Overall level of perceived exertion (RPE: 6 - 20 category scale) and overall enjoyment (1 low to 5 high Likert scale) were determined for each activity. Subjects participated in both activities in a counter-balanced order with five minutes sitting rest between activities. **Results:** Differences between the activities were examined with the use of paired sample t-tests (α = 0.05). **Results:** Average heart rate (HR) and peak heart rate (PPHR) were significantly higher playing pickleball (pk) than walking (w) p<0.001, 171.3 ±15.5, wHR 102.6 ±16.5, pPHR 140.5 ±118.5, wPHR 119.8 ±23.5; p<0.001). While significantly more steps were taken while playing than walking (wSteps 3,175 ±582, pkSteps 1,658 ±148; p<0.001), significantly more calories (Cal) were expended in pickleball than in walking (pkCal 229.2 ±66.1, wCal 161.4 ±50.2; p<0.001). Participants rated their level of exertion higher in pickleball than walking (wRPE 11.0, pkRPE 8.9) and their level of enjoyment higher in pickleball than walking (pkEnjoy 4.7, wEnjoy 2.7). **Conclusions:** This study provides critical information on the physiological demands associated with playing pickleball, heretofore, unreported. Pickleball is higher in intensity, expends more calories, and is more enjoyable than walking at a self-selected speed.
performed maximal voluntary isometric strength (MVC) of knee extensors. Physical fitness [30-second chair stand (CS-30) test, standing broad jump (SBJ), handgrip and thigh girth at 50% of thigh length (mid-thigh girth)] were also measured.

**Results:** The following were similar to the standard values of the overall Japanese population for the same age group: age (± 0.2 ± 0.5 years), standing height (1.71 ± 0.48 m), body mass (62.9 ± 7.9 kg), body mass index (BMI, 21.6 ± 2.6), MVC (41.4 ± 12.2 kg), MTH (52.3 ± 6.6 mm), CS-30 (33.1 ± 4.3 reps), SBJ (2.13 ± 0.20 m), handgrip (41.2 ± 6.4 kg) and mid-thigh girth (50.8 ± 4.3 cm). Knee extensor MVC was correlated with SBJ (r=0.361, p<0.001), hand grip (r=0.523, p<0.001) and mid-thigh girth (r=0.401, p<0.001), but not with CS-30 test (r=0.126, p<0.05). Knee extensor MTH was correlated with handgrip (r=0.317, p<0.001) and mid-thigh girth (r=0.632, p<0.001), but not with SBJ (r=0.038, p>0.05) and CS-30 test (r=0.145, p<0.05).

**Conclusion:** Our results indicated that the measurements of handgrip and mid-thigh girth are useful methods for evaluating knee extensor muscle strength and size, and thus they could play an important role in the physical fitness of university freshmen male students for the prevention of sarcopenia and to maintain an active life in the future.

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**Table: Descriptive statistics of participants' characteristics by age**

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<th>Age Group</th>
<th>N</th>
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**Variables**

- **Age**
- **Gender** (female/male)

**Anthropometrics**

- **Weight**
- **Height**
- **BMI**
- **Fat mass (%)**
- **Fat free mass (%)**

**Fitness**

- **HR (beat min⁻¹)**
- **VO₂ peak (L·min⁻¹)**
- **Relative VO₂ peak (ml·kg⁻¹ ·min⁻¹)**
- **HRmax (beat min⁻¹)**
- **Right hand-grip (kg)**
- **Left hand-grip (kg)**
- **Leg strength (kg)**
- **Sit & reach test (cm)**
- **Standing long jump test (m)**
- **Flamingo test (sec)**
- **Gesell bar test (sec)**
- **Get up and Go Test (sec)**

**Note:** Values are means (SD)

**Abbreviations:** BMI, body mass index; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; VO₂, oxygen consumption; 6MWT, six minute walk test.

**Results:**

- Significant difference (p < 0.05) 20-29 yr vs. 40-49 yr
- **Significant difference (p < 0.05) 20-29 yr vs. 40-59 yr and 20-29 yr vs. 60-75 yr**
- **Significant difference (p < 0.05) 30-39 yr vs. 50-59 yr and 30-39 yr vs. 60-75 yr**
- **Significant difference (p < 0.05) 40-49 yr vs. 50-59 yr and 50-59 yr vs. 60-75 yr**

**Test-retest Reliability Of A Field-based Physical Fitness Assessment For Children And Adolescents**

**Aged 9-17 Years: The Fuprecol Study**

- **Diogo Rodrigues-Bezerra 1, Monica Liliana Ojeda-Pardo 2, Diana Lorena Camelo-Prieto 2, Luis Andrés Téllez Tinjaca 2, Jorge Enrique Correa-Bautista 1, Robinson Ramirez-Vélez 1, 1Universidad del Rosario, Bogotá D.C, Colombia. 2Universidad Santo Tomas, Bogotá D.C, Colombia. Email: robin640@hotmail.com**

**Purpose:** Substantial evidence indicates that youth physical fitness levels are an important marker of lifestyle and cardio-metabolic health profiles and predict future risk of chronic diseases. The reliability physical fitness tests have not been explored in Latino-American youth population. The present study aims to determine the test-retest reliability of the Fitness Test Battery in children and adolescents aged 9-17 years.

**Methods:** Participants were 229 Colombian youth (boys n=124 and girls n=105) aged 9 to 17 years old. Five components of field-based physical fitness were measured: 1) morphological component: height, weight, body mass index (BMI), waist circumference, triceps skinfold, subscapular skinfold, and body fat (%) via impedance; 2) musculoskeletal component: handgrip and standing long jump test; 3) motor fitness (6 MWT, shuttle run test, get up and go test, standing long jump test, and sit & reach test).

**Note:** Values are means (SD)

**Abbreviations:** BMI, body mass index; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; VO₂, oxygen consumption; 6MWT, six minute walk test.

**Results:**

- Significant difference (p < 0.05) 30-39 yr vs. 40-49 yr
Methods: Participants (n=8) wore Fitbit® Charge and Actigraph® monitors for 7 days. First, correlations were run to examine the concordance of step counts and physical activity intensity intervals derived from Fitbit® Charge and Actigraph® algorithms. Next, accuracy was investigated by paired sample t-tests comparing each device’s assessment of step counts and minutes spent in light, moderate and vigorous intensity activity. Results: Significant correlations were found for all study outcomes (p<.05). Significant differences were observed for step counts on all days and weekly total step count (p<.05). Analyses of the intensity level revealed significant differences on most days for light and moderate intensity (p<.05). For vigorous intensity, only day 6 (p<.007) and accumulated weekly total of minutes were different (p<.014). Conclusions: Our correlation results were similar to previous research examining validity of other Fitbit® models. However, Fitbit® Charge devices may overestimate step counts. Moreover, the algorithm used by Fitbit® may overestimate light and underestimate physical activity, with underestimation rates in moderate physical activity. Further research is needed to determine reliability of Fitbit® Charge to assess activity and intensity that reflects current health recommendations. Therefore, researchers should use discretion if considering use of Fitbit® Charge for research purposes.

The latest evidences of the ergogenic effects of a dentistry-design bite-aligning mouthpiece required more studies comparing its acute effects in anaerobic ability and ventilatory parameters. However, the cost and the comfortability of the pieces, together with its obstructive effect on air flow dynamics, put the athletes away from its use. PURPOSE: To test the ergogenic acute effects of using a custom-made mouthpiece on oral airflow dynamics, 30-sec Wingate Anaerobic Test performance parameters. METHODS: Twenty-eight healthy and physically active male subjects participated. Experimental trials were performed in a random counterbalanced order. RESULTS: There were significant differences between mouthpiece and no-mouthpiece condition in mean power (W·Kg-1), peak power (W·Kg-1), Time to peak (s), Rate to Fatigue (W·s-1) of a 30-sec Wingate Anaerobic Test. Also, there were significant lower lactate production (mMol·L-1) but no significant differences were found in RPE. In airflow dynamics, the maximum expiratory volume (VEmax L·min-1) was significantly higher when comparing the mouthpiece and the no-mouthpiece conditions in both forced and unforced conditions. CONCLUSIONS: Wearing a customized mouthpiece, the anaerobic ability measured through the performance parameters in Wingate Test has been improved and forced expiratory volume has been increased in an oral airflow testing procedure.
analyses of variance (ANOVAs) were utilized to examine the inter-rater reliability of the overall ME score and individual sub-test scores. An α = 0.05 determined statistical significance. RESULTS: The ICCcs of the overall ME score and all individual sub-tests were statistically significant (ρ < 0.05) and no statistically significant differences were identified between raters (ρ > 0.05). The ICCcs of the overall ME test score was 0.970 (95% CI = 0.840 – 0.995) and the ICCcs of the seven sub-tests ranged from 0.750 – 0.976 (95% CIa = 0.186 – 0.996). CONCLUSIONS: The results of this study suggest that the inter-rater reliability of the Fusionetics™ ME test ranged from moderate to good (ICCcs = 0.750 – 0.976) and no systematic bias was identified between raters. This implies that raters of differing expertise can utilize the Fusionetics™ ME test to quantify functional movement quality among the firefighter cadet cohort population.

In an attempt to decrease musculoskeletal injury risk, practitioners have begun implementing interventions in an attempt to enhance functional movement quality among various populations, including firefighters. However, the responsiveness of the Fusionetics™ Movement Efficiency (ME) test, a commonly utilized tool used to quantify functional movement quality, has yet to be examined. PURPOSE: To determine the response stability of the Fusionetics™ ME test between two raters of differing expertise among the firefighter cadet population. METHODS: Seven firefighter cadets (5 males, 2 females) volunteered to participate in the current study. All were Cobb firefighters and adapted the ME test during the 2014-15 training season. The study was approved by the university’s Institutional Review Board. The athletes were divided into two groups: 1) a control group (n = 2) who performed the ME test twice during the season, and 2) an intervention group (n = 5) who performed the ME test three times during the season. Athletes were given appropriate warm-up with a focus on repetition to avoid the learning effect. The ME test was performed on a standard 30m agility course with two trunk movements and two cervical spine movements. The first movement of the fusionetics™ ME test was a running start to maximize training potential and competitive performance. The purpose of this study was to evaluate athletes’ pre-training hydration. Twenty-eight athletes, who were actively training, volunteered and gave informed consent to participate in this study. The thirteen men had a mean age 21.23 [21.5] years, height 177.8 [7.9] cm, weight 88.1 [8.5] kg and a body composition 13.2 [5.4] %fat. The 15 women had a mean age 21.9 [8.5] years, height 164.8 [7.5] cm, weight 66.8 [8.9] kg and a body composition 18.5 [8.5] kg and a body composition 13.2 [5.4] %fat. After following a pre-determined euhydration (EU) protocol the athletes were measured for hydration status prior to their training sessions (PT) on three different occasions. The mean EU Hct for males and females was 44.8% (3.3) and 39.7% (1.9), respectively. The mean PT Hct for males and females was 46.0% (3.0) and 40.4% (2.0), respectively. The mean EU USG for males and females was 1.037 [0.002] and 1.016 [0.004], respectively. The PT USG for males and females was 1.020 [0.006] and 1.017 [0.006], respectively. The mean EU BWT for males and females was 88.1 kg (8.5) and 66.8 kg (8.9), respectively. The mean PT BWT for males and females was 89.9 kg (7.9) and 67.1 kg (9.1), respectively. There was no significant difference between the EU and PT Hct by gender. Likewise no difference was found between the EU and PT USG for the females. However, the USG (EU=1.017 [0.002], PT=1.020 [0.006]) of the males was significantly different between the EU and PT conditions. Also, males’ BWT increased from the EU to the PT conditions. This was contrary to the Hct and USG trend results. It is concluded that differences in the athletes’ training times of day compared to the euhydration protocol time of day significantly affected the BWT and USG measures of hydration status more so than Hct. When EU time and PT time were matched it was found that the athletes tend to be hydropohtized prior to training when measured for hydration status by Hct and USG. In an attempt to decrease musculoskeletal injury risk, practitioners have begun implementing interventions in an attempt to enhance functional movement quality among various populations, including firefighters. However, the responsiveness of the Fusionetics™ Movement Efficiency (ME) test, a commonly utilized tool used to quantify functional movement quality, has yet to be examined.

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Monitoring of biomechanical properties using Myoton can evaluate muscle disorder and dynamic sports performance. Trunk muscles provide postural control and spinal stability. However, little is known about relationships between mechanical properties and strength, and flexibility in flexion of trunk muscles. PURPOSE: The purpose of this study was to investigate whether the mechanical properties of trunk muscles using Myoton were correlated with isokinetic strength and flexibility at trunk flexion.

METHODS: Eighty-one healthy young men without orthopedic disorders participated in this study. To evaluate the mechanical properties; frequency (F), decrement (D), stiffness (S), creep (C), and relaxation (R), of trunk muscles, Myoton applied on rectus abdominis (RA), external oblique (EO), and 3-site of erector spine (9th thoracic vertebrae, T9; between 1st and 2nd lumbar vertebrae, L1–2; between 4th and 5th lumbar vertebrae, L4–5). Moreover, isokinetic strength of trunk at trunk flexion was measured as peak torque by isokinetic dynamometer (at 60, 120°/sec). Furthermore, trunk flexibility was assessed through trunk forward flexion (TF) and sit and reach (SR) test.

RESULTS: On the correlation between Myoton indices of the abdominal muscles and peak torque at trunk flexion, peak torque had a positive relationship (p < 0.05) with F (EO: r = 0.259 at 60 °/sec; RA: r = 0.279 at 120 °/sec) and S (EO: r = -0.222 at 120 °/sec whereas C (EO: r = -0.224, EO: r = -0.230 at 120 °/sec) and R (EO: r = -0.229 at 60 °/sec; RA: r = -0.270, EO: r = -0.246 at 120 °/sec) had a negative correlation (p < 0.05). Moreover, peak torque at trunk flexion was positively related to C (r = -0.272 at 60 °/sec and R (r = 0.243 at 60 °/sec) of T9 in erector spine (p < 0.05). Furthermore, trunk flexibility had a positive relationship with F (TF: r = 0.259, SR: r = 0.246 whereas C (TF: r = 0.259, SR: r = 0.277) and R (TF: r = 0.355, SR: r = 0.247) had a negative correlation, respectively (p < 0.05), on the correlation between mechanical properties of EO and trunk flexibility. CONCLUSION: Myoton would be a new method to evaluate biomechanical muscle properties related to physical fitness components of trunk, based on these results correlated with strength and flexibility at trunk flexion.
METHODS: 14 participants from a University Track and Field program were recruited. Participants reported to the laboratory three times to complete in a counterbalanced order, a Graded Anaerobic Test (WAnT), and a SeaRed test (combined assessment of aerobic and anaerobic). Each test was performed on the same electronically braked cycle ergometer. The SeaRed test consisted of a three minutes warm up at 100W followed by two minutes at approximately ventilatory threshold, followed immediately by a 45$s$ sprint with 7.5% of bodyweight applied to the flywheel. Aerobic capacity (Wmax) was assessed against the graded VO2max protocol, where work was increased every 2 minutes by 50W, and by 25W as the participant neared maximal intensity. Anaerobic variables of peak power (PP), average power (MP), and fatigue index (FI) were compared to a 45$s$ WAnT with 7.5% of body weight applied to the flywheel.

RESULTS: The SeaRed protocol obtained a valid measurement of the VO2peak (53.9 $\pm$ 7.9 kgmin-1, p=1.00). An ICC, using an absolute agreement model, of the SeaRed and the VO2max test revealed a strong intraclass correlation (0.911). Intra-test correlations using an absolute agreement model show strong correlations in absolute PP (0.92), MP (0.95), FI (0.90), relative PP (0.76), and relative MP (0.78), however, significant differences were observed between PP and MP for both absolute and relative values (p<0.05). Large confidence intervals were also present for PP, MP, FI, relative PP and relative MP.

CONCLUSIONS: Valid measurements of aerobic capacity were obtained through the traditionally anaerobic task, indicating the SeaRed can be used as an abbreviated VO2max test. However, more work is required before the SeaRed is a suitable replacement for the WAnT.

373 Board #210 June 1, 11:00 AM - 12:30 PM
Comparison of Medial Knee Displacement Assessment on the Overhead Squat and Landing Error Scoring System
Timothy C. Gribbin, Sarah J. de la Motte, Anthony I. Beutler. Uniformed Services University of the Health Sciences, Bethesda, MD. (Sponsor: Patricia Deuster, FACSM) (No relationships reported)

Medial knee displacement (MKD) in females has been associated with increased risk for anterior cruciate ligament injury (ACL). It can be reliably detected using clinical movement screens and is readily modifiable through corrective exercise. The Overhead Squat (OHS) and Landing Error Scoring System (LESS) are both valid indicators of MKD.

Purpose: To determine concordance between evaluation of MKD from the OHS relative to the more dynamic LESS.

Methods: Female U.S. Military participants (n=48, 20.6±2.7 yrs, 161.4±6.7 cm, 60.4±8.3 kg) from the Baltimore MEPS performed the OHS and LESS prior to entering military basic training. MKD for both tests was evaluated dichotomously: 0 indicating no MKD and 1 indicating the presence of MKD. The OHS was evaluated in real time. MKD on the LESS was evaluated at maximum knee flexion. McNemar’s Test for non-homogeneity was performed to determine paired proportions of MKD between the OHS and LESS.

Results: A total of 55 females (65.4%) displayed MKD on the OHS, and 76 females (90.5%) had MKD on the LESS. McNemar’s test showed non-homogeneity for MKD detection on both the OHS and LESS (X²=15.21, p<0.001); the majority of females (60.7%, n=51) who displayed MKD on the OHS also displayed MKD on the LESS. However, 29.8% (n=25) of females who displayed MKD on the LESS did not display MKD on the OHS. Only 4 (4.8%) females did not display MKD on either screen.

Conclusion: The OHS and LESS are both commonly used clinical screens for assessing MKD, a risk factor for ACL injury in females. Although the majority of females who displayed MKD on the OHS also displayed it on the LESS, 29.8% only displayed MKD on the more dynamic LESS suggesting that MKD manifests differently between static and dynamic tasks. Both screens have been biomechanically validated as indicators of MKD, but the dynamic task requirements of the LESS may be more representative of sport-specific movement. Further analyses comparing injury rates in recruits with MKD detected by OHS versus LESS are pending. The LESS could be a more accurate test for assessing dynamic MKD as a readily modifiable risk factor for ACL injury in females.

374 Board #211 June 1, 11:00 AM - 12:30 PM
Physical and Physiological Comparison between Marine Corps Forces Special Operations Command Operators and Combat Support Personnel
Scott D. Royer, Joshua D. Winters, John Abt, FACSM, Nicholas Heebner, Takashi Nagai, Matty Lovalekár, Brad Lambert, CAPT Necia Williams, Scott Leplatt, FACSM. 1University of Kentucky, Lexington, KY. 2United States Marine Corps, Camp Lejeune, NC. (Sponsor: Dr. John Abt, FACSM) (No relationships reported)

Tactical demands of a Marine Corps Forces Special Operations Command (MARSOC) Operator require high levels of physical performance. During combat deployments, teams of Operators may be supplemented with Combat Support personnel (CSP), who specialize in mission-specific tasks. MARSOC Operators and CSP may serve alongside each other in extreme combat environments, often enduring the same physical demands; however, they do not go through the same tactical training. PURPOSE: To examine the differences in physical and physiological characteristics between MARSOC Operators and CSP. METHODS: Testing included body composition (BF), anaerobic power (PAnP), aerobic capacity (AC), and knee and torso isokinetic strength testing (KF, KE, TF, TE) were collected on ~42 Operators (Age: 28.4 ± 6.1 years, Height: 178.8 ± 6.7 cm, Mass: 85.4 ± 7.9 kg) and 19 CSP (Age: 28.0 ± 7.1 years, Height: 178.0 ± 6.0 cm, Mass: 81.4 ± 11.3 kg). Differences between groups were evaluated using independent samples t-tests. RESULTS: Operators demonstrated greater physiological performance in ManP (9.2 ± 7.0 kg, 8.0 ± 1.3 kg; p<0.001), and AC (51.8 ± 5.4 ml/kg/min, 47.7 ± 7.6 ml/kg/min; p<0.009). Operators also demonstrated greater right KF (135.4 ± 27.4 %BW, 112.8 ± 26.9 %BW; p<0.005), left KF (132.3 ± 25.7 %BW, 113.3 ± 29.1 %BW; p<0.007), right KE (263.3 ± 47.5 %BW, 218.4 ± 60 %BW; p<0.002), left KE (250.8 ± 50.7 %BW, 215.4 ± 54.3 %BW; p<0.01), TF (231.1 ± 35 %BW, 198.1 ± 37.8 %BW; p<0.002), and TE (404.2 ± 101.8 %BW, 355.3 ± 50.2 %BW; p<0.019). No significant differences were found in BF and PAnP. CONCLUSION: Results exhibit significant discrepancies in physical and physiological performance between Operators and CSP. These findings suggest the need for CSP to incorporate additional training designed to enhance their ability to maintain performance at a higher standard, similar to that of Operators. Special operations teams require all personnel to perform as a unit; not having all team members perform at the required physical levels may be detrimental to the mission and all members of the combat team. Future research is needed to examine the physiological and physical dichotomy between Operators and CSP and minimum necessary standards to achieve successful tactical performance.

375 Board #212 June 1, 11:00 AM - 12:30 PM
Physiological Changes in College Students Following a Single Semester Physical Activity Class
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Most college physical activity classes fall short of providing enough physical activity to meet the ACSM’s current minimum weekly recommendations for physical activity. Since these courses are only 3–4 months in length, there is a question regarding the ability of these courses to produce physiological changes that have potential health benefits. PURPOSE: The purpose of this study was to examine changes in body composition, aerobic fitness, and muscular strength in college students following a single semester physical activity class. METHODS: Sixty four females (BMI – 25.4 ± 5.8, age – 21.2 ± 2.7 yrs) and 47 males (BMI – 27.7 ± 7.4, age – 21.7 ± 2.9 yrs) were enrolled in a one semester (16 week) physical activity class. Participants were enrolled in one of five different physical activity courses. All courses met for 50 minutes, twice per week. These courses consisted of weight training, circuit training, body weight training, and cross training and were designed to stress different energy systems on different days. Students were also encouraged to continue physical activity outside of class hours. The following measures were obtained during the first two and last two weeks of classes; resting heart rate, body weight, height, body composition (Bioelectrical impedance), left & right knee and torso isokinetic strength testing (KF, KE, TF, TE), and a push-up test. Pre- and post-test comparisons were made using paired t-tests. RESULTS: As a group, there were significant decreases in resting heart rate (4.3 ± 1.5 bpm), 1.5 mile run time (1:01 ± 0.30 min) and significant increases in hand grip strength (3.4 ± 1.2 kg) and push-ups completed (3.9 ± 0.8). In females, there was a significant decrease in 1.5 mile run time (1:05 ± 0.5 min) and a significant increase in push-ups completed (4.4 ± 1.0). In males, there was a significant decrease in heart rate (5.1 ± 2.3 bpm) and 1.5 mile run time (0.57 ± 0.5 min) and significant increases in hand grip strength (7.5 ± 2.4 kg) and push-ups completed (3.2 ± 1.1). There were no significant changes in body
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Recently, the use of wrist worn activity monitoring devices using tri-axial accelerometers to estimate step counts has become widespread in the general population. PURPOSE: To evaluate whether common, commercially available fitness monitoring devices can accurately estimate wheelchair stroke counts and arm ergometer revolutions. METHODS: 30 able-bodied wore three commercially available activity trackers using tri-axial accelerometers on the right wrist in random order. Participants propelled a wheelchair on a roller treadmill at three separate frequencies (30, 45 and 60 strokes per minute), 3 minutes each. They also propelled the wheelchair on the rollers at pre-determined varied frequencies, ranging from 30 bpm to 80 bpm for 2 minutes. Each frequency was performed 3 times in random order. The participants were shown a video recording of a metronome at each of the frequencies to maintain the prescribed frequencies for each task. Participants also freely wheeled through an obstacle course twice. Two experimenters used tally counters to count actual wheelchair strokes. A second group of subjects performed an arm ergometry task at three different frequencies (40, 60 and 80 cycles per minute) for three minutes each in a randomized order. RESULTS: Mean (SD) percentage error for 30, 45 and random stroke frequencies were ≤20 (11%) for all monitors. At 60 rpm, mean percent error was 12 (13), 12 (11), 5 (5)% for monitors A, B, and C, respectively. For obstacle course strokes, intraclass correlation coefficients (95% CI) were 0.888 (0.767-0.946), 0.853 (0.693-0.930), 0.917 (0.828-0.961) and Lin’s concordance coefficient (95% CI) were 0.792 (0.655-0.879), 0.740 (0.531-0.864), 0.846 (0.715-0.919) for monitors A, B, and C, respectively. For arm ergometry, standard error of the measurement varied widely for each monitor across all frequencies from 20, 33 and 261 strokes for monitors A, B, and C, respectively, at 40 rpm; 49, 190 and 8 strokes at 60 rpm; to 268, 267 and 107 strokes at 80 rpm. CONCLUSION: At low wheelchair stroke frequencies, and at low and high ergometer cycling frequencies, commercially available wrist worn fitness monitors perform rather poorly in estimating counts. Activity monitors specific to activities commonly performed by persons with lower limb paralysis are necessarily to accurately estimate their activity.

