DEHYDRATION IMPAIRS EXERCISE PERFORMANCE INDEPENDENT OF THIRST PERCEPTION: A BLINDED STUDY

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Hypohydration >2% body mass loss impairs endurance exercise performance, but the majority of previous studies are confounded by the lack of subject blinding. Previous blinding hydration studies have used intravenous infusion methods which bypass the oropharyngeal receptors and gastrointestinal tract which have been previously shown to play an important role on thirst and performance. PURPOSE: The purpose of this study was to examine the effect of hypohydration on exercise performance in a blinded manner using intra-gastric water delivery to manipulate hydration status, while thirst was matched between trials. METHODS: Seven male cyclists (weight: 71±8 kg, body fat: 14±6%, VO2peak: 59.4±6 ml/kg/min) exercised for 2 hours on a cycle ergometer at 55% VO2peak, in a hot-dry environment (35 °C, 30% rh), with a nasogastric (NG) tube under euhydrated (EUH) and hypohydrated (HYP) conditions. In both trials, thirst was matched by drinking 25 mL every 5 min (600 mL total). In the EUH sweat losses fully were replaced via the NG tube (calculated from the familiarization visit). Following the 2 hours of steady state, the cyclists completed a 5-kilometer cycling time trial at 4% grade. RESULTS: Following 2 hours of steady state cycling, post-exercise body mass loss for EUH trial was -0.1% compared to the HYP trial which was -2.2%. Thirst (28±11 vs. 42±12 mm) and stomach fullness (41±8 vs. 38±8 mm) were both similar between EUH and HYP trials (P>0.05). Cyclists completed the 5km time trial faster in the EUH trial compared to the HYP trial (777±47 vs. 822±55 sec, P<0.05), while producing higher power output (295±29 vs. 270±26 W, P<0.05). During the 5 km time trial, core temperature was higher in the HYP trial (39.2±0.3 °C) compared to the EUH trial (38.8±0.2 °C; P>0.05). CONCLUSION: These data indicated that hypohydration decreased cycling performance and impaired thermoregulation in the absence of thirst, while the subjects were unaware of their hydration status.
A PILOT INVESTIGATION OF FEAR OF RE-INJURY IN HIGH SCHOOL ATHLETES WITH CONCUSSION
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BACKGROUND: The return to play process for sport-related concussion (SRC) may be a time of uncertainty for both the injured athlete and the sports medicine professional. Recent consensus statements have advocated for research on the emotional sequelae that is associated with SRC. However, changes in fear of re-injury throughout SRC recovery are understudied. PURPOSE: The purpose of this study is to provide a preliminary description of fear of re-injury in high school athletes with SRC and to compare changes in fear of re-injury throughout SRC recovery. METHODS: Two high school athletes with SRC completed a computerized neurocognitive assessment (Immediate Post-Concussion Assessment and Cognitive Testing) and a battery of measures that assessed fear of re-injury, locus of control, and perceptions of recovery. All measures were completed 1-7 days following SRC. RESULTS: Fear of re-injury scores for these two athletes were 37 and 53. These scores reveal a moderate (e.g., Tampa Scale of Kinesiophobia (TSK) score of 33-42) severe level (e.g., TSK score of 43 or above) of fear of re-injury. CONCLUSION: These pilot data demonstrate that some athletes experience fear of re-injury in the acute time period following SRC. These data warrant the continued investigation of fear of re-injury and also the future identification of predictors for fear of re-injury in high school athletes with SRC.
COMPARING BEFORE-AND AFTER-SCHOOL NEUROCOGNITIVE PERFORMANCE IN HIGH SCHOOL ATHLETES: IMPLICATIONS FOR CONCUSSION MANAGEMENT

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Sport-related concussion (SRC) requires a multifaceted assessment and management approach that relies on computerized neurocognitive (CNT) assessments as an objective complement to subjective symptom reporting. Previous literature has identified several factors that negatively influence CNT performance and may complicate post-injury assessment. One factor is cognitive fatigue from the academic school day. The cognitive demands from an academic school day should be considered, and optimal timing for CNT assessment is unknown. **PURPOSE:** This study compared before-and after-school CNT performance in a sample of non-concussed high school athletes. **METHODS:** A randomized crossover design was used for this study. After receiving University IRB approval, 29 high school athletes completed CNT both before and after school. A series of paired samples t-tests were conducted for each CNT outcome score (verbal and visual memory, reaction time, processing speed) for both time points. Statistical significance was set at a Bonferroni-corrected ($p \leq .01$). **RESULTS:** Significant differences for visual memory and reaction time were documented across time points. Visual memory ($p = .008$) was significantly better before school ($86.14 \pm 11.01$) than after-school ($81.57 \pm 12.14$) and reaction time ($p = .001$) was significantly slower before-school ($0.60 \pm 0.07$) than after-school ($0.57 \pm 0.06$). **CONCLUSION:** This study suggests that time of day and the demands of a school day should be considered when determining the optimal timing for CNT assessments. More research is needed to determine the best time to administer CNT and examine the mechanisms for which the time of day and cognitive fatigue, from a school day, may impact CNT assessment scores.
iCan Bike, a subdivision of the iCan Shine organization, started in 2007 and serves a variety of individuals with special needs or disabilities, with the primary objective of learning to ride a typical two wheeled bicycle. One camp consists of five 75-minute sessions a day for five days, for a total of 375 minutes for the week. **PURPOSE:** To analyze participant demographics and outcome data from the 2015 multi-facility iCan Bike organization. **METHODS:** Descriptive statistics were conducted on data from 90 camp facilities using SPSS. Permission to utilize the data was provided by the iCan Shine national organization. **RESULTS:** From the 2,652 participants, 64.3% (n=1,705) were male and 35.7% (n=947) were female. The average age was 11.7 ± 4.5 years of age, with the average height of 55.9 ± 6.1 inches and weight of 92.3 ± 34.9 lbs. Conclusive data showed 67.7% of participants (males=70.2%; females=60.4%) learned to independently ride a two wheeled bike. The two primary diagnoses with the achievement of learning to ride a bike were autism spectrum disorder (overall=75.5%; males= 76.1%; females= 73.2%) and Down syndrome (overall=51%; males= 51.6%; females= 50.4%). **CONCLUSIONS:** The majority of participants that attended one iCan Bike camp learned to ride a typical two wheeled bicycle. These findings support past research, indicating this teaching style is an effective way for individuals with special needs or disabilities to learn how to ride a typical two wheeled bicycle. Future research still needs to examine the success rate among various disabilities, those with multiple disabilities, and the success rate of participants that are repeaters of the camp.
Ageism, a set of discriminatory or prejudicial beliefs against an adult because they are “old” is more pervasive than sexism or racism, but goes largely unstudied. Although negative attitudes toward older adults are more prominent among young adults, education has a significant impact on attitudes toward aging. Education modality most influential on perspective change has not been elucidated. **PURPOSE:** The purpose of this study was to examine changes in perceptions of older adults among undergraduate (UG) students following education sessions, aging simulation, or service-learning project participation. **METHODS:** A total of 99 UG students (21.8 ± 0.9 years) were randomly assigned to one of three groups: education group (n = 57; EDU), who attended an educational lecture on aging; aging simulation group (n = 24; AS), who performed functional tasks wearing an aging suit; or service-learning group (n = 18; SL), who participated in a service project at a local retirement community. Before and after participation in their assigned intervention, participants completed the Aging Semantic Differential Scale (ASD), a survey designed to determine attitudes toward older adults and used to assess ageism. ASD composite scores (ranging from 1-100) were used to assess perspectives on aging; the larger the composite score, the more negative the perception of aging, and vice versa. **RESULTS:** General perspectives on aging were negative among all groups. However, there was a significant change in perspectives on aging from pre- to post-intervention between groups (p < .05). There was not a significant change in perspective, positive or negative, among the EDU (p = .83) or AS (p = .35) groups. Among the service-learning group, there was a significant improvement in perspectives on aging (p < .05). **CONCLUSION:** Results from this study indicate UG students generally have a negative attitude toward older adults. While exposure to aging in the form of educational lectures and aging simulation provided for no change in overall attitudes toward older adults, participation in the service-learning project at a retirement community most positively impacted UG students.
MYOGENIC AND ATROPHIC SIGNALING IN THE PROGRESSION OF CANCER-CACHEXIA

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Cancer is a major public health problem in the US and the world. In 2013 there were an estimated 1,660,290 new cases of cancer in 2013 alone. Severe weight and muscle loss (cancer-cachexia) is accepted as a common side effect of most cancer, and is estimated to be responsible for 20-40% of cancer-related deaths. The mechanisms that control the development of cancer-cachexia are not well understood. In order for muscle wasting to occur, there must be either a decrease in myogenic factors or an increase in catabolic factors. Most investigations of cancer-cachexia focus on the post-cachectic state and do not examine the progression of the condition.

PURPOSE: The purpose of this study is to determine the roles of classical myogenic (MyoD and Myogenin; regulators of myocyte proliferation and differentiation), and catabolic (Atrogin and MuRF; E3 ubiquitin ligases regulating ubiquitin mediated protein degradation) factors in the onset of Cancer-Cachexia.

METHODS: Lewis Lung Carcinoma cells (LLC) or Phosphate Buffered Saline (PBS, control) were injected into the hind-flank of normal wildtype C57BL6/J mice at 8 weeks of age, and tumor allowed to develop for 1, 2, 3, or 4 weeks. MyoD, Myogenin, Atrogin, and MuRF were analyzed using RT-PCR for all 5 groups (1, 2, 3, 4 week LLC and PBS).

RESULTS: MyoD and Myogenin were significantly lower ~50% in weeks 1 and 2 post-tumor implantation, and returned to baseline for weeks 3 and 4. Atrogin was significantly greater ~3.5-fold in week 4, while MuRF was significantly higher ~2.3-fold in week 3 and ~3.8-fold in week 4 post-tumor implantation.

