SOUTHWEST CHAPTER

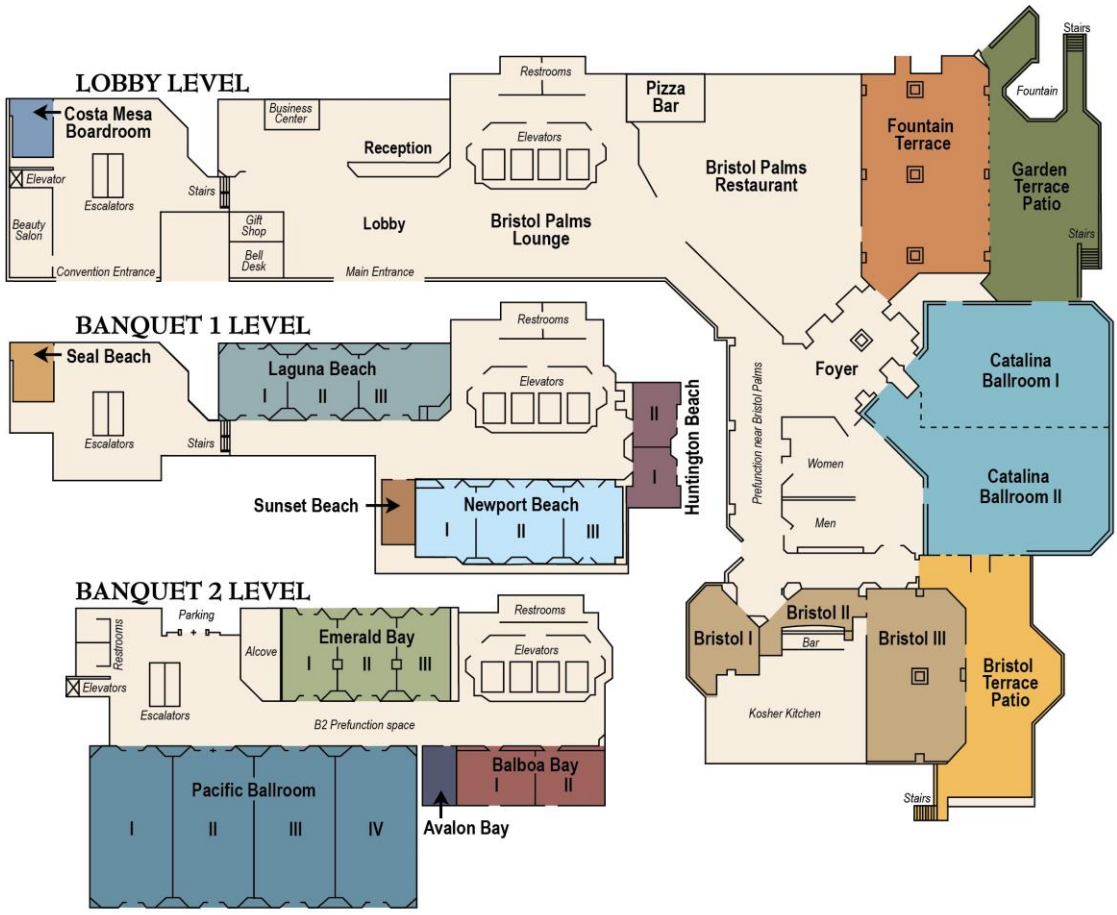
AMERICAN COLLEGE OF SPORTS MEDICINE

2018 ANNUAL MEETING

October 26-27, 2018

Orange County/Costa Mesa Hilton
Costa Mesa, California

Jointly sponsored by the American College of Sports Medicine
and the Southwest Chapter of the American College of Sports Medicine