The North Carolina Basic Law Enforcement Training Program (BLET) is used to certify law enforcement officers in the State of North Carolina. PURPOSES: 1) To develop new physical fitness assessment tables from recent (2013-2015) NC police recruit scores. 2) To compare the Cooper Institution physical fitness tables and the new NC physical fitness tables. METHODS: Data was collected from eight NC law enforcement academies. The physical fitness tests conducted include muscular endurance, muscular strength, power, and cardiovascular assessments. The sample included n=593 male officers age <40 years. Post assessment scores were used in the comparison. Percentiles, two-sample Kolmogorov-Smirnov test and a Welch two-sample t-test were used to compare the Cooper and NC tests. RESULTS: NC recruits had significantly better scores than the Cooper sample (P<0.001) for the following tests: pushups, sit-ups, vertical jump, bench-press ratio, and 300 meter run. For <30 year olds, the means were 55.79±12.6 vs 35.4±17.4 reps, 48.7±7.1 vs 39.9±6.7 reps, 62.6±11.8 vs 51.6±12.0 cm, 1,233±24 vs 1,190±35, and 50.9±8.4 vs 56.4±8.4 sec, respectively. For the 30-39 year olds, the means were: 53.7±11.3 vs 29.0±15.1 reps, 46.5±6.5 vs 36.2±9.3 reps, 58.7±11.4 vs 48.8±10.6 cm, 1,160±24 vs 0.94±2.04, and 54.5±9.1 vs 57.2±10.6 sec, respectively. However, the Cooper sample had faster times for the 1.5 mile run for both age groups, <30 being 12:13±2:30 vs 11:50±2:19 min/sec, and 30-39 being 13:58±3:06 vs 12:16±2:22 min/sec. CONCLUSION: Overall the Cooper tables being used in the State of NC for BLET fitness standards are substantially lower than what the NC police recruit data displays. Therefore, the need is justified to update the BLET fitness standards for the State of NC.

The StepWatch 3, an ankle mounted pedometer, has previously been deemed 98-100% accurate for counting walking steps (26.8 to 107.3 m·min⁻¹) using the default settings for cadence and sensitivity. With the same settings, however, this device does not accurately count running steps. Through the advanced programming mode, one can vary the cadence and sensitivity settings, which may improve accuracy at higher speeds of ambulation. PURPOSE: To examine how changing the cadence settings on the StepWatch affects the device output at various walking and running speeds. METHODS: Fifteen participants (28.3±9.7 years) completed 2-min trials of treadmill ambulation at 10 different speeds (2.6-8 to 268 m·min⁻¹) while wearing a device on the medial and lateral aspect of each ankle, directly above each malleoli for a total of 4 devices overall. Sensitivity was held constant at the default value of 13 while the cadence setting varied across the devices (C₉₀=100%, C₆₃=83%, C₅₀=70%, and C₃₉=60% of the default cadence setting). Devices were randomized for ankle location. Direct observation was used as the criterion of step count (steps/min). RESULTS: The following table shows the percent accuracy for each setting and speed. Values in bold denote statistically significant differences as compared to the criterion.

<table>
<thead>
<tr>
<th>Speed (m·min⁻¹)</th>
<th>C₉₀</th>
<th>C₆₃</th>
<th>C₅₀</th>
<th>C₃₉</th>
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</thead>
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<tr>
<td>26.8</td>
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<td>99.6</td>
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</table>

Conclusions: When using the default cadence settings, the StepWatch accurately counted walking steps but severely under-counted running steps. However, by entering a cadence value equal to 70% of the default value (C₅₀), the device accurately counted...
steps from 107.2 to 268.2 m·min⁻¹. At walking speeds of 26.8 to 80.5 m·min⁻¹ Cₚ₀ over-counted steps. Further research is needed to explore the sensitivity setting with a goal of improving accuracy.

CONCLUSION: This study confirms the importance of the length of time staying active and its role in improving cholesterol level. An important finding of the study is that the length of the longest sedentary bout in the entire dataset had an impact on TC, non-HDL, and FBG. Therefore, results indicate that breaks from long continuous periods of sedentary time may improve level of FBG and cholesterol in young college-aged Hispanic females.

The StepWatch ankle-mounted pedometer is accurate for step count at walking speeds but it does not accurately count steps at running speeds using the default settings. Advanced programming allows users to enter cadence and sensitivity settings in an attempt to optimize step counting over a range of speeds. PURPOSE: To examine the effect of altering the StepWatch sensitivity setting on accuracy of step count across 10 speeds while holding the cadence setting constant. METHODS: Fifteen participants (28.5 ± 9.7 years) completed 2-min trials of treadmill ambulation across 10 speeds ranging from 26.8 to 268.2 m·min⁻¹ while wearing one device on the medial and lateral aspects of each ankle, directly above the malleoli, for a total of 4 devices overall. A second set of trials was conducted to examine a fifth setting. The cadence setting on each device was held constant at 70% of the default value while sensitivity was altered (S₁ = 12, S₂ = 13, S₃ = 14, S₄ = 16 and S₅ = 18). All device outputs were compared against a criterion measure of hand step count (steps/minute). RESULTS: The following table shows the percent accuracy for each setting and speed. Values in bold denote statistically significant differences as compared to criterion measurements.

<table>
<thead>
<tr>
<th>Speed (m · min⁻¹)</th>
<th>S₁</th>
<th>S₂</th>
<th>S₃</th>
<th>S₄</th>
<th>S₅</th>
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<td>90.2</td>
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<td>91.3</td>
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</tbody>
</table>

CONCLUSIONS: The default cadence setting varies with height of the individual. By configuring the StepWatch with a cadence setting equal to 70% of the default value and a sensitivity setting of 16, the device is able to accurately report steps for the majority of daily ambulation speeds.

Physical activity (PA) benefits the outcome of various diseases by impacting risk factors such as high level of total cholesterol (TC), low level of high-density lipoprotein (HDL) and high fasting blood glucose (FBG). Life is demanding and stressful for college students when they encounter rigorous course loads that influences their PA levels.

METHODS: Thirty-five female subjects (age 19.5 ± 1 year) visited the laboratory on two separate days. In the first visit, subjects signed and completed documentation on two separate days. In the first visit, subjects signed and completed documentation that consisted of consent forms, demographic and contact information. Following the initial screening, subjects were instructed to maintain their normal daily routine and were given ample instructions on proper placement and guidelines on the accelerometer. The subjects wore the accelerometer for seven consecutive days, which included five weekdays and a weekend. After the seven days had passed, the subject would return, fasted, to turn in the accelerometer and have their TC, HDL, non-HDL cholesterol, TC-HDL ratio, and FBG tested. A two-tailed Pearson’s correlation was used to analyze the results.

RESULTS: There was a significant negative correlation between total break time in sedentary bouts to TC (r = −.460, p < .01), non-HDL (r = −.532, p < .01), and TC-HDL ratio (r = −.401, p < .02). There was also a significantly positive correlation between maximum sedentary bouts to TC (r = .358, p < .04), non-HDL (r = .341, p < .05), and FBG (r = .455, p < .02). Steps per minute were negatively correlated with TC (r = −.346, p < .04), average kcal per day was significantly and negatively correlated with HDL (r = −.360, p < .04), but positively correlated with FBG (r = .416, p < .02).

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Purpose: Transcranial magnetic stimulation (TMS) has been broadly used to assess changes in cortical voluntary activation (VATMS) after fatigue protocols. The most currently used method encompasses a superimposed TMS during a maximal voluntary contraction (MVC) and two submaximal contractions (75% MVC and 50% MVC), interspersed with a rest period (5 to 10 s) between contractions. However, when fatigue etiology has to be understood immediately after exercise or task failure, this traditional approach may underestimate the contribution of central mechanisms in force generating capacity decrease, as the recovery of the neuromuscular system is very quick. To test the hypothesis that methodology to assess VATMS influences the rate of central fatigue, we conducted a study that compared the traditional (TRAD) method to a continuous one (CONTI) with no rest periods between contractions.

METHODS: Voluntary activation was determined in 8 young healthy adults before and after a 2-min sustained MVC of the knee extensors in two randomly assigned sessions. In the TRAD session, evaluations comprised a 7-s rest between the 3 contractions (100%, 75% and 50% MVC) allowing to determine VATMS and evaluation following the 2-min sustained MVC started after a minimal rest (3.5 s). In the CONTI session, evaluations were performed with no rest allowed between the 3 levels of contraction and evaluation following the 2-min sustained MVC commenced without any rest. VATMS assessment was repeated 2 min after the end of the fatiguing task in each session.

RESULTS: Voluntary force at the end of the 2-min MVC was equally depressed in TRAD and CONTI. After the sustained MVC, there was a significant depression in VATMS in both TRAD and CONTI (P < 0.05). However, the deficit was significantly greater (P < 0.001) in CONTI than in TRAD (~30% vs ~9%, respectively). Two minutes after exercise completion, the values were not different from baseline, whatever the session.

CONCLUSIONS: These finding show that when only a few seconds of recovery are allowed, the amount of central fatigue assessed by VATMS can be extremely underestimated. Thus, the continuous method should be preferred when determining voluntary activation deficit.

Purpose: Physical activity has been shown to have beneficial effects on cognition in elementary school children as well as elderly individuals. This study was conducted to determine if the relationship persists in young adults and to what extent aerobic fitness might be associated with academic performance in a graduate school setting.

METHODS: Thirty-seven apparently healthy medical and nursing students (18 men) were recruited to a clinical trial to evaluate the effects of improved fitness on objective measures of academic performance in terms of maximum voluntary activation deficit. Students were allowed, the amount of central fatigue assessed by VATMS can be extremely underestimated. Thus, the continuous method should be preferred when determining voluntary activation deficit.
Trained runners often face injury due to the high impact nature of the sport and lower limb strain. When injury occurs, runners commonly substitute alternative low-impact exercises modes like cycling and swimming. While these modes promote cardiovascular fitness they do not mimic the biomechanical patterns of running. An alternate form of training, ElliptiGO cycling, combines the low-impact of elliptical training with the mechanical patterns of running. However, the metabolic demands of ElliptiGO cycling have not been investigated.

**PURPOSE**: To compare the metabolic demands of stationary ElliptiGO cycling with treadmill running.

**METHODS**: In a randomized cross-over design, 17 trained runners (9 males; 8 females, age 21.4 ± 1.1 yr, body mass 60.8 ± 9.2 kg, height 1.70 ± 0.07 m, body fat 12.6 ± 5.9%) completed 5 × 5 min stages while either cycling on a stationary ElliptiGO bike or running on a treadmill during which heart (HR), rating of perceived exertion (RPE), and expired gases were collected using a metabolic analyzer during each exercise bout. Subjects increased one gear or 1 mph every 3 min during cycling or running respectively. Pedaling cadence was fixed at ~70 rpm using a metronome. Linear regression analyses were performed for each physiological variable and speed. Metabolic demand data for running and ElliptiGO were matched to determine equivalent running and cycling speeds. The other physiological measures were then matched with the corresponding running and ElliptiGO cycling speeds.

**RESULTS**: For each testing intensity, metabolic demand (VO2), HR, and VE were matched with the corresponding running and ElliptiGO cycling speeds. The other physiological measures were then matched for VO2, the HR, VE, and RPE were significantly higher for ElliptiGO (4 mph run = 10.2 mph ElliptiGO, 7 mph = 17.1 mph, 10 mph = 24.1 mph). When speed during running had a steeper slope compared to ElliptiGO. As a result, the ElliptiGO metabolic (lactate) threshold (VO2θ) and sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), Flinders Fatigue Scale (FFS) and Athens Insomnia Scale (AIS).

**CONCLUSIONS**: ElliptiGO cycling is a practical training device that will elicit a similar metabolic demand, but higher HR, VE, and RPE compared to running at faster cycling speeds. Supported by the Student Summer Scholars program at Grand Valley State University.
CONCLUSIONS: While the Chinese college students did not gain weight and remained flexible during the past decade, a decline in both aerobic capacity and upper-body strength was observed. The targeted intervention to improve these fitness components of the Chinese college students is urgently needed.

Prone plank is a widely used exercise in core stability training. Research showed that pelvic tilt plays an important role on the EMG activation of core musculature. However, the influence of scapular position on EMG activation is currently unknown.

METHODS: Fifteen participants (10 men and 5 women) were included in this study (mean ± SD age: 24.35 ± 4.29 years; weight: 68.97 ± 9.28 kg; height: 1.73 ± 0.11 m; training experience: 8.64 ± 1.39 years). Muscle activation was measured by electromyography in rectus abdominis (RA), external oblique, (EO), internal oblique (IO) and erector spinae (ES). Joint positions were controlled with 2D kinematic analysis. Four variations were performed: scapular abduction and anterior/posterior pelvic tilt (ABANT and ABRET); and scapular adduction and anterior/posterior pelvic tilt (ADANT and ADRET). The rated perception of effort (RPE) was also registered.

RESULTS: ADRET showed significantly higher values, in terms of total intensity (145.39 ± 88.25%) compared to ABANT and ADANT (55.14 ± 33.85 and 56.91 ± 30.33; p < 0.05). RA presented higher activation in ADRET (77.48 ± 43.72%) compared to ABANT and ADRET (7,44 ± 2,1) compared to the rest (ABANT 49.76 ± 24.02%, ABRET 70.42 ± 35.45%, ADANT 48.27 ± 35.14%; p < 0.01). ES and ADANT (40.26 ± 29.72%; p < 0.01) and ABRET, 73.53 ± 31.11%; p < 0.05). RA presented higher activation in ADRET (77.48 ± 43.72%) compared to ABANT and ADRET (145.39 ± 88.25%) compared to ABANT and ADRET (55.14 ± 33.85 and 56.91 ± 30.33; p < 0.05). RA presented higher activation in ADRET (77.48 ± 43.72%) compared to ABANT and ADRET (7,44 ± 2,1) compared to the rest (ABANT 49.76 ± 24.02%, ABRET 70.42 ± 35.45%, ADANT 48.27 ± 35.14%; p < 0.01). ES showed significantly higher differences in ADRET (119.91 ± 60.28%) compared to the rest (ABANT 49.76 ± 24.02%, ABRET 70.42 ± 35.45%, ADANT 48.27 ± 35.14%; p < 0.01). ES showed significantly higher differences in ADRET (7.44 ± 2.1) compared to the rest (ABANT 4.74 ± 1.47%; p < 0.01; ADANT 5.56 ± 1.73% and ADRET 5.48 ± 1.24; p < 0.05). Finally, In RPE, ADRET elicited the highest values (7.5 ± 1.16) compared to ABANT 4.57 ± 1.82, ABRET 5.21 ± 1.67, (p < 0.01); and ADANT (5.75 ± 2; p < 0.05).

CONCLUSIONS: Scapular position had a significant influence on EMG activation, showing highest values in ADRET position.

The time constraint is the major problem for inactive people to reach minimal physical activity ACSM requirements. Nanotaining, short high intensity training, can be a solution providing that the intensity is high enough. However, few tools are available to the public to access a NanoTraining program. PURPOSE: to measure if an active video game providing Nanotaining can prescribe the minimum intensity necessary to induce health benefits.

METHODS: A total of 23 participants (11 women and 12 men, 33 ± 4 years) practicing less than 120 minutes per week of physical activity were recruited to test 4 mini-games (Shape-Up, Ubssoft Entertainment Inc). Each mini-game lasted around 1.5 mins where the participant needed to give their maximum during the games. The 4 mini-games selected were: Squat me to the moon (squat), Push them up (push-up), Snow ball (running), and Arctic punch (punch). During the mini-games, oxygen uptake (VO2), heart rate (HR) and energy expenditure (EE) were measured with a portable metabolic analyser (K482, Cosmed, Fr) and these variables were reported, relatively and respectively, to peak VO2 obtained by a progressive maximal step test.

RESULTS: The % VO2peak for the 4 mini-games were respectively 81±12%, 49±17%, 93±13%, 60±14%. The average VO2 was respectively: 23±3, 15±2, 26±4, 17±5 ml/kg/min. The average heart rate was 164 ± 13, 150 ± 11, 164 ±21, 138±17 bpm.

CONCLUSIONS: Shape-up has the potential to be used as a NanoTraining modality providing that some of the mini-games selected are high intensity games (ex: Squat and running). Furthermore, the motivation and pleasure of using active video games can help to improve the exercise intensity deployed.
INTRODUCTION Competitive swim coaches commonly use swim time observed from pace clocks and stopwatches and or direct verbal feedback from athletes as the primary means of quantifying competitive swim activity (i.e. swim bout distance, speed, and energy expenditure). However, current methods such as crank or hub-based meters. However, being a more recent device, the development of mobile power meters (e.g., SRM, Garmin Vector Power Meter) now permit the use of accelerometer-based monitors during aquatic activity. Recent studies suggest the use of activity monitors can provide an alternative, unobtrusive means of quantifying competitive swim activity (i.e. swim bout distance, speed, and energy expenditure). Wu et al. (2013) analyzed activity counts from activity monitors and or direct verbal feedback from athletes as the primary means of quantifying competitive swim activity (i.e. swim bout distance, speed, and energy expenditure). This study demonstrates that regression techniques using accelerometer-based activity counts recorded from arm stroke and leg kick movement can provide an estimate of competitive swim bout intensity within a group of collegiate swimmers.

MATERIALS AND METHODS: Nine sets of collegiate swimmers were analyzed. Swimmers were monitored for 10 training sessions totaling 60 swimmers. Activity counts were recorded from arm stroke and leg kick movement, and swim bout intensities were measured. The coefficients of determination (R^2) were calculated for each subject. RESULTS: Linear and 2nd order polynomial fits for each subject were calculated. The relationship between activity counts and physiological measures were modeled using linear and 2nd order polynomial fits for each subject. CONCLUSIONS: Linear regression analyses were significant in all models examining blood lactate (p < 0.05) and for eight of the ten subjects in models examining HR (p < 0.05). Polynomial regression analyses were significant for all subjects in models examining blood lactate (p < 0.05) and for five of the ten subjects in models examining HR (p < 0.05). Mean values for individualized regression analyses R^2 values ranged from 0.71-0.95 and 0.76-0.98 for linear and polynomial models respectively. Polynomial models for all groups were significant in all subjects (p < 0.05; R^2 values ranged from 0.94-0.99). CONCLUSIONS: This study demonstrates that regression techniques using accelerometer-based activity counts recorded from arm stroke and leg kick movement can provide an estimate of competitive swim bout intensity within a group of collegiate swimmers.

INTRODUCTION Heart rate, blood lactate, and accelerometer-based Activity Data During An Incremental Swim Test

PURPOSE: The purpose of this study was to further examine the relationships between physiological measures (i.e. heart rate and blood lactate) and activity counts (from arm stroke and leg kick movement) during a progressive series of swim bouts. METHODS: Actual activity counts (from arm stroke and leg kick movement), swim speed, heart rate (HR), and blood lactate were collected during a series of seven linearly progressive free swim crawl swim bouts each one 182.8m (200 yard) in distance. Subjects consisted of ten collegiate competitive swimmers (5 men & 5 women, Age 20.8 ± 1.1 years). The relationship between activity counts and physiological measures were modeled using linear and 2nd order polynomial fits for each subject. RESULTS: Linear regression analyses were significant in all models examining blood lactate (p < 0.05) and for eight of the ten subjects in models examining HR (p < 0.05). Polynomial regression analyses were significant for all subjects in models examining blood lactate (p < 0.05) and for five of the ten subjects in models examining HR (p < 0.05). Mean values for individualized regression analyses R^2 values ranged from 0.71-0.95 and 0.76-0.98 for linear and polynomial models respectively. Both linear and polynomial polynomial models examining the relationship between activity counts and swim speed were significant in all subjects (p < 0.05; R^2 values ranged from 0.94-0.99). CONCLUSIONS: This study demonstrates that regression techniques using accelerometer-based activity counts recorded from arm stroke and leg kick movement can provide an estimate of competitive swim bout intensity within a group of collegiate swimmers.

INTRODUCTION Cardiovascular disease (CVD) has been identified as a leading cause of death in the United States, with more than two million Americans having a heart attack or a stroke and close to a million deaths each year. Research shows that one of the independent risk factors for CVD is increased sedentary time. Sedentary behaviors predominate modern life and there are numerous negative health effects associated with inactivity. Physical fitness is inversely related to mortality, and it is believed that by simply decreasing sedentary time and increasing exercise time, cardiovascular risk factors and vascular health measures will improve. Previous studies have found that four weeks of exercise reduces blood pressures, leads to fat weight loss, and improves fitness.

PURPOSE: The purpose of this study is to determine if a 4-week self-report lifestyle intervention will increase fitness measures such as VO2peak, balance, core strength, power and speed.

METHODS: Nine adults have completed the 4-week exercise program, and data collection is ongoing. Participants underwent pre- and post-intervention testing. During the fitness test, participants' VO2peak, power, speed, core strength, and balance were measured. The functional fitness test included a maximal Bruce protocol treadmill test to estimate VO2peak, 2-min stair climb, left and right single leg balance, plank pose, and a wall sit. For the intervention, three times a week, participants completed a 6-station exercise circuit, rotating through the stations 3 times. The circuit included functional exercises such as weighted carries, stair climbs, balance, and core strength.

RESULTS: Participants' average age was 34.8 ± 16.2 yrs, and body weight was 153.7 ± 28.2 lbs. There was a 96.3% adherence to exercise over the 4-week intervention. After four weeks of exercise, we found increases in the number of stairs climbed (33.7 steps, p = 0.02), the amount of time held for single leg balance (left 50.7 sec, p = 0.12; right 41.3 sec, p = 0.04), the amount of time a plank pose was held (18.2 sec, p = 0.02), the amount of time a wall sit was held (9.5 sec, p = 0.02), and VO2peak increased by 1.8 ml/kg/min (p = 0.08). CONCLUSION: Our results suggest that four weeks of a functional fitness exercise circuit improves fitness measures, but additional data collection is necessary.

The development of mobile power meters (e.g., SRM, Garmin Vector Power Meter, VPM, PowerTap (PT) has allowed cyclists to track their power output (PO) while both training, competing, and as an assessment tool to establish training zones. The VPM is a newer power meter that measures PO at the pedal as opposed to other methods such as crank or hub-based meters. However, being a more recent device, the VPM has not been independently tested in any research studies to our knowledge.

PURPOSE: Thus this study was done to determine the validity and reproducibility of the VPM by comparing it to the PT during a maximal ergometer test.

METHODS: Two active college students (age: 21.5 ± 0.7 years, height: 172.4 ± 0.5 cm, body mass: 70.2 ± 10.6 kg) volunteered to participate in the study. After being fitted for the bike, the subjects performed a 5 min warm-up at 40 W. After the warm-ups, the subjects completed a maximal step-wise test to exhaustion beginning at 60 W. The subjects were instructed to ride at greater than 70 RPM, and the resistance increased 20 W every 3 minutes until their cadence dropped below 60 RPM.
Cardiorespiratory fitness, typically determined by maximal oxygen uptake (VO$_2$max), represents the maximal rate of oxygen consumption during exercise testing to volitional fatigue. Previous research (Katch, Sady, & Freedson, 1982) has reported that the biological variability of VO$_2$max at sea-level equates to 5.3%. To our knowledge, the biological variability of VO$_2$max has not been studied at altitude.

**Purpose:** The aim of this study was to quantify the biological variability of VO$_2$max at 2,348 meters (a desirable elevation for altitude training) using two different VO$_2$max criteria: the traditional VO$_2$ plateau at VO$_2$max concept and verification procedure.

**Methods:** Ten physically active men and women (age = 27.1 ± 7.2 yr, height = 176.0 ± 9.4 cm, weight = 75.1 ± 12.2 kg) participated in this study. In week #1 participants performed 2x maximal graded exercise trials (GXT) on the treadmill separated by 1-4 days with the traditional VO$_2$ plateau at VO$_2$max concept and verification procedure. In week #2 participants completed 2x GXT + verification bout trials on a cycle ergometer separated by 1-4 days with the verification procedure to confirm attainment of VO$_2$max. Verification bouts were performed 20 min after GXT at a constant exercise workload of 105% peak work rate. Coefficient of variation (CV%) was calculated to quantify biological variability of VO$_2$max for each VO$_2$max criteria.

**Results:** Trends of VO$_2$max values for trials #1 and #2 were 45.2 ± 6.4 and 46.7 ± 6.9 mL/kg/min, respectively with the biological variability of VO$_2$max equating to 4.3% when using the VO$_2$ plateau at VO$_2$max concept applied to confirm VO$_2$max. Cycle ergometry VO$_2$max values for trials #1 and #2 were 45.3 ± 7.3 and 43.2 ± 7.0 mL/kg/min, respectively with the biological variability of VO$_2$max equating to 2.3% when using the verification procedure to confirm attainment of VO$_2$max. **Conclusion:** In summary, our findings support use of the verification procedure to quantify biological variability of VO$_2$max at altitude. This is particularly relevant to interpretation of studies that have used repeated measurements of VO$_2$max to establish a training effect or when VO$_2$max is used for designing training programs.

**REFERENCES**


limited research has been done on the relationship between physical fitness (PF), objectively measured physical activity levels (PAL) and different markers of fitness in AID. PURPOSE: To examine associations between PF, PAL and fitness in AID. METHODS: An AID group (54 m/44 f; 44±12 y) were recruited from an Occupational Day Center. BMI, body fat percentage (BF%), fat free mass percentage (FFM%), waist (WC) and hip circumferences (HC) were obtained. VO2 peak was obtained during a metabolic treadmill test. GTx Actigraph accelerometers were used to collect total PA (TPA), steps per day (DS), time spent in sedentary (ST), light PA (LPA); moderate PA (MPA), vigorous PA (VPA), moderate to vigorous PA (MVPA). The timed up and go test (TUGT) to assess dynamic balance and gait speed was used. Handgrip (HG) and leg strength (LS) were also obtained.