CONCLUSION: Myogenic factors MyoD and Myogenin are significantly repressed only one week following tumor implantation suggesting repressed myogenesis. Whereas classic catabolic factors are not impacted until later in progression of cancer-cachexia. MyoD seems to promote expression of Atrogin and MuRF in cancer-cachexia models.
Respiratory training masks have been utilized to increase warm-up intensity via increased respiration rate, heart rate, and body temperature without inducing muscular fatigue. However, the majority of such claims appear to be based on anecdotal evidence as opposed to evidence-based research. **PURPOSE:** The purpose of this study was to investigate the effect of a high-intensity warm-up (HWU) using a respiratory training mask on vertical jump (VJ) performance in Division I American football athletes. **METHODS:** Seventeen male (mean ± SD: age = 17.94 ± .75 years, mass = 104.43 ± 23.02 kg, height 184.93 ± 7.06 cm) American football athletes from the NCAA Division I level were recruited to participate in this study from a Midwestern university. Participants were informed of risks, and after completing an informed consent form, completed two testing sessions to assess VJ performance. Prior to each testing session, a member of the university’s strength and conditioning staff led the participants through a dynamic warm-up that focused on lower body musculature. For one testing session, participants completed the warm-up (WU) without the respiratory training mask, while for the other testing session, participants completed the warm-up with the respiratory training mask. The respiratory training mask was set so as to increase the athlete’s respiratory efforts 12-fold in order to create the high-intensity warm-up (HWU). After completing the warm-up, participants executed three countermovement vertical jumps (VJ). For data analysis purposes, values from each participant’s highest VJ performance were selected from both the control (WU) and experimental (HWU) sessions. A one-way repeated measure analysis of variance (ANOVA) design was used to assess differences between control and HWU results. All statistical analyses were performed using SPSS (Version 21.0 for Windows; SPSS, Chicago, Illinois) with statistical significance set at $p < .05$. **RESULTS:** No statistical difference was found ($p = 0.07$) between vertical jump performance using a standard warm-up and high-intensity warm up. **CONCLUSION:** Using a respiratory resistance mask for a warm-up does not impact vertical jump height, and practitioners should exercise caution when prescribing its use to increase performance.
MITOCHONDRIAL DEGENERATION PRECEDES CANCER-INDUCED MUSCLE ATROPHY
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Cancer is associated with severe weight and muscle loss (cancer-cachexia). Cancer-cachexia is the most common manifestation of the advanced malignant disease, leading to death. Underlying mechanisms of cancer-cachexia are not well understood. Mitochondrial degeneration is associated with cancer-cachexia and may instigate skeletal muscle atrophy through pathways affiliated with reactive oxygen species signaling and energy demand. PURPOSE: Assess mitochondrial quality and function throughout the progression of cancer-cachexia. METHODS: Lewis Lung Carcinoma cells (LLC) or Phosphate Buffered Saline (PBS, control) were injected into the hind-flank of C57Bl6/J mice at 8 weeks age, and tumor allowed to develop for 1, 2, 3 or 4 weeks. Muscle size was assessed by muscle wet weights and cross sectional area (CSA). Mitochondrial function was assessed in permeabilized adult myofibers for each time point. In order to measure mitochondrial degeneration, the reporter gene pMitotimer were inserted to the Flexor Digitorum Brevis muscle 2 weeks before LLC or PBS injection and imaged in whole-mounted muscle at harvest by fluorescence microscopy. RESULTS: Muscle wet weights were significantly decreased by ~10-20% at 4 weeks post LLC implantation when compared to PBS. Average CSA decreased by ~40% by 4-week post LLC implantation. Mitochondrial function was disrupted by 3-week post LLC implantation indicated by a ~25% decrease in Respiratory Control Ratio. Mitochondria displayed significant signs of degeneration by 2-weeks post LLC implantation when compared to PBS control, portrayed by a 50% increase in pMitotimer Red/Green ratio, indicating general degeneration of the network, and 400% increase in pure red puncta, revealing the presence of completely degenerated mitochondria marked for degradation. CONCLUSION: Mitochondrial degeneration appears to occur prior to the onset of skeletal muscle atrophy in the progression of cancer-cachexia. This study indicates novel potential early stage mechanisms leading to muscle wasting in cancer-cachexia.
Maximal oxygen consumption (VO$_2$max) testing is widely used in laboratories and requires expensive pieces of equipment. There are numerous prediction equations used to determine VO$_2$max, but none are based on the anaerobic treadmill test (AnTT). **PURPOSE:** The purpose of this investigation was to develop a regression model to predict maximal oxygen consumption (VO$_2$max) from anaerobic treadmill test time. **METHODS:** A total of 30 college-aged males and females participated in this investigation. Subjects reported to the Applied Physiology Laboratory for both VO$_2$max and AnTT. On day 1 and day 2 of testing basic anthropometric data was collected. On day 1 of testing subjects performed a VO$_2$max treadmill (TM) test utilizing the Bruce protocol. Subjects were properly fitted into a safety harness (SH) to ensure subjects reached volitional fatigue in safety. Subjects were fitted with a face mask connected to a metabolic cart (MMC) for collection of expired gases and determination of VO$_2$max. Blood pressure (BP), heart rate (HR), and RPE were recorded at rest, 30s prior to the end of each stage, and at volitional fatigue. On day 2 of testing (≥48h after day 1 testing) subjects performed an AnTT. Subjects were, again, properly fitted into the SH and fitted with a face mask connected to a MMC for determination of VO$_2$max. For this test the treadmill was set at a 20% grade and at a speed of 8mph. Subjects were timed with a standard stop watch from the time they began running until volitional fatigue was reached. Measures of BP and HR were recorded at rest and at termination of the test and RPE was measured at termination of the test. **RESULTS:** The mean VO$_2$max for the AnTT was 57.1 ml·kg$^{-1}$·min$^{-1}$ and the mean VO$_2$max for the aerobic (Bruce) treadmill test was 58.6 ml·kg$^{-1}$·min$^{-1}$. Multiple linear regression analysis was used to develop a model for predicting VO$_2$max from AnTT time. The correlation between the aerobic protocol and the AnTT time was significant ($p$$\leq$0.003; $r$ = 0.603), thus, the regression analysis produced the following predictive model: $y = 37.2 + 0.38(x)$. **CONCLUSION:** Based on these results, we have demonstrated a model to predict VO$_2$max from anaerobic treadmill test time. However, the data demonstrate that subjects must complete at least 30 sec on the anaerobic treadmill test for the prediction model to work effectively for the 8mph test. This VO$_2$max prediction equation could be used to shorten the amount of time subjects spend in the laboratory. Follow up studies are currently being conducted with variations in speed and grade and reliability studies are being conducted for the 8mph test in a similar population.
MARKERS OF HYDRATION DURING PRE-SEASON HIGH SCHOOL AMERICAN FOOTBALL
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American football athletes often report to practices and games in a hypohydrated state, potentially placing them at risk for performance and thermoregulatory impairments. **PURPOSE:** Evaluate the hydration status of high school American football players at various intervals during preseason practices and assess the clinical utility of spot-check urine sampling for identifying sub-optimal hydration. **METHODS:** Thirty-one male, high school American football players (age 16 ± 1y, ht 179.0 ± 6.6cm, mass 88.4 ± 19.9kg, body fat 19.9 ± 9.4%) participated in this observational study. Body mass (BM), blood, and urine samples were obtained 2-3 days prior to the start of (Baseline) and at Days 4 (D4), 7 (D7), and 10 (D10) of pre-season practices. On D4 and D7, samples were collected prior to the start of practice while D10 samples were obtained post-practice. Serum osmolality (S\text{osm}) was analyzed via freezing point depression. Urine specific gravity (U\text{SG}) and urine color (U\text{color}) were also measured. Receiver operating characteristic-area under the curve (ROC-AUC) analysis was used to assess sub-optimal hydration identification via urine, with S\text{osm} as the standard. Sub-optimal hydration status for each marker was defined as BM loss >1% from baseline, S\text{osm} >290 mOsm/kg, U\text{SG} >1.020, and U\text{color} >4. **RESULTS:** BM did not change significantly over time (**P** = 0.26). BM loss of >1% was present in 37% and 42% of players prior to practice on D4 and D7, respectively. S\text{osm} was 292 ± 4, 293 ± 4, 294 ± 6, and 295 ± 4 mOsm/kg for Baseline and D4, D7, and D10, respectively, with only D10 significantly elevated from Baseline (**P** = 0.05). Further, 67-73% of players reported to practice, and 80% finished practice, with S\text{osm} >290 mOsm/kg. U\text{SG} at Baseline and D4, D7, and D10 were 1.023 ± 0.007, 1.018 ± 0.009, 1.019 ± 0.009, and 1.027 ± 0.005, respectively (**P** <0.001). U\text{color} from Baseline through D10 were 4 ± 1, 3 ± 1, 3 ± 1, and 4 ± 1, respectively (**P** = 0.003). U\text{SG} identified sub-optimal hydration with a ROC-AUC of 0.72, a sensitivity of 0.71 and a specificity of 0.50. The ROC-AUC using U\text{color} to identify sub-optimal hydration was 0.60 with a sensitivity of 0.18 and a specificity of 0.97. **CONCLUSIONS:** In congruence with prior literature, at least two-thirds of players reported for or completed practice sub-optimally hydrated, as identified via S\text{osm}. Furthermore, the spot-urine samples did not provide accurate diagnostic value for identifying inadequate hydration. Thus, clinicians should encourage fluid consumption prior to and during practice throughout pre-season activity, however caution should be used if spot-urine samples are collected to identify sub-optimal hydration.

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INDEPENDENT AND COMBINED EFFECTS OF HEAT STRESS AND EXERCISE ON ARTERIAL STIFFNESS
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Many studies have established that arterial stiffness, assessed via pulse wave velocity (PWV), is reduced following passive heat stress or exercise. Yet, no study to date has simultaneously investigated the cumulative effects of exercise and heat stress on measures of PWV. **PURPOSE:** Determine the independent and combined effects of heat and exercise on arterial stiffness.

**METHODS:** Nine subjects (n=3 females, 46±11 years old; 24.1±2.8 kg/m²) completed four trials, with different interventions, in a randomized order. In a control trial subjects rested supine (CON). In order to independently test the effect of heat stress, subjects were passively heated (i.e. no exercise) in a hot environment (~40ºC) while wearing a water perfusion suit with hot water (PH). In two other trials, subjects cycled at ~50% of VO2peak in a hot (~40ºC; HC) or cool (~15ºC; CC) environment. Prior to interventions and in the hour following interventions, pulse wave velocity (PWV), via Doppler ultrasound, was assessed at the tibial, radial, femoral and carotid artery sites. Central PWV (CPWV) was assessed using measures between the carotid/femoral artery sites, while peripheral stiffness was assessed using the radial/carotid (UPWV), and tibial/femoral (LPWV) artery sites. Mean body temperature (TB) was measured with skin and rectal thermistors.

**RESULTS:** No significant changes in TB were observed during the CON and CC trials. However, the PH and HC trials elevated TB 2.69±0.23ºC and 1.67±0.27ºC, respectively (p<0.01). No changes in any measure of PWV were observed in the CON, CC, or HC trials (p>0.05). However, in the PH trial UPWV, but not CPWV or LPWV, was reduced immediate post (-107±81 cm/s) and 15 minutes (-93±82 cm/s) post heating (p<0.05).

**CONCLUSION:** Contrary to previous data, we did not observe changes in arterial stiffness during aerobic exercise (i.e., CC). Further, although heat stress alone reduced arterial stiffness (specific to the upper peripheral arteries), when combined with exercise in the heat, there was no change in arterial stiffness (i.e., HC). This suggests that heat stress has an independent effect on arterial stiffness that is obliterated when combined with exercise.
PROPOSING A NEW METHOD OF ADMINISTERING THE KING-DEVICK TEST FOR CONCUSSION ASSESSMENT

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The King Devick Test (KD) is a rapid number naming test that is intended to screen for sport-related concussion (SRC). This assessment uses a prospective methodology that compares an athlete’s post-injury scores to their pre-injury (i.e., baseline) scores. Administration guidelines for the KD recommend recording a baseline score from the faster of two error-free trials. However, post-concussion administration guidelines recommend administering the KD only once following a suspected SRC, and if the athlete performs slower than their baseline or makes an error, a concussion should be suspected. It is unclear why post-injury administration of the KD only includes one trial in contrast to the baseline administration. No study to date has investigated the clinical utility of a second post-injury trial on the KD. PURPOSE: To compare changes in the sensitivity of the KD for detecting SRC between one and two post-injury trials.

METHODS: Nineteen high school athletes with SRC (13 male, 6 female, age: 15.5 ± 1.1 years) completed two trials of KD (baseline and within 7 days following SRC). Baseline KD scores were compared to two post-injury scores that included the first (i.e., recommended administration) post-injury trial and a second post-injury trial. Percent of athletes scoring above clinical cutoffs for SRC were calculated for each comparison. RESULTS: Comparing baseline (44.30 ± 9.00 secs with 0 errors) to the first post-injury trial (58.15 ± 21.04 secs with 0.21 ± 0.54 errors), 84.2% (n = 16) of athletes were classified as having a SRC. Comparing baseline (44.30 ± 9.00 secs with 0 errors) to the second post-injury trial (53.89 ± 20.33 secs with 0 errors), 63.2% (n = 12) were classified as having a SRC. The same three athletes that scored better than baseline at post-injury trial 1 also scored better than baseline at post-injury trial 2. However, there were an additional four athletes that scored better than baseline on post-injury trial 2, despite scoring worse than baseline on post-injury trial 1. CONCLUSION: Clinicians may want to include a second KD trial following SRC when making clinical decisions regarding concussion. Further research should investigate the utility of two KD trials following SRC.
THE EPIDEMIOLOGICAL EVIDENCE OF OVERWEIGHT, OBESITY, AND CARDIOMETABOLIC DISEASE RISK FACTORS IN COLLEGE-AGED SUBJECTS: A CROSS-SECTIONAL INVESTIGATION