LOBBY LEVEL
Costa Mesa Boardroom
Business Center
Restrooms
Pizza Bar
Fountain Terrace
Stairs
Fountain
Garden Terrace Patio
Elevator
Escalators
Stairs
Reception
Elevators
Bristol Palms Restaurant
Beauty Salon
Gift Shop
Bell Desk
Lobby
Bristol Palms Lounge
Convention Entrance
Main Entrance
Stairs
BANQUET 1 LEVEL
Seal Beach
Laguna Beach
I II III
Restrooms
Elevators
II
I
Huntington Beach
Foyer
Catalina Ballroom I
Escalators
Stairs
Prefunction near Bristol Palms
Women
Men
Catalina Ballroom II
Sunset Beach
Newport Beach
I II III
BANQUET 2 LEVEL
Parking
Restrooms
Alcove
Emerald Bay
I II III
Restrooms
Elevators
Elevators
Escalators
B2 Prefunction space
Bristol I
Bristol II
Bar
Bristol III
Bristol Terrace Patio
Kosher Kitchen
Pacific Ballroom
I II III IV
Balboa Bay
I II
Avalon Bay
Stairs

Welcome to the

38th Annual Meeting

of the

Southwest Regional Chapter

of the

AMERICAN COLLEGE of SPORTS MEDICINE SM

October 26-27, 2018

Orange County/Costa Mesa Hilton
Costa Mesa, California

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The Southwest ACSM annual meeting has been approved for 12 Continuing Education Credits by the American College of Sports Medicine. There is no separate fee for CECs. Please retain the Certificate obtained at registration.

FRIDAY, 26 OCTOBER 2018

Registration **Pacific Ballroom Foyer** **7:30 am – 4:00 pm**

General Session **9:00 am – 10:30 am** **Pacific 3 & 4**

Moderator: Ann Gibson, Ph.D., FACSM, President, SWACSM
University of New Mexico

SWACSM Recognition Award
Glenn Gaesser, Ph.D., FACSM
Arizona State University

Preview of Meeting: Todd Astorino, Ph.D.
California State University, San Marcos

D.B. Dill Lecture
Cardiometabolic Disease after Spinal Cord Injury: Component Risks and Guideline Intervention
Mark Nash, Ph.D.
University of Miami

Undergraduate Student Research **10:45 am-12:15 pm** **Emerald Bay**

Link to Expanded Abstracts:
https://www.acsm.org/docs/default-source/default-document-library/all-expanded-abstracts-2018ec457be85e9247b0b9d6819dd4c518fa.pdf?sfvrsn=d5c2caa8_0

Moderator: Sarah Dunn, Ph.D., University of La Verne

10:45 **Daily heat treatment maintains mitochondrial function and attenuates atrophy in human skeletal muscle subjected to immobilization**
Kaitlin Abbott, Paul S. Hafen, Jennifer Bowden, Ryan Lopiano, Chad R. Hancock, and Robert D. Hyldahl
Brigham Young University

11:00 **6th Vital Sign App: Testing Validity and Reliability**
Brian Bischoff[1], Rosalba Saavedra[1], Elijah Weiss[3], Shelby Delcambre[1], Nathan Sanders[2], Alana Unfried, Ph.D.[2], Steven Kim, Ph.D.[2], & Eric Martin, Ph.D.[1]

[1]Kinesiology Department, [2]Mathematics and Statistics Department, and [3]Biology Department, California State University, Monterey Bay

11:15 **Comparison of an iPad Application and 3D Body Scanner to the Bod Pod for Measurement of Body Fat Percentage**
Felipe Castaneda, Brennan Bohman, Wayne Sterr, Dale Wagner PhD FACSM
Utah State University

11:30 **Differing Impact of Weight Cycling on Ambulatory Blood Pressure versus Conventional Blood Pressure Assessment: A Possible Explanation to Controversy**
Mallory Durnbaugh and Zachary Zeigler, Ph.D.
Grand Canyon University

11:45 **Downhill Running: An Effective Countermeasure to Limitations of Exercise in Acute Hypoxia?**
Felipe Gorini Pereira and Trevor Gillum, Ph.D.
California Baptist University

12:00 **Effect of Fed State on Affective Response to Exercise Following Public Health Guidelines**
Rhodewalt Ryan[1], Largent Katelyn[1], Saur Blaque[1], Todd Astorino, Ph.D.[1], Zachary Zenko, Ph.D.[2], Mathew Schubert, Ph.D.[1]
[1]California State University, San Marcos and [2]California State University, Bakersfield

Concurrent Symposia 10:45 am – 12:15 pm

Energy Compensation and Exercise **Pacific 3**
Matthew Schubert, Ph.D.
Heidi Lynch, Ph.D.
Brandon Sawyer, Ph.D.