RESULTS: VO2 peak correlated with TPA (r=−0.421), DS (r=−0.318), VPA (r=−0.240), MPA (r=−0.517), BF% (r=−0.496), FFM% (r=−0.480), WC (r=−0.445), HC (r=−0.412), TUGT (r=−0.363), HG (r=−0.435) and LS (r=−0.432). TPA and DS were correlated with HG (r=−0.348; r=−0.280) and LS (r=−0.294; r=−0.221). VPA was correlated with BF% (r=−0.229) and FFM% (r=−0.218). MVPA was correlated HG (r=−0.347; r=−0.268), LS (r=−0.326) and TUGT (r=−0.229).

CONCLUSIONS: The present results show that high levels of PA are positively associated with PF. VPA, in particular, is associated with BF% and FFM% in AID. Future PA recommendations for AID should consider a particular emphasis on the amount of VPA when promoting PA.

Partially supported by: MEC (Ref: DEP2012-35335) & AGAUR (Ref: 2013FI_B2_00091)

Table 1. Physical fitness, physical activity levels and fitness data for AID

<table>
<thead>
<tr>
<th>Variables</th>
<th>AID (n=98)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>71.9 (14.3)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>28.1 (6.4)</td>
<td></td>
</tr>
<tr>
<td>Body fat percentage (%)</td>
<td>30.4 (10.5)*</td>
<td></td>
</tr>
<tr>
<td>Fat free mass (%)</td>
<td>33.3 (7.7)*</td>
<td></td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>94.5 (13.7)*</td>
<td></td>
</tr>
<tr>
<td>Hip circumference (cm)</td>
<td>101.4 (10.2)*</td>
<td></td>
</tr>
<tr>
<td>VO2 peak (ml·kg·min⁻¹)</td>
<td>26.5 (6.6)*</td>
<td></td>
</tr>
<tr>
<td>Steps (steps·day⁻¹)</td>
<td>6162 (2790)*</td>
<td></td>
</tr>
<tr>
<td>Total PA (counts·min⁻¹)</td>
<td>251.8 (124.4)*</td>
<td></td>
</tr>
<tr>
<td>Sedentary (mins·day⁻¹)</td>
<td>613.1 (80.5)</td>
<td></td>
</tr>
<tr>
<td>LPA (mins·day⁻¹)</td>
<td>128.4 (46.7)</td>
<td></td>
</tr>
<tr>
<td>MPA (mins·day⁻¹)</td>
<td>29.9 (22.1)*</td>
<td></td>
</tr>
<tr>
<td>VPA (mins·day⁻¹)</td>
<td>0.9 (0.9)*</td>
<td></td>
</tr>
<tr>
<td>MVPa (mins·day⁻¹)</td>
<td>30.8 (22.6)*</td>
<td></td>
</tr>
<tr>
<td>Right HG (kg)</td>
<td>20.9 (7.7)*</td>
<td></td>
</tr>
<tr>
<td>Left HG (kg)</td>
<td>19.8 (7.4)*</td>
<td></td>
</tr>
<tr>
<td>Leg strength (kg)</td>
<td>40.7 (21.5)*</td>
<td></td>
</tr>
<tr>
<td>TUGT (sec)</td>
<td>14.5 (3.3)*</td>
<td></td>
</tr>
</tbody>
</table>

Note: values are mean (Standard Deviation)

Abbreviations: BMI (body mass index); PA (physical activity); LPA (light physical activity); MPA (moderate physical activity); VPA (vigorous physical activity); MVPa (moderate to vigorous physical activity); HG (hand grip); TUGT (timed up and go test).

* Significant correlation with VO2 peak (p < .05).
† Significant correlation with Total PA and Steps (p < .05).
§ Significant correlation with VPA (p < .05).

Board #238
June 1, 11:00 AM - 12:30 PM
How Undergraduates’ Attitudes toward Fitness Testing Is Related to Their Performance on Physical Assessments
Mitch Barton, E. Whitney G. Moore, Paul E. Yeatts, Gene L. Farren, Tsz L. Chu, Scott B. Martin, FACSM. University of North Texas, Denton, TX. (Sponsor: Scott Martin, FACSM)
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(No relationships reported)
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WEDNESDAY, JUNE 1, 2016

402 Board #239 June 1, 11:00 AM - 12:30 PM
A Comparison of Standing vs. Seated Cycle Ergometer Graded Exercise Test Protocols

Courtney Hicks, Cherilyn Mclester, Jonathan Howard, Thomas Evans, John Mclester, FACSIM. Kennesaw State University, Kennesaw, GA. (Sponsor: John R. Mclester, FACSIM)

Historically, staged cycle ergometer (CE) graded exercise tests (GXT) have elicited lower maximal oxygen consumption (VO2 max) values when compared to a treadmill (TM) GXT. It is believed that these lower values are due to localized muscle fatigue in the legs before the participant has reached their true VO2 max. While standard staged CE GXT protocols have subjects remain seated throughout the entirety of the GXT, investigations exploring standing protocols have produced mixed results.

PURPOSE: To investigate if allowing participants to stand at the end of a ramp protocol CE GXT would elicit a VO2 max closer to a TM GXT compared to remaining seated.

METHODS: A sample of healthy low risk participants (male = 14, female = 9) aged 26.2 ± 7.1 completed body composition testing, a TM GXT, a seated ramp CE GXT (seat-CE), and a seated-to-standing ramp CE GXT (stand-CE) over 3 visits. Participants could stand once they reached an RPE of 15 on the Borg scale. The order of these tests was randomized and completed within 2 weeks of the initial visit.

RESULTS: For males, TM VO2 max (49.3 ± 7.2 mL/kg/min) was higher than seat-CE (44.6 ± 8.1 mL/kg/min) (p < 0.001) and stand-CE (45.6 ± 8.8 mL/kg/min) (p < 0.001), with a difference between seat-CE and stand-CE (p = 0.047). The average time spent standing during seat-CE in males was 100.4 ± 54.4 seconds. For females, TM VO2 max (39.4 ± 5.0 mL/kg/min) was higher than seat-CE (36.3 ± 6.0 mL/kg/min) (p = 0.024), and stand-CE (39.4 ± 5.0 mL/kg/min) (p = 0.005) with no difference between seat-CE and stand-CE (p = 0.880). The average time spent standing during stand-CE in females was 66.0 ± 31.1 seconds.

CONCLUSIONS: Though there was a significant difference between seat-CE and stand-CE VO2 max in males, there was a difference in males. The results of this investigation suggest that allowing participants to stand at the end of a TM GXT will not affect VO2 max values for a ramp protocol in females and may actually produce values closer to those from a TM GXT in males. Based on these data further investigation is warranted to determine if standing at the end of a ramp protocol significantly affects results for healthy males.

403 Board #240 June 1, 11:00 AM - 12:30 PM
Reliability and Repeatability of Countermovement Jump Waveforms

Adam J. Sterczala, Justin X. Nicoll, Jake A. Deckert, Alexander R. Bryce, Joseph P. Weir, FACSIM. University of Kansas, Lawrence, KS.

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(No relationships reported)

Though the countermovement vertical jump (CMJ) has traditionally been used to assess lower body force and power, the force-time characteristics of the CMJ ground reaction force (GRF) waveform may be critical to optimizing injury risk and assessing training readiness. Prior to evaluating the CMJ GRF waveform as a diagnostic and evaluative tool, the reliability of the waveform on a within and between day basis should be established. PURPOSE: To determine the within day and between day reliability of the CMJ GRF waveform in healthy individuals. METHODS: Twenty-five healthy (age = 21.5 ± 1.9 years), recreationally active men and women completed one familiarization and three experimental visits, a minimum of 48 hours apart. Each visit consisted of a brief, standardized warm up test and 2m maximal jump, and maximal GRF (i.e., handgrip) and endurance (i.e., pushups, curl-ups, plank). They also completed a questionnaire that measured the following attitudes toward fitness testing (Mercier & Silverman, 2014): cognition (e.g., usefulness of fitness testing), enjoyment, and feelings, as well as the influence of teachers on these attitudes. Responses ranged from 1 (strongly disagree) to 5 (strongly agree).

RESULTS: A descriptive discriminant analysis investigated if males and females differed on a composite of the attitudes toward fitness testing subscales. Sex differences were primarily due to enjoyment (r2 = .93), feelings (r2 = .36), and the teachers’ effect (r2 = .32). Males had significantly higher scores (p < .01) on enjoyment (M = 3.25, SD = 3.87), feelings (M = 3.50, M = 3.95), and teachers’ effect (M = 3.54, M = 3.76), but not cognition (p > .05). Follow-up canonical correlation analyses associating the four attitudes with the seven fitness variables were also statistically significant (p < .01) for males (r2 = .25) and for females (r2 = .25).

CONCLUSION: Males had significantly more positive attitudes toward fitness testing than females. Students’ attitudes toward fitness testing can be improved and if different strategies are needed for males and females.

404 Board #241 June 1, 11:00 AM - 12:30 PM
Comparison of Physical and Physiological Characteristics based on Injury History


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(No relationships reported)

US Marines perform extremely demanding training and tactical tasks that come with inherent musculoskeletal injury risk. These injuries limit the physical and tactical readiness required of Marines. Recovery from musculoskeletal injury is not only critical to optimizing resiliency and well-being, but tactical performance and recurrent injury mitigation. PURPOSE: To compare physical and physiological characteristics in Marines based on a retrospective analysis of injury history. METHODS: A total of 71 Marines completed testing for isokinetic strength, flexibility, body composition, aerobic capacity/lactate threshold, and anaerobic power/capacity. Marines were stratified based on self-reported injury history for the past 12 months (Previously Injured: (N = 13), Age: 27.9 ± 5.8 years, Height: 179.1 ± 6.6 cm, Mass: 85.7 ± 7.1 kg; Non-Injured: (N = 58), Age: 28.9 ± 7.0 years, Height: 179.1 ± 6.1 cm, Mass: 84.7 ± 9.9 kg). Mann-Whitney U Tests were used to analyze the data between cohorts of Marines (p < 0.05). RESULTS: A prior musculoskeletal injury was reported in 18.3% of Marines and regionally reported at 53.9% for the lower extremity, 38.5% for the spine, and 7.6% for the upper extremity. No significant differences existed between cohorts for demographics (p = 0.338 – 0.491) or years of experience (p = 0.446). The previously injured Marines demonstrated significantly weaker trunk flexion compared to the non-injured group (Previously Injured: 323.8 ± 65.3 %BW, Non-Injured: 398.8 ± 90.0 %BW, p = 0.003) and knee flexion (Previously Injured: 114.1 ± 22.2 %BW, Non-Injured: 128.9 ± 29.6 %BW, p = 0.035). No significant differences were demonstrated for other strength comparisons or flexibility, body composition, and aerobic/anaerobic performance comparisons (p > 0.058 – 0.489). CONCLUSION: Although limited differences in physical and physiological characteristics exist, restoration of trunk extension and knee flexion strength may be critical to prevent the recurrence of musculoskeletal injury. This is essential given the frequency of injury to the spine and lower extremity and the importance of these muscles to transfer load through the kinetic chain during multi-joint movements. Future research should consider a prospective analysis of Marines to determine injury risk associated with physical and physiological characteristics.

405 Board #242 June 1, 11:00 AM - 12:30 PM
Squat Assessment following a Postural Correction Intervention

Ryan M. Hasenkamp, Guilherme M. Cesar, Jack W. Ransone, FACSIM. University of Nebraska, Lincoln, NE. (Sponsor: Jack Ransone, FACSIM)

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(No relationships reported)

The back squat (BaSq) is an exercise that has been shown to be very effective in improving athletic performance. As such, the BaSq should be a primary focus of any strength and conditioning program. However, performance of the BaSq with poor technique under load is a potentially harmful scenario. Therefore, it is important for athletes to learn and for coaches to screen for proper posture and technique during the
BaSq exercise. PURPOSE: To introduce a protocol for assessing squat technique and determine the effectiveness of a postural correction program. METHODS: A total of four female collegiate student-athletes (age: 17.8 ± 0.5 yrs; height: 156.8 ± 8.3 cm; mass: 53.4 ± 4.9 kg) were assessed at baseline during the offseason, and then 12 weeks after having gone through a postural correction program. The postural correction program consisted of mobility exercises focused on avoiding postural asymmetries and maintaining a neutral spine and a neutral subtalair joint. Three-dimensional motion capture and two force plates were used to record the kinematics and kinetics of two body-weight squats. Peak joint angles and power absorption and generation were calculated bilaterally for ankle, knee, and hip, and inter-limb difference was calculated. Squat depth was calculated from the sacrum marker as a percentage of standing height. Pre and post comparisons were made using separate t-tests. RESULTS: Ankle range of motion significantly improved for both limbs (left: 24.9±6.8° vs. 30.3±5.1°, right: 25±5.8° vs. 29.3±5.8°, p<0.05). However, range of motion decreased in the left knee (125.4±18.0° vs. 121.2±17.5°, p<0.05), and in both limbs (left: 112.0±94.4° vs. 94.4±9.2°; right: 110.8±94.4° vs. 95.8±7.9°, p<0.05). There were no significant changes in any other variable. CONCLUSIONS: The proposed analysis may prove to be an effective method of evaluating lower extremity range of motion. Following the experimental postural correction program, the athletes showed improve range of motion at the ankle, but decreased range of motion at the knee and hip leading to no change in overall squat depth. Further investigations should consider a larger experimental group and non-athletic population.

Individuals with functional ankle instability (FAI) often present with problems in neuromuscular control and balance performance. Joint mobilization is a common intervention for ankle joint dysfunction, but its effect on corticospinal excitability (an important component of the neuromuscular control) of the ankle musculature has not been discussed in individuals with functional ankle instability. PURPOSE: To examine the immediate effect of joint mobilization on corticospinal excitability in individuals with functional ankle instability. METHODS: This is a single blind, randomized, two-session, single-blind, sham-controlled study. The study included 30 participants (n=15 FAI, 15 non-FAI) who were randomly assigned to the active mobilization group or the sham mobilization group. RESULTS: Joint mobilization improved the corticospinal excitability which might have a beneficial effect on the neuromuscular control of the fibularis longus muscle in individuals with FAI (No relationships reported).

Effects of Varied Intensity on Torque and Neuromuscular Parameters during Intermittent Isometric Muscle Actions
Cory M. Smith, Terry J. Housh, FACSM, Ethan C. Hill, Kristen C. Cochrane, Nathaniel DM Jenkins, Amelia Miramonti, Joel T. Cramer, FACSM, Richard J. Schmidt, Glen O. Johnson, FACSM. UNL, Lincoln, NE. (Sponsor: Terry Housh, FACSM) (No relationships reported)

PURPOSE: The purpose of the present study was to examine the neuromuscular responses during intermittent isometric muscle actions at constant and varied intensities. METHODS: Eleven men and 5 women (mean ± SD, age 22.0 ± 2.6 yr) visited the lab on 2 separate days. A maximal voluntary isometric contraction (MVIC) was performed before (pretest) and after (posttest) each of the randomly ordered protocols. The 2 protocols consisted of 50, 6-s isometric muscle actions of the leg extensors followed by 2-s of rest at 60% MVIC or an alternating 40 then 80% MVIC. Each protocol averaged 60% MVIC force after the 50 intermittent isometric muscle actions during the 60% MVIC (totaling 50 repetitions at 60% MVIC) and 40/80% MVIC protocols (totaling 25 repetitions at 40% MVIC and 25 repetitions at 80% MVIC). Electromyographic (EMG) amplitude (RMS), EMG frequency (MPF), mechanomyographic (MGM) RMS, and MMG MPF were recorded for the vastus lateralis during the pretest and posttest MVIC protocols. Separate 2 x 2 (time x protocol) repeated measures ANOVAs were used to analyze the MVC torque, EMG RMS, EMG MPF, MGM RMS, and MMG MPF values. RESULTS: There were no significant (p > 0.05) interactions, but there were significant main effects (p < 0.05) for time (collapsed across protocol) for torque, EMG RMS, EMG MPF, and MMG MPF, but not MGM RMS (Table 1). CONCLUSION: The neuromuscular responses were typical of fatiguing, intermittent isometric muscle action, but there were no differences in the torques or neuromuscular responses from the 60% and 40/80% MVIC protocols. Thus, these findings indicated that the intensity that torque was applied had no effect on fatigue-related neuromuscular responses or motor unit activation strategies during intermittent isometric muscle actions.
Decomposing surface EMG signals into motor unit action potentials trains enables innovative insights into the activation of motor units. Several studies revealed an inverse hierarchical relationship between recruitment thresholds and firing rates. This so-called ‘onion skin’ property has been analyzed under various testing conditions by examining linear regression analyses of different subjects and regressions derived from the pooled sample.

**PURPOSE**: It became apparent that the evaluation of this physiological feature deserves further consideration. Thus, the aim was to identify a statistical method which represents the relationship between recruitment thresholds and firing rates of different subjects in a physiologically accurate way.

**METHODS**: A surface sensor array consisting of five protruding blunted pins (each 0.5 mm in diameter, located in the corners and in the middle of a 5x5 mm square) (Delsys Inc., Natick, MA, USA) was attached to the distal part of the medial gastrocnemius’ muscle belly. Decomposed EMG data obtained from 2 subjects conducting voluntary isometric plantar flexions (IsoMed 2000. DKR Fermil GmbH, Hemau, Germany) at two different ankle joint angles (70°, 110°) served to determine an appropriate analytical method to illustrate the mean relation of these two parameters embodying the hierarchical control scheme of motor units. Common pooled (CP) regression lines were calculated with SPSS V22.0 (IBM Inc., Chicago, IL, USA) for each subject to assess the relation between recruitment thresholds and mean firing rates. In contrast, individual averaged (IA) linear regression lines were computed as arithmetic means of the individual slopes and intercepts.

**RESULTS**: At both ankle joint angles, the analysed motor unit pools had comparable minimum, maximum and mean recruitment thresholds and firing rates. At 110°, no difference existed between both methods became apparent (IA: -0.859, CP: -0.883). However, at 70° the IA linear regression strongly deviated from the CP in terms of slope, intercept and most notably in correlation coefficient (IA: -0.721, CP: -0.262).

**CONCLUSION**: If the subjects’ regression lines showed a strong variance, the IA regression provided a physiologically more meaningful correlation compared to the CP analysis which suggestively masked the accurate recruitment strategy.
RESULTS: Affective responses (Feeling scale) were determined 10 min after the end of
the session. Affective responses (Feeling scale) were determined 10 min after the end of
the session. RESULTS: Among the cycle ergometer protocols, the 7 x 20 s presented the
highest mean values for VO2 and RPE, and the lowest mean session-affect. Mean RPE was higher for the 5 x 50 s than VO2max among the treadmill protocols. Session-affect responses were lower for the 5 x 50 s than VO2max compared to the 4 x 4 min protocol. None of the participants were capable of finishing the cycle ergometer 7 x 20
s and the treadmill 5 x 50 s than VO2max protocols without adjustments to decrease its intensity.

<table>
<thead>
<tr>
<th>Physiological, perceptual and affective values (mean ± SD) for six HIIT protocols</th>
<th>Cycle Ergometer Protocols</th>
<th>Treadmill Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 x 30 s</td>
<td>10 X 60 s</td>
</tr>
<tr>
<td>VO2 (ml/kg/min)</td>
<td>25.9 ± 2.8</td>
<td>32.5 ± 4.7</td>
</tr>
<tr>
<td>RPE</td>
<td>9.3 ± 0.8</td>
<td>7.0 ± 1.0</td>
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<tr>
<td>S-Affect</td>
<td>0.4 ± 2.9</td>
<td>2.1 ± 2.0</td>
</tr>
</tbody>
</table>

CONCLUSION: Our findings highlight the potential limited application of some HIIT
protocols, especially in low fitness or non-athletic populations. In addition, the most intense protocols elicited negative affective responses, which may decrease adherence
to such exercise protocols.

### 413 Board #250 June 1, 9:30 AM - 11:00 AM
**Effects Of Attention-Deficit/Hyperactivity Disorder Medications On Resistance-Exercise-Induced Hypoalgesia, Perceived Exertion, Heart Rate, And Blood Lactate**

Robert R. Kraemer, FACSM, Chelsea N. Chabreck, Daniel B. Hollander, Brandon A. Baiamonte. Southeastern Louisiana University, Hammond, LA. Email: rkraemer@selu.edu

**PURPOSE:** An increase in prescribed stimulant medication for the treatment of
Attention-Deficit/Hyperactivity Disorder (ADHD) has led to treatment misuse as a result of the ability of these medications to improve concentration and decrease fatigue. Although they provide cognitive benefits, the effects of stimulant treatment for ADHD during physical activity are fairly unknown. The primary goal of this study was to investigate the effects of ADHD medications on resistance exercise-induced pain perception, perceived exertion, heart rate, and blood lactate concentrations.

**METHODS:** Thirty college-age students (10 no ADHD diagnosis, 10 ADHD
diagnosis, and 10 ADHD diagnosis with medications) completed 2 sessions: 1) a
maximal strength testing session and 2) an experimental session consisting of three
conservative dynamic resistance exercise circuits. Each circuit was comprised of 12 repetitions of 9
resistance exercises at 60% of 1-repetition maximum using a 1:1:1 work to rest ratio. Blood lactate was measured with a lactate analyzer and pain was measured with a
pressure algometer.

**RESULTS:** Both men and women exhibited increases in pain tolerance [F(3,63)=4.79,
*p=0.001], blood lactate levels [F(3,60)=109.19, p=0.001], heart rate [F(2,42)=119.41,
*p=0.001], and perceived exertion [F(2,44)=35.78, p=0.001] across 3 time points
following resistance exercise. Moreover, men displayed significantly higher blood lactate
levels when compared to women [F(1,20)=8.82, *p=0.01].

**CONCLUSIONS:** Collectively, these results suggest that a bout of dynamic resistance
exercise increases pain tolerance with concurrent changes in both physiological and
psychological processing, which may be directly responsible for the alterations in pain
perception.

### 415 Board #252 June 1, 9:30 AM - 11:00 AM
**High Intensity Interval Ergometry: Power Output, Catecholamines, Substance P, And Perceived Pain**

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**PURPOSE:** High intensity interval exercise (HIIE) is promoted as a time-effective means of increasing physical activity levels and gaining health benefits. However, the influence of power output during HIIE on physiological and psychological markers of stress is not fully known. **Purpose:** To examine the effect of HIIE on peripheral lactate, epinephrine (EPI), norepinephrine (NOR), and substance P (SP), as well as ratings of perceived pain. **Methods:** Nine healthy, untrained males (25.09±3.94 years of age) performed a 10min warm-up and 5min of HIIE on a cycle ergometer (ten 20sec work intervals against a resistance of 5.5% body weight, each separated by 10sec rest). Venous blood samples and self-reported indices of pain, effort, and affect were obtained at baseline (PRE), immediately following HIIE (POST), and approximately 15 min post-HIIE (15POST). **Results:** HIIE elicited significant increases in lactate, EPI, NOR, SP, pain, effort, and a decrease in affect (p < 0.05). Greater maximum power was positively associated with peak lactate (r = 0.467, *p = 0.046) and peak perceived pain (r = 0.437, *p = 0.005), and negatively associated with the overall decline in affect (r = -0.718, *p = 0.029). In addition, maximum power was positively associated with the percent increase in NOR from PRE to 15POST (r = 0.682, *p = 0.001), while higher average power output was positively associated to the percent increase in SP from PRE to 15POST (r = 0.724, *p = 0.042). **Conclusions:** Maximum and average power outputs achieved during HIIE may differentially influence peripheral markers of physiological stress and perceived pain.
Previous research has shown a relationship between pain sensitivity and daily physical activity. However, it is unclear whether the type of physical activity may also influence pain sensitivity. PURPOSE: The purpose of this study was to examine differences in thermal pain sensitivity among college-aged females who engage in different amounts and types of physically activity. METHODS: Participants (n=27) were tested on two occasions. For the first visit participants went through informed consent, completed a menstrual history questionnaire, and were then familiarized with the protocol for pain sensitivity testing. Participants then wore an accelerometer at the waist for 7 days during waking hours (excluding water activity). The second visit was timed to occur during luteal phase of their menstrual cycle. Pain sensitivity was determined by having participants provide ratings of pain intensity (0-20) and ratings of pain unpleasantness (0-20) in response to brief (15 sec) applications of temperatures ranging from 43-49°C. Based upon their self-reported and measured activity levels and activity types participants were placed into the following groups: aerobically trained (AERO), resistance trained (RES), aerobic and resistance trained (A+R), and sedentary (SED). RESULTS: Total activity differed among the groups with the AERO (203±83 min) and A+R (183±28 min) groups accumulating more physical activity compared to the RES (39±39 min; p=0.05) and SED (62±32 min; p=0.05) groups. AERO (32±13 min) and A+R (34±7 min) also accumulated greater “vigorous” intensity activity than the RES (10±4 min; p=0.05) and SED (12±5 min) groups. Mean ratings of PI across all temperatures did not differ among activity groups for (6±0.32; 7.4±2.9; 6.6±3.5; and 5.3±3.3 for AERO, RES, A+R, and SED, respectively; p=0.652) nor did ratings of PI across all temperatures for 4.1±2.3, 6.4±2.5, 4.5±3.0, and 3.5±2.4 for AERO, RES, A+R, and SED, respectively (p=0.78). CONCLUSIONS: Unlike previous results in middle-aged and older women where higher activity was associated with lower pain sensitivity, our results suggest pain sensitivity does not differ among individuals with different activity levels in college-aged females. Additionally, we demonstrated pain sensitivity also did not differ among different types of physical activity.