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As students enter into their college careers many are either not engaged in a structured exercise routine or have been previously but find other activities to occupy their time. There are scarce data investigating how the college years affect student’s health and much less data on what cardiometabolic risk factors may develop during this time. **PURPOSE:** The purpose of this 5-year cross-sectional investigation was to collect basic body composition and fitness data on college-aged males and females to determine cardiometabolic disease risk throughout the college years. **METHODS:** A total of 3,388 college aged males (n = 1919) and females (n = 1469) age 18 – 25yrs participated in this investigation. Subjects performed the following tests: height; weight; body composition; muscular strength and endurance; cardiopulmonary function; flexibility; waist and hip circumferences; and resting blood pressure. **RESULTS:** Females demonstrated a significant increase, from 18-19 yrs to 20-25 yrs, respectively, in weight (67.1 to 70.8kg), % body fat (27.9 to 30.4%), waist (80.5 to 83.3cm) and hip (95.1 to 98.9cm) measurements, fat mass (19.9 to 24.3kg), BMI (24.4 to 25.8kg∙m²), diastolic blood pressure (75.8 to 77.4 mmHg), waist-to-height ratio (0.48 to 0.51), and total overweight and obese status (33.9 to 39.1%). These subjects demonstrated a significant decrease, from 18-19yrs to 20-25yrs, respectively, in sit-and-reach (15.4 to 14.6 in.) and total push-ups (15.2 to 13.3). Males demonstrated a significant increase, from 18-19yrs to 20-25 yrs, respectively, in weight (80.8 to 85.3 kg), % body fat (15.1 to 17.6 %), waist-to-hip ratio (0.88 to 0.90), waist (85.9 to 89.4 cm) and hip measurements (97.3 to 99.7 cm), waist-to-height ratio (0.48 to 0.50), fat mass (13.3 to 17.1 kg), BMI (25.1 to 26.3), total overweight and obese status (38 to 48.5%), diastolic blood pressure (76.7 to 79.3 mmHg), and right (49.1 to 51.1 kg) and left (46.8 to 48.3 kg) grip strength. These subjects demonstrated a significant decrease, from 18-19yrs to 20-25 yrs, in sit-and-reach (14.5 to 13.9 in), total sit-ups (52.7 to 50.9), and total push-ups (33.6 to 32.1). All data was analyzed using independent sample t-tests (SPSS, v. 23; p < 0.05). **CONCLUSION:** Based on the results of this 5-year cross-sectional investigation, we have demonstrated that as college-aged males and females continue through their academic careers there is a continuous decline in basic health and fitness outcomes that may lead to the development of morbid/co-morbid conditions and the development of cardiometabolic diseases such as diabetes, hypertension, cardiovascular disease, and increased early mortality.
The trunk is a vital part of any motion the body performs. The core muscles of the trunk are often the first muscles activated to maintain stability. As a result, it is important to know how the trunk is able to function properly and what factors go into optimal function. PURPOSE: The purpose of this preliminary study is to analyze a large data set of subjects performing a standardized trunk rotation movement to find the underlying variables that may affect how successful the movement is. METHODS: The success of the movement was determined by overall range of motion (ROM) of 2,364 different test subjects. 36 variables were recorded using 3-dimensional markerless motion capture. Subjects were classified into 3 groups (low, mid, high) based on their trunk ROM in the transverse plane. High and low groups were compared using independent t-tests. RESULTS: Out of the 36 different variables analyzed, 17 were considered to be statistically significantly different at or below the p = 0.001 level. Of those 17, several had very large percent mean differences, including: right knee valgus minimum, left knee valgus, lower torso flexion minimum, and lower torso flexion maximum (63.13%, 84.5%, 130.98%, 200.98%, respectively). CONCLUSION: With this data it is now possible to find the variables that may contribute to having increased trunk rotation ROM and thus having better fitness and decreased potential for injury. From this it can be inferred what variables may be important to focus on to maintain optimal stability during athletic training to allow the subject to attain their peak level of fitness.
EFFECTS OF PGC1-α OVEREXPRESSION AT THE ONSET OF MUSCLE REGENERATION


Peroxisome proliferator-activated receptor-γ coactivator-1α (PGC-1α) is a transcriptional activator shown to stimulate mitochondrial biogenesis. Down-regulation of PGC-1α is observed during muscular dystrophy, a model of impaired regeneration. However, in healthy muscle PGC-1α expression is unaltered during muscle regeneration. Therefore, the role of PGC-1α at the onset of skeletal muscle regeneration is unclear and needs further elucidation. **PURPOSE:** To examine the effects of overexpression of PGC-1α on gene expression of lactate dehydrogenase (LDH), TNF-α, and myogenesis markers MyoD and Myogenin at the onset of muscle regeneration. **METHODS:** 23 C57BL/6 (WT) and 24 Transgenic (A1) mice were used for this study, with A1 mice genetically modified to overexpress the protein PGC-1α. Mice were injected with either PBS or Bupivacaine (MAR) at 12 weeks of age. Tibialis anterior (TA) muscle and tibias were excised 3-days post injection. Tissue was immediately frozen for gene expression analysis using RT-qPCR. **RESULTS:** There were no differences in body weight, TA weight, tibia length (TL), or TA to TL ratio in any mice 3-days post injection. **PGC-1α** gene expression was 13-fold greater in the A1-PBS group compared to the WT-PBS group (p<0.05). The A1-MAR group however, expressed approximately 4-fold less PGC-1α compared to the A1-PBS group 3-days post injection (p<0.05). In WT mice, MyoD gene expression was 1.5 fold greater in the MAR group compared to the PBS group (p<0.05). In A1 mice, there was no difference in MyoD expression between the MAR and PBS groups. There was a main effect of genotype to decrease LDH-A expression in both A1 groups (p<0.05). There was a 4-fold increase in LDH-B expression in the A1-PBS group compared to the WT-PBS group (p<0.05). In WT mice, there was no effect of MAR on LDH-B gene expression. However, in A1 mice there was a 50% decrease in the A1-MAR group compared to the A1-PBS group (p<0.05). The inflammation marker TNF-α increased approximately 2-fold as a main effect of genotype in both A1 mice groups (p<0.05). **CONCLUSION:** A surplus of mitochondria may result in more ROS production and higher levels of TNF-α. Lowered expression of MyoD 3-days post-injection in A1 mice could be attributed to the increased levels in TNF-α. With TNF-α possibly activating NF-κB, a nuclear factor shown to negatively regulate myogenesis.
EVALUATING INSTRUCTIONS FOR USE OF THE RATE OF PERCEIVED EXERTION SCALE: A PILOT STUDY

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PURPOSE: The purpose of this study was to determine if there is a difference in understanding of Rate of Perceived Exertion (RPE) with two types of instructions. METHODS: Older adults that lived independently at a life care community participated in this study (N = 18). Two interviews took place more than seven days apart from each other. One participant only attended the first interview. At the first interview, participants signed the necessary paperwork and randomly chose which script (Brief or Modified Borg) would be read. At the second interview the remaining script was read. Identical sets of description, scenario and feedback questions were asked after each script. Participants were asked to describe the feeling of RPE’s 6, 9, 13, 17, and 20. In addition, scenarios were said and they were asked to label the situations RPE level for themselves. Scenarios included gate closing at the airport (Airport Scenario), playing with children, and a typical trip to the grocery store. Responses were rated ‘Good,’ ‘Needs Improvement,’ and ‘Exact.’ Situations were analyzed by script and frequency. RESULTS: The Modified Borg instructions had a higher number of ‘Good’ descriptions for 6 (n = 13 vs. n = 12), 9 (n = 14 vs. n = 11), 13 (n = 9 vs. n = 4), and 17 (n = 12 vs. n = 3). RPE of 20 had equal (n = 10) participants with ‘Good’ descriptions for both scripts; however, the Modified Borg had two more participants that ‘Needed Improvement.’ The Airport scenario for the Brief instructions ranged from 13 to 20 RPE and 8 to 17 RPE for the Modified Borg. The most common answers were 13 (n = 5) and 15 (n = 5) for the Brief, and the Modified Borg’s were 12 (n = 4) and, 11, 13 and 14 (n = 3). Playing with children scenario resulted in 11 and 12 being the most common answer given for both scripts (n = 3 – 6). The children scenario ranged from 7 to 18 for the Brief Script and 6 to 13 for the Modified Borg. Most answered response was 11 (n = 6) to the grocery store scenario for both scripts ranging from 8 to 14 and 6 to 14 for the Brief and Modified Borg. CONCLUSION: Perception widely varies between the participants for the different scenarios. The longer more descriptive instructions were helpful but were possibly too long for the adults to be more accurate than the brief script.
ACUTE EFFECTS OF TWO DIFFERENT FOAM ROLLERS ON RANGE OF MOTION  

Self-myofascial release via foam rolling does not yield significant acute effects on muscular performance, but it can yield benefits to range of motion (ROM) similar to static stretching, without the negative effects to muscular performance. Additionally, exercising through larger ROM during resistance training will produce superior chronic benefits. PURPOSE: Therefore, the aim of this study was to determine if differences existed between the acute effects two different foam rollers had on hip and shoulder ROM. METHODS: Ten college students participated in a random cross over design study. Participants’ hip and shoulder ROM were measured with a goniometer pre and post three different conditions: control, supernova (SN), and grid. The first session consisted of taking pre ROM measurements followed by 10 minutes of rest and post ROM measurements (control). Then the participants were familiarized with the foam rolling procedures that were used for the next two sessions. During the next two sessions the control trial procedures were repeated, except instead of resting between pre and post testing the participants foam rolled using one of the foam rollers. RESULTS: Repeated measures ANOVA followed by protected dependent t tests revealed that significant ($p<.05$) differences existed between control and SN, control and grid, but not between SN and grid ($p>.05$). Effect sizes revealed that when comparing mean differences from pre to post for SN and grid: a large effect was seen for shoulder extension ($d = -.80$) in favor of SN, moderate effects were observed for shoulder flexion ($d = -.50$) in favor of SN, hip flexion ($d = -.62$) in favor of SN, and hip abduction ($d = .57$) in favor of grid. CONCLUSION: Both foam rollers produced similar acute improvements to hip and shoulder ROM, which were significantly better than the control condition. When improvements to ROM are desired prior to resistance training, the use of either foam roller in this study would be preferred over static stretching or no mobility exercises.

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Guidelines for adequate water intake for children (0-18 y) are outlined by the Institute of Medicine (IOM) and the European Food Safety Authority (EFSA). While the human body safeguards against dehydration via physiological pathways, the state of active total body water conservation is manifested by excretion of small volumes of highly concentrated urine. Recent research has shown detrimental health effects in adults reporting with chronically elevated markers for total body water conservation. This suggests a potential for preventative measures for health when implementing adequate hydration habits in children. However, studies report that up to 50% of children are voluntarily hypohydrated. It is unclear if this is due to the pediatric population struggling to meet hydration guidelines or due to inadequacy of the current guidelines. **PURPOSE:** The aims of the study were threefold. 1) Assess fluid intake and hydration biomarkers in Greek children. 2) Determine relative risk for hypohydration in children not meeting daily water intake recommendations compared to those that do. 3) Analyze current guidelines for efficacy to meet euhydration in children. **METHODS:** 150 boys and girls (9-13y) recorded their fluid intake for 2 consecutive days, with 24h urine samples being collected on day 2. Fluid intake records were analyzed for total water intake from fluids (TWI-F). Urine samples were analyzed for osmolality, color, specific gravity, and volume. Urine Osmolality ≥ 800 mmol·kg\(^{-1}\) H\(_2\)O was defined as hypohydration. **RESULTS:** Water intake from fluids was 1729(1555-1905) and 1550(1406-1686)mL·d\(^{-1}\) for boys and girls. Prevalence of hypohydration was 33% (44% boys, 23% girls). Children that failed to meet TWI-F recommendations demonstrated a risk that was 1.99-2.12 times higher than in those meeting recommendations (P≤0.01). Boys aged 9-13y displayed urine osmolality of 777(725-830) mmol·kg\(^{-1}\) and urine specific gravity of 1.021(1.019-1.022), higher values than reported in the 9-13y girls (P≤0.015), with >27% classifying as hypohydrated despite meeting fluid intake recommendations. **CONCLUSION:** Failure to meet TWI-F guidelines doubled risk of hypohydration in children. While 23% of Boys 9-13y reported hypohydration despite satisfying current guidelines and therefore may require greater water intake to achieve adequate hydration avoiding hyper concentration of urine.