Spinal Cord Injury and Exercise; Gene Expression following Exercise Training for People with Spinal Cord Injury: Not What You Would Expect **Pacific 4**
Kevin Keslacy, Ph.D.
Deborah Won, Ph.D.

LUNCH 12:30 PM- 1:45 PM

Graduate Student Research 1:45 pm – 3:15 pm Emerald Bay

Link to Expanded Abstracts:
https://www.acsm.org/docs/default-source/default-document-library/all-expanded-abstracts-2018ec457be85e9247b0b9d6819dd4c518fa.pdf?sfvrsn=d5c2caa8_0

Moderator: Sarah Dunn, Ph.D., University of La Verne

1:45 **Effect of Two Regimes of Sled Sprinting on 40-Meter Sprint Performance in Collegiate Soccer Players**
Patrick Mara and Todd Astorino, Ph.D.
California State University San Marcos

2:00 **Effect of a Golf Intervention on Center of Pressure Control**
Jared Moore[1], Andrea DuBois, M.S. [1], Nicole Marcione, M.S. [1], Hyun Lee[1], Steven Castle, M.D. [2], George Salem, Ph.D. [2]
[1]University of Southern California and [2]VA Greater Los Angeles Healthcare System - GRECC

2:15 **The Genetic Profile of Individuals with Traumatic Spinal Cord Injury Following an 8-Week Group Exercise program**
Ruiz L[1], Dy C[1], J Ramirez[1], L Le[1], D Salas[1], Won D[2], Pebdani R[3], de Leon R[1], S Keslacy [1].
[1]School of Kinesiology and Nutritional Sciences, [2]College of Engineering, Computer Science and Technology, [3]Charter College of Education, California State University, Los Angeles

2:30 **Cardiovascular Adaptations in a Male-to-Female Transgender Athlete Before and During Estrogen Therapy: A Case Study**
Shannon L. Wilson[1], Theresa M. Jorgensen[1], Joanna Harper[2], Andrew C. D'Lugos[1], Glenn A. Gaesser FACSM[1], Jared Dickinson FACSM[1], and Siddhartha S. Angadi FACSM[1]
[1]Arizona State University and [2]Providence Portland Medical Center Portland, Oregon

2:45 **Physiological response to exercise intensity in spinal cord injured compared to able-bodied individuals**
Ramirez, Joel; Keslacy, Stefan; De Leon, Ray; Defiesta, Dominic; Ruiz, Lloyd; & Dy, Christine
California State University, Los Angeles

FRIDAY, 26 OCTOBER 2018, continued

Concurrent Symposia **1:45 pm – 3:15 pm**

Both Simple and Detailed Mechanical Models Can Help to Understand Upper-Extremity Function **Pacific 3**

Devin Jindrich, Ph.D.
Deanna Asakawa

Use of Various Ultrasound Imaging Techniques for Lower Extremity Assessment: Implications for Pathology and Rehabilitation **Pacific 4**

Brent Feland, Ph.D.
Wayne Johnson, Ph.D.
Julia Dunbar
Abbigail Fietzer, Ph.D.

Concurrent Symposia **3:30 pm – 5:00 pm**

Muscle-Bone: Match Across the Ages – Can Muscle Power Predict Bone Strength Across the Lifespan? **Pacific 3**

Vanessa Yingling., Ph.D.
Jennifer Sherwood, Ph.D.

Exercise and Cognition: Identifying Adjunct Therapies to Treat Brain Disorders **Pacific 4**

Micah Zuhl, Ph.D.
Ann Gibson, Ph.D.
Terence Moriarty

SOCIAL EVENT

Pacific 1 & 2 **5:00 -7:30 PM**

Poster Presentation I

No Host Wine/Cheese Reception

SPECIAL EVENT

Pacific 3 & 4 **7:00 - 8:00 PM**

Student Jeopardy Bowl

SATURDAY, 27 OCTOBER 2018

Registration **Pacific Ballroom Foyer** **7:30 am - 9:30 am**

Student Career Session

8:00 am – 9:30 am **Emerald Bay**

Phillip Drouet, MS, CEP, CSCS
Jeff Rothschild, MS, RD, CSSD, CSCS
Josh Hannan, MPA
Richard Armenta, Ph.D.
Rob Lewis, MS
Natalie Vartanian, MPH
Ernie Sacco, EP, MA
Gioella N. Chaparro, Ph.D.
Ismael Aguila, M.S.