Differences in athletes’ pain tolerances are a continued source of interest in the field of sports medicine. It is unknown whether playing surface and indoor versus outdoor conditions effect pain tolerance or pain threshold in athletes. This information could help team physicians and trainers understand how particular athletes deal with pain and evaluate the severity of an injury. PURPOSE: To explore the differences in pain tolerance and pain threshold in male and female collegiate basketball (BB) and soccer (SOC) players. METHODS: Forty NAIA Division I collegiate athletes (age 20.9±3.1 yrs.) participated in this investigation. Athletes were selected from male (n=10) and female (n=10) BB, and male (n=10) and female (n=10) SOC teams. Each subject completed two separate pain tolerance protocols that included a cold-water immersion test (CWIT) where subjects placed their hand into a tank of circulating cold water at 2.0 °C and a tourniquet pain test (TPT) using a modified submaximal tourniquet procedure. Pain threshold was reported as the time each subject first recognized pain or discomfort. Pain tolerance was reported as the time each subject requested the stimulus be discontinued due to intolerable pain or discomfort. Pain tolerance and pain threshold responses were examined using a two-factor (sport x sex) ANOVA for both the CWIT and TPT tests. Significant main and interaction effects were examined with a Tukey post hoc procedure. Statistical significance was accepted at p<0.05. RESULTS: No differences were found in the main effects of pain tolerance and pain threshold when comparing sport for both the CWIT and TPT. Differences were identified in pain threshold between sexes. Males reported a significantly higher pain threshold than females (43.9±25.8 sec vs 28.6±20.9 sec; p<0.05) for the TPT, or in pain tolerance. CONCLUSION: Based on the primary findings of this investigation, physicians, trainers, coaches, etc. should treat injuries of indoor and outdoor sports equally because pain tolerance and pain threshold did not differ between groups. Additional research is needed to explore possible differences in athletes that vary in age, ethnicity, and sport.

Purpose of Effort During Moderate And Heavy Intensity Cycle Ergometry

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Purpose: To examine responses for physiological and perceptual variables during cycle ergometry at a constant rating of perceived exertion (RPE) within the moderate and heavy intensity activity domains. Methods: Nineteen (mean ± SD age 21.3 ± 0.5 years) moderately trained cyclists performed an incremental test to exhaustion, cycle ergometry at a constant rating of perceived exertion (RPE) within the moderate and heavy intensity activity domains. Monitoring intensity using the Borg CR-10 scale, metabolic cost throughout the rides at RPEGET and RPEGET+15% were examined with 2 separate, 1 way repeated measures (RM) ANOVAs. Results: O2 values across the 60 min ride at RPEGET were not different from O2 at GET (incremental test). There was a significant main effect for O2 at min 179 (166.2 ± 8.8 cm; body mass: 74.7 ± 11.7 kg; VO2max: 417.2 ± 8.1 mL kg⁻¹ min⁻¹), and all were less than O2 at min 7-19 and from the incremental test. Conclusion: Only tracked RPE during the 60 min constant RPE rides within both exercise intensity domains. Monitoring intensity using an RPE corresponding with GET may be useful for up to 60 min of cycling exercise and a common mechanism may mediate and the perception of effort during moderate and heavy intensity cycle ergometry.

Effect of Different Verbal Commands On Perceptual, Affective And Physiological Performance Responses Of Running In Recreational Runners.

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Purpose: To compare the effect of different verbal commands on perceptual, affective and physiological performance responses to running. Methods: Twenty recreational runners participated in the study (male – age: 30.7 ± 10.1 yrs; height: 175.2 ± 8.8 cm; body mass: 74.7 ± 11.7 kg; VO2max: 153.7 ± 7.1 mL min⁻¹; HR; 189.3 ± 8.5 bpm; treadmill speed max 15.3 ± 1.1 km/h). All subjects completed four exercise sessions: a familiarization trial; three running sessions consisting of self-select pace defined by one of the verbal commands: low, moderate, high. The information conveyed to subjects were: “I want you to think what it would be for you to run (continuously) at an intensity: low, moderate, high,” “Now, I would like you to self-select 20 minutes of running at an intensity (low/moderate/high).” These conditions were counterbalanced. Each running session consisted of 20 min. Subjects could adjust their pace defined by one of the verbal commands: low, moderate, high. The information conveyed to subjects were: “I want you to think what it would be for you to run (continuously) at an intensity: low, moderate, high,” “Now, I would like you to self-select 20 minutes of running at an intensity (low/moderate/high).” These conditions were counterbalanced. Each running session consisted of 20 min. Subjects could adjust their pace defined by one of the verbal commands: low, moderate, high.

Conclusion: Based on the findings of this investigation, physicians, trainers, coaches, etc. should treat injuries of indoor and outdoor sports equally because pain tolerance and pain threshold did not differ between groups. Additional research is needed to explore possible differences in athletes that vary in age, ethnicity, and sport.
Research has shown that an athlete’s perception of pain has an impact on cognitive appraisals of injury, emotional and behavioral responses to the injury, and return to sport. According to the Fear Avoidance Model, when pain is misinterpreted as catastrophic, the athlete becomes fearful of pain, thus exhibiting avoidance behaviors due to kinesiophobia or fear of re-injury/movement (Leeuw, 2006). PURPOSE: To determine if psychological factors can predict an athlete’s perception of pain following induced muscle injury. METHODS: 35 (24 men) Division I collegiate student-athletes underwent a high-intensity conditioning session following a week of inactivity from their sport in order to induce muscle soreness. Prior to completing the exercise protocol, participants completed the Fear of Pain Questionnaire (FPQ), Tampa Scale of Kinesiophobia (TSK), and State Trait Anxiety Inventory Scale (STAI-Y1). Sessions were conducted under three conditions (an experimental treatment of 0.15 g/kg -1 body weight CaCO3) in a double-blind manner. Blood lactate concentrations were determined via capillary blood samples. HRV variables were analyzed as follows: time domain variables (absolute values of various time domain indices from R-R intervals, as well as SD1 and SD2 from Poincaré plots), frequency domain indices, as well as SD1 and SD2 from Poincaré plots. The variables were analyzed using 3 (trial) by 2 (time [pre and post]) repeated measures ANOVAs. Alpha was set at .05. RESULTS: There was no significant interaction effects (all p > 0.19) for mean heart rate (η2 = 0.12), root mean square of the successive differences (η2 = 0.02), low-frequency to high-frequency ratio (η2 = 0.06), SD1 (η2 = 0.02), or SD2 (η2 = 0.005). CONCLUSION: Regardless of cathode electrode placement, 20 minutes of 2.00 mA anodal stimulation of the insular cortex did not modulate the most common measures of HRV.

Previous studies have reported that transcranial direct current stimulation (tDCS) of the insular cortex modulates heart rate variability (HRV) and attenuates fatigue during high intensity exercise. The ability to buffer lactate while simultaneously maintaining HRV has not been investigated.

PURPOSE: To examine the utility of actigraphy to elaborate on activity pacing strategies. A semi-structured interview was conducted regarding actigraph acceptance by patients. RESULTS: The sample of 20 patients included 15 women (75%), with mean age of 32.14 years, mean duration of illness of 246.164 weeks and SF-36 physical function of 48.8±24.8. Of 22 patients to whom actigraphy was offered, 2 refused due to perceived inconvenience and 5 out of 20 experienced it as inconvenient. According to actigraph data, the mean percentage of time spent sedentary was 74.23%, at light intensity 17.34%, moderate intensity 4.26% and vigorous intensity 0.1%. Clinician ratings of activity pacing were generally unaffected by the availability of weekly activity traces from the actigraphs (r=0.67, p=0.25). Similarly the hourly fluctuation in actigraph recordings was not associated with clinician rating (r=0.270, p=0.250) and questionnaire scores (r=-0.106, p=0.656). Cumulative sum plots of weekly actigraphy data revealed substantial differences between patients in their activity patterns. CONCLUSIONS: Actigraphy was reasonably well accepted, but was only modestly effective for providing an objective measure of pacing behaviour. More detailed analysis of the dispersion of bouts of activity and rest within and across days may enhance the utility of actigraphy for this purpose.

Elevated lactate levels have resulted in increased perceptions of exertion and anxiety during high intensity exercise. The ability to buffer lactate while simultaneously performing high intensity bouts of exercise is important to the performance of athletes, but whether supplemental buffering of lactate impacts psychological measures has not been investigated. PURPOSE: To examine the impact of a sodium bicarbonate (NaHCO3) on perceptions of exertion, anxiety, and mood in response to cadenced exercises of increasing intensity. METHODS: Twelve recreationally active subjects performed three separate 20-min exercise sessions which progressively increased in cadence over the course of each condition. Participants completed three separate exercise bouts under a control condition (no supplementation) and two supplemented conditions (an experimental treatment of 0.15g/kg -1 body weight NaHCO3 or a placebo treatment of 0.30 g/kg -1 body weight CaCO3) in a double-blind manner. Blood lactate (BLA) levels and ratings of perceived exertion (RPE) were measured prior to the start of exercise (0 min), during the exercise protocol at 5 min intervals, and immediately post-exercise at 20 min. State anxiety (SAI) and perception of mood states (POMS) were measured prior to the start of the exercise session and then again upon cessation of exercise. RESULTS: Results demonstrated BLA levels were significantly different from baseline levels and were reduced when participants consumed NaHCO3. SAI scores were not significantly altered by the experimental conditions.
between the three conditions (F<sub>2,58</sub> = 2.04, p<.05). Further, BLA (F<sub>2,58</sub> = 41.25, p<.05) and RPE (F<sub>2,58</sub> = 140.13, p<.05) values increased significantly as exercise progressed, and BLA (F<sub>2,58</sub> = 5.55, p < .05) and RPE (F<sub>2,58</sub> = 4.09, p<.05) also changed significantly between conditions. POMS and SAI scores were significantly greater compared to pre-exercise in all three conditions, but there were not significantly differences between the three conditions for these measures.

**CONCLUSIONS:** Exercise of increasing intensity increased BLA, RPE, SAI, and POMS measures in all the conditions, but changes in SAI and mood were not different between conditions, suggesting factors beyond lactate influence perceptions of mood, exertion, and anxiety during exercise of increasing intensity.

### 424 Board #261 June 1, 9:30 AM - 11:00 AM

**The Effect of Cognitive Fatigue on Metabolic and Psychological Parameters during High Intensity Exercise**

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The psychophysiological effects of cognitive fatigue are important because physical performance is often contingent on the ability to physically and mentally engage in a task. Pre-conditioning with a cognitive load increases subjective feelings of tiredness during prolonged exercise; however, the effect of cognitive fatigue on energy expenditure and exertion during high intensity exercise is unknown. **PURPOSE:** To determine the effect of cognitive fatigue on VO2 and perceived exertion during high intensity exercise.

**METHODS:** 10 male and 6 female (age = 27.8 ± 3.9 yrs) moderately trained participants performed high intensity exercise on 2 separate occasions in a counter-balanced design. Prior to each exercise, participants completed a cognitive task or watched a non-arousing video. Cognitive fatigue was induced by a 50 minute vigilance task where participants responded to a numeric Go No-Go stimulus on a computer screen. The whole body exercise consisted of continuous rounds of 3 exercises: pull-ups (5 reps), push-ups (10 reps) and squats (15 reps) which were performed for as many rounds as possible for 20 minutes. Oxygen uptake (VO2) and heart rate (HR) were recorded continuously during the exercise while rate of perceived exertion (RPE) was taken at 5 minute intervals. T-tests between days were performed for mean VO2 and HR while a repeated measures ANOVA was performed for RPE. Alpha level was set at a priori of 0.05.

**RESULTS:** There was no difference between cognitive fatigue and control conditions in VO2 (31.8±5.8 ml O2/kg/min, respectively), Blood lactate (12.6±10.3 and 16.0±11.0 ml·kg<sup>-1</sup>·min<sup>-1</sup>, respectively), Blood lactate (2.7±1.8 and 2.1±1.2 mmol/L, respectively), Borg’s Scale (6.0±0.8 and 7.8±1.2, respectively), RER (0.8±0.1 and 1.1±0.1, respectively) and Heart Rate (bpm) (162.7±10.3 and 163.6±8.9, respectively). However, VO2 peak (32.8±5.8 and 31.8±4.3 ml·kg<sup>-1</sup>·min<sup>-1</sup>, respectively; P=0.09); however, RPE increased across time (16.5±2.0 and 16.0±2.3, respectively; P=0.09). Further, POMS and SAI scores were significantly greater compared to pre-exercise in all three conditions, but there were not significantly differences between the three conditions for these measures.

**CONCLUSIONS:** Exercise of increasing intensity increased BLA, RPE, SAI, and POMS measures in all the conditions, but changes in SAI and mood were not different between conditions, suggesting factors beyond lactate influence perceptions of mood, exertion, and anxiety during exercise of increasing intensity.

### 425 Board #262 June 1, 9:30 AM - 11:00 AM

**Glycaemia, Blood Lactate And Thermoregulation In Endurance Trained Men**

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(No relationships reported)

**INTRODUCTION:** Glucose is a major metabolic substrate in endurance sports (ES) to provide its energy requirements and prevent fatigue. When metabolized, it produces heat (high body temperature (BT)) and when its supply is not enough, an increase of lactate level will appear. **PURPOSE:** To study the relationship between glucose intake, lactate production and thermoregulation in ES trained male adults. **METHODS:** 30 trained male adults (age=39.4±6.8 yrs; height=177±9.6 cm, HR=162.7±10.3 and 162.9±10.1 bpm, respectively), along with no main effect for condition on RPE (16.5±2.0 and 16.0±2.3, respectively; P>0.09), however, RPE increased across time regarded of condition (P<0.001).

**CONCLUSIONS:** In contrast to endurance studies, there appears to be no effect of cognitive fatigue on VO2 or perceived exertion during high intensity exercise. Exercise modality and duration may play a role in cognitive fatigue due to differing metabolic and neuromuscular strategies. Further research is required to determine the mechanisms behind cognitive fatigue’s effect on physical performance.
During constant velocity exercise, the heavy and severe intensity domains are denaturated by critical velocity (CV), and are defined by unique physiological responses. Specifically, it has been suggested that exercise within the severe intensity domain drives physiological and perceptual responses to peak values, while heavy intensity exercise does not. Purpose: This study examined the metabolic (VO2), neuromuscular (electromyographic amplitude [EMG AMP] and EMG mean power frequency [MPF]) and perceptual (rating of perceived exertion [RPE]) responses during severe intensity treadmill running. Methods: Ten runners (mean ± SD: age = 23 ± 3 years) completed an incremental test to exhaustion for the determination of the VO2peak, EMG AMPpeak, EMG MPFpeak, and RPEpeak peak as well as the velocity associated with VO2peak (vVO2peak). CV was the slope of the total distance (TD) versus time to exhaustion (Tt) relationship derived from four exhaustive, constant velocity runs. On separate days, VO2, EMG AMP, EMG MPF, RPE, and Tt were recorded during two exhaustive, constant velocity runs (V1 = highest; V2 = lowest) above CV. Mean differences for VO2, EMG AMP, EMG MPF, and RPE at exhaustion from the constant velocity runs and the respective peak values were examined with repeated measures ANOVAs and Bonferroni corrected dependent samples t-tests (p < 0.017). Results: Critical velocity (12.1 ± 1.5 km h⁻¹) occurred at 80 ± 6% of VVO2peak. The mean Tt values for V1 (150.0 ± 1.6 km h⁻¹) and V2 (132.1 ± 4.7 km h⁻¹) were 6.57 ± 0.80 and 17.72 ± 2.63 min, respectively. The mean VO2 at exhaustion for V1 (97 ± 3% VVO2peak) was not different from VVO2peak but was less than VO2 for V2 (91.6 ± 6% VVO2peak). There were, however, no differences between the EMG AMP (V1 = 94 ± 18; V2 = 90 ± 24% AMPpeak), EMG MPF (V1 = 109 ± 21; V2 = 111 ± 14.6% MPFpeak), and RPE (V1 = 98 ± 4; V2 = 100 ± 0% RPEpeak) at exhaustion and the AMPpeak, MPFpeak, and RPEpeak, respectively, for V1 or V2. Conclusion: During exhaustive treadmill running at a velocity just above the demarcation of the heavy and severe intensity domains, VO2 may not always be driven to peak. The current findings suggested that neuromuscular and perceptual parameters were more consistent indicators of severe intensity exercise than VO2.

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Individual symptoms related to prostate cancer (PCa) have been thoroughly investigated, yet the interaction between symptoms, or symptom clusters, remains unexplored. The importance of identifying symptom clusters including fatigue is evident as 50-90% of men with PCa report fatigue as a significant adverse event that impacts quality of life (QoL). PURPOSE: To identify the association between fatigue and quality of life in men treated for PCa. We hypothesize significant correlations will be observed between fatigue and multiple subscales related to QoL in men with PCa.

METHODS: We conducted a preliminary analysis of an ongoing cross-sectional study to determine the impact of PCa and PCa treatment on fatigue and QoL. In 100 men with PCa and 200 age-matched controls. Thirty men treated for PCa are included in this analysis (age: 70±10; BMI: 29±4.3). Participants completed three questionnaires: the Brief Fatigue Inventory, the Functional Assessment of Chronic Illness Therapy-Fatigue (FACT-F) and the Short Form (SF)-36. Patient demographic data was extracted from the medical records. Correlations were performed between the subscales of each survey and demographic data. Significance was set at p<0.05.

RESULTS: Body mass index (BMI) and fatigue had significant negative correlations with multiple subscales of the SF-36 and the FACT-F. Increased BMI was negatively associated with SF-36 subscales of physical function (-.621; p=.001), energy/fatigue (-.449; p=.02), social function (-.409; p=.04), pain (-.422; p=.04) and FACT-F subscales of functional wellbeing (-.546; p=.006), general health (-.494; p=.01), and total score (-.456; p=.02). Fatigue, measured using the BFI and FACT-F was significantly correlated with each subscale of the SF-36 (p=0.05). A tendency for significance was observed between BMI and role limitation due to physical (-.385; p=.057) and emotional (-.386; p=.056). CONCLUSIONS: The results of this study support our hypothesis that fatigue significantly impacts multiple QoL indicators in men with PCa. This cluster is relevant as it helps us better understand the complexity of symptoms in this clinical population. Management of this symptom cluster has the potential to improve QoL.

Maximal aerobic capacity (VO2max) is a strong variable in predicting risk of death from all-cause mortality as well as performance in many endurance sports. Proper test selection is important, and test preference may affect the results of VO2max testing.

PURPOSE: To compare the preferred test method between three different VO2max tests and determine the relationship to performance.

METHODS: 13 active subjects (8 men, 5 women; age 24.3±3 years) volunteered to participate in this study. All underwent three tests including: a standard Bruce protocol treadmill test followed by, in random order, a self-paced maximal VO2max test (SPV) on a cycle ergometer (CE SPV) and a treadmill (TM SPV). The SPV's were ten minutes long with intensity increasing every two minutes based on the 6-20 Rating of Perceived Exertion (RPE) scale, and included RPE values of 11, 13, 15, 17 & 20. With the SPV's, subjects were asked to maintain the prescribed RPE. After the last test, subjects were immediately asked which test they preferred of the three, without further instruction. A chi-square goodness of fit was performed to determine if the tests were equally preferred and a chi-square test of independence was used to examine the relationship between preference and performance.

RESULTS: Of the 13 subjects, five preferred the TM SPV (38%), six preferred the CE SPV (46%) and two preferred the Bruce protocol treadmill test (16%). Preference was equally distributed (X2=2.000, p=.368). Eight of the subjects (62%) preferred the test they performed their best on while five did not (38%). The relationship between test preference and performance was not significant (X2=8.790, p=.067).

CONCLUSIONS: In this study, “preference” was not defined for the subjects. Some may have chosen their preferred test based on which one they thought they would perform best. These tests are maximal and thus subjects usually discontinue their efforts due to signals of overall or peripheral discomfort. The preferred test may have been chosen based solely on the level of discomfort experienced. Regardless, the results suggest that test preference may not affect performance during VO2max testing. Future studies should seek to examine how subjects define “preference” and if it could be used to choose the most appropriate protocol.
interaction. CONCLUSIONS: It appears that stimulative music has motivational qualities that exerts a positive influence on self-paced recovery, wherein participants are motivated to move at a faster rate, which can facilitate blood lactate clearance.

435 Board #272
June 1, 9:30 AM - 11:00 AM
Cohesion Is Associated With Perceived Exertion and Enjoyment During Group Exercise in Recreational Runners
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(No relationships reported)

Two elements of group exercise, cohesion and social support, have been shown to positively affect exercise adherence. Recreational runners often join informal training groups to increase motivation, and thus training frequency and intensity. However, no previous research has investigated how training with a group may affect recreational runners’ exercise behavior, perceived exertion, or enjoyment, nor the relationship of perceived cohesion and social support with these variables.

PURPOSE: Determine if performing an interval running workout coactively with a regular training group affects average speed, perceived exertion, and/or enjoyment in recreational runners, and if these variables were associated with perceived cohesion and/or social support.

METHODS: Recreational runners (n = 7 male, n = 10 female) who regularly met with a local group performed two experimental trials, each under a different social condition, in a randomized order. Both trials took place on the same outdoor course and consisted of 8 uphill 400-meter running intervals separated by an equivalent jogging recovery. One trial was performed alone while the other was performed coactively with the group. Participants’ average interval time, RPE, and heart rate over the eight intervals was recorded for each trial. Enjoyment (end of each trial), social support and cohesion (prior to participation) were assessed with a visual analog scale and questionnaires, respectively.

RESULTS: Mixed model regression analysis showed that men (122 ± 16.1 sec) ran faster (p = 0.002) than women (155 ± 27.8 sec) across both social conditions. There were no main or interaction effects of social condition on average speed (p > .87), RPE (p > .08), or enjoyment (p > .26). However, task cohesion (r = -.58, p = .01) and social support (r = -.73, p < .001) were negatively associated with RPE in the group condition only, despite similar speed in both conditions. Task cohesion was also positively associated with average enjoyment of the two trials.

CONCLUSIONS: Performing an interval running workout amidst a familiar running group did not significantly affect recreational runners’ average speed, enjoyment, or RPE. However, although speed was similar in both conditions, those with higher perceived task cohesion and social support reported less effort when running in the group.

436 Board #273
June 1, 9:30 AM - 11:00 AM
Does Mental Fatigue Alter Core And Skin Temperature In The Heat?
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(No relationships reported)

PURPOSE: To examine the effect of a mentally fatiguing task and/or subsequent exercise, both performed in 30°C, on core and skin temperature and temperature sensation.

METHODS: Ten endurance-trained male athletes (Age: 22 ± 3 y; Wmax: 332 ± 41 W) completed two experimental trials in a single blind, randomized, cross-over design in 30°C (30% RH). After 45min of Stroop or watching a documentary (control), subjects cycled for 45min at a fixed pace equal to 60% Wmax, immediately followed by a self-paced time-trial (TT) in which they had to produce a fixed amount of energy (equal to cycling 15min at 90% Wmax) as fast as possible. Reaction time and accuracy were assessed during the Stroop task, while core and skin temperature, thermal sensation, ratings of perceived exertion, the NASA-Task Load Index (NASA-TLX) and a mental fatigue-VAS-scale (M-VAS) were assessed throughout the entire trial.

RESULTS: The NASA-TLX scale showed that the Stroop task was more mentally demanding (p < 0.05) and the M-VAS indicated that mental fatigue was higher during and after the Stroop compared to the control condition (p < 0.05), however mean reaction time and accuracy did not decline significantly during the Stroop. Mean Tskin during the cognitive task tended to be higher (p = 0.068) during the Stroop (34.0 ± 0.4°C) compared to the control (33.8 ± 0.3°C), while both mean Tcore (Stroop: 36.9 ± 0.3°C; Control: 37.0 ± 0.2°C) and thermal sensation (2 ± 1 in both conditions) did not differ between conditions. No effects were observed between conditions in the exercise part.

437 Board #274
June 1, 9:30 AM - 11:00 AM
Premature Termination Of A Maximal Incremental Exercise Test Due To ‘Pain’ 48 H Following A Downhill Run
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PURPOSE: Exercise induced muscle damage (EIMD) decreases time to exhaustion during maximal incremental exercise (MIE) testing. However, the reasons for this, remain unclear. The aim of this study was to employ qualitative measures to investigate the effects of EIMD on reasons for terminating a MIE test.

METHODS: Fifty (14 female), apparently healthy participants randomly allocated into a control (CON) group (n = 10), or experimental (EXP) group (n = 40) visited the laboratory a total of six times: visit 1 (familiarisation), visit 2 (MIE_CON1 or MIE_EXP1), visit 3 (MIE_CON2 or MIE_EXP2), visit 4 (intervention), visit 5 (24 h post) and visit 6 (MIE_CON3 or MIE_EXP3). Both groups performed identical testing during all visits, except during visit 4, where only EXP performed a 30 min downhill run and CON performed no exercise. During visits 2, 3 and 6 all participant performed MIE, and the following markers of EIMD were obtained: maximum voluntary contraction (MVC), voluntary activation (VA), creatine kinase (CK) and muscle soreness. Additionally, following each MIE test participants completed a questionnaire to discover the reason(s) they terminated the test.