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CANCER CACHEXIA-INDUCED MUSCLE ATROPHY: EVIDENCE FOR ALTERATIONS IN MICRORNAS IMPORTANT FOR MUSCLE SIZE

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Muscle atrophy is a hallmark of cancer-cachexia resulting in impaired function and quality of life and cachexia is the immediate cause of death for 20-40% of cancer patients. The resulting atrophy leads to a decreased functional ability of the muscle, therefore, muscle atrophy developed during cancer-cachexia leads to an exacerbation in the functional decline of cancer patients. microRNAs regulate to translation of specific mRNAs, and are implicated in regulation of muscle size. The impact of cancer-cachexia on the microRNA profile is poorly understood.

PURPOSE: The purpose of this investigation was to examine the miRNA profile of skeletal muscle atrophy induced by cancer-cachexia in order to uncover potential miRNAs involved with this catabolic condition. METHODS: Two groups of C57BL/6J mice were either injected with sterile phosphate buffered saline (PBS) or LLC1 lung carcinoma cells into the dorsal flank. After four weeks, LLC1 mice developed cancerous tumors and cachexia. Hindlimb muscles were collected, snap frozen and processed to isolate pure high quality, short RNAs. RNAs were analyzed using miRSEQ microRNA sequencing and data was analyzed using Ingenuity Pathway Analysis. RESULTS: Tumor weights were ~3.3g in LLC1 compared to 0g in PBS mice. Tibialis Anterior (18%), Gastrocnemius (7%), and Epididymal Fat (10%) were all lower weight in LLC1 compared to PBS (p<0.05) verifying cachexia. Three hundred seventy-two distinct microRNAs were identified as being expressed in the tissue. Nine of these miRNAs were significantly different between groups (p<0.05), and 20 total miRNAs were identified as being altered between LLC1 and PBS at the p<0.10 level. These miRNAs were classified as playing a role in numerous physiological processes and intracellular signaling pathways such as those involved with cell cycle progression (MYC) and cellular growth (Akt) among others.

CONCLUSION: This investigation has taken clear steps to discover novel alterations in microRNAs in the context of cancer-cachexia-induced muscle atrophy and potential mechanisms involved in the onset of both cachexia and possibly other forms of muscle atrophy. Future experiments can be designed to identify specific cellular necessity and sufficiency of these microRNAs in maintenance of muscle size as possible therapeutics for muscle atrophy.

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COMPARING PATIENT SATISFACTION BETWEEN FACE-TO-FACE AND TELEHEALTH CLINICAL VISITS FOR SPORT-RELATED CONCUSSION
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A multifaceted and interdisciplinary management of sport-related concussion (SRC) is key to concussion assessment and rehabilitation, and oftentimes requires specialty referral for comprehensive and targeted care. However, geographical barriers and lack of specialty providers with concussion expertise, may prevent access to specialized care. Telehealth is an innovative method for providing increased access to healthcare for athletes with SRC. However patient rapport (i.e., therapeutic alliance) and satisfaction have not been documented with this new method of healthcare delivery. **PURPOSE**: The purpose of this study was to compare patient and caregiver ratings of the therapeutic alliance and clinical visit satisfaction scores between telehealth and in-office consultations for youth athletes with concussion. **METHODS**: A between-subjects randomized controlled design was utilized. Twenty patients (M= 15.20, SD= 1.55 yrs) with SRC and their caregiver were randomly assigned to either a telehealth or face-to-face clinical visit. The concussed patient and their caregiver completed the therapeutic alliance and satisfaction scale after the clinical visit. **RESULTS**: Therapeutic alliance scores did not differ between telehealth and face-to-face conditions (p=.21), and patient satisfaction scores were also similar between conditions (p=.19). **CONCLUSION**: There are no significant differences among patient and parent reports of satisfaction between face-to-face and telehealth visits for concussion treatment. Therefore, this study shows the therapeutic alliance for the concussion clinical visit can be effectively established via telehealth.

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THE EFFECTS OF ULTRA SHORT HIGH INTENSITY INTERVAL FUNCTIONAL EQUIPMENT TRAINING ON ANAEROBIC CAPACITY AND BODY COMPOSITION IN HEALTHY COLLEGE STUDENTS

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High-intensity interval training (HIIT) refers to a group of short intense exercise bouts separated by short rest periods. Standardized protocols have not been established to determine the most efficient intensity, exercise mode, exercise volume, and recovery duration of the HIIT exercises. **PURPOSE:** The purpose of this study was to determine the effects of ultra-short, high-intensity interval functional-equipment training (SHIIFT) on anaerobic capacity and body composition of recreationally active college students. **METHODS:** The SHIIFT protocol consisted of 6 cycles of 6 different exercise at a 10 s: 5 s work-to-rest ratio), and a 1 minute rest period between each cycle, for a total duration of 6 min of exercise. The SHIIFT workouts were performed 5 days per week for 2 weeks, for a total of 10 sessions. Fifteen participants completed the SHIIFT protocol, while another fifteen participants were randomized in the control group, who did not change their normal exercise routine. Before and after the 2 weeks, all participants underwent testing for anaerobic capacity and body fat percentage (BFP). **RESULTS:** Both groups significantly decreased (p < 0.05) body fat percentage and fat mass (SHIIFT group: BFP = 31.1% ± 8.6 to 30.3% ± 8.3; FM = 26.5 kg ± 14 to 25.8 kg ± 13.6, control group: BFP = 26.3% ± 10.2 to 25.6% ± 9.6; FM = 19.34 kg ± 12.6 to 18.6 kg ± 11.5), as well as increased (p < 0.05) maximum power and fatigue index in the post-testing (SHIIFT group: MP = 1212.2 ± 491 to 1227.8 ± 486.8; FI = 31.9 ± 13.98 to 32.53 ± 14.77, control group: MP = 966.7 ± 280.2 to 1014.6 ± 295; FI = 23.74 ± 7.80 to 26.06 ± 7.91). However, there were no significant changes (p < 0.05) in body fat percentage and anaerobic capacity between the two groups after the post-testing. **CONCLUSION:** Results from our study show no significant improvement in body composition or anaerobic capacity after 2 weeks of the SHIIFT protocol. Since no blood or muscle tissues were collected from the SHIIFT participants, we are not able to say if this protocol induced any molecular and/or cellular changes that might precede whole body and performance improvements. Thus, further research is needed to determine the physiological adaptation of the ultra-short high intensity interval training.
LOWER LIMB KINETIC AND KINEMATIC EFFECTS OF AN ARM SWING DURING COUNTER-MOVEMENT VERTICAL JUMPS

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The counter-movement vertical jump (CMVJ) is a complex multi-joint activity where muscles of the lower and upper extremities collectively summate forces to produce movement.

PURPOSES: This study determined the effects of an arm swing on lower limb kinematics (joint ranges of motion; ROM) and kinetics (peak joint torques; Nm) during a CMVJ. METHODS: Fourteen healthy, recreationally active men (X±SD; age=24.1±3.9 yrs, height=1.76±0.05 m, weight=82.6±10.6 kg) performed 6 CMVJ, 3 with an arm swing (AS) and 3 with no arm swing (NAS), in random order. The AS CMVJ began with the participant standing upright with arms fully raised above the head. The NAS CMVJ began with the dominant upper limb fully raised overhead, while the non-dominant hand remained on the iliac crest during the entire CMVJ. All jumps were performed by descending to an internal knee angle of 90°, using maximal effort, and reaching for an overhead target. A three dimensional markerless motion capture system (MCS; DARI, Lenexa, KS) was used to analyze the kinetic and kinematic data. T-tests and ANOVAs (*AS vs. NAS, †eccentric [ECC] vs. concentric [CON]; p<0.05) were performed on mean values from all 3 jumps for AS and NAS for each subject. RESULTS: Results for AS and NAS CMVJs are shown in the table. The AS CMVJ produced greater vertical jump height (VJH) an average of 0.07±0.03 m (3.0±1.3 in). The hips and ankles produced greater ECC and CON torques, less hip flexion, and greater time in the concentric phase during the AS CMVJ. The knees produced greater concentric torque, however there were no differences between jump conditions. The AS CMVJ also had greater time in the concentric phase of the jump. CONCLUSION: Compared to NAS, use of an AS produced a 13% increase in CMVJ height, and greater peak torques for the hips and ankles, even when comparing eccentric and concentric phases. The AS CMVJ also increased the duration of the concentric phase, thus permitting greater torque generation to increase CMVJ height.
In 1990, 23.6% of the elderly population (60+ years old) was obese (≥30 BMI). By 2010, it increased to 39.5%. Aging is typically associated with a reduction in lean mass. Loss of muscle mass with advanced age coupled with increased fat mass is referred to as sarcopenic obesity. Cardiac dysfunction is highly associated with both age and obesity. A contributing, underlying mechanism of cardiac dysfunction is cardiac fibrosis. As the prevalence of obesity in the elderly population continues to rise, a firmer understanding of how age and obesity interact to affect cardiac fibrosis is needed. PURPOSE: To examine how sarcopenic obesity affects markers of fibrosis in cardiac tissue.

METHODS: Twenty-four C57BL/6J mice were evenly distributed into either a normal chow (17% kcals from fat) or high-fat (60% kcals from fat) diet after weaning. Twelve mice from each diet were euthanized at 12-16 weeks of age (young). The remaining 12 were sacrificed at 22-24 months of age (aged). The classification of the 4 groups is as follows: young-lean, young-obese, aged-lean, aged-obese (n=6 per group). Whole hearts were excised at time of euthanasia, snap-frozen, and processed for use in gene expression assays. Gene expression was measured using RT-qPCR and normalized to 18s. RESULTS: The aged obese group had a 50% decrease (p<0.05) in the collagen III to I ratio compared to all other groups. The aged obese mice had a two-fold higher TIMP-1 gene content compared to the young obese and aged lean groups (p<0.05). There was a main effect of obesity to increase MMP-2 gene content (p<0.05). There was a main effect of obesity to decrease MMP-9 gene content (p<0.05). CONCLUSION: Elevated collagen III to I ratio has been observed in some forms of end-stage cardiomyopathy. Increased mRNA abundance of TIMP-1 has been shown to be related to cardiac fibrosis and dysfunction. Downregulation of MMP-9 mRNA in conjunction with upregulation of MMP-2 mRNA have been correlated with cardiac pathology and fibrosis, respectively. The tendency for the aged, obese group to display all four of these expressions leads to the conclusion that the aged, obese population is at higher risk of developing cardiac fibrosis, a leading cause of cardiac dysfunction.
MUSCLE SPECIFIC OVEREXPRESSION OF PGC-1α1 PROMOTES FAVORABLE EXERCISE RESPONSES UNDER LIPID OVERLOAD CONDITIONS REGARDLESS OF EXERCISE VOLUME