SOCIAL EVENT

7:30 -9:30 AM **Pacific 1 & 2**

Poster Presentation II

Continental Breakfast

Colloquium **9:30 am – 10:30 am** **Pacific 4**

Exercise and Cancer: Translating Science into Practice
Jessica Clague-Dehart, Ph.D.

SATURDAY, 27 OCTOBER 2018, continued

Gatorade Sports Science Lecture

9:30 am – 10:30 am **Pacific 3**

HIIT to Get Fit: Physiological Adaptations to Interval Training in Health and Disease
Martin Gibala, Ph. D., McMaster University

General Session **10:45 am – 12:15 pm** **Pacific 3 & 4**

Moderator: Ann Gibson, Ph.D., FACSM President, SWACSM
University of New Mexico

Student Awards – Sarah Dunn, Ph.D., University of La Verne

Recognition of Host School:
California State University, Stanislaus

Business Meeting

Founders Lecture

The 2-Hour Marathon and Limitations to Human Performance
Michael Joyner, M.D.
Mayo Clinic, Rochester, MN

SOUTHWEST ACSM RECOGNITION AWARD

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1983	Albert Behnke
1984	Steve Horvath
1985	Fred Kasch
1986	John Boyer
1987	Herbert de Vries
1988	Charles Tipton
1989	G. Lawrence Rarick
1990	Lawrence Morehouse
1991	William Haskell
1992	Ralph Paffenbarger
1993	Franklin Henry
1994	George Brooks
1995	James Skinner
1996	Christine Wells
1997	Lawrence Golding
1998	Ken Baldwin
1999	Robert Conlee
2000	Gail Butterfield
2001	R. James Barnard
2002	Gene Adams
2003	Vivian Heyward
2004	Fred Roby
2005	Marta Van Loan
2006	Jack Wilmore
2007	Larry Verity
2008	Steven Loy
2009	Lorraine Turcotte
2010	William Beam
2011	Priscilla MacRae
2012	Barbara Ainsworth
2013	J. Richard Coast
2014	Michael Hogan
2015	Marialice Kern
2016	Lee Brown
2017	Alan Hargins
2018	Glenn Gaesser

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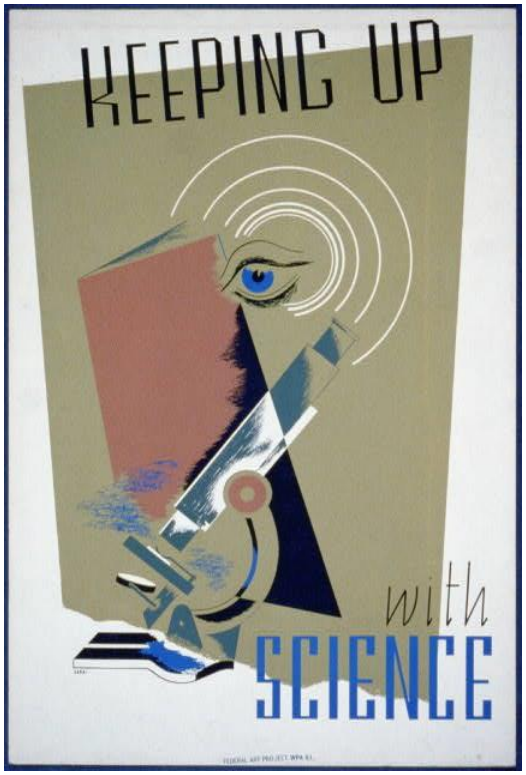
2018 SWACSM