RESULTS: There was a significant association between group (EXP, CON) and termination of the MIE due to ‘pain’ during MIE_CON3 and MIE_EXP3 (ρ = 14.7, p = 0.002). In the CON group 60% of the participants said pain was not a contributory factor to them terminating the test, 30% reported pain as a minor contributory factor, 10% a major contributory factor, and 0% the only contributory factor to them terminating the MIE test. In the EXP group 13% reported that pain was not a contributory factor, 13% reported pain as a minor contributory factor, 72% a major contributory factor, and 3% reported pain as the only contributory factor to them terminating the MIE test.

CONCLUSIONS: EIMD results in premature termination of a MIE test, which is associated with the perception of pain. The exact mechanisms responsible for this require further investigation, however, it is postulated that EIMD derived pain may stimulate type III/IV afferent fibres.

A-49 Free Communication/Poster - Physical Activity Interventions in Older Populations
Wednesday, June 1, 2016, 7:30 AM - 12:30 PM
Room: Exhibit Hall A/B

438 Board #275
June 1, 9:30 AM - 11:00 AM
Effects of a Group-based Behavioral Intervention On Dietary Behaviors in Older Adults
Rebecca A. Schlaff1, Meghan Baruth1, Valerie J. Adams2, Tatum Goldufsky1, Nathan A. Peters3, Gracecon C. Kerr4, Ashley Boggis1, Ashley Ewald1, 1Saginaw Valley State University, University Center, MI. 2Duke University, Durham, NC. 3Michigan State University, East Lansing, MI. 4University of South Carolina, Columbia, SC. Email: raschlaff@svsu.edu
(No relationships reported)

There is evidence to suggest that aging impacts dietary behaviors. Specifically, older adults may have a difficult time engaging in healthy eating behaviors and meeting dietary recommendations. Group-based, behavioral interventions may assist in improving dietary behaviors within this population. PURPOSE: To examine the effect of a 12-week group-based, behavioral nutrition intervention on dietary behaviors. METHODS: Inactive older adults (>50 years) were randomized to a 12-week, group-based, nutrition or exercise behavioral intervention. Participants completed a questionnaire at baseline and post-intervention assessing demographic variables. Fruit and vegetable (FV) consumption was assessed via the National Cancer Institute Fruit and Vegetable all-day screener (cups/day), and the Fat and Fiber-related

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Behavior Questionnaire was utilized to determine fat- and fiber-related behaviors at baseline and post-intervention. Objectively measured height and weight were also obtained. Repeated measures ANOVAs examined changes in diet-related behaviors (FV, fat, and fiber) over time between intervention groups, controlling for age, gender, and education. An alpha level of 0.05 was used to determine statistical significance.

RESULTS: Participants (n=50) averaged 64.1±8.4 years of age and had a BMI of 33.3±7.5 kg/m². A majority were women (72%), married (62%), white (86%), and reported at least some college education (86%). Participants in the nutrition group had significantly greater increases in FV consumption (p=0.004), and significantly greater improvements in fat- (p=0.03), and fiber-related (p=0.008) behaviors than the exercise group post-intervention.

CONCLUSIONS: Our findings indicate that a 12-week group-based behavioral nutrition intervention increased FV consumption, and fat- and fiber-related behaviors. Behavioral interventions may be a low-cost way to promote healthy eating behaviors among older adults, potentially affecting population health significantly. Future research should seek to corroborate these findings within more diverse samples of older adults (with respect to gender, race, and education level) to increase external validity.

439 Board #276 June 1, 9:30 AM - 11:00 AM Effects of a Group-based Behavioral Physical Activity Intervention in Older Adults Meghan Baruth1, Rebecca A. Schlauff1, Gracess Kerr1, Valerie J. Adaya1, Tatsum Goldfusky1, Natasha Peters1, Ashley Ewald1, Sageval State University, University Center, MI. 2Duke University, Durham, NC. 3Michigan State University, East Lansing, MI. 4University of South Carolina, Columbia, SC.

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(No relationships reported)

Chronic diseases are highly prevalent among older adults. Despite the known benefits of regular physical activity (PA), particularly for disease prevention and management, a majority of older adults do not meet PA guidelines. There is a need for evidence-based programs that can successfully initiate and maintain PA behaviors. PURPOSE: To examine the effects of a 12-week, group-based, behavioral PA intervention on PA behaviors and weight-loss in older adults. METHODS: Inactive older adults (>50 years) were randomized to a 12-week, group-based, behavioral PA intervention, or to an attention control nutrition intervention. Demographic variables were collected via a survey; objectively measured height and weight were obtained. Participants wore an accelerometer during all waking hours for 7 days on the right hip. Percent of day spent in sedentary, light, and moderate to vigorous PA was calculated. All measures were obtained at baseline and 12-weeks (post intervention). Repeated measures ANOVAs examined changes in weight and PA behaviors over time between groups, controlling for age, gender, and education. RESULTS: Participants (n=50) averaged 64.1±8.4 years of age and had a BMI of 33.3±7.5 kg/m². A majority were women (72%), married (62%), white (86%), and had at least some college education (86%). Participants spent 62% of the day sedentary, 37% in light PA, and 1% in moderate to vigorous PA. Participants in the PA group had significantly greater increases in moderate to vigorous PA than those in the nutrition group (p=0.04). Participants in the nutrition group had significantly greater decreases in time spent sedentary than those in the PA group (p=0.03). There was no significant change over time in light PA (p=0.29).

There was a significant decrease in weight over time among participants from both groups (p<0.001).

CONCLUSIONS: Findings from our study suggest that group-based behavioral PA interventions may be an effective way to increase moderate to vigorous PA among older adults. Behavioral PA and dietary interventions may also result in weight loss. Given the expected growth in the number of adults >65 in the U.S., there is a need for interventions that can successfully increase PA and be disseminated widely. Such interventions have the potential to increase independence and longevity across the population.

440 Board #277 June 1, 9:30 AM - 11:00 AM The Effects Of Home Based Nutrition And Exercise Intervention In Improving Functional Capacity Associated With Falls Among Older Adults Shanthi Johnson, FACSM1, Sabayasachi Gupta1, Katherine Kline1, William McLeod1, University of Regina, Regina, SK. 2Acadia University, Wolfville, NS, Canada.

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(No relationships reported)

THE EFFECTS OF HOME BASED NUTRITION AND EXERCISE INTERVENTION IN IMPROVING FUNCTIONAL CAPACITY ASSOCIATED WITH FALLS AMONG OLDER ADULTS C.S. Johnson, K. McLeod, S. Gupta, & W. McLeod University of Regina, Regina, SK

e-mail: Shanthi.johnson@uregina.ca (Sponsor: Shanthi Johnson, FACSM)
PURPOSE: The purpose of the study was to examine the synergistic role of functional capacity and nutrition on falls as well as the impact of combined, home-based nutrition and exercise interventions. MEASURES: For the purpose of the study, 134 individuals over 60 years of age were recruited through Continuing Care and other community-based organizations. The participants were placed in one of four groups: exercise only, nutrition only, exercise and nutrition group, and no intervention comparison group. The exercise intervention was the Home Support Exercise Program and consumption of liquid adult nutritional supplement (Ensure®) daily for six months. The participants’ demographic information, status on health, function, nutrition, and falls were assessed at baseline and again at 6 months. RESULTS: The participants’ age ranged from 61-98 (ave=81). Of the participants, 83% were female, 50% lived alone, and 65% required personal assistance to leave their home. Participants in the exercise only and exercise-nutrition interventions were more likely to be notes those in the nutrition only and exercise-nutrition groups received liquid nutritional supplement. Results showed significant changes in groups scores over time for functional reach with significant differences existing between exercise and nutrition-exercise groups. Overall, the exercise only group performed better than the other groups in improvement of functional capacity and psychophysical well-being after a 6 months intervention. CONCLUSION: Working with frail elderly provides unique opportunities and challenges.

Supported by Nova Scotia Health Research Foundation and the Canadian Institutes of Health Research

The population of older adults is growing significantly and is expected to reach 56.4 million by the year 2020. Aging reduces muscle mass that leads to decrease in muscle strength, flexibility, and balance in older adults and sedentary lifestyle increases rate of progression of these conditions. Increased muscle mass and muscle strength are associated with improved flexibility and balance. Strength training exercises may help to increase muscle mass, muscle strength, flexibility and balance in older adults. The Stay Strong, Stay Healthy (SSHS) program is an 8-week strength training program for older adults, modeled after the Strong Women Program from Tufts’ University and designed by Extension professionals at University of Missouri - Extension. It is currently running in more than 50 counties in Missouri. PURPOSE: The purpose of this study was to investigate the effects of SSHS program on muscle strength, flexibility, and balance in older adults. METHODS: A total of 4801 participants (men: n=654, women: n=4069, gender unknown: n=78, age >60 years: 70.1%) enrolled in 10-week SSHS program (attended once or twice weekly) and 3695 participants completed at least 60% of the training sessions. Five outcomes (30-s chair stand, chair sit-and-reach left and right, back scratch left and right, 8-foot up-and-go, and balance test) were measured in 2013 participants since 2010. RESULTS: Post-SSHS program participants felt stronger (89.5%), more flexible (85.8%), and more balanced (85.9%) at follow-up. Outcomes improved or remained stable in all five (30.4%), four (30.6%), or one to three (39.0%) fitness measures. Among them, 59.4% also continued to exercise at their home during 10-week program. Post-3 month follow-up, 81.1% continued to strength train at home (56.3%), in a gym (17.5%), or at gym (7.4%). Additionally, 67.3% agreed that their ability to perform activities of daily living (ADL) improved. CONCLUSION: The University of Missouri’s SSHS program improved muscle strength, flexibility, and balance in older adults. Additionally, participants continued strength exercises during and after program. SSHS also improved ADL suggesting that SSHS can be adapted and implemented in community settings all over the United States.
To compare strength, physical function and QOL adaptations following 12-weeks of high-load (HL) and BFR training in older adults at risk of mobility limitations. METHODS: Thirty-six male and female older adults (76.0±7.6 years; 26.6±3.3 kg m-2) who possessed low knee extension muscle strength placing them at risk of developing mobility limitations participated. They were randomly assigned to perform twice weekly sessions of HL (70% 1-RM), BFR (30% 1-RM coupled with a vascular restriction of 1.5 times systolic blood pressure at the proximal thigh) or attention control (CON) exercise for 12 weeks. HL and BFR groups engaged in three sets of leg extension (LE), leg press, and leg curl resistance training to muscular failure. The CON group performed three sets of light upper body resistance and flexibility training that was not expected to result in muscle adaptations. LE 1-RM, isometric strength, strength-to-weight (STW) ratio, Short Physical Performance Battery (SPPB), 400 m walking speed and four domains of QOL via survey were assessed before, midway and after 12 weeks of training. RESULTS: HL and BFR groups had increases of 8-56% in LE 1-RM, isometric strength and STW ratio within 6-weeks of training and maintained these changes at 12-weeks while the CON group had no changes (time x group P<0.05). Walking speed and SPPB improved 3% and 5%, respectively among all groups (time main effect P<0.05). There were no changes in QOL in any group (time x group P>0.05). CONCLUSION: HL and BFR training improves muscle strength similarly in older adults at risk of mobility limitations, suggesting BFR exercise is a viable exercise modality. Enhanced physical function without changes in QOL was seen in all groups. The impact of increased strength on physical function should be further evaluated with additional tests of daily activities.

Supported by NIH grant 1R15 AR07070-01A1.

The possibility that exercise intervention in the elderly does not always result in an increased total amount of physical activity per day has recently been reported. It remains unknown whether exercise training affects the daily energy expenditure of other physical activities pattern during the remainder of the day.

PURPOSE: The purpose of this study was to compare the physical activity in elderly people on exercise and non-exercise days.

METHODS: The participants included 22 healthy elderly individuals (13 men, 9 women; aged 69±4 years) at exercise facilities in Okinawa Prefecture. Using a uniaxial accelerometer to measure the daily physical activity, we observed the number of steps, the time spent at different intensity levels of activity and the total energy expenditure. Over a two-week period, each subject wore an accelerometer throughout their waking hours (except during activities in water). The subject’s data were analyzed if at least 2 days of valid data were available on the days when the subjects exercised at the facility and at least 3 days of valid data were available on the days when the subjects did not exercise at the facility.

RESULTS: The number of hours that the accelerometer was worn did not significantly differ between the exercise and non-exercise days (15.0±2.2 vs 15.1±1.9 hours). The mean time that the subjects spent at the exercise facility was 113.5±31.2 min. The total energy expenditure (1711.6±227.6 vs 1635.6±237.7 kcal; P<0.01) and the number of hours that the accelerometer was worn did not significantly differ between the exercise and non-exercise days (6.2±0.8 no. of hours; P=0.001). Significant differences (EG x CG) were identified for 30-s chair-stand, chair sit & reach and isokinetic strength. Peak torque of isokinetic strength for the lower limbs increased in the EG: right knee flexion by 180% (8.2±2.2 2-s 1-Nm) with a significant main effect for Tgx interaction (P=0.017), left knee flexion at 60% (4.8±2.7 2-s 1-Nm) with a significant main effect for Tgx interaction (P=0.026), and right knee flexion at 60% (6.0±1.8 2-s 1-Nm) with a significant main effect for Tgx interaction (P=0.001). Muscular endurance increased in EG (5.6±0.8 no. of stands) with a significant main effect for Tgx interaction (P=0.015). Flexibility of the lower limbs improved in EG (2.8±1.9 cm) with a significant main effect for Tgx interaction (P=0.001).

CONCLUSION: Concurrent 8-month AT and RT increased lower limbs flexibility and strength for knee flexors (BIODEX), and for muscular endurance, as observed in the 30-s chair-stand test. However, it was not effective to improve participants’ cardiorespiratory fitness. Supported by FCT with grant UID/DTP/00617/2013.

Diabetes is a disease that is characterized by microvascular complications. Exercise training is the first line of defense. However, relative efficacy of land-based and water-based exercises is unknown.

PURPOSE: To determine acute effects of cycling exercises performed on land and in water on cutaneous microvascular function in older patients with type 2 diabetes.

METHODS: Twenty-four adults (67.5± years) with type 2 diabetes mellitus were randomly assigned into land-based exercise (n=12) and water-based exercise (n=12). Both exercise programs consisted of cycling at 60-70% of maximal heart rate for 15 minutes on land and in warm water. Before and after each exercise session, body composition, heart rate, blood pressure, and blood glucose concentrations were measured. Cutaneous post-occlusive reactive hyperemia was determined using the laser-Doppler fluxmeter in a fingertip and foot.

RESULTS: Systolic blood pressure increased similarly with both exercises and diastolic blood pressure did not change. Blood glucose concentration decreased (P<0.05) in both exercise groups similarly. Peak cutaneous blood flow to the fingertips and foot did not change significantly in both exercise groups. The time to peak cutaneous blood flow to the fingertip and foot as well as the recovery time on foot decreased (all p<0.05) only after the water-exercise.

Conclusions: Our findings indicate that both land- and water-based cycling exercises reduce blood glucose concentration in patients older patients with type 2 diabetes but that cutaneous microvascular function was increased only after the cycling exercise performed in warm water.
446  Board #283  June 1, 9:30 AM - 11:00 AM
Changes in Cortical Activation Patterns in Language Areas Following Aerobic Exercise in Older Adults
Joe Nocera, Keith McGregor, Bruce Crosson. Emory University, Decatur, GA.
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(No relationships reported)

PURPOSE: Over the past few decades, considerable attention has been devoted to examining the benefits of aerobic exercise on central nervous system plasticity. The current study sought to build on previous research demonstrating improved language functioning in older adults following exercise by quantifying the change in neural activation patterns during a semantic fluency task via functional magnetic resonance imaging (fMRI). METHODS: Twenty-one community-dwelling older adults were recruited and randomly enrolled to an aerobic “Spin” exercise group or a control condition. Participants were evaluated before and after the intervention with an estimated VO2max test and semantic fluency task while undergoing an fMRI. Change score of clusters sizes in a priori regions of interests included: Posterior Cingulate Cortex, Left Broca’s Area, Right Broca’s Homologue, Right Precentral, and Mesial Frontal Areas. RESULTS: There was a significant increase in the change scores for estimated VO2max of the ‘Spin’ group when compared to the control group (t(19)=4.63, p = .0002). There was a significant improvement in the change scores for semantic fluency of the spin group when compared to the control (t(9)=2.58 p = .018. There was a significant decrease in positive activity in posterior attention areas, posterior cingulate cortex, right precuneus and mesial frontal areas (p’s <.05). CONCLUSION: Aerobic exercise results in increased efficiency of attention networks involved in a semantic fluency task in previously sedentary older adults. This alteration may facilitate increase fluency in older adults.

447  Board #284  June 1, 9:30 AM - 11:00 AM
Combined Effects of Diet and Exercise or Diet to Improve Physical Function in Older Adults
María Giné-Garriga1, Eulàlia Vidal-García2, Natàlia Gomara-Toldrà2, Blanca Roman-Viñas3, Miriam Guerra-Balic2, Marta Roqué-Figuls2. 1Universitat Ramon Llull de Barcelona. Faculty of Psychology, Education and Sport Sciences Blanquerna, Barcelona, Spain. 2Universitat Ramon Llull de Barcelona. Faculty of Health Sciences Blanquerna, Barcelona, Spain. 3Universitat Autònoma de Barcelona, Barcelona, Spain.
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(No relationships reported)

Older adults aged 65 and over are the fastest growing segment of the world’s population. Recent randomized controlled trials (RCTs) and systematic reviews have shown that exercise seems to be beneficial in improving physical function in older adults. However, most research studies assessing the effects of a diet intervention (excluding diet supplementation) on physical function had used prospective population-based designs excluding strong methodological designs such as RCTs, likely because of the resources (i.e. money and time) needed to conduct an intervention over a long enough period of time to see change in the outcome of interest. Therefore, systematic reviews assessing the effects of diet and a combination of diet and exercise interventions to improve physical function have yet to be published. PURPOSE: We conducted a systematic review aiming to integrate the most current evidence on the effect of combined exercise and diet interventions (not limited to caloric restriction) or diet interventions alone on improving performance-based measures of physical function in community-dwelling older adults. METHODS: Randomized clinical trials and observational population-based studies of community-dwelling older adults were selected through comprehensive bibliographic searches in Medline (up to September 2014). Included trials had to assess performance-based measures of physical function such as strength, balance, mobility and gait, and diet measured as diet indexes or food intake. Seven studies were included. Meta-analysis was performed with the inverse variance method under the random effects models. RESULTS: Combined exercise and diet interventions, when compared with control or diet interventions alone, were shown to improve walking speed and performance on the Short Physical Performance Battery (SPPB), although SPPB results failed to show clinical significance. No consistent effect was observed for balance outcomes. CONCLUSION: Although exercise interventions are known to improve physical function outcomes, based on current data, it is not possible to affirm that a combination of diet and exercise interventions can further improve physical function. The evidence comparing different patterns of diet is scarce, and it is not possible to pinpoint which diet intervention is the most effective.

448  Board #285  June 1, 9:30 AM - 11:00 AM
Effect of a Walking Program on Functional Fitness Measures in Older Adults
Joohee Im, Hector Raya, Tyler Cover, Joe Farabaugh, Morgan Horowitz, Darla Bourassa, Samuel Forlenza, Ben Meyer, Sally Paulson. Shippensburg University, Shippensburg, PA. (Sponsor: William (Turi) A. Braun, FACSM)
Email: jooheeim@yahoo.com
(No relationships reported)

Increasing physical activity for an elderly population can positively affect functional fitness and activities of daily living by increasing muscular strength, endurance, and gait speed. PURPOSE: To determine the effects of a 6-month walking program on functional fitness measures in older adults. METHODS: Twenty one healthy, older individuals were recruited from a Senior Center (age: 72.4±6.1 yrs; height: 158.9±6.6 cm; weight: 81.1±12.7 kg; BMI: 31.9±0.9). Subjects self-selected to participate in either a walking (WG) or control (CON) group. WG was given pedometers to wear and assigned a daily step goal of reaching ≥10,000 steps/day. Subjects were evaluated monthly using a 6 min walk test, a 20 m walk at maximum pace (with initial 2.44 m and middle 10 m components), a 30 s chair stand (CS 30), and get-up-and-go (GUAG) task that measured the time to walk a loop of 4.88 m after standing from a seated position. A two-way ANOVA with repeated measures was used to make group and time (baseline vs. month 3) comparisons. RESULTS: Compared to baseline, many of the functional fitness measures improved, after 3 months of walking intervention. Furthermore, a significant difference (p=0.05) was observed in average daily steps between groups (WG: 7251±3305 steps·day-1 vs. CON: 2592±799 steps·day-1).

Increasing physical activity for an elderly population can positively affect functional fitness and activities of daily living by increasing muscular strength, endurance, and gait speed. PURPOSE: To determine the effects of a 6-month walking program on functional fitness measures in older adults. METHODS: Twenty one healthy, older individuals were recruited from a Senior Center (age: 72.4±6.1 yrs; height: 158.9±6.6 cm; weight: 81.1±12.7 kg; BMI: 31.9±0.9). Subjects self-selected to participate in either a walking (WG) or control (CON) group. WG was given pedometers to wear and assigned a daily step goal of reaching ≥10,000 steps/day. Subjects were evaluated monthly using a 6 min walk test, a 20 m walk at maximum pace (with initial 2.44 m and middle 10 m components), a 30 s chair stand (CS 30), and get-up-and-go (GUAG) task that measured the time to walk a loop of 4.88 m after standing from a seated position. A two-way ANOVA with repeated measures was used to make group and time (baseline vs. month 3) comparisons. RESULTS: Compared to baseline, many of the functional fitness measures improved, after 3 months of walking intervention. Furthermore, a significant difference (p=0.05) was observed in average daily steps between groups (WG: 7251±3305 steps·day-1 vs. CON: 2592±799 steps·day-1).

Walking Group  Control Group

Baseline | Month 3 | % change  Baseline | Month 3 | % change
---|---|---|---|---|---
6 min Walk (m)  | 351.5 ± 46.8 | 398.1 ± 70.4* | 13.3 | 312.7 ± 52.0 | 360.8 ± 45.4* | 15.4
2.44 m GS (m/s) | 1.2 ± 0.2 | 1.4 ± 0.2* | 15.4 | 1.1 ± 0.2 | 1.2 ± 0.3 | 6.6
10 min (s) | 6.7 ± 1.3 | 6.4 ± 0.7 | -3.3 | 7.7 ± 1.6 | 7.5 ± 1.4 | -1.6
CS 30 (rep) | 13.0 ± 3.9 | 15.2 ± 3.9* | 17.0 | 11.8 ± 2.4 | 13.3 ± 1.5 | 12.3
GUAG (s) | 6.9 ± 1.2 | 6.2 ± 1.0 | -9.2 | 7.9 ± 1.7 | 7.1 ± 1.4 | -9.6

Note: *Significantly different from the baseline (p<0.05).

Conclusion: The preliminary findings suggest that a three-month walking intervention program for older adults can significantly improve some of their functional fitness measures, which may aid in their activities of daily living.

449  Board #286  June 1, 9:30 AM - 11:00 AM
Effect Of Increased Daily Physical Activity On Lower-extremity Physical Function In Older Adults
TAKASHI JINDO1, KEISUKE FUJII2, KENJI TSUNODA2, YUYA FUJII3, KEIKO SAKAIDA1, SONTHAYA SRIRAMATR2, TOMOHIRO OKURA1. 1University of Tsukuba, Tsukuba, Japan. 2Physical Fitness Research Institute, Meiji Yasuda Life Foundation of Health and Welfare, HACHIOJI, Japan. 3Sirinakarinwirost University, Nakhonnayok, Thailand.
(No relationships reported)

Regular exercise can improve lower-extremity physical function (LEPF) in older adults. It is important that participants do exercise not only in the exercise classroom but also in their daily lives. We conducted an exercise program and compared the effects on LEPF between participants with goal-setting (GS) aimed at increasing daily physical activity (PA) by 1000 steps/day and participants without GS. PURPOSE: To investigate the effects of GS on daily PA and LEPF during the exercise program. METHODS: The study was conducted in Ibaraki Prefecture, Japan. Participants (community-dwelling older adults) were non-randomly allocated to two groups: with GS (n = 19, average age: 68.9±3.3 years) and without GS (n = 13, average age: 69.9±4.2 years). Participants in the GS group were encouraged to increase their PA by 1000 steps/day above their baseline step counts. All subjects in both groups participated in a square-stepping exercise program for 90 min once a week for 9 weeks. To determine the LEPF benefits of the program, we performed six types of test before and after the program. We evaluated the participants’ daily PA during the program by using pedometers. RESULTS: There was a significant group-by-time interaction on daily PA (p = 0.004): the group with GS significantly increased their PA (early period: 9650±3939, late period: 10892±4416), and the group without GS did not change their PA (early period: 8055±3566, late period: 7809±2982). There were significant time effects in the 5-m habitual walk, the choice stepping reaction time and the 6-min walk. There was a significant group-by-time interaction in the five-repetition sit-to-stand test (p = 0.006): only the group without GS improved their performance.
Knee osteoarthritis (OA) is a common joint disorder, with main complaints of chronic pain, functional limitation and physical disability. Because of these symptoms, patients with OA are often reluctant to reduce their physical activity and consequently worsen their quality of life and sleep quality. Tai Ji Quan is a traditional Chinese exercise, which could reduce pain and physical disability and improve quality of life. However, there was no study that evaluated the long-term effects of Tai Ji Quan on quality of life and sleep quality in patients with knee OA.