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Obesity and its associated comorbidities remain the pivotal public health concern of the 21st century. One predominant interest in the development of insulin resistance is the degradation and dysfunction of skeletal mitochondria. PGC-1α1, the principle regulator of mitochondrial biogenesis has been proposed as a possible therapeutic target to alleviate lipid overload-induced mitochondrial dysfunction, yet current data remain controversial on the efficacy of artificially promoting PGC-1α1 as a therapeutic modality. **PURPOSE:** The purpose of this study was to investigate the efficacy of genetic overexpression of PGC-1α1 alone and in combination with physical activity as a therapeutic agent during lipid overload. **METHODS:** ~40 wild type (WT) mice and mice with muscle-specific overexpression of PGC-1α1 (MCK-PGC-1α) were given Western Diet (WD) at 8 wks of age and allowed to consume food *ab libitum* throughout the course of the study. At 12 wks of age, animals were randomly divided into sedentary (SED) and physical activity (voluntary wheel running [VWR]) interventions. At ages 7, 11, and 15 wks animals underwent glucose tolerance tests (GTT). At 16 wks of age animals were humanely euthanized and tissues collected for analysis. **RESULTS:** MCK-PGC-1α animals were slightly lighter and had less epididymal fat compared to WT (~6% and ~28% respectively). Food efficiency (ratio of weight gained to food consumed) was ~17% lower in MCK-PGC-1α animals. While there was no difference at 7 wks age, at 11 wks age MCK-PGC-1α had ~50% greater integrated area under the curve (IAUC) compared to WT. Yet at 15 wks, VWR had 30% lower IAUC compared to SED, regardless of genotype. MCK-PGC-1α-VWR ran ~3X more per day compared to WT-VWR. Correlations for distance per day v. IAUC, body weight, and epididymal fat were significant and moderately strong (r=0.67-0.71) for WT-VWR, but in TG there was no correlation between these variables and distance per day (r=0.10-0.20). **CONCLUSION:** Taken together, these results suggest increasing PGC-1α1 may augment exercise-induced adaptations regardless of exercise volume, but overexpression of PGC-1α1 during lipid overload without physical activity does not appear to mitigate insulin resistance and may in fact exacerbate the condition.
EFFECTS OF A DYNAMIC WARM-UP USING A RESISTANCE TRAINING MASK ON SPRINT PERFORMANCE
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In recent years, coaches and athletes alike have taken a keen interest in maximizing the efficiency of a dynamic warm-up without inducing muscular fatigue. One proposed method of doing so is using a respiratory training mask to provide breathing resistance to increase the intensity of a warm-up. Though there is limited empirical evidence on the topic, many athletes have adopted this warm-up strategy, possibly due to testimonials from high-profile athletes in their respective sports. PURPOSE: The purpose of this study was to investigate the effect of a high-intensity warm-up (HWU) using a respiratory training mask on sprint performance, heart rate measures (HR), and ratings of perceived exertion (RPE) in Division I football athletes using a timing system. METHODS: Seventeen male (mean ± SD: age = 17.94 ± .75 years, weight = 104.43 ± 23.02 kg, height 184.93 ± 7.06 cm) American football athletes from a NCAA Division I level were recruited to participate in this study from a Midwestern university. Athletes were informed of risks, and upon completing an informed consent document, completed 2 testing sessions separated by 7 days. Each testing session took place on artificial turf in the university’s indoor training facility at the same time of day. Both testing sessions began with a warm-up (WU) under the instruction of a member of the university’s strength and condition staff. The WU consisted of dynamic exercises targeting the lower body musculature. During the initial visit, participants completed the dynamic WU and testing without a respiratory training mask. During the second visit, the HWU was completed with the respiratory training mask set to increase the resistance level of breathing by 12-fold. Upon completion of the HWU, participants removed the mask and performed 5 × 10-meter sprints. A one-way repeated measures analysis of variance (ANOVA) design was used to assess differences between control and experimental results. All statistical analyses were performed using SPSS (Version 21.0 for Windows; SPSS, Chicago, Illinois) with statistical significance set a p < .05. RESULTS: Sprint time was not significantly different after a HAWU using a respiratory training mask (p = 0.874). CONCLUSION: These findings do not suggest the use of a respiratory resistance training mask during a dynamic warm-up is useful in increasing 10-meter sprint times for football players. Athlete’s performance on repeated sprints was not improved after using a resistance mask; however, performance was also not hindered.
A FLUID CONSUMPTION PATTERN BASED ON PLAIN WATER AND MILK IS ASSOCIATED WITH BETTER HYDRATION
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Children consume various fluids in order to cover daily water needs. However, the contribution of different beverage categories to hydration is unclear. PURPOSE: To examine whether various fluid intake patterns are associated with hydration, as indicated by urine osmolality.

METHODS: Two hundred and ten healthy Greek children (height: 1.49±0.13 m, weight: 43.4±12.6 kg, body fat: 25.2±7.8%), 105 girls and 105 boys, were asked to collect their urine for 24 hours while conducting normal daily activities. For two consecutive days they were instructed to record their fluid consumption using a provided fluid diary including type, amount, and time of fluid consumed. A trained nutritionist evaluated total water intake and categorized beverages into 6 drinking groups. Urine samples were analyzed for color, specific gravity, and osmolality. Factor analysis with the Principal Components method was applied to extract dietary patterns from 6 drinks or drinking groups. Linear regression analysis evaluated the associations between the extracted dietary patterns and hydration levels deriving from 24h urine osmolality.

RESULTS: Component 1 was mainly characterized by consumption of milk and fresh juice but not packaged juice, component 2 by regular soda and other drinks but not water, component 3 by fresh juice and other drinks, component 4 by packaged juice but not regular soda, component 5 by water and milk and component 6 by fresh juice. Component 2 was positively correlated with high urine osmolality (P<0.001), whereas Component 5 was negatively correlated with urine osmolality (P<0.001). CONCLUSION: A fluid consumption pattern that features water and milk was associated with better hydration. Contrastingly, a drinking pattern featuring regular soda and other drinks but not water was associated with inadequate hydration.

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A COMPARISON OF THE BODYGEM® AND THE VACUMED VO₂ LAB FOR MEASURING RESTING METABOLIC RATE
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Indirect calorimetry is used to measure oxygen consumption as a means of accurately estimating resting metabolic rate (RMR). Many commercial devices are available for measuring RMR, such as the BodyGem® indirect calorimeter and the Vacumed VO₂ Lab metabolic measuring system. Metabolic carts, such as those manufactured by Vacumed and Cosmed, tend to be viewed as the criterion method for cardiopulmonary exercise testing equipment. However, newer, less expensive, and more portable devices, like the BodyGem® and MedGem®, are being used in non-laboratory settings to measure RMR. PURPOSE: The purpose of this study was to compare the measured RMR of college-aged participants using a BodyGem® indirect calorimeter and a Vacumed VO₂ Lab metabolic cart. METHODS: Each participant (male=15; female=15; age=22.7±3.3 yrs; wt=77.5±14.5 kg; ht=173.5±9.6 cm) completed a thirty-minute supine resting session in a quiet environment. Five minutes of resting data were then collected using the Vacumed VO₂ Lab while in the supine position. Immediately thereafter, five minutes of resting data was collected using the BodyGem® indirect calorimeter while in the seated position. RESULTS: A paired samples t-test revealed a significant difference between the BodyGem® (1995.0±540.5 kcals) and the Vacumed (1520.9±452.5 kcals) (p<.001). The BodyGem® was significantly higher for both male (p=.001) and female (p=.042) participants. CONCLUSION: Inconsistent with past research, the BodyGem® indirect calorimeter yielded RMR values significantly greater than the Vacumed VO₂ Lab metabolic measuring system. Further research needs to be conducted comparing the various hand-held indirect calorimeter and metabolic cart instruments before methods such as the BodyGem® can be deemed accurate for measuring RMR.
THE RELATIONSHIP BETWEEN OUTDOOR TIME AND TV VIEWING TIME WITH CHILDREN’S PHYSICAL ACTIVITY AT CHILD CARE

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Childhood obesity is a public health concern with 9.4% of 2-to-5 year old children classified as obese and the trajectory into adult obesity. Increasing moderate-to-vigorous physical activity (MVPA) and decreasing sedentary behavior (SB) are associated with lowered childhood obesity. Environmental factors, such as outdoor time and TV viewing time, may contribute to MVPA and SB in preschool-age children. The child-care environment influences MVPA and SB, and is an area for improving activity patterns since 60% of preschool-age children spend a majority of their weekdays in this environment. PURPOSE: The purpose of this study is to determine the relationship between outdoor time and TV viewing time with physical activity in preschool children at the child-care center, while adjusting for the similarities within the classroom. METHODS: An observational study at child-care centers was conducted during 2011-2014. Outdoor time was defined as time children spent in an outdoor play space, and TV viewing time was defined as time children spent watching TV. Outdoor time and TV viewing time were observed on two days using a digital wrist watch. Physical activity intensity and duration was measured for the entire school-day using waist-worn accelerometers. Data were recorded in 15-second epochs and analyzed with age-specific cut points to determine intensity. Dependent movement variables included minutes of SB, light physical activity (LPA), MVPA, and total steps. Hierarchical models were adjusted for weather, and used for the clustering of children within the classroom. RESULTS: Participants (n=202) of 34 classrooms were 3.7±0.7 years old, 51% male, and 60% Caucasian. Children took 4453±1655 steps, 310±83 minutes of SB, 36±13 minutes of LPA and 19±10 minutes of MVPA. Outdoor time was observed in 87% of classrooms for 77±65 minutes, and TV viewing time was observed in 52.4% classrooms for 57±39 minutes. In hierarchical modelling, outdoor time was associated with SB (df=29, F=1.85, p<0.01), LPA (df=29, F=2.13, p<0.01), MVPA (df=29, F=2.40, p<0.01) and steps (df=29, F=2.69, p<0.01). At the classroom level there were mixed results on the impact of outdoor time, some classrooms with higher outdoor time exhibited higher LPA, MVPA and steps, while others engaged in more SB. TV Viewing time was only associated with MVPA (df=16, F=2.51, p<0.01), with differing directions of association at the classroom level. With higher TV viewing time, some classrooms showed more MVPA, and others less MVPA. CONCLUSION: Investigating the differences between classrooms and the role of the teacher may help increase children’s physical activity.
DOES THE GARMIN VIVOSMART® HR ACCURATELY MEASURE STEPS AND ENERGY EXPENDITURE?
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**Purpose:** The purpose of this study was to evaluate the accuracy of the step counts and energy expenditure (EE) from the Garmin Vivosmart® HR (GVS). **Methods:** Twenty participants completed 1 mile of walking followed by 1 mile of running on a treadmill in the lab. Participants wore a GVS that was set up for their height, weight, and age in addition to an Actigraph GT3X (GT3X) accelerometer. Data from the GVS were compared to the GT3X for steps and American College of Sports Medicine metabolic equations (ACSMME) for estimated EE. **Results:** Mean steps counted for walking and running by the GVS was 1956 steps (sd = 219 steps) and 1677 steps (sd = 235 steps) respectively. Mean EE measured for walking and running by the GVS was 88 kcals (sd = 55 kcals) and 127 kcals (sd = 50 kcals) respectively. Mean steps counted for walking and running by the GT3X was 2101 steps (sd = 103 steps) and 1655 steps (sd = 177 steps) respectively. Mean EE estimated by the ACSMME for walking and running was 82 kcals (sd = 12 kcals) and 129 kcals (sd = 19 kcals) respectively. Paired samples t tests were calculated to compare mean steps counted and EE by the GVS and the GT3X for walking and running. Walking step counts from the GVS were significantly different from the GT3X, t(19) = -3.23, p = .004. No significant difference in running step counts from the GVS and GT3X was found, t(19) = .848, p = .407. No significant difference was found between EE from the GVS and ACSMME for the walk, t(18) = 0.571, p = .575, or the run, t(19) = -0.372, p = .714. **Conclusion:** The GVS may not measure steps accurately at speeds slower than 4.5mph when compared to a validated accelerometer; however, measurements taken at speeds greater than 4.5mph may be accurate. Additionally, the GVS was found to be accurate for calculating EE for both a 1-mile walk and 1-mile run when compared to estimated EE determined by ACSMME.
Muscular power declines 6-10% per decade throughout life. It is unknown, however, when the decrease is most apparent. Therefore, it’s important to examine the difference in power amongst different age cohorts. **PURPOSE:** The purpose of this study was to examine the difference in power output measures among adults over the age of 18 years, separated into age decade cohorts (18-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80-89 years). **METHODS:** A total of 160 men and women participated in the study (40.6 ± 20.1 years; 71.1 ± 14.0 kg), spanning in age from 18-86 years. Power was assessed using the Tendo power analyzer during a sit-to-stand (STS) task. Participants sat on a standard height (0.47 m) chair, arms crossed over their chest and performed five separate STS trials, rising from a seated to full standing position as quickly as possible; one-minute rest periods provided between each trial. The Tendo was positioned on the floor in alignment with the participant’s heel and the Kevlar string attached to the participant’s hip with a carabineer clip and belt. With each STS task, peak (PPOW) and average (APOW) power, as well as peak (PVEL) and average (AVEL) velocity were recorded in watts (W) and meters per second (m/s), respectively. PPOW, APOW, PVEL, and AVEL were recorded for each stand, with the average taken. **RESULTS:** One-way ANOVA analysis indicated a significant difference between groups for PPOW, APOW, PVEL, and AVEL measures ($p < .05$). Younger subjects produced significantly greater PPOW and APOW than individuals in age cohorts over 40 years ($p < .05$). When assessing PVEL and AVEL, the younger age cohorts produced significantly greater values than the older age cohorts ($p < .05$). **CONCLUSION:** Findings indicate muscular power to be significantly greater among younger cohorts (≤ 40 years), as compared to older cohorts (> 40 years); however, among older cohorts, there was no significant decline in power. This gives an indication that decline in muscular power may occur around the age of 40, which is when the decline becomes less apparent. Based on findings, preservation of muscular power is necessary before 40 years of age.
HIGHER WATER INTAKE AND BETTER HYDRATION STATE IS ASSOCIATED WITH LOWER RISK OF INSULIN RESISTANCE IN HEALTHY ADULTS: NHANES 2009-2012

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Preliminary data suggest that low water intake is associated with the risk of developing diabetes, while most of U.S. adults do not meet the requirements for daily water intake. PURPOSE: To study the effect of high water intake on glucose regulation in healthy adults. METHODS: 2,233 participants from 2009-10 & 2011-12 National Health and Nutrition Examination Survey were selected to examine the association between water intake and hydration state with insulin resistance in healthy individuals (females: 48.3%, age: 44±1 y, BMI: 27.5±0.2 kg·m⁻²) in the US.