**PURPOSE:** The purpose of this study was to determine the effect of 24-week Tai Ji Quan training on quality of life, sleep quality and physical performance among older adults with knee OA.

**METHODS:** We conducted a 24-week randomized controlled trial of forty-six Chinese older adults with knee OA. Participants were randomly assigned to either a Tai Ji Quan group (Tai Ji Quan; n=23) or Control group (Control; n=23). Participants in the Tai Ji Quan group participated in a 3-time weekly Tai Ji Quan sessions, while those in Control group participated in a 60-minutes bi-weekly educational classes. The primary outcomes were changes in physical component summary (PCS) and mental component summary (MCS) of Short Form 36 health survey (SF-36) survey with secondary outcomes being eight subscales of SF-36 survey, the Pittsburgh Sleep Quality of Index (PSQI), Timed Up & Go (TUG), and Berg Balance Scale (BBS).

**RESULTS:** Compared to those in Control group, participants in Tai Ji Quan group had significantly improved the primary outcome (PCS=1.21 points, P=0.012) and secondary outcomes, including three subscales of SF-36 survey (body pain=11.11 points, general health=9.47 points, and social functioning=1.72 points, P=0.047) and PSQI score (-0.06 points, P=0.043). There was a significant within-group change (improvement) in three subscales of SF-36 (physical functioning=15.72 points, P<0.001; role-emotional=12.70 points, P=0.029; mental health=8.57 points, P=0.043), TUG (-0.73 seconds, P=0.006) and BBS (1.9 points, P=0.001) in Tai Ji Quan group.

**CONCLUSION:** 24-week Tai Ji Quan training has positive effects on quality of life and self-reported sleep quality for older adults with knee OA. Supported by National Natural Science Foundation of China (11372194).
PURPOSE: To examine effectiveness of three-stages fall-prevention program on balance ability and ADL-related functional fitness for community-dwelling Japanese old-old women with knee pain.

METHODS: After giving written informed consent, the subjects, unable to stand on one leg more than 20 seconds with eyes open, were divided into the 3 times/week group (HFG: 15 females, 81.6±2.7 yrs, BMI 22.6±1.6) and the 1times/week group (LFG: 14 females, 81.8±1.2 yrs, BMI 21.4±1.4). The program was composed of three stages for 16 weeks. First, they learned about managing skill for their physical soreness and were asked to stand on one-leg with eyes open for one minutes, 3 times a day both each leg at class and at home. Second, they learned to strengthen their core and lower legs muscle using a swiss ball and elastic band. The last stage was to learn 3 minutes arm-and legs combined chair-exercise program with music. ADL-related functional fitness (sitting & standing time, zigzag walking time), one-leg standing time with eyes open, knee extension strength, fear of falling score, and pain score (modified-WOMAC) were obtained. Balance ability was measured by the area covering and total length of the center of gravity sway (COP). Each measurement items were assessed before and after the intervention period. Student’s T-test and two-way repeated measures ANOVA were used to test the effectiveness.

RESULTS: The class participation were 82.7±1.5% and 81.0±2.7% respectively. Sitting & standing time (HFG: 17.4±1.7 to 16:3.1±1.6 sec., LFG: 17:4±1.2 to 11.8±6.5 sec. P<0.031), zigzag walking time (HFG: 19.6±1.8 to 17.0±0.9sec., LFG: 17:4±1.2 to 17:1±1.3sec., P<0.046), one-leg standing time with eyes open (HFG: 5.8±0.9 to 12.4±0.4 sec., LFG: 5.4±0.9 to 6.1±0.6sec., P<0.000), knee extension strength (HFG: 192.0±4.9 to 208.5±11.3 N, LFG: 192.0±15.6 to 196.5±4.6 N, P<0.012), and balance ability, area covering of COP (HFG: 15.3±1.6 to 16.0±2.0 cm², LFG: 14.6±1.3 to 16.7±3.0 cm², P<0.043), total length of COP (HFG: 130.6±8.2 to 100.7±7.6 cm, LFG: 134.0±1:11 to 135.7±1:1 cm, P<0.033), knee pain score also improved significantly in HFG. Fear of falling score was not change in both groups.

CONCLUSIONS: Three-stage fall-prevention program was effective on balance ability and functional fitness for Japanese old-old females with knee pain.

The estimated numbers of dementia patients may increase to 115 million by 2050 in worldwide, thus early detection of the development of cognitive decline and dementia would potentially be of substantial benefits to the patients, families and society. Although some evidence from qualitative systematic review has indicated an inverse association between walking pace and cognitive dysfunction, the magnitude of the association has not been systematically investigated and remains unclear.

PURPOSE: To quantitatively assess the association of walking pace with the risk of cognitive decline and dementia among elderly population through a meta-analysis of prospective cohort studies. METHODS: The relevant prospective cohort studies were identified by searching the PubMed and Embase database through October 2015. The association between walking pace and the risks of cognitive decline and dementia was expressed as weighted RR as comparing the lowest to the highest level of walking pace, and dose-response relation. Random-effects model was used in all analyses.

RESULTS: A total of 16 articles were included. Seven/six articles investigated only cognitive decline/dementia as primary outcome, while other 3 articles examined both. 1) Comparing the lowest to the highest level of walking pace, a significant increased risk of cognitive decline was observed among 7 articles (RR=1.189; 95% CI=1.54-2.31), but no linear relation was observed among 3 studies (RR=1.09; 95% CI=0.96-1.23). 2) The pooled RR indicated slow walking pace significantly increased the risk of dementia (RR=1.67; 95% CI=1.41-1.97), comparing to the highest level of walking pace. The linear trend analysis included 3 articles, a significant dose-response relation was observed (RR=1.08-1.10). CONCLUSION: Our meta-analysis of prospective cohort studies indicates slow walking pace significantly increases the risks of cognitive decline and dementia among elderly people. In light of its characteristics of safety, cost-effectiveness, easy to test and interpret, we suggest walking pace as an effective indicator of the development of cognitive decline and dementia in elderly population.

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Cognitive declines are associated with modifiable risk factors such as physical activity and fitness in older population. Little is known the relation between cognitive function and physical fitness in Korean elderly. PURPOSE: To investigate the relationship between functional physical fitness and mild cognitive impairment (MCI) in a sample of older adults. Methods: In a cross-sectional design, a total of 415 elderly persons aged 62–91 yrs (108 men and 307 women) underwent body composition assessment and senior fitness test (SF) consisting of strength, flexibility, endurance, and agility/dynamic balance. Korean version of mini-mental state examination (MMSE) and a short-form of geriatric depression scale (GDS) were used to assess cognitive performance and symptoms of depression, respectively. Serum levels of glucose, insulin, and lipids were measured. Homeostasis model assessment of insulin resistance was calculated by using fasting glucose and insulin. A composite score of SFT was calculated as a sum of z scores for each domain of the SFT parameters. Subjects were classified as low fit (lower 25 percentile), moderate fit (middle 50 percentile), and high fit (high 25 percentile) based on the com posed score of the SFT parameters. Results: Linear contrast analysis using one-way ANOVA showed significant linear trends for (p<0.001), GDS score (p<0.001) and body fat (p=0.034) across the incremental standardized fitness levels from low to high fit. In particular, a linear increase for MMSE score (p<0.001) was found across the incremental standardized fitness levels. Logistic regression analyses showed that compared to the low-fit group, the moderate- and high-fit groups had significantly lower odds ratios (p<0.001 and p<0.001, respectively) for having MCI even after adjusted for age, sex, education, and the measured risk factors. Conclusion: The current findings suggest that physical activity and fitness should be promoted as a preventive means to combat declined cognitive functioning in elderly Koreans. Supported by the National Research Foundation Grant funded by the Korean Government (NRF-2014R1A1A0506473).
The inactivity rates of children are on the rise. Meanwhile, the Center for Disease Control recommends 60 minutes of moderate-vigorous activity each day for children. The majority of time spent exergaming falls within the moderate-vigorous intensity range.

**Purpose:** To compare energy expenditure (EE), exercise intensity [metabolic equivalent of task (MET)], rating of perceived exertion (RPE), and number of steps taken while playing competitive exergames vs. single player exergames.

**Methods:** Participants who volunteered in this study (N=61) were healthy men (N=34) and healthy women (N=27) of various ages (16-40 yrs). Participants who chose competitive play were randomly arranged to play in groups of two on a videogame designed for players to simulate dance moves for 30 minutes. Participants played the same game for the same amount of time whether in single or multiplayer mode. During the 30 minutes of gameplay, EE, MET, and number of steps taken were measured using accelerometers. After gameplay each subject reported RPE.

**Results:** No difference in EE was measured between the two groups. Solo players expended 858.2±130 J while competitive players expended 896.9±140 J. During competitive play, players played with a higher average intensity (6.0.13 MET) than solo players (5.3.14 MET) (p=0.001) while the time spent in the 6-9 MET (high intensity) range was also greater in competitive players (12.9±0.007 vs. 17.9±0.002 min., p<0.002). During competitive play, participants took more steps than during solo play (2070.58±58 vs. 2230.1±48 steps, p<0.04). A trend for lower RPE was noted in competitive players 12.23 (p=0.068).

**Conclusion:** There was no significant difference in EE between groups. There was a trend for lower RPE during competitive play even though competitive players played more intensely and took more steps than solo players. It seems that the thrill of competition caused competitive players to play a little harder but to feel as if they exerted themselves less.

**REFERENCES**

Cognitive behavioral strategies (CBS) have been shown to be an effective way to increase physical activity (PA); however, many kinesiology students are not trained to deliver such strategies (Brawley, 2013).**Purpose.** The purpose of this project was to explore if training students to use cognitive behavioral skills training (CBS) when working with clients was an effective way for increasing PA level of clients. This study also aimed at investigating changes in clients’ self-efficacy (SE) to be physically active as well as students’ self-efficacy to deliver these cognitive behavioral strategies.

**METHODS.** Twenty-eight students (age: 23.5±2.4) received CBS training as part of an upper division kinesiology class. All students were matched with a client (N=25, 27.5±11.1) who was seeking to increase their PA. Students met with their clients for a minimum of 5 visits over the course of 6 weeks. At the first and last meeting with students and clients, clients’ levels of SE were measured using a multidimensional SE scale consisting of three subscales (task, coping, and planning SE; Roger et al., 2008). Clients’ physical activity was assessed using Godin Leisure Time Exercise Questionnaire (Godin & Shephard, 1985). Students’ SE was measured using a 10-item scale developed for this study. Paired t-tests were performed to compare differences between pre and post scores.

**RESULTS.** There was a significant increase in PA levels of clients (p<0.01). Clients’ scheduling SE also significantly increased from pre to intervention levels (p<0.01); whereas client’s coping SE showed a positive trend that did not reach significance (p=0.07). Students SE to deliver cognitive behavioral strategies also increased significantly during the course of the class (p<0.003).

**CONCLUSIONS.** These findings provide preliminary evidence that CBS may be an effective way to increase clients’ PA and scheduling SE along with students’ SE to deliver CBS.
differences were observed in the awareness and knowledge between the intervention and control groups as short-term impacts of the CWC, PA did not change in the two years. The long-term effects of CWCs should be investigated in the future. This study was partially supported by Comprehensive Research on Aging and Health Science Research Grants for Dementia R&D from the Japan Agency for Medical Research and Development (AMED).

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Music is often used as an ergogenic aid to enhance physical performance during exercise. While the effects of music on exercise performance have been extensively studied, the effects of the deprivation from visual and auditory stimulation are not as well characterized. PURPOSE: To assess the influence of various sensory environments, including neutral, music and sensory deprived conditions, on the perceived exertion and exercise output at a moderate intensity. METHODS: Thirteen healthy young adults (22.5 ± 1.8 years) were recruited to participate in four separate exercise sessions on a Monarch cycle ergometer. During the first session the participants completed a sub-maximal YMCA test to predict their maximal workload. The participants then came in for three more sessions in varied order containing a neutral environment, a music environment and a sensory deprived environment. During each session the participant warmed up for 5 minutes, exercised on the cycle ergometer for 15 minutes at 60% of their maximal workload and then cooled down for 5 minutes. The music environment contained self-selected music via head phones and during the sensory deprived environment participants wore a blindfold and noise cancelling ear buds. Significant differences were determined by using repeated measures ANOVA. RESULTS: A significant (p<0.05) difference was found between the total distance biker during the neutral environment and the sensory deprived environment (4.15 ± 0.60 km vs 4.02 ± 0.72 km). There was also a significant (p<0.05) difference between the neutral environment and the music environment (4.15 ± 0.60 vs 4.45 ± 0.58 km). A significant difference was also found between music and the sensory deprived environment (4.45 ± 0.58 vs 4.01 ± 0.72 km). CONCLUSION: Music lead to an increase in exercise output during moderate intensity cycling, while sensory deprivation may have a negative effect on exercise output during moderate intensity exercises.

Regular physical activity benefits the health of the general population, more in those with sedentary behaviors. In an ongoing epidemiological study (‘Move for Health’) conducted by this Institution, it was previously shown that 18.3% presented lower values than 150 min/wk of physical activity. Lower quartile of leisure domain activities (h/week) at baseline (M0) and after 10 weeks (M1) of physical intervention. 

Methods: The studied sample referred low income (71% earning less than 5

Behaviors of sedentary transport (4.55±.4.22h/wk) and sit down time either weekdays (5.6x±5.9h/d) or weekends (5.6x±7.6h/d) did not change significantly (p>0.05).

CONCLUSION: Inexpensive and institutional-led lifestyle modification programs would provide extra energy expenditure as leisure time physical activity to these low socioeconomic communities. Supported partially by CNPq, CAPES.

PURPOSE: Delayed discounting, defined as preference for immediate utility over future benefits, has been linked previously to unhealthy behaviors, such as smoking and excessive alcohol intake. However, insufficient evidence has examined the relationship between delayed discounting and physical activity.

METHODS: We examined the cross-sectional relationship between adults’ time preferences and meeting physical activity guidelines among a national sample (n=7,071) of US adults. Physical activity was self-reported; MET minutes per week were computed based on the frequency, intensity and duration of activity and then dichotomized into meeting guidelines (yes/no). Time preferences were determined via responses to preferences for a hypothetical dollar amount today or a larger sum in the future; i.e., 30 days or 60 days from the present time. Multivariate logistic regression was applied in the analyses.

RESULTS: Multivariate analysis reveals that the more willing participants were to be patient (i.e. willing to receive a higher dollar amount in the future) the higher the likelihood was to meet physical activity guidelines (P for Linear Trend <0.05).

CONCLUSIONS: Results indicate a dose response relationship between more patient economic time preferences and meeting physical activity guidelines among a large sample of US adults. Future research and practice should aim to assess temporal discounting among the population and tailor intervention programs accordingly utilizing insights from behavioral economics.

The physical exercise protocol was composed by daily sessions of 100 min, 3-5x/10- week program of supervised physical exercises training and dietary counseling. of 2004 to 2015. After a baseline assessment the participants were submitted to a 11.1 yrs, 76% women) enrolled in our “Move for Health” Program during the period

PURPOSE: To verify the impact of adding leisure-time activities to the resulted sedentary behaviors.

METHODS: The longitudinal study comprised 1572 subjects older than 35 yrs (53.8 ± 11.1 yrs, 76% women) enrolled in our “Move for Health” Program during the period of 2004 to 2015. After a baseline assessment the participants were submitted to a 10-week program of supervised physical exercises training and dietary counseling. The physical exercise protocol was composed by daily sessions of 100 min, 3-5x/week, including 20min warm up/ stretching, 30 min walking (60-80% VO2max), 40min strength in academy (3x 8-12 rep, 60-70% 1RM) and 10min stretching and cool down. By using the International Physical Activity Questionnaire (IPAQ-way long-version 8), it was evaluated the time spent on sedentary activities during the week and on weekends (h/day), in the fields sedentary transport (h/week) and physical leisure activities (h/week) at baseline (M0) and after 10 weeks (M1) of physical intervention. The Student’s t test was used to compare the two moments with a significance level of 5%.

RESULTS: The studied sample referred low income (71% earning less than 5 minimum salary wage), low schooling (52.6% uncompleted elementary school) but in a good – excellent status of health, according their self – perception. Leisure time - physical activity increased 2.12x (7.3x±15.5h/wk; p<0.001) post program.

PURPOSE: Exercise Cycling Performance

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CONCLUSIONS: We examined the cross-sectional relationship between adults’ time preferences and meeting physical activity guidelines among a national sample (n=7,071) of US adults. Physical activity was self-reported; MET minutes per week were computed based on the frequency, intensity and duration of activity and then dichotomized into meeting guidelines (yes/no). Time preferences were determined via responses to preferences for a hypothetical dollar amount today or a larger sum in the future; i.e., 30 days or 60 days from the present time. Multivariate logistic regression was applied in the analyses.

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Transit-related physical activity (PA) can contribute to total daily PA. Public transit use is related to increases in PA. Identifying the determinants of public transit use could be important in understanding ways to promote PA. The Theory of Planned Behavior (TPB) has been used to predict many health behaviors, but not transit use. The Transit-Related Activity in Neighborhoods (TRAIN) Study, a prospective natural experiment of transit use following expansion of the light-rail infrastructure in Houston, TX, may be used to address this question.

**Purpose:** To examine the utility of the TPB model for predicting transit use in a low-income, minority population.

**Methods:** This study used baseline TRAIN Study data (2013-2015) which included reported transit use and key TPB constructs. Structural equation modeling tested the fit of the TPB model for explaining the number of trips taken on buses or light rail in a typical week. The latent variables were: attitudes, subjective norms, perceived behavioral control, and intentions related to transit use.

**Results:** Participants included 695 (63% women) with a mean age of 52 (SD = 14) years and the majority (n = 92; 23.5%) were black or Hispanic. The average number of reported transit trips per week was 8.7 (min = 0; max = 102) with 28% reporting zero trips.

Standardized item-factor loadings for TPB constructs were all statistically significant (p < 0.001), ranging from 0.69 to 0.87. The model demonstrated adequate fit with the data: χ²(106, N=593) = 375.3, p < 0.001, CFI = 0.93, RMSEA = 0.067. Attitudes (β = 0.97, SE = 0.07) and perceived behavioral control (β = 0.50, SE = 0.09) were significantly related to intentions (p < 0.001). Intentions (β = 3.32, SE = 0.59, age (β = -0.1, SE = 0.041), education (β = -0.1, SE = 0.34) and reported concern about becoming the victim of crimes in the neighborhood (β = 1.25, SE = 0.49) were significantly associated with reported transit use (p < 0.05). The variance in intentions and the outcome accounted by the model were 68.5% and 13.5%, respectively.

**Conclusion:** Results suggest that TPB is a promising theoretical model to explain transit use. Although more data are needed to confirm these results, this model may be useful to guide future interventions to promote transit-related PA among adults in low-resource communities.

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**Scapular Stabilisers And Ball Speed Of A Tennis Serve In Influence Of Kinesiology Tape - EMG-activation Of The Use in the Houston Train Study**

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The effects of Kinesiology Tape on the neuromuscular system have been discussed in recent literature. The effects on power, range of motion, proprioception, and muscle strength can be vital to reach optimal functional performance. There is no research available that studies the effect of Kinesiology Tape on the scapular stabilizers in tennis players.

**Purpose:** To determine if Kinesiology Tape can have an effect on the muscle activation of scapular muscles and the ball speed of the tennis serve in tennis players between the age of 18-25 years.

**Methods:** The study is a quantitative analytical case study on 30 collegiate tennis players (19 male, 11 female, mean age 20 years). The muscle activation of the serratus anterior and lower trapezius muscles were measured by means of Electromyography (EMG). The intervention was the application of Kinesiology Tape on the scapular stabilizers.

**Results:** EMG-activation for lower trapezius muscle’s mean highest measurement (p = 0.7143) and maximum measurements (p = 0.336, SD 295 ± 451) (both p < 0.05) improved, but were not statistically significant. EMG-activation for serratus anterior muscles highest measurement was 0.218% (p = 0.536, SD 131 ± 131) (both p > 0.05) and the mean measurement was 0.0045% (p = 0.05) after the application of Kinesiology Tape.

**Conclusions:** It appears that there is statistically improvement in the mean EMG-activity of the serratus anterior muscle after the application of Kinesiology Tape on the scapular stabilizers. However, the Kinesiology Tape had no influence on the activation of the lower trapezius muscle nor the ball speed during service.

With wearable technology topping the 2016 ACSM Fitness Trends survey, research in this area may help quantify the importance of such devices.

**Purpose:** To determine if the FITBIT accelerometer altered physical activity levels in those wearing the accelerometer versus those not wearing the device.

**Methods:** There were 19 participants in this study, recruited from the University of Central Oklahoma employee wellness program. Each participant completed the Human Activity Profile (HAP) survey to measure physical activity levels pre- and post- experimentation. Ten participants received a FITBIT accelerometer to wear post-program.

**Results:** Nine participants (6 female, mean age 37 yrs, all non-Hispanic white or mixed race) joined the program and completed a baseline assessment. Program completion rate was 78% (7/9). Despite a small sample size, the program led to medium effect sizes for change in steps (d = 0.41) and exercise self-efficacy (d = 0.48), Average daily steps increased by 1,494, with increases in four of six participants with complete PA data. There were also small effect sizes for change in depressive symptoms (d = 0.19) and subjective stress (d = 0.20) and perceived stress (d = 0.20) and perceived stress (d = 0.20) and perceived stress (d = 0.20).

**Conclusion:** These data demonstrate the feasibility of pairing people with shelter dogs for 10 weeks, and provide preliminary evidence that fostering a dog increases PA and mental wellbeing. Community-based interventions centered on dog fostering could be a novel approach to wellness promotion with added humanitarian benefits.
Exercise on Physical Fitness, Activity and Body Weight

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University employees have varying structures regarding their work schedule and daily responsibilities. Thus, job classification may have an impact on daily step counts before, during, and after the workday. PURPOSE: To compare baseline step data of university employees based on job classification to aide in worksite wellness intervention tailoring. METHODS: Employees were recruited via email to participate in an 8-week worksite walking intervention. Only participants not currently meeting minimum physical activity recommendations (<150 minutes of moderate to vigorous physical activity (MVPA) per week) could enroll. Baseline data were collected prior to the start of the intervention. Participants wore a blinded accelerometer (New Lifestyles -1000) with a 7-day memory recall during waking hours for one week. Faculty (n=17), staff (n=1), and civil service (n=18) data were analyzed and compared. RESULTS: A one-way between subjects ANOVA was conducted to compare the effect of job category on baseline daily step averages in university faculty, staff, and civil service workers. There was a significant effect of job category on baseline step averages for the three conditions [F(2, 63) = 4.54, p = .014]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for staff was significantly different than faculty (p = .046) and civil service workers (p = .037). However, faculty did not significantly differ from civil service workers in baseline step averages (p = .999). CONCLUSION: Staff had greater daily step count averages compared to faculty and civil service workers. Therefore, traditional job descriptions regarding overall activity may not be accurate and should be considered when tailoring workplace interventions. Future studies should incorporate minutes of MVPA to better assess physical activity levels.
A 12 week, pedometer-based physical activity program was implemented at Slippery Rock University of Pennsylvania as a means to provide an interactive way to increase step counts amongst students and non-students. PURPOSE: The primary purpose of this study was to determine if there was a significant difference in step counts taken during weekdays versus weekend days for both students and non-students during a 12 week, pedometer-based physical activity program. A secondary purpose of this study was to examine the step counts between students and non-students. METHODS: Participants (n=258) were encouraged to wear a pedometer every day for 12 weeks during the spring semester of 2015. Each Monday, participants reported daily step counts from the previous week. Participants were encouraged and incentivized to increase step counts throughout the 12 week program. RESULTS: Of the 258 participants who registered, 160 completed the program (62% adherence). There was a significant difference between step counts taken on weekdays (10,604±6,184) versus weekend days (8,958±6,069) (p<0.01) for both students and non-students. Upon further analysis, it was found that both students and non-students had the highest step counts on Mondays (10,989±5,205) and the lowest step counts on Saturdays (8,564±5,780). Monday step counts were significantly higher than both Saturday and Sunday step counts (p<0.01). Although students and non-students mimic the same step count patterns throughout the week, students actually had a significantly higher number of daily step counts than non-students (10,288±6,321 versus 9,660±5,777 respectively) (p<0.01). CONCLUSION: Step counts were higher on weekdays as opposed to weekend days for both students and non-students. Although displaying similar patterns throughout the week, students had significantly higher daily step counts than non-students. In the future, program coordinators should consider incentivizing participants to increase step counts during the weekend, where step counts were reportedly the lowest.

Observational evidence supports an association between sedentary behavior and increased risk for cardiovascular disease (CVD). Physical activity recommendations now advocate for all age groups to minimize time spent sitting. Functional intervention strategies to decrease prolonged sitting, tested in “real world” settings, are needed to provide specific public health guidelines (e.g. frequency and duration of breaks in sitting) for CVD reduction. PURPOSE: To examine the potential acceptability of a tactile vibration prompt (TVP) as an intervention to reduce prolonged sitting. METHODS: Thirteen healthy adults who self-reported sitting ≥7 hours/day typically in bouts ≥30 minutes were a thigh-based accelerometer with a TVP feature (actiPAL3) for seven days. The TVP was programmed to vibrate after 30 consecutive minutes of uninterrupted sitting during waking hours. Participants were asked to stand or walk for ≥1 minute in response to the TVP. Upon returning the device, participants completed a Likert-scale questionnaire assessing TVP protocol acceptability, embarrassment, and ease of responding. RESULTS: Participants found the TVP protocol easy to comply with (Mean±SD: 4.5±0.5, 100% agreed), would be willing to follow a longer protocol (e.g. 3 months: 4.0±0.9, 76.9% agreed) and did not find it difficult to respond while at work (2.1±1.1, 69.2% disagreed) or home (2.2±0.7, 76.9% disagreed). Participants found the 1-minute standing/walking breaks in response to the TVP not to be ‘too long’ (2.3±0.9, 69.2% disagreed), but were mixed regarding frequency (every 30 minutes) being ‘too often’ (2.7±0.9, 46.2% disagreed). The device was generally not embarrassing when seen (1.9±0.8, 76.9% disagreed) or heard (2.0±0.8, 69.2% disagreed) by others. Participants generally found the TVP protocol easy to follow during weekdays (3.8±1.9, 76.9% agreed) and did not decrease work productivity (2.0±1.2, 69.2% disagreed). CONCLUSION: Subjective user experience will be a driving factor in the success of devices providing TVP-based sitting interruption. Our findings indicate that a TVP was generally accepted by most participants both at home and work, suggestive that a TVP-based intervention may be a viable methodology to ameliorate prolonged sitting behavior.

Cardiorespiratory fitness (CRF) and muscular strength are associated with improved functional performance, less disability, and lower all-cause mortality. Health care providers often struggle to motivate individuals to increase their physical activity to achieve the associated health benefits. PURPOSE: To determine if measuring CRF and muscular strength influences physical activity as determined by the Exercize Vital Sign (EVS). METHODS: Subjects were attendees at the 2014 Minnesota State Fair who were ≥18 years of age, did not have cardiovascular disease or take negative chronotropic drugs. Those consenting to participate were randomized 1:1 to control and intervention groups. EVS, calculated by multiplying the number of moderate-vigorous exercise sessions/week by the average minutes/session (capped at 840), was measured in all subjects. Intervention subjects completed a timed step test, estimating VO2max using pre and post heart rate values, had muscular strength measured with a hand dynamometer and were provided their results with age appropriate normative data for VO2max and grip strength. All subjects received information on exercise recommendations and benefits and were contacted by email 3 months after randomization to determine their current EVS. RESULTS: Of the 776 individuals screened, consented and randomized, 336 (43.3%) participants responded to the 3 month follow-up survey (162 control, 174 intervention). Mean initial EVS was 247.3 (median 180) and 242.6 (median 180) for the intervention and control groups respectively. Initial EVS was positively associated with estimated VO2max (r=0.14, p=0.007), but not with grip strength (p=0.15) or age (p=0.28). Mean follow-up EVS was 218.6 (median 280) and 194.6 (median 150) for the intervention and control groups (p=0.02). At follow up 76 (43.5%) of the intervention and control respondents reported participation in strength training activities (p=0.005), increased from 30.9% & 25.9% in the baseline groups. There were no other significant differences between the groups.
CONCLUSIONS: EVS as a measure of physical activity correlates with estimated VO2max and therefore provides a simple tool to estimate CRF. Measuring CRF and strength had no influence on EVS at 3 months but may increase participation in strength training activities.

478
Board #315
June 1, 11:00 AM - 12:30 PM
Workstations To Increase Workplace Physical Activity And Reduce Sitting Time: A Pilot Study
Alyssa Olenick, Crandall Jason, Mark A. Schafer, Zagsuren Battogtokh, Scott T. Lyons, Joshua Brown, Dustin Falls. Western Kentucky University, Bowling Green, KY. (Sponsor: Dr. James Green, FACSM)
Email: alyssa.olenick196@topper.wku.edu
(No relationships reported)

There is growing evidence prolonged workplace sitting is associated with multiple health risks. Utilizing static and active workstations may increase daily workplace physical activity and reduce workplace-sitting time. PURPOSE: The purpose of study was to determine if access to both static and active workstations could increase workplace physical activity and decrease sitting time.

METHODS: Participants (N=15) were assigned to an experimental (sit-stand workstation and shared treadmill desk; n=8) or control group (n=7) for seven weeks. The International Physical Activity Questionnaire long form was administered at baseline and at the end of the study to assess workplace physical activity and sitting time. Participants were an activity tracker (Fitbit One) to objectively assess daily footsteps and physically active hours. A mixed-within subject analysis of variance was used to compare the groups (alpha: p < .05).

RESULTS: There were no statistically significant between group differences in the dependent variables.

CONCLUSIONS: This is the first study to examine the use of static and active workstations to increase workplace physical activity and reduce sitting time. Workday sitting decreased 61% in the experimental group, while increasing 8% in the control group. Although only half of the experimental group participants used the shared treadmill desk, the mean number of footsteps taken (8897.25) was well above the recommended >5000 steps/day. Because no attempt was made to motivate or promote use of the equipment in any way, a health education component may be needed, along with a larger sample size to attain more significant increases in workplace physical activity and reductions in sitting time.

479
Board #316
June 1, 11:00 AM - 12:30 PM
Signage Increases Stair Use: Applying Visual Metaphors with Health and Non-health Messages For Behavior Change
Dixie Stanforth1, Allison Lazard2, Philip R. Stanforth1, Benjamin Wyeth1, Michael Mackert1, Xiaoshan Li1. ‘The University of Texas at Austin, Austin, TX. ’The University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: John Bartholomew, FACSM)
Email: d.stanforth@austin.utexas.edu
(No relationships reported)

Increased routinized activity, such as stair-climbing, is an accepted method to increase physical activity. Behavioral and attitudinal outcomes of previous research are inconsistent. The low cost and large benefits of increased stair usage warrant study. Purpose: To evaluate the effectiveness of and attitudes toward a communication campaign promoting stair use on a university campus. Campaign messages incorporated health and non-health text and visual metaphors.

Methods: Two campus buildings were selected based on proximity of elevators and open stairwells and randomly assigned health or non-health messages. Unobtrusive observers conducted baseline counts of stair/elevator usage for 10 days prior to placing signs. Each building had four different signs: two at points of entrance and two at point of choice (entrance to elevator/stairwell space). Point of entry and choice signs were switched after two weeks. Counts of stair/elevator usage were conducted each week. At four weeks signs were removed and surveys administered to determine awareness and response.

Results: 65.2% of survey respondents reported seeing the signage (t = 30.576, p <.001, d =1.363) and 48.1% of that group reported that the signage influenced stair-taking behavior (t=17.261, p<.001, d= -.96). Repeated measures analysis of variance determined a significant influence of the signage on use of stairways (F=10.604, p <.001, partial η2=.373). Stair usage significantly increased after the signage was first placed (F= 10.720, p<.05, partial η2=.373) and the increase remained after the signage was shifted (F= 13.766, p<.01, partial η2=.433). There was no difference between the health and non-health messages (t2=.760, p>0.02).

Conclusion: Stair climbing is a simple and efficient strategy to increase daily physical activity. Both highlighting health benefits, such as improved heart health, and providing novel visual messages to promote cognitive processing led to a significant increase in stair usage.
484 Board #321
June 1, 11:00 AM - 12:30 PM
The Effect of Cooperation and Competition on Energy Expenditure and Exercise Intensity During Exergaming
Jordan Cruz, Sidney Merryweather, Benjamin B. Roush, Caleb Johnson, James Tidwell, Michael Bohne, Steven F. Namanny, Ellis B. Jensen. Utah Valley University, Orem, UT. Email: jordanwcruz@hotmail.com (No relationships reported)

Introduction: Exergaming mixes video games with physical activity. Exergaming may help people convert inactive time to active time. Exergames may involve individual, cooperative, or competitive gaming modes. In cooperative exergaming players work together to achieve a common goal. In competitive exergaming players compete against one another. The aim of this study was to determine whether players in solo, competitive, or cooperative exergaming play with greater intensity or expend more energy. Materials/Methods: Twenty male and female (9 females and 11 males) adult (ages 18-28) volunteers completed four trials of exergaming including individual, cooperative or competitive play using two different games. Playing Kinect Adventures (KA), subjects completed a solo and a cooperative trial. Playing Motion Sports Adrenaline Rush (MSA), subjects completed a solo and a competitive trial. Energy expenditure (Joules - J) and exercise intensity (METS) were measured using SenseWear accelerometers (BodyMedia). Results: Group means: KA solo trial energy expenditure 590 J, exercise intensity 3.81 METs. KA cooperative trial 570 J, 3.65 METs. MSA solo trial 610 J, 3.97 METs. MSA competitive trial 701 J, 4.50 METs. ANOVA revealed no difference in METs or energy expenditure between solo play and the cooperative or competitive versions of either game however when comparing cooperative gaming to competitive gaming MET values were higher in the competitive group (p = .007). The trend with cooperative gaming was toward an energy expenditure that was slightly less than solo play while competitive gaming demonstrated a trend towards increased intensities so while neither competitive or cooperative were different from solo play, cooperative had a lower average intensity than competitive. Conclusion: Exergaming cooperatively or competitively did not result in higher exercise intensity or energy expenditure than playing alone. A significant difference in exercise intensity was shown while playing exergames competitively compared to cooperating. The ability for competitive exergaming to stimulate more physical activity and healthy adaptations to exercise may make competitive play a better way to improve health through exergaming.

485 Board #322
June 1, 11:00 AM - 12:30 PM
Future Sports and Exercise Medicine Doctors’ Attitudes and Physical Activity Counseling Practice
Eszter Füzéki, Winfried Banzer. Goethe University Frankfurt, Frankfurt am Main, Germany. Email: fuezeki@sport.uni-frankfurt.de (No relationships reported)

PURPOSE: Physical activity (PA) promotion in health care setting has been shown to be efficient, effective, and cost-effective with relevant clinical benefits for various patient groups. Sports and exercise medicine physicians might be especially qualified to counsel inactive patients. Purpose of the study was to assess the knowledge and attitudes related to physical activity counseling practice of future sports medicine physicians.

METHODS: We used an adapted version of a previously tested and published questionnaire to assess future sports medicine physicians’ knowledge and practice in PA counseling. Responders were recruited among prospective sports medicine physicians participating in the subspecialty program “Sports Medicine” of the Department of Sports Medicine, Frankfurt University, Germany. After descriptive data analysis a cross-tabulation between counseling practice and selected parameters was tested using the chi-square test.

RESULTS: Response rate was 56.58% (205/116), with 35% female respondents. Age distribution was as follows: under 30 years 5% (6), 30-39 years 29% (34), 40-49 years 21% (24), 50-59 years 35% (40) and 60 and above 10% (12). 35% (40), 24% (27) and 41% (46) reported having been in practice for under 10 years, 10-20 years and above 20 years respectively. All responders judged PD to be very important (86%, n=100) or important (14%, n=16) in the prevention of chronic diseases. Self-reported competence to give advice on PA was very high (9%, n=10) or high (73%, n=84). Only 18% (n=21) assessed their own competence as low or very low. 67% of respondents reported not knowing current PA recommendations. 28% (n=33) of responders reported giving counseling less than 25% and 34% (n=40) max. 49% of their patients. Self-rated competence to provide PA counseling, the knowledge of current PA recommendations, and good education were associated with an increased rate of counseling.

CONCLUSIONS: There is a large discrepancy between perceived importance of PA in the prevention of chronic diseases, self-rated competence to provide PA counseling and actual PA counseling. Cooperation with organized sports providers is limited. Knowledge of current PA recommendations seems to enhance PA counseling.
Menopause is associated with a decline in physical activity. Previous studies using mouse models have shown that after ovariectomy (OVX), estradiol restores wheel running distances to pre-surgical levels. However, the effects of the other major ovarian hormone, progesterone, have not been investigated.

PURPOSE: The purpose of this study was to determine the effect of progesterone and a combined estradiol-progesterone replacement on wheel running activity after ovariectomy in mice. Methods: Forty female C57Bl/6 mice, 4 months of age, were given free access to running wheels for 2 weeks prior to intervention to assess baseline-running distances. Baseline-running distance was used to randomize mice into 4 groups (n=10 for each): 1) Sham (sham surgery, no treatment), 2) estradiol (E2), 3) progesterone (P4), or 4) no treatment (OVX). All mice then underwent ovariectomy, were allowed to recover for ~8 days, and then returned to the running wheels for ~2 weeks. Three weeks after ovariectomy mice were implanted with hormone replacement pellets and returned to the running wheels for 6 weeks. Subsets of mice were also analyzed for cage activities. Results: Mice ran an average of 8.93±2.8 km/24 hr before OVX and 4.60±0.40 km/24 hr after OVX (p=0.001). There were no differences in cage activities, such as ambulation distance, among the 4 groups before or after OVX, or in response to treatment (p > 0.05). There was no difference in running distance among groups after hormone replacement (p=0.057). Conclusion: Progesterone, estradiol and combined treatment have a similar effect on wheel running distance after ovariectomy. This work was supported by NIH grant RO1-A0931743.

**Table 1: Wheel Running Distance After Ovariectomy in Mice**

<table>
<thead>
<tr>
<th>Group</th>
<th>Running Distance (km/24 hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sham</td>
<td>8.93±2.8</td>
</tr>
<tr>
<td>Estradiol (E2)</td>
<td>4.60±0.40</td>
</tr>
<tr>
<td>Progesterone (P4)</td>
<td>4.60±0.40</td>
</tr>
<tr>
<td>No Treatment (OVX)</td>
<td>4.60±0.40</td>
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</table>

**METHODS:** Ten recreationally-active healthy participants (25.2±3.0 y) stood blindfolded on a force plate with their heads turned to the left and arms relaxed at their sides for two 180-s trials. During each trial, participants were exposed to stochastic vestibular stimulation (SVS) (0.25 Hz, ±2.5 m/s²). Participants executed a cognitive task (double-digit arithmetic) for one trial and during another, they stood quietly.

**RESULTS:** Coherence for SVS-AP forces and SVS-EMG spanned similar operational t-tests for all dependent variables. Cumulant density values were considered physiologically relevant when exceeding vestibular stimulation (SVS) (0-25 Hz, ±2.5 mA). Participants executed a cognitive blindfolded on a force plate with their heads turned to the left and arms relaxed at their side.

**REFERENCE:**


**CONCLUSION:** Cumulant density function data demonstrate enhanced vestibular control of balance when cognitive demand is elevated, despite similar COP displacement between conditions. This augmented neural strategy may act to supplement divided cortical processing within the balance system, thus compensating for the acute neuromuscular modifications associated with increased cognitive demand.
Power production and dynamic balance are important in maintaining and improving functionality in older adults. When working to improve exercise performance or activities of daily living (ADLs), older adults often encounter difficulty due to insufficient power or balance. While a relationship exists between power and dynamic balance, peak power may be a more significant contributor than average power. Furthermore, 83.5% of the variance was unexplained, between power and dynamic balance, peak power may be a more significant contributor than average power. Furthermore, 83.5% of the variance was unexplained, suggesting dynamic balance may be predicted by multiple factors.

**Methods:** Twenty-nine healthy male subjects (age 25.± 6.4 years; height 180.0 ± 9.3 cm; mean ± SD) volunteered for this study. Three testers, one experienced and two trained, tested each subject on four different occasions in random order. The order of tests was not randomized. All subjects performed the HSBT on a mat specifically designed for ease and repeatability of measurements (Athletic Knowledge Nordic AB, Stockholm, Sweden). Horizontal reaches were measured in centimeters and rotational reaches in degrees. Instructions and a minimum of three practice trials were given prior to each test. The testers were blinded to other results and the statistical analysis. Intra class correlation coefficient (ICC1,3) was used to calculate intrarater reliability of one tester and interrater reliability between three testers, using SPSS v 21.0. The following criteria were used to evaluate ICCs: high=>0.90, 0.80-0.89 moderate and below 0.80 questionable.

**Results:** Interrater reliability ranged from 0.80-0.97 and 0.88-0.96 for left and right foot respectively. Interrater reliability ranged from 0.81-0.97 and 0.88-0.97 for left and right foot respectively.

**Conclusion:** HSBT show moderate to high inter- and intrarater reliability.
The ability to maintain balance, or postural control, is an essential component in motor skills ranging from simply maintaining posture to performing complex voluntary movements. Improving balance has been shown to help with recovery from injury, injury prevention, and improved functional performance in both young and older adults. **PURPOSE:** To determine if different applications (i.e., mediolateral (ML) vs. anterior-posterior (AP)) of kinesiology tape affect postural control. **METHODS:** Participants (6 men, 20 women; 23.7 ± 3.9 yr) ML stability index (MSLI), AP stability index (APSI), and overall stability index (OSI) were measured using a balance platform under three bare-footed conditions in random order: control (no tape); tape applied in a ML stirrup under the heel, extending 12” above the medial malleolus; and tape applied in an AP direction under the heel and extending proximally on the posterior calf in a Y-pattern on each side of the gastrocnemius. Each application was made bilaterally with 50% tension. For each condition, three stances (should-width, full tandem, unilateral) held for 10 sec each with eyes closed were assessed on stable and foam surfaces. **RESULTS:** Kinesiology tape did not have an effect on any measure of balance while standing on a firm surface in all 3 stances. Tape applied in the AP and ML direction did improve (p<0.05) MSLI by 20% while standing on foam with a shoulder-width stance. Tape in the ML direction had no other effect on balance while standing on foam for any stance. Tape applied in the AP direction improved (p<0.05) APSI (19%) and OSI (17%) for both the full tandem and unilateral stances on foam. **CONCLUSIONS:** Kinesiology tape applied in the ML direction has little, if any, effect on balance. However, tape applied in the AP direction does appear to improve balance in the AP direction, as well as overall stability, in more challenging static conditions such as standing on foam with a reduced base of support. Further research is needed to understand the effects of kinesiology tape, particularly when applied to the lower leg in the AP direction, during situations when postural control is challenged, not only in static positions, but also during dynamic movements.

**Impact of Working Hours in Worker’s Postural Control**

**PURPOSE:** To determine how working hours in different shifts (e.g., day workers, night workers) affects postural control. **METHODS:** Thirty-two night workers were included, 12 bus drivers (42±8y) who worked eight-hours in a 5-consecutive-night system, that is, 12 hours working and 16 hours off. All participants wore wrist actigraphs for four days. On the fourth day, before and after shift, they fulfilled the Karolinska Sleepiness Scale and were evaluated in a force platform for measures of postural control performance, standing as still as possible for 30 seconds with eyes-opened. **RESULTS:** Significant differences between variables before and after shift, and statistical significance at 5%: A significant and average increase of 2.15±1.59 points in the KSS was observed after-night shift for workers, as well as an increase of 0.15±0.03 cm in mean sway amplitude. ROC curve analysis evidenced that an increase of at least 0.17 cm in mean sway amplitude discriminates sleepy and non-sleepy individuals (scores greater than 7 in the KSS) with 72% sensitivity and 96% specificity. **CONCLUSION:** Our findings suggest that longer working hours may have a negative impact in postural control, independently of age, and with an additive effect of body mass index. Shift size (5x2 days or 12x36 hours) is more important in determining the level of impairment in postural control than is working hours’ duration per se, and, therefore, future investigations should be aimed.

**Financial Support:** CAPES, CNPQ, CEMSA, CEPE.
suggest that ATH use different postural mechanisms than NON during quiet upright stance with eyes open. This could be due to an enhanced utilization of visual cues as a result of a visually rich training paradigm.

Stroboscopic vision (SV), intermittent obstruction of normal visual information, has been used to interfere with motor control in order to challenge and tune up the motor control system for better functional performance. However, it is unknown whether SV can disrupt postural control, as continuous visual information is crucial in maintaining postural stability. PURPOSE: To determine effects of SV on postural stability during Sensory Organization Test (SOT).
METHODS: Nineteen healthy subjects without any history of lower extremity injuries (9 males, 10 females; age=21.9±2.2 years; height=169.4±8.4cm; mass=65.7±10.8kg) participated. Subjects underwent two SOT sessions with and without SV in a randomized order. SV effects were made with an eyewear creating intermittent opaque states for 100 milliseconds of visual occlusion. SOT was composed of 6 postural tasks: 1) eyes open and with fixed support, 2) eyes closed and with fixed support, 3) sway-referenced vision and with fixed support, 4) eyes open and with sway-referenced support, 5) eyes closed and with sway-referenced support, and 6) with sway-referenced vision and support. The task 2 and 5 were excluded because of test conditions with eyes closed. For each of the other tasks, subjects were asked to stand on bare feet with shoulder width apart for 20 seconds, and complete 3 trials. Postural stability was determined with an equilibrium score that was computed using the equation as specified by Clinical Interpretation Guide of the NeuroCom International, Inc. Higher equilibrium scores indicate better postural stability during each of the 4 SOT tasks. Separate dependent t-tests were performed to determine differences between SOT sessions with and without SV. The alpha level was set at P < 0.05.
RESULTS: There were significant differences observed in task 1 (SV: 71.38±9.08, CON: 72.62±8.33, P = .109), PL (R2=0.091; p=0.076), or CS (R2=0.060; p=0.236). CONCLUSION: SV had differential effects on postural control during SOT: the intermittent obstruction of normal visual feedback decreased postural stability in a test environment where the vestibular and somatosensory feedback was normal, but improved balance in a test condition where the two sensory inputs were interrupted.

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The Y-Balance Test (YBT) is a field-expedient screen that assesses dynamic balance during a single-leg reach task for prediction of musculoskeletal injuries. Recent evidence has shown differences in dynamic balance abilities between collegiate and high school (HS) football players; however, we are unaware of any previous studies that have examined this relationship across lower levels of competition. PURPOSE: To examine differences in YBT scores between HS and middle school (MS) football players, as well as determine if previous injury history, age, and anthropometric composition and BMD were measured by DXA. Muscle performance tests included postmenopausal women (n=47), 60 to 75 yr, participated in this study. Body composition and BMD were measured by DXA. Muscle performance tests included grip strength, gait speed, and vertical jumps. The sarcopenia criteria were: 1) skeletal muscle mass index (SMI) <5.5 kg/m²; and 2) SMI <5.5 kg/m² and grip strength <20 kg or gait speed <0.8 m/s. RESULTS: The prevalence of sarcopenia was 23% using the conventional definition, and 6% based on the EWGSOP definition. The prevalence of osteopenia and osteoporosis were 66% and 13%, respectively. There was no association between sarcopenia and osteopenia statuses. SAR had significantly (p<0.05) lower body weight, bone free lean body mass, left femoral neck (FN) BMD, grip strength and jump power compared to NOR, but not gait speed. There were no significant differences in muscle mass or functional performance variables based on BMD status. HRT history was associated with sarcopenia status (p=0.05). CONCLUSION: There was no association between low muscle mass and low bone mass.
mass in postmenopausal women. Also, gait speed did not reflect loss of muscle mass. Jump power may be a better measure of lower body muscle function changes with aging.

Table 1. Comparison between Sarcopenic and Normal Postmenopausal Women

<table>
<thead>
<tr>
<th>Variables</th>
<th>SAR (n=11)</th>
<th>NOR (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left FN BMD (g/cm²)</td>
<td>0.796 ± 0.113*</td>
<td>0.875 ± 0.109</td>
</tr>
<tr>
<td>Grip Strength (kg)</td>
<td>22.4 ± 5.4</td>
<td>25.5 ± 3.6</td>
</tr>
<tr>
<td>Jump Power (Watt)</td>
<td>497.4 ± 94.7*</td>
<td>591.1 ± 120.9</td>
</tr>
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Conclusions: The findings indicate overall agreement between SMF-BIA and DXA, but there were some discrepancies. Further study is needed to validate the use of SMF-BIA as a valid, more portable, and less expensive alternative to DXA for estimating ALM among older women with characteristics of sarcopenia, but the relationship between the two methods for ALM and agreement between the two techniques was assessed using a Bland-Altman plot method. RESULTS: A significant and strong correlation was observed between the two techniques with a Pearson’s correlation coefficient of 0.88 (95%CI: 0.75 to 0.95, P<0.001). The Bland Altman plot showed a mean difference of 0.5 kg and an indication of overall agreement between techniques. However, SMF-BIA overestimated ALM for one participant (-2.9kg, 95%CI -3.76 to -2.03) and underestimated ALM for another participant (-3.9kg, 95%CI -5.27 to -2.54) compared to DXA. CONCLUSION: The findings indicate overall agreement between SMF-BIA and DXA for the estimation of ALM among older women with characteristics of sarcopenia, but SMF-BIA may overestimate or underestimate ALM in some individuals. These data suggest that SMF-BIA may be an acceptable alternative for the assessment of ALM in older women who have sarcopenia or dynapenia.

Skeletal muscle mass is a major health index either as a major amino acids reservoir or energy balance controller by its insulin-dependent blood glucose removal, fatty-acid oxidation and total energy expenditure. Besides metabolically, muscle mass is also an important biomodulator, allowing body equilibrium and strength for locomotor and other daily free-living activities. Once well recognized in elderly and older women who have sarcopenia or dynapenia.

METHODS: Physical function, ALM, strength and anthropometric tests were performed to determine the presence of sarcopenia and/or dynapenia in a sample of older (72±3.4 years) women (n=25) using established sarcopenia classification criteria. Estimation of ALM using SMF-BIA and DXA were performed under standardized testing conditions. Both techniques were administered within the same hour with participants adequately hydrated, fasted, following urine elimination, and while wearing hospital scrubs. A Pearson correlation coefficient was used to determine a relationship between the two methods for ALM and agreement between the two techniques was assessed using a Bland-Altman plot method. RESULTS: A significant and strong correlation was observed between the two techniques with a Pearson’s correlation coefficient of 0.88 (95%CI: 0.75 to 0.95, P<0.001). The Bland Altman plot showed a mean difference of 0.5 kg and an indication of overall agreement between techniques. However, SMF-BIA overestimated ALM for one participant (~2.9kg, 95%CI -3.76 to -2.03) and underestimated ALM for another participant (~1.9kg, 95%CI 0.98-2.71) compared to DXA. CONCLUSION: The findings indicate overall agreement between SMF-BIA and DXA for the estimation of ALM among older women with characteristics of sarcopenia, but SMF-BIA may overestimate or underestimate ALM in some individuals. These data suggest that SMF-BIA may be an acceptable alternative for the assessment of ALM in older women who have sarcopenia or dynapenia.