RESULTS: Insulin resistance was assessed by homeostasis model assessment of insulin resistance (HOMA-IR) and data were divided into tertiles (≤1.77, 1.78-3.45, and >3.45). Hydration status was assessed by urine osmolality (621±7 mmol·kg⁻¹) and urine flow rate (0.96±0.03 ml·min⁻¹). Plain water (1,203±35 mL) and total water intake (TWI; 3,190±43 mL) was assessed from a 24 h dietary recall. Urine osmolality was highest in the upper HOMA tertile (679±9 mmol·kg⁻¹) compared to lowest tertile (583±1 mmol·kg⁻¹, P<0.001), while urine flow rate was highest in the lowest HOMA-IR tertile (1.03±0.04 ml·min⁻¹) compared to upper tertile (0.92±0.03 ml·min⁻¹, P=0.001). Multinomial logistic regression showed healthy adults who consumed more plain water (≥859 mL) were half as likely to be in the upper HOMA-IR tertile, compared with their peers who consumed less (≤207 mL, OR=0.50; 0.34-0.73), after adjusting for age, gender, BMI, waist circumference, race/ethnicity, education, and physical activity. Similarly, adults with higher levels of daily TWI (≥2,657 mL) had significantly lesser odds (42%) of being in the upper HOMA tertile, compared to adults with a lower level of TWI (1,598 mL, OR=0.58; 0.38-0.90). CONCLUSION: Higher plain water (≥859 mL) and total water intake (≥2,657 mL), as well as better hydration state were associated with lower insulin resistance.
THE EFFECT OF CARBOHYDRATE, CAFFEINE, AND CARBOHYDRATE + CAFFEINE MOUTH RINSING ON INTERMITTENT RUNNING PERFORMANCE IN COLLEGIATE MALE LACROSSE ATHLETES
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Independently, carbohydrate and caffeine mouth rinsing can improve varying types of performance, but studies have yet to examine their combination. PURPOSE: This study investigated the independent and synergistic ability of carbohydrate and caffeine mouth rinsing to improve intermittent running performance. METHODS: The Yo-Yo Intermittent Recovery Test-Level1 (Yo-Yo IRT-1) was completed in ten collegiate (NCAA Division II) male lacrosse players after a 10-second mouth rinse with a solution, randomly assigned, of either 6% carbohydrate (CHO), 1.2% caffeine (Caff), 6% carbohydrate + 1.2% caffeine (CHO+Caff), placebo (H₂O) or a no rinse control (CON). On testing days, participants reported to facility after an overnight fast, in groups of three or four and were lead through a standard warm-up then given their experimental solution immediately followed by their Yo-Yo IRT-1. Rating of Perceived Exertion (RPE) was collected by the Borg Scale at the start of each stage, marked by the audio cues. The total distance ran during the test before termination was the main variable. Participants completed all conditions separated by one week of recovery. A One-way ANOVA was used to determine the impact of the mouth rinses with a p-value of 0.05 to determine statistical significance. RESULTS: No significant improvements in Yo-Yo IRT-1 performance were found between solutions (p > 0.05). Significantly lower RPE (p < 0.05) was reported at the conclusion of stage 11 in the CHO and CHO+Caff when compared to CON. CONCLUSION: Further research is needed to determine if mouth rinsing with carbohydrate, caffeine, or their combination can impact field-based running performance.
DEVELOPMENT OF DIELECTRIC ELASTOMER ARTIFICIAL MUSCLE FOR USE AS A HUMAN ASSISTIVE DEVICE
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PURPOSE: The purpose of this study is to develop new dielectric elastomer (DE) artificial muscle to meet requirements for use as a human assistive device including biocompatibility, achievable stress and strain, and power consumption. METHODS: We develop an artificial muscle structure using DE as a soft actuator to simulate muscle with carbon nanofibers embedded to simulate a tendon structure. A contractile force is generated when an electrical voltage is applied to the DE material through the conductive tendons. The DE material was stretched across a frame and the electrical current applied. RESULTS: Preliminary experimental results show that, when loaded with a 100 gram weight, the DE artificial muscle structure can achieve up to 2% strain output. Power consumption of the DE muscle was less than 100 mW. CONCLUSION: DE artificial muscle has built in sensing and actuation capability and can provide compliant actuation with low power consumption requirements. The DE artificial muscle has significant potential as a human assistive device.
THREE WEEKS OF CROSSFIT® TRAINING DOES NOT CONTRIBUTE TO OVERTRAINING SYNDROME IN RECREATIONALLY TRAINED MALES: A PILOT STUDY

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Physical inactivity remains a significant public health concern. CrossFit® (CF) is currently one of the most popular health and fitness activities. However, CF faces strong opposition and criticism claiming it causes injury. PURPOSE: Therefore, the purpose of this study was to investigate if CF participation contributes to overtraining syndrome. A secondary purpose was to determine if there are differences between CF original methodologies and real-world practice. METHODS: Six recreationally trained males (height, 182.8 ± 8.6 cm; weight, 84.3 ± 12.4 kg, and age, 25.0 ± 5.4 years) were randomized into two groups, either theoretical (TH) or real-world (RW) prior to the intervention. Both groups completed pre-testing assessment of body composition, physiological, biochemical, psychological, and performance-based data. Both groups participated in CF training 5 days/week. However, the TH group completed training designed to follow original CF methodology while the RW group followed programming designed by a randomly selected CF affiliate. At the beginning and end of each week blood was collected for serum analyses and select joint range-of-motions (ROM) were measured. Additionally, prior to each training session, resting heart rate (RHR), blood pressure (BP), muscle soreness (DOMS), and select training variables were collected. Following the completion of each training session, HR and perceived exertion (RPE) were collected. RESULTS: There are no significant differences in physiological, biochemical, immunological, psychological, or performance outcome variables assessed in this study for both between groups and pre-post testing (all \(p > .05\)). However, there are differences in intervention programming between TR and RW groups. In practice, there were significantly less element priority sessions in practice compared to what is recommended (40% vs 0%; \(\chi^2=8.25\); \(p=.016\)). Further, these element priority sessions had significantly lower associated training heart rates (127.4 vs 167.0, 172.4 bpm; \(F=8.63\); \(p=.001\)) and ratings of perceived exertions (9.4 vs 14.8, 14.7; \(F=15.26\); \(p=.000\)) than other session designs common in CF. CONCLUSION: These data suggest that short-term CF participation does not contribute to the development of overtraining syndrome in recreationally trained males. Questions still remain on the potential for where CF may have the greatest impact on health and fitness and its implementation in practice.

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Falls are a leading cause of injury and accidental death among elderly. Most falls are preceded by muscle weakness, poor balance, and vision impairment which contribute to over $35 billion in annual medical costs. **PURPOSE:** The aim of this study was to compare the effectiveness an independent static balance (ISB) protocol with the National Institute on Aging (NIA) supervised protocol for improving balance in an elderly population. **METHODS:** Twenty-four ambulatory residents (age 87.1 ±5.6 yr; wt 76.74 ±17.59 kg; ht 163.57 ±7.1 cm) in a community dwelling served as volunteers for the study and were randomly placed in the ISB or NIA group. Pre- and post-tests included assessments of fall risk (FR), overall stability (OS), anterior/posterior (AP) index, and medial and lateral index (MLI) collected using a Biodex Balance System®. Training consisted of 20 minutes, two times per week for 12 weeks. Result data was adjusted based on missed/attended sessions. **RESULTS:** Analysis yielded improvement of all dependent variables for both groups without any significant differences ($p>0.05$) between the two groups for any variable. For FR the ISM group improved by 30.4% while the NIA group improved by 17.8%. For OS the NIA group improved by 23.6% and the ISB group by 9.8%. For AP the average improvement for the NIA group was 41.0% compared to the ISB group at 18.0%. Similarly, the average improvement ML for the NIA group was 43.9% compared to the ISB group at 17.1%. **CONCLUSION:** Static balance exercises conducted independently without safety supervision led to similar improvements in balance and fall risk reduction as the highly supervised NIA protocol, thereby indicating that balance and stability can be improved independently without close supervision thus allowing supervisory personnel to tend to other clients or patients.
WORKPLACE FALL PREVENTION IN A HIGHER EDUCATION SETTING
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Workplace falls result in significant medical and legal costs. Regardless of financial concern, Rockhurst’s established value of “CuraPersonalis,” care of the whole person, places high priority on the welfare of Rockhurst’s campus members. **PURPOSE:** The current investigation was undertaken to examine fall risk factors, the pattern of Rockhurst falls, and general and Rockhurst fall prevention strategies and to implement a fall prevention program consistent with findings. **METHODS:** A campus-wide safety audit was performed using a previously published checklist. The most common issue was electrical cords on floors that could pose a tripping hazard. Fall prevention initiatives on the Rockhurst campus mainly related to communication. Information about falls reported to Campus Security from September 2014 to July 2015 was categorized based on location and individuals involved. While the number and severity of reported falls did indicate that an exercise-based intervention program was warranted, an informational campaign was considered useful. Investigators staffed a table with brochures, a computer displaying an educational video, and a poster during the initial part of the all-employee university opening workshop. They engaged interested individuals in conversation about fall prevention and offered to provide tripping hazard signage. Copies of three different brochures were distributed and displayed in eight offices on campus, and the tripping hazard signs were made available. **RESULTS:** Few individuals took initiative to view materials at the opening workshop. Those who approached investigators engaged them in conversation about falls, often describing unreported falls. Investigators distributed brochures to each individual on entering the meeting room. With respect to brochures distributed to campus offices, after ten days, no brochures remained at four locations, and seven to nine brochures remained at four other locations. Repeating the audit at that time revealed many but not all of the same tripping hazards. **CONCLUSION:** The level of concern displayed by the administrator who initiated interest in the project was inconsistent with the data on reported falls. Since anecdotal evidence suggested that fall underreporting, especially falls that did not result in major injuries, may be prevalent, ongoing informational efforts may be both helpful and aligned with Rockhurst values.
BODY COMPOSITION CHANGES WITH USE OF A SIT-TO-STAND WORKSTATION
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Emerging research has noted the ill effects of sedentary time on overall health. Sit-to-stand workstations have risen in popularity as a solution to sedentary office time. To date, there has been little research into the effectiveness of sit-to-stand work stations. This pilot study was carried out as part of a larger study investigating the effects of sit-to-stand workstations in the workplace. **PURPOSE:** The purpose of this pilot study was to determine the effect of a sit-to-stand workstation intervention on body-composition. **METHODS:** Eleven apparently healthy participants agreed to stand at the sit-to-stand workstation for a minimum of 3 hours per workday. Body composition was measured before and 5 months after the intervention using body mass index, waist circumference, and percent body fat as determined by bioelectrical impedance. Nine participants completed body composition assessments. Dependent t-tests were used to analyze changes in body composition variables. **RESULTS:** Non-significant ($p > .05$), small improvements were seen in body fat percentage ($d = .13$), but not for waist circumference ($d = .06$), and BMI ($d = .01$). **CONCLUSIONS:** The authors conclude regular use of a sit-to-stand workstation may improve body fat percentage. Further study is warranted to determine if body composition changes more over a longer period of time or with more use of the sit-to-stand workstation.
A substantial amount of research on pre-exercise nutrition suggests that carbohydrate ingestion prior to exercise and sport activity increases performance due to various factors like blood glucose maintenance, better-facilitated carbohydrate breakdown, and higher glycogen turnover. 