To date there are no studies that have examined peptide F’s acute and chronic response to different exercise modalities in women in a single study. PURPOSE: To investigate the acute and chronic effects of resistance exercise (RE) and different exercise modalities on peptide F concentrations in women. METHODS: Fifty-nine healthy recreationally active women were recruited and matched for age, body mass, height, strength, and peak O2 consumption (VO2peak) and then randomly assigned to one of four training groups: control group (CN); endurance exercise only training group (EE), resistance exercise only training group (RT), and combined endurance and resistance exercise training group (CB). The treatment groups trained three days a week for eight weeks. The control group did not complete any training, but was tested at the same time points as the three treatment groups. Proenkephalin peptide F concentrations were measured prior to and following an intense acute resistance exercise test (ARET) both before and after training. A four (group) x two (time) block analysis of variance (ANOVA) was for analysis. Significance was set a priori at P<0.05. RESULTS: Before training there were no significant differences in the concentration (pmol/ml) of plasma proenkephalin peptide F for any of the groups. For each treatment group, after training, peptide F concentration was significantly greater post-exercise than pre-exercise. In addition, peptide F concentration in the EE and CB ALM increased post-exercise compared to their corresponding values before training. For the RT group peptide F increased post-exercise, but not pre-exercise compared to the before training values. Compared to the control group all of the treatment groups after training had a significantly greater concentration of peptide F post-exercise compared to the corresponding value for the control group. The CB group after training had a significantly greater concentration of peptide F than the other two (EE, RT) treatment groups. CONCLUSION: There are differential responses to different training programs from young, healthy, untrained women to acute and chronic resistance exercise stress after training. Training-induced adaptations appear to occur in the adrenal gland leading to changes in the circulating concentrations of proenkephalin Peptide F.

Old age is associated with a decline in skeletal muscle function and increased fall risk, with older women at a greater risk than men. While greater physical activity (PA) may be associated with better skeletal muscle function and a lower risk of falling in young, older adults, the contributions of muscle contractile properties and PA intensity to dynamic stability are not known. PURPOSE: To determine the association between dynamic stability and both MVPA (min d) and knee extensor (KE) muscle contractile properties in older women. METHODS: Nine healthy older women (69±2.5yr, mean±SD) were studied. Stimulation isotropic contractions of the KE muscles of falling and older men were used to quantify muscle contractile properties (maximal rate of force development (RFD), %peak force ms⁻¹) and force half relaxation time (T₁, ms). Dynamic stability

Abstracts were prepared by the authors and printed as submitted.
was determined with a forward fall test and quantified as the margin of stability (MoS, m). In the forward fall tests, participants were released without warning from a fixed forward-leaning position (25% of body weight) and asked to recover balance with a single forward step. Ten trials were conducted, with the average of the last 4 trials used for analysis. Actigraph accelerometers were worn for 1 week on the right hip to determine average total PA counts and moderate-vigorous (MVPA) minutes per day. Pearson product moment correlations were used to determine associations between variables. RESULTS: Linear regression analyses indicated a positive relationship between MoS and MVPA (r²=0.58, p<0.02) and no association between MoS and KE muscle contractile properties (RFD: r²=0.02, p=0.71; T₂: r²=0.15, p=0.30) or MoS and total PA (counts d⁻¹, r²=0.11, p=0.38). CONCLUSION: The observation that dynamic stability is positively associated with MVPA but not KE muscle contractile characteristics in older women suggests that factors external to the muscle (i.e., neurological factors) likely contribute to the benefits of MVPA on dynamic stability in older women.

Conclusions: Low-impact activities (dance) compared to high impact activities (gymnastics) and running resulted in greater bone strength than athletes that participated in low-repetitive impact activities (Nichols et al., 2007, Unni-Rasi et al., 2006, and Nikander et al., 2010); however, it is not clear how medium impact activities (dance) compare to high impact activities (gymnastics) and low-repetitive activities (running) with respect to their osteogenic effects at the tibia. PURPOSE: To compare tibial strength between female adult dancers, gymnasts, and runners.

METHODS: Eleven eumenorrheic dance majors and eleven eumenorrheic collegiate gymnasts (ages 18-22) were recruited. Runner (n=22) and sedentary control (n=19) data were obtained from the University of Minnesota Laboratory of Musculoskeletal Health database (Smock et al., 2009 and Bruininks, 2009). Participants’ non-dominant tibias were scanned using peripheral quantitative computed tomography at two locations - 4% (metaphyseal) and 66% (diaphyseal) sites from the distal tibia epiphysis. The scans provided two estimates of bone strength: bone strength index (BSI; mg.mm⁻⁴/10,000) and polar strength-strain index (SSIp, mm³). BSI is an estimate of bone compressive strength at metaphyseal sites and SSIp is an estimate of bone’s ability to resist torsion at diaphyseal sites (Smock et al. 2009; Farr et al. 2010). BSI at the 4% site and the SSIp at the 66% site were compared between groups using linear regression models.

RESULTS: Participants did not differ in age, weight, or tibial length. After controlling for height and body mass, SSIp did not differ significantly between groups. Dancers, gymnasts and runners had significantly greater BSI (33.2%, 43.7% and 20%, respectively) than controls (p=0.001, p<0.001, and p=0.03, respectively).

CONCLUSIONS: Despite differences in impact type, dance, gymnastics, and running appear to be effective at increasing distal tibia compressive strength - which is known to delay or prevent bone fragility later in life. Future studies should analyze the magnitude and frequency of loadings to further identify which activities provide the greatest osteogenic benefits in adult females.

The magnitude, frequency, and patterns of mechanical loading are important factors in how weight-bearing bones adapt their strength. Overall, adolescent and adult female athletes that participate in high impact physical activity have greater gains in bone strength than athletes that participate in low-repetitive impact activities (Nichols et al., 2007, Unni-Rasi et al., 2006, and Nikander et al., 2010); however, it is not clear how medium impact activities (dance) compare to high impact activities (gymnastics) and low-repetitive activities (running) with respect to their osteogenic effects at the tibia.

- PURPOSE
- METHODS
- RESULTS
- CONCLUSIONS

The Relationship Between A Bone-specific Physical Activity Score, Body Composition, And Bone Mineral Density In Korean College Females

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Purpose: The purpose of this study was to investigate the relationship between a bone-specific physical activity (BPAQ) score, body composition, and bone mineral density (BMD) in Korean college females. METHODS: Seventy three college females (21.7 ± 1.8 years; 162.1 ± 4.6 cm; 53.9 ± 5.8 kg between the ages of 19 and 26 years were recruited from the Universities in Seoul and Gyeonggi areas, South Korea. We used Dual Energy X-ray to measure the BMD of AP lumbar spine (L2-L4) and proximal femur (non-dominant side; total hip, femoral neck, trochanter ). We used X-scan plus II (Hospital body Composition Analyzer, Jawon Medical Korea) to measure height (cm), weight (kg), fat free mass (kg), percent body fat (%), and body mass index (BMI). Participants were asked to record 24-hour food intake recall questionnaire. We analyzed total caloric intake (kcal), protein (g), carbohydrate (g), fat (g), vitamin D (µg), calcium (mg), and magnesium (mg) using the Computer Aided Nutritional analysis program (CAN-Pro 4.0). The BPAQ current (previous 12 months) and past (from one year of age) scores were used to obtain a comprehensive account of lifetime physical activity. RESULTS: Weight (p<0.01), BMI (p=0.05), and fat free mass (p<0.001) were positively related to the BMD of L2-L4. Also, weight (p<0.05) and BMI (p<0.05) were positively related to the BMD of femoral neck. Pearson’s correlation showed a positive relationship between vitamin D and spine L2-L4, but there were no linear relationships between other dietary intake variables (p>0.05). There were no significant correlations between BMD variables and BPAQ scores (p>0.05). When fat free mass, BPAQ past score, and vitamin D were included in a multiple linear regression analysis, fat free mass and BPAQ past score were the only remaining predictors of L2-L4 BMD and femoral neck BMD, accounting for 26.4% and 11.8%, respectively. CONCLUSION: It is recommended that healthy body composition and active lifestyle are important to maintain bone health in college females.

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Effect Of A Suspension-Training Movement Program on Muscular Fitness In Youth

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(No relationships reported)

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PURPOSE: The purpose of this study was to assess the efficacy of a 6-week suspension-training movement program on muscular fitness in youth athletes, compared to a control condition.

METHODS: A cohort of youth athletes participated in this study (N=28, age: 9.6±1.2, BMI Percentile: 68.6±27.5, 54% Female). Muscular fitness assessments included: trunk lift (TL, cm), isometric plank (IPP, seconds), push-up (PU, # completed) and modified pull-up (MPU, # completed). Following baseline measurements, participants were randomly assigned to either a suspension intervention (INT; N=17) or control (CON; N=11). The INT group participated in a suspension-training intervention (adapted from a new school-based curriculum) that met for two, one-hour sessions per week for six weeks. Following the intervention, all INT and CON participants reported for follow-up testing within one week after the last session.

RESULTS: Across group analyses of changes in muscular fitness, baseline to follow-up changes in the TL were statistically significantly higher in INT (INT: +2.4±2.9 cm; CON: -0.9±2.2 cm, p<0.01). Baseline to follow-up changes in the MPU completed by the INT group was statistically significantly higher than in CON (INT: +1.9±2.3; CON: -1.9±3.8, p<0.01). Baseline to follow-up changes in the TL were statistically significant in both groups (INT: +8.5±6.4, CON: +3.8±7.9, p<0.01) but the group differences in these changes did not achieve statistical significance. No other significant within- or between-group effects were detected.

CONCLUSIONS: This study suggests that a suspension-training intervention program may improve muscular fitness in children. Improvements were seen in the muscular fitness variable of TL and MPU. Future research in larger sample sizes should consider implementing a suspension-training program over a longer period of time and in diverse youth populations.

Equipment donation provided by Fitness Anywhere, LLC, San Francisco, CA

510 Board #347 June 1, 9:30 AM - 11:00 AM Effect of Resistance Exercise on Neck Muscle Activation Patterns in Youth Athletes: A Pilot Study

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The effect of a resistance training program targeting the neck has not been reported in youth athletes.

Purpose: The purpose of this pilot study was to determine the effect of an 8-week supervised manual resistance training program on the neck’s force generating capacity in each primary plane of motion in youth athletes, as well as to explore the potential mechanism of any observed change.

Methods: Seventeen youth athletes (15 males, mean age 14.8 ± 1.8 years) were allocated into intervention (n = 13) and control (n = 4) groups using weighted block randomization. All participants completed 16 general resistance training sessions over an 8-week period with a Certified Strength and Conditioning Specialist. The intervention group performed barbell shrugs and manual resistance exercises targeting the neck that were not performed by the control group. Before and after the exercise program, each participant completed a laboratory-based assessment of neck girth, force generating capacity, and surface electromyography (EMG) of the sternocleidomastoid, upper trapezius, splenius capitis, and semispinalis capitis muscles during maximum voluntary contraction in each plane of motion and during voluntary bracing.

Descriptive statistics were calculated to compare pre-post changes between the two groups.

Results: Across all planes of motion, force generating capacity increased in 35 of 48 (72.9%) and 11 of 16 (68.8%) measurements taken in the intervention and control groups, respectively, with median changes of +20.6 N and +8.2 N in the two groups. Median changes in neck girth were +0.5 cm in both groups. Across the 4 cervical muscles, surface EMG activation (% of maximum), increased in 26 of 52 (50%) measurements in the intervention group and 5 of 16 (31.3%) of measurements in the control group during voluntary bracing. In flexion and extension, antagonist cervical muscle activation (% of maximum) decreased in 23 of 29 (79.3%) and 2 of 12 (16.7%) measurements taken in the intervention and control groups, respectively.

Conclusion: In this pilot study, an 8-week manual resistance training program was effective in increasing neck strength in male and female youth athletes. These results suggest that the mechanism of this change may be more attributable to greater efficiency of muscle recruitment than to muscle hypertrophy.
Conclusion: The PFC HbR threshold during incremental exercise can be displaced toward greater absolute workloads with improved fitness, supporting its potential role in volitional control of early exercise termination.

NIH NICHD P01HD048721 & UL1 TR000153

A growing body of evidence suggests that a neural component influences exercise tolerance. During exhaustive exercise, the prefrontal cortex (PFC) has been shown to switch from a steady state of deoxygenated blood levels (HbR) to a state of rapidly increasing HbR preceding exercise termination. We report alterations to the threshold at which HbR changes within obese (Ob) relative to normal-weight (Nw) children.

Purpose: To compare, in Ob vs Nw children, PFC HbR thresholds in response to incremental exercise, as measured non-invasively with Diffuse Optical Spectroscopy (DOS).

Methods: A DOS probe was placed on the left forehead of 7 Ob children (13 ± 0.3 yrs, 97 ± 0.6 BMI%, 3F) and 12 Nw children (13 ± 0.2 yrs, 44 ± 8.7 BMI%, 10F). DOS measurements of HbR were obtained via a continuous wave near-infrared spectroscopy system (pocket NIRS, Hamamatsu) as the children underwent an incremental exercise test until exhaustion. HbR thresholds were calculated via linear segmented regression. Comparisons were made using one-tailed, independent Student’s t-tests.

Results: The HbR threshold occurred in Ob not only at a lower absolute work-rate (watts, W) (82 ± 9 vs. 106 ± 8W, p<0.05) as could be expected by a lower aerobic capacity (27 ± 2 vs. 38 ± 2 ml O2/kg/min, p<0.05), but also at a lower % of peak work rate (60 ± 3 vs. 70 ± 3%, p<0.05), suggesting an additional, obesity-related component to this reduction.

Conclusion: Our cohort of Ob children experienced earlier HbR thresholds in incremental exercise relative to Nw children. Our findings are consistent with the concept that alterations in HbR threshold are related to exercise tolerance, highlighting the PFC’s potential role in the volitional control of exercise termination.

NIH NICHD P01HD048721 & UL1 TR000153

PURPOSE: The purpose of this study was to ascertain the degree tracking of physical fitness during the growth and development period, by examining the relationship of physical fitness at 3-5 years of age, with that at 12 years, using longitudinal data.

METHODS: Subjects included 61 children (23 boys and 38 girls) who performed the physical fitness test at ages 3, 4, 5, and 12 years. The first principal component score was used as an indicator of overall physical fitness. The measured values of running, jumping, and throwing were added to this value and used as an indicator of motor ability. To determine the amount of tracking, we calculated the Pearson correlation coefficient between the assessments at 3-5 years and 12 years.

RESULTS: In boys, the assessment at 12 years showed a significant correlation with that at 3, 4, and 5 years, in terms of overall physical fitness (with 3 years: r=0.498, with 4 years: r=0.590, with 5 years: r=0.671), throwing ability, and jumping ability. On the other hand, in girls, the assessment at 12 years showed a significant correlation with that at 3, 4, and 5 years, in terms of overall physical fitness (with 3 years: r=0.445, with 4 years: r=0.521, with 5 years: r=0.559), jumping ability, and running ability; and with throwing ability at 5 years.

CONCLUSIONS: The characteristics of physical fitness at the age of 12 years strongly influenced by the overall physical fitness during the ages of 3-5 years, in both boys and girls. Therefore, the lifestyle during childhood, especially related to exercise play habits, are important for the improvement of subsequent healthy development and motor function.

Supported by Grant-in-Aid for Scientific Research (C) (No.25350840) from Ministry of Education, Culture, Sports, Science and Technology in Japan.
It is clear that children’s physical fitness is strongly affected by their daily amount of physical activity. Their daily amount of physical activity is also strongly affected by the activity motives of children. Accordingly, it is hypothesized that activity motives strongly influence children’s physical fitness. These motives will differ by activity form (e.g., the amount of area they can move and the distance they can move during outdoor physical play). PURPOSE: The purpose of this study was to examine the relationship between activity form during outdoor physical play and physical fitness among young children.

METHODS: The subjects were 78 young children between 4 and 5 years old. We measured seven parameters related to physical fitness. Subjects were grouped into either a high-fitness group or a low-fitness group, using physical fitness test data. Each group consisted of two participants from each sex and grade. Sixteen subjects were selected and their activity form during outdoor physical play was measured. To consider the role of activity motives, we adopted a success-reward type of physical play. We measured moving area, moving distance, average moving speed, and maximum moving speed during outdoor physical play, using a wristwatch with a GPS function. In addition, we tracked the number of steps children took on weekdays. Activity form differences during outdoor physical play were examined using an independent t-test. Moving form was drawn on Google Earth for visual comparison.

RESULTS: Both distance moved and average moving speed were significantly higher in the high-fitness group. A difference in moving track was also observed. The average number of steps on weekdays was 14259±3947 in the high-fitness group and 11870±5384 in the low-fitness group, but this difference was not significantly.

CONCLUSIONS: Since the high-fitness group was more active, perhaps activity motive is higher in the high-fitness group. The state of enthusiastic activity was confirmed visually. In the low-fitness group, the type of activity was not enthusiastic, as they have stopped completing challenging exercise tasks.

Physical fitness provides important health benefits and can enhance the quality of life for children and adults. Criterion reference grade standards have been established for the health-related fitness components, but achievement of healthy fitness zone (HFZ) standards in elementary school children in Puerto Rico have not been reported. PURPOSE: To assess FITNESSGRAM HFZ achievement in 1st to 4th grade children in Puerto Rico. METHODS: 129 participants (69 boys and 60 girls, 6.4 ± 0.56 years of age) recruited from two schools in San Juan, completed the FITNESSGRAM fitness assessment protocol yearly in their 1st to 4th grade (gr). Achievement was defined as being in the HFZ on: at least 2 of the 3 strength and endurance assessments (90 degree push-up, curl-up, and trunk lift), both flexibility assessments (back-saver sit and reach and shoulder stretch), both body composition assessments (BMI and % body fat) and the 20-m PACER cardiorespiratory test. The frequencies (%) and percentages (%) of children from 1st to 4th grade achieving the HFZ in each fitness component was determined. Chi-squares were used to detect differences in HFZ achievement by grade.

RESULTS: Table 1. Achievement of HFZ in health-related fitness components by grade achieving the HFZ in each fitness component was

<table>
<thead>
<tr>
<th>Fitness Component</th>
<th>1st (n=116)</th>
<th>2nd (n=129)</th>
<th>3rd (n=119)</th>
<th>4th (n=148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>f %</td>
<td>f %</td>
<td>f %</td>
<td>f %</td>
<td></td>
</tr>
<tr>
<td>Strength &amp; Endurance</td>
<td>82 73.9</td>
<td>108 83.7*</td>
<td>87 73.1*</td>
<td>10 62.5</td>
</tr>
<tr>
<td>Flexibility</td>
<td>75 66.4</td>
<td>78 60.9</td>
<td>85 71.4</td>
<td>37 77.19</td>
</tr>
<tr>
<td>Body composition</td>
<td>71 61.2**</td>
<td>68 52.7</td>
<td>58 48.7</td>
<td>18 37.5**</td>
</tr>
<tr>
<td>Cardiorespiratory endurance</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>23 52.3</td>
</tr>
</tbody>
</table>

Significant difference between *p<0.05 and **p<0.01
CONCLUSIONS: A high percentage of 1st to 4th grade children in Puerto Rico achieved and maintained HFZ criterion standards in muscular strength and endurance, and in flexibility. The decrement in healthy body composition achievement is a concern that should be addressed to prevent future adverse health consequences. Funded by the University of PR - FPII Institutional Grant

In 2013, it was estimated that nearly 5.3 million adolescents ages 7-17 played organized baseball (Costa, 2015). Pitching is a key component to the game and is of particular interest to sports medicine professionals due to the tremendous stress placed on the arm. In 2001 Lyman found that 26% and 32% of little league pitchers experienced elbow and shoulder pain respectively. Olsen, in 2006 also found that pitching with arm fatigue caused a significant increase in injuries. Many risk factors are associated with these injuries such as poor mechanics, underdeveloped musculoskeletal system, and poor coaching/game management. This raises serious concerns for the current health of adolescent athletes but also raises the question as to the effect this may have on youth baseball players as they mature. To date there is very limited research describing the relationship between exposure to risk factors as a youth and ability to play collegiate baseball.

PURPOSE: The purpose of this study was to acquire descriptive data related to collegiate baseball player’s exposure to risk factors associated with injury.

METHODS: Participants included 136 DII baseball players. An electronic survey consisting of 54 questions was distributed to current players asking them to recall youth (ages 6-17) playing history. The response rate was 76% (n=104) which were used for data analysis.

RESULTS: Of the 104 responses 97.1% of subjects reported playing with arm pain and 96.2% reported playing with arm fatigue. From those statistics 53.8% reported injury resulting in losing 1 week or more of playing time and 51% further reported seeking out a physician. Data also revealed that injured players threw an average of 78.9 ± 17.9 pitches over 5.33 ± 1.19 innings while those that remained healthy threw 66.9 ±22.9 pitches over 4.34 ± 1.39 innings. Additionally, 47.1% reported pitching for more than 1 team and 85.7% reported immediately being placed in another position.

CONCLUSIONS: The present results suggest that a large majority of current collegiate players experienced significant amounts of arm pain and fatigue while playing youth baseball, this resulted in over half of the subjects reporting missing time or needing to see a physician. Future research depicting the correlation of past exposure to risk factors and current playing and injury status is warranted.

Introduction: Functional movement screen (FMS) involves several tests aimed at classifying basic movements used to qualitatively determine movement weaknesses and asymmetries, that modify motor control. Additionally, the range of motion (ROM) measured by goniometry is a quantitative method used in clinical settings to determine normality, symmetry, limitation or excess of a particular joint movement.

Purpose: To identify the relationship between functional movement screen and goniometric assessment of active mobility of the shoulder, hip, knee, and ankle, in young athletes.

Methods: Forty four healthy young ages (age 14.34 ± 1.2 y), who take part in the National Talent Program of Coldepores, were evaluated using 5 FMS tests and 6 ROM tests (active movement) for the shoulder, hip, knee and ankle. Correlations were calculated through Spearman coefficient.

Results: No significant correlation was found for shouder (r=0.005, p=0.52), hip (r=0.04, p=0.43) and ankle (r=0.14, p=0.35) movements. A moderate correlation (r=0.525, p<0.01) was found in the knee.

Conclusion: Based on the results of this study, we conclude that FMS has only a moderate relationship with active ROM for the knee test. Therefore, the functional screening is sensitive to hamstring muscle length, in relation to the active joint mobility considered.

Keyword: Functional movement screen, range of movement, joint mobility

Purpose: To determine the effects of a 6 week training program on biomechanical factors associated with increased risk for anterior cruciate ligament (ACL) injury in female high school basketball, soccer, and volleyball athletes. Methods: 95 female athletes (age = 16 ± 1y) completed a 25-30 minute warmup protocol, 2-3 times a week before each practice. The protocol involved dynamic stretching, landing and cutting technique training, balance, coordination, agility, and lower body strength exercises supervised by study personnel. Injury risk was determined using a drop jump test and the Landing Error Scoring System (LESS) at the beginning and end of the 6 week training program using a Kistler Quattro Jump force plate and Dartfish video analysis. LESS includes measures of knee, hip, and trunk flexion, landing force, stance width, knee-joint displacement, foot positioning, and landing symmetry. Results: LESS scores significantly (p = 0.001) decreased from pre (5.9 ± 1.3) to post-training (5.2 ± 1.4). Only 14% were in the ideal range (LESS score ≤ 2) at the start of the study and that improved to 31% after training with 52% of the athletes showing improved LESS scores. 70% of the athletes had decreases in landing force (pre: 4.8 ± 1.7 and post: 4.0 ± 1.1 body weights; p<0.001; ideal =4). 61% of the athletes increased their knee flexion (pre: 32 ± 9 post: 34 ± 8 degrees ; p<0.02; ideal >30 deg) and trunk flexion (pre: 11 ± 8 and post: 13 ± 6 degrees ; p<0.05; ideal >0 deg) at initial contact when landing. Conclusion: Six weeks of a 25-30 minute of a supervised warm-up injury prevention program improved player landing biomechanics. The improved biomechanics may result in reduced injury risk as there were no knee injuries during the interventional training program.

Purpose: The study aimed to investigate the relationship between functional movement screen and active range of motion in young athletes.

Methods: Forty healthy young (age 14.34 ± 1.2 y), who take part in the National Talent Program of Coldepores, were evaluated using 5 FMS tests and 6 ROM tests (active movement) for the shoulder, hip, knee, and ankle. Correlations were calculated through Spearman coefficient.

Results: No significant correlation was found for shouder (r=0.005, p=0.52), hip (r=0.04, p=0.43) and ankle (r=0.14, p=0.35) movements. A moderate correlation (r=0.525, p<0.01) was found in the knee.

Conclusion: Based on the results of this study, we conclude that FMS has only a moderate relationship with active ROM for the knee test. Therefore, the functional screening is sensitive to hamstring muscle length, in relation to the active joint mobility considered.

Keyword: Functional movement screen, range of movement, joint mobility