**PURPOSE:** The purpose of this study was to determine if a high-carbohydrate pre-exercise meal allowed sedentary and recreationally active people to produce higher peak anaerobic power outputs in watts than if they consumed a high-fat or high-protein meal. 

**METHODS:** Five male and four female college students at the University of Central Missouri, who identified as sedentary or recreationally active, were recruited to consume a high-fat, high-carbohydrate, or high-protein meal at three different sessions. Participants were instructed after feedings to return to the lab approximately 180 minutes later to perform a 30-second maximal power output test known as the Wingate Anaerobic Test. 

**RESULTS:** The results showed peak anaerobic power outputs were highest for the fat trials at a mean of 847.78 ± 278.52 W, followed by a mean of 832.22 ± 224.39 W for the carbohydrate trials, and a mean of 801.67 ± 245.41 W for the protein trials. 

**CONCLUSION:** The hypothesis that peak anaerobic power output in watts would be higher following the consumption of a high-carbohydrate meal compared to a high-fat or high-protein meal was not supported by the data. Although the mean peak anaerobic power output in watts was highest for the high-fat meal trials, only four subjects performed their best trials after the high-fat meal.
VASCULAR K\textsubscript{ATP} CHANNELS REDUCE SEVERE MUSCLE O\textsubscript{2}-DELIVERY TO O\textsubscript{2}-UTILIZATION MISMATCH DURING CONTRACTIONS IN CHRONIC HEART FAILURE RATS

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The vascular ATP-sensitive K\textsuperscript{+} (K\textsubscript{ATP}) channel is a regulator of skeletal muscle microvascular O\textsubscript{2} pressure (PO\textsubscript{2mv}; set by the O\textsubscript{2}-delivery to O\textsubscript{2}-utilization ratio) during contractions. Inadequate tissue PO\textsubscript{2mv} during exercise in chronic heart failure (CHF) constrains exercise capacity and may be exaggerated by K\textsubscript{ATP} channel inhibition. **PURPOSE:** We tested the hypotheses that 1) K\textsubscript{ATP} channel inhibition via glibenclamide (GLI), often prescribed for hyperglycemic CHF patients, would augment the PO\textsubscript{2mv} undershoot, increase the time to reach the steady-state PO\textsubscript{2mv} and decrease the mean PO\textsubscript{2mv} during contractions of the spinotrapezius muscle in CHF rats and 2) these effects would be reversed by the administration of pinacidil (PIN, K\textsubscript{ATP} channel activator). **METHODS:** Muscle PO\textsubscript{2mv} was measured via the phosphorescence quenching technique during 180s of 1-Hz twitch contractions (~6 V) under control, GLI (5 mg/kg), and PIN (5 mg/kg) conditions in 16 male Sprague-Dawley rats with CHF induced via myocardial infarction (left main coronary artery ligation). **RESULTS:** GLI augmented the PO\textsubscript{2mv} undershoot (control: 2.3 ± 0.4, GLI: 4.1 ± 0.5 mmHg, \(p<0.05\)) and time-to-reach contracting steady state (control: 66.1 ± 10.2, GLI: 93.6 ± 7.8 s, \(p<0.05\)), and reduced baseline (control: 28.3 ± 0.9, GLI: 24.8 ± 1.0 mmHg, \(p<0.05\)) and mean PO\textsubscript{2mv} (control: 20.6 ± 0.6, GLI: 17.6 ± 0.3 mmHg, \(p<0.05\)). PIN reversed these effects of GLI (\(p<0.05\) for all) indicating that the primary effects of GLI were K\textsubscript{ATP} channel specific. **CONCLUSIONS:** K\textsubscript{ATP} channels protect against severe mismatch of muscle O\textsubscript{2}-delivery to O\textsubscript{2}-utilization during contractions in CHF rats. These data suggest that sulphonylurea therapy (e.g. GLI) poses an additional constraint to muscle O\textsubscript{2} delivery in CHF patients and may further compromise physical activity; a contributing factor to morbidity and mortality.
COMPARISON OF HEART RATE RECOVERY TIMES AMONG UNTRAINED, RECREATIONALLY-TRAINED, AND ATHLETICALLY-TRAINED COLLEGE STUDENTS

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Post-exercise heart rate recovery time has been used as an indicator of cardiovascular fitness and health. Typically, the amount of time it takes for the heart rate (HR) to return to its resting value is inversely proportional to cardiovascular health. **PURPOSE:** The purpose of this study was to examine post-exercise heart-rate recovery time among undergraduate college students of different weekly physical activity levels. **METHODS:** Twenty-one participants completed this study. Volunteers were sought for meeting one of three criteria based on physical activity level: untrained (UT; n=7, 83.7±20.2kg), recreationally-trained (RT; n=7, 72.5±24.4kg), and athletically-trained (AT; n=7, 59.17±5.6kg). Prior to exercise, each participant’s resting HR was recorded. The exercise session consisted of walking and jogging on a treadmill of increasing speed and incline until a HR of 70% of age-predicted HR maximum was reached. This intensity was then maintained for four minutes. Upon completion of the exercise session, HR was monitored until it returned to the pre-exercise resting value. **RESULTS:** HR recovery times for each group: UT=468.0±51.8 seconds, RT=179.8±31.2 seconds, AT=115.3±38.1 seconds. An ANOVA indicated a significant difference among the HR recovery times of the three groups (p<.001). Bonferroni post-hoc tests revealed that AT had significantly shorter recovery times than RT (p=.023) and UT (p<.001), and that RT was significantly shorter than UT (p<.001). **CONCLUSION:** Athletically-trained college students have a shorter HR recovery time than both of their RT and UT counterparts. Recreationally-trained students have a longer HR recovery time than AT students, but shorter times than UT students. These data indicate that the level of weekly physical activity achieved by college students may influence their post-exercise HR recovery time. Therefore, exercise may play a role in the cardiovascular health of this population, as determined by HR recovery time.
THE EFFECTS OF ACUTE NIACIN SUPPLEMENTATION ON RESTING HEART RATE AND BLOOD PRESSURE IN COLLEGE-AGED MALES

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Niacin is a common ingredient in many sports and energy drinks. Niacin has been shown to have a vasodilation effect when taken orally. As with many supplements that are advertised as increasing athletic performance, student- and recreational-athletes will inevitably try these products in an attempt to gain an edge during performance. **PURPOSE:** The purpose of this investigation was to determine the effects of acute niacin supplementation on measures of resting heart rate and blood pressure in college-aged males. **METHODS:** A total of 30 college-aged males participated in this investigation. Subjects reported to the laboratory for pre-test measurements of height, weight, and body composition. Subjects were then instructed to either sit or lay down for 15 min to stabilize heart rate and blood pressure to a resting state. Following the stabilizing period resting heart rate and blood pressure measures were obtained and recorded. Subjects then consumed an oral dose of 1000mg of a commercially available niacin (nicotinic acid) supplement. Subjects were then instructed to remain seated and inactive for 90 min. Heart rate and blood pressure were then recorded every 10 min. If any adverse side effects were noticed, subjects were instructed to go immediately to the student health center or their primary care physician for consultation. **RESULTS:** The descriptive characteristics of the subjects were as follows (mean ± SD): age (22.1 ± 1.2yrs); height (179.2 ± 10.4cm); weight (89.9 ± 16.6kg); and body fat percentage (20.9 ± 9.5%). Resting systolic blood pressure (mmHg) was significantly decreased from baseline (124.7±11.9) at 30 min (120.6±10.5), 40 min (120.3±12.7), 50 min (120.8±14.9), 60 min (119.3±12.4), 70 min (117.9±12.6), 80 min (118.5±11.9), and 90 min (119.4±8.9) post-consumption. Resting diastolic blood pressure (mmHg) was significantly decreased from baseline (77.8±9.1) at 20 min (75.8±7.4) and at 80 min (74.7±10.8) post-consumption. Resting heart rate (bpm) was significantly decreased from baseline (71.3±11.3) at 20 min (67.5±12.2), 30 min (68.2±13.2), 40 min (66.7±12.5), 50 min (65.7±12.5), 60 min (66.2±11.4), 70 min (67.8±11.6) and 90 min (67.8±12.6) post-consumption. **CONCLUSION:** Based on the results of this investigation we have demonstrated that acute niacin supplementation of 1000mg significantly decreased resting systolic and diastolic blood pressure, and resting heart rate post-consumption. Follow up experiments are focused on the effects of niacin supplementation on pre-exercise, exercise, and post-exercise blood pressure and heart rate, in a cross-over fashion, in college-aged recreational athletes.
The act of extensive (e.g. 4 x 30 s) stretching immediately prior to muscular strength, power, and endurance activities has been shown to reduce performance. Minimal stretching (e.g., 1 x 30 s) has shown more equivocal results. No known studies have evaluated if single sets of stretching performed between sets of an exercise have a cumulative effect on muscle endurance.

PURPOSE: To determine if stretching between sets of bench press reduces the number of repetitions that can be performed. METHODS: 11 participants (9 male (M), 2 female (F)) (Mean: age (M) 21.4 y, (F) 22.5 y, 1RM (M) 271 lbs, (F) 133 lbs) completed 3 bench press workouts of 4 sets to failure at 75% of 1RM with 3 min of recovery between sets. During each session participants were randomly assigned to: 1) No stretching (NS), 2) 4 x 30 s of chest and triceps stretches prior to the workout (IS), 3) 1 x 30s chest and triceps stretches prior to each set (BS). Repetitions completed after the first set and total repetitions were evaluated with repeated measures ANOVAs and LSD post-Hoc tests. Alpha level was set at p < 0.05. RESULTS: IS resulted in significantly (p = 0.01) less repetitions of the first set compared to BS. NS allowed for significantly more total repetitions to be completed than IS (p < 0.01) and BS (p < 0.02) (Figure 1). CONCLUSION: This study evaluated if the undesirable effects of extensive stretching could be mitigated by integrating the stretching between sets. The results suggest stretching between sets using single stretches has the same effect on muscle endurance as performing 4 sets stretching prior to lifting. However, participants were able to complete the same number of repetitions in the first set after performing single 30 s stretches as when they did not stretch. Although the difference in repetitions completed during the first set and total repetitions is small, this difference could have an impact on cumulative training. The results suggest that stretching should be performed after completion of the workout.

Figure 1. Mean repetitions of the first set and total repetitions completed after four sets to failure during three different stretching conditions.

* = Significantly different (p <0.05) compared to initial stretching
$ = Significantly different (p <0.05) compared to initial stretching and between sets
LOSS IN MUSCLE OXIDATIVE PHENOTYPE IN LEWIS LUNG CARCINOMA-INDUCED CANCER-CACHEXIA

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Cancer is one of the leading causes of death across the world. Cancer-cachexia is a serious complication induced by cancer resulting in whole body muscle wasting. In fact, cancer-cachexia is responsible for up to 40% of cancer related deaths depending on the type of carcinoma. Underlying mechanisms of cancer-cachexia are not well understood; however, a loss in oxidative metabolism in skeletal muscle is apparent in cancer-cachexia. Therefore, mitochondria degeneration in muscle cells may be an underlying cause of cancer-cachexia that ultimately leads to patient death. **PURPOSE:** To examine oxidative phenotype of skeletal muscle in tumor bearing mice in cancer-cachexia. **METHODS:** Mice were implanted with Lewis Lung Carcinoma (LLC) or sham phosphate buffered saline (PBS) at 8 weeks of age. The tumor was allowed to progress for 4 weeks. Tibialis Anterior muscle was extracted and snap frozen in optimum cutting temperature compound (OCT). 10 µM cross sections were cut and stained for Succinate dehydrogenase (SDH) to analyze the percent of oxidative muscle fibers. Slides were fixed with a glycerol based mounting medium and imaged using a Nikon microscope at 20X objective. Percent SDH positive fibers were analyzed by counting SDH+ (purple) and SDH-muscle fibers. **RESULTS:** Tibialis Anterior weight decreased approximately 10% in LLC mice when compared to PBS control mice. We observed a decrease from 65% SDH + oxidative phenotype in PBS group to a 40% SDH+ oxidative phenotype in the muscle fibers in tumor bearing mice. **CONCLUSION:** LLC in mice may promote a cellular energy crisis induced by a decrease in skeletal muscle oxidative phenotype likely tied to a loss in muscle mitochondrial content. Energy stress promotes atrophic signaling in myofibers, leading to cachexia. Based on these findings, promoting the oxidative phenotype and hence the mitochondrial network could be a potential therapeutical target to treat cancer-cachexia.
Limited range of motion (ROM) is often considered detrimental to both athletic performance and everyday function similar to balance. **PURPOSE:** The purpose of this study was to determine a relationship between hip range of motion and BESTest scores. **METHODS:** 20 college age women (19.55 ± 3.45 years) with no prior lower extremity injuries or previous concussions volunteered for this study. Using standard goniometer measuring techniques, participants passive range of motion for flexion (FL), extension (EX), internal rotation (IR) and external rotation (ER) was established and compared to scores from the BESTest (Balance Evaluation Systems) to determine a correlation. Overall BESTest scores were compared to each aspect of hip musculature ROM. **RESULTS:** Although there was no significant correlation between any specific aspect of ROM and overall BESTest scores (P>0.05), both right and left internal rotation showed a statistically significant moderate correlation (R=0.52 (P<0.05) and, R=0.51 (P<0.05) respectively) to stability in gait. **DISCUSSION:** Despite no correlation between overall BESTest score and range of motion, internal rotation was shown to have a statistically significant moderate correlation to a single aspect of the BESTest, stability in gait. We determined that range of motion does not pose as a limiting factor to balance as measured by the BESTest.
THE EFFECTS OF A PRE-WORKOUT SUPPLEMENT ON RECREATIONALLY TRAINED INDIVIDUALS

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Pre-workout supplements have become increasingly popular over the past couple years due to claims made by manufacturers of their ability to boost exercise performance for a longer and stronger workout. The factual information based on these claims is unclear in significance to the public. PURPOSE: Therefore, the purpose of this study was to test the effects of pre-workout supplement on blood lactate levels, anaerobic capacity, anaerobic fatigue, and peak power output in recreationally trained individuals. METHODS: Nine recreationally trained males and females participated in a single-blind study and reported to the Human Performance Lab twice in one week with two days’ separation in between testing. Participants were randomly selected on the first day regarding who would receive the supplement (SUP) and who would receive placebo (PL). Participants performed anaerobic exercise through the vertical jump, which included 3 trials to obtain highest jump, and a 30 second Wingate test, which analyzed power output and anaerobic fatigue. Blood was acquired through a finger prick and analyzed for lactate concentration by a Scout lactate analyzer directly after the cycling was completed. On the second visit, participants received opposite SUP or PL from the initial testing and performed the same anaerobic exercises. RESULTS: Significant differences were recorded for lactic acid levels (SUP: 16.2±4.7, PL: 11.5±3.5). No differences were observed for anaerobic peak power output, vertical jump, or fatigue although data for the fatigue index approached significance (SUP: 13.7±2.91, PL: 16.1 ± 6.39). CONCLUSION: These results suggest that SUP did not improve anaerobic exercise by increasing peak power, endurance, or anaerobic fatigue, yet the SUP increased lactic acid levels. The conclusion from this data does not support the use of a pre-workout supplement prior to anaerobic work.

KEY WORDS: pre-workout supplement, Wingate, lactic acid, anaerobic exercise, peak power, anaerobic fatigue, vertical jump.
EFFECTS OF EXTERNAL STIMULI ON EXERCISE ENJOYMENT IN COLLEGE FEMALES
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Important to the promotion of physical activity is the assessment of the psychological effects that occur when trying to adhere to exercise regiments. By measuring the effects of exercise on mood, enjoyment, and exertion it allows for the ability to evaluate engagement in one’s program and provides a means to measure and potentially predict their continuance in the exercise.

PURPOSE: To examine the effects of external stimuli on exercise enjoyment in college females.

METHODS: 18 college female subjects (age: 19 ±1 years) completed 4 separate trials of treadmill walking with a different intervention for each trial. The conditions being tested: no external stimuli (NES), self-selected music (MU), self-selected video with sound (VS), and self-selected video without sound but with captions (VC). Every 3 minutes throughout the 30-minute session, the subjects rated perceived exertion and mood with the Borg rate of perceived exertion (RPE) scale and the Fast Assessment of Children’s Emotion scale (ES). At the end of each session, the participants evaluated their enjoyment of the exercise using the Physical Activity Enjoyment Scale (PACES). Statistical comparisons on each condition were determined as well as any correlations between having a stimuli (MU, VS, and VC) vs no stimuli using ANOVA, contrast, and Bon Ferri statistical analysis.

RESULTS: We found when comparing no stimuli to all external stimuli collectively, PACES (p < 0.05) and ES ratings (p < 0.05) were significantly different. Specific to the PACES scale, we found significance when comparing NES to MU (p < 0.05), NES to VC (p < 0.05), and NES to VS (p < 0.05). RPE was not statistically significant in any condition (p > 0.05).

CONCLUSION: Greater levels of overall enjoyment and increased mood were seen when an external stimuli was used as compared to exercising with no stimuli. No changes in rate of perceived exertion were seen whether a stimulus was used or not. For best adherence to an exercise program use of external stimuli is recommended.
GENETIC OVEREXPRESSSION OF PGC-1α1 DOES NOT PROTECT AGAINST LIPID-INDUCED DECREMENTS IN RUNNING CAPACITY, REGARDLESS OF GREATER OXIDATIVE PHENOTYPE

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Obesity and lack of cardiorespiratory fitness continue to remain major public health concerns. Lipid-overload is known to diminish aerobic capacity under sedentary conditions. Aerobic fitness is protective against lipid-induced degradations, which is largely mediated by mitochondrial function; however, it is unclear if artificially increasing mitochondrial content will promote similar protections. **PURPOSE:** To assess how genetic overexpression of PGC-1α1 affects muscle oxidative phenotype and aerobic fitness after a period of Western Diet feeding with(out) voluntary physical activity. **METHODS:** ~40 Muscle Creatine Kinase-PGC-1α1 transgenic (TG) and wildtype (WT) littermates were placed on Western Diet (WD) at 8 wks of age and allowed to chow ad libitum throughout. At 12 wks of age, animals were randomly assigned to voluntary wheel running (VWR) or sedentary (SED) conditions. At 16 wks of age, mice were euthanized and hindlimb muscles collected. At 7, 11, and 15 wks of age, animals were administered graded exercise tests (GXT) to evaluate aerobic fitness. To assess muscle oxidative phenotype, tibialis anterior muscles were sectioned and stained for succinate dehydrogenase (SDH). Number of myofibers positive for SDH were then counted and expressed as percent of total myofibers counted. Data was analyzed by repeated measures or cross-sectional ANOVA as appropriate, significance was determined at p<0.05. **RESULTS:** Gastrocnemius, plantaris, and soleus muscles were heavier (5%, 11%, and 20% respectively) in VWR groups compared to SED and EDL was lighter (~10%) in TG compared to WT animals. For GXT, TG animals ran ~35% longer compared to WT regardless of time point. Distances run progressively lowered in SED animals across time (~30%) regardless of genotype, with no difference in VWR animals across time points. At 15 wks of age, VWR ran ~45% longer compared to SED, regardless of genotype. TG animals had 32.6% more SDH positive stained fibers compared to WT animals, with no effect of exercise. **CONCLUSION:** Under conditions of lipid overload, genetic overexpression of PGC-1α1 results in a greater oxidative phenotype and longer GXT distances compared to WT animals. However, exercise appears to have a greater benefit than PGC-1α1 overexpression in respect to preventing loss of running capacity under lipid overloaded conditions.
INCREASING PHYSICAL ACTIVITY IN RURAL KANSAS THROUGH ALZHEIMER’S DISEASE EDUCATION AND EXERCISE INTERVENTION
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Rural Americans (RA) report significantly higher percentages of obesity and chronic disease than their more populated, urban counterparts. However, rural individuals face different barriers to physical activity and exercise than their urban counterparts. Clinicians know that exercise has been shown to be a powerful tool for reducing the risk of chronic diseases and cognitive decline. \textbf{PURPOSE:} The purpose of this study was to test the ability of the SMART Aging curriculum to increase physical activity in rural Kansas communities. \textbf{METHODS:} 69 healthy, older, underactive adults (ages 50-85 years) participated in this study. Subjects were randomly assigned to one of three groups: Education (E), Education + Exercise (E+E) or Control (C). During the 10 week study, subjects received either one weekly education seminar, presented by the research team (E), education in addition to three weekly supervised exercise sessions (E+E) or no intervention (C). All subjects received a physical activity tracking device, used to measure their daily step count. Changes in physical activity, reported as average weekly step counts were tracked over the course of 10 weeks. The research team hypothesized that both of the experimental groups (E and E+E) would increase physical activity levels after 10 weeks, and that the E+E group would see the largest improvement between those two groups. \textbf{RESULTS:} Average percent change from week 1 to week 10 for each group are as follows: E+E=15.11\pm 53.5\%, E=5.2\pm 46.5\%, and C=-1.08\pm 19.6\%. A one-way ANOVA found no significant difference between the percent change of the step count averages among the three groups (p=.606). \textbf{CONCLUSIONS:} These data indicate that no significant improvements in physical activity, as determined by step counts, were seen among the groups. Longitudinal studies are necessary to determine long-term interventions to significantly increase physical activity in rural Kansas.

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USE OF SIT-TO-STAND WORKSTATIONS: IMPACT ON PHYSICAL ACTIVITY
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Prolonged sitting affects daily total physical activity. Standing in order to break long periods of sitting may be beneficial to an individual’s health. **PURPOSE:** The purpose of this pilot study was to determine whether physical activity would change when using a sit-to-stand workstation in a workplace environment. **METHOD:** Volunteers from the faculty of the University of Central Oklahoma included apparently healthy male and female adults (N = 11, M = 39.09±10.445 years). Participants were asked to use sit-to-stand workstations for a minimum of three hours per workday. The International Physical Activity Questionnaire (IPAQ) was used to measure self-reported daily physical activity. **RESULTS:** Dependent t-tests were used to analyze changes in self-reported physical activity over 5 months. Non-significant (p>.05), meaningful improvements were seen in METmin/wk for walking (d=.19), total physical activity (d=.14), moderate activity (d=.01), and vigorous activity (d=.02). Total minutes of sit time per week (d=.25) and average daily minutes sitting (d=.25) decreased (p>.05). **CONCLUSION:** Sit-to-stand workstations do provide an increase in daily physical activity levels. Although the results were non-significant, they do indicate a small decrease in time spent sitting along with small improvements in walking and total physical activity. Decreasing employee sitting time can increase the amount of physical activity achieved throughout the day. Future research should evaluate the use of sit-to-stand workstations in a larger, more diverse group of employees.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Walking (met-min wk)</td>
<td>699.00 (537.72)</td>
<td>[337.75, 1060.25]</td>
<td>802.78 (626.05)</td>
<td>[382.19, 1223.36]</td>
</tr>
<tr>
<td>Total PA (met-min wk)</td>
<td>3333.18 (908.30)</td>
<td>[1309.37, 5356.99]</td>
<td>3764.32 (3491.25)</td>
<td>[1418.87, 6109.77]</td>
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<tr>
<td>MPA (met-min wk)</td>
<td>1567.27 (1657.81)</td>
<td>[453.54, 2681.01]</td>
<td>1590.91 (1303.82)</td>
<td>[714.99, 2466.83]</td>
</tr>
<tr>
<td>VPA (met-min wk)</td>
<td>1341.82 (1479.50)</td>
<td>[347.88, 2335.76]</td>
<td>1370.91 (2379.25)</td>
<td>[227.50, 2969.32]</td>
</tr>
<tr>
<td>Weekly ST (min-wk)</td>
<td>2119.10 (1147.42)</td>
<td>[1348.25, 2889.94]</td>
<td>1838.18 (618.48)</td>
<td>[1422.68, 2253.68]</td>
</tr>
<tr>
<td>Daily ST (min-d)</td>
<td>302.73 (163.92)</td>
<td>[192.61, 412.85]</td>
<td>262.60 (88.36)</td>
<td>[203.34, 321.95]</td>
</tr>
</tbody>
</table>

*Note.* MET = metabolic equivalent; min. = minutes; wk. = week; d= day; PA = physical activity; MPA = moderate physical activity; VPA = vigorous physical activity; ST = sit time; SD = standard deviation; CI = confidence interval.