Annual Meeting

ABSTRACTS

Poster Presentations



FRIDAY POSTER PRESENTATIONS

1. PREVALENCE OF VISUAL AND TEXTUAL INFORMATION WITHIN PERSONAL FITNESS TRAINER BIOGRAPHIES: AN EXPLORATORY STUDY

Robin Acosta-Daniel, Sungjun Park, and Alison Ede, Ph.D.
Long Beach State University

Introduction: Exercisers choose to work with trainers for a variety of reasons. However, little research has been conducted on the information that clients use to learn about or choose a trainer. Previous research shows that messaging about a fitness instructor's expertise and style can influence a novice exercisers' confidence in them (Priebe et al., 2012). Therefore, the purpose of our study is to examine the content of online biographies and photographs of personal trainers to understand what information is available to potential clients. Methods: We examined photos and online biographies of 210 personal trainers from commercial fitness facilities and community recreation centers. Two researchers examined an initial subset of messages to construct the guidebook and list of codes, and three researchers coded the online messages for frequency of information. Results: The majority of trainers (87.1%) included only one photo in their biography. Of those photos, most (95.9%) were posed headshot-style photos, with a small percentage (1.0%) shown training someone else or engaged in physical activity (3.0%). The majority also included some type of written biography (94.3%). Of those biographies, they included information about expertise, such as education (49.4%), type of certification (87.3%), training philosophy (67.7%), training focus (61.6%), years training or working in the fitness industry (46.4%), and target populations (39.3%). Nutrition was mentioned in 32.3% of biographies, with 16.1% demonstrating nutrition expertise (e.g., certification or registered dietitian). Biographies also included personal information unrelated to training expertise (25.3%), such as relationship status, travel, food, or pets. Conclusion: Online written biographies and visual information have the potential to provide an initial impression of expertise when exercisers are choosing a personal trainer. However, many biographies do not include information clients may find relevant, such as photos of trainers in their actual work setting, a list of target populations, or a training focus. Future research is also needed to determine what types of visual or textual information might influence potential clients in deciding whether or not to choose a specific trainer.

2. THE EFFECTS OF GENDER ON THE HR-VO_2 RELATIONSHIP DURING TREADMILL RUNNING

Sabrina Adams, Kaylee Massey, Nicole Tafuna'i, Brady Hanson, and Pat Vehrs, Ph.D., FACSM
Brigham Young University

Intensity of aerobic exercise is often prescribed using a target heart rate (HR) range based on the linear relationship between HR and oxygen consumption (VO_2) during exercise. The linear relationship between HR and VO_2 can be expressed as a percentage of maximal HR (%HRM) and VO_2 (%V_{O2}M) values or a percentage of HR reserve (%HRR) and VO_2 reserve (%V_{O2}R) values. These relationships are presumed to be similar for both men and women. The purpose of this study was to evaluate the HR-VO_2 relationship during treadmill running in men and women who were running as a mode of training. Resting metabolic rate (RMR) and VO_2max were measured in 17 men and 15 women. The HR and VO_2 values recorded during the maximal exercise test were used to determine the HR-VO_2 relationship. The RMR in males (3.7 ± 0.4 mL/kg/min) and females (3.4 ± 0.3 mL/kg/min) were significantly different (p = 0.01). Likewise, the VO_2max values (55.8 vs 46.3 mL/kg/min) and V_{O2}R values (52.0 vs 42.8 mL/kg/min) were significantly ($p < 0.0001$) higher in males than in females, respectively. The HR-VO_2 relationship was expressed in absolute terms (bpm vs mL/kg/min) as well as %HRM - %V_{O2}M and %HRR - %V_{O2}R. A mixed model analysis of the data indicated a significant gender effect in the intercept ($p < 0.0001$) and slope ($p < 0.0001$) of the HR-VO_2 relationship when HR and VO_2 were expressed in bpm and mL/kg/min, respectively. The gender differences in the HR-VO_2 relationship were abolished when HR and VO_2 were expressed as a percentage of maximal values and a percentage of reserve values. The results of this study indicate that the HR–VO_2 relationship is similar in males and females when HR and VO_2 are expressed relative to maximal values or relative to reserve values. Gender and gender related differences in resting VO_2 and maximal VO_2 values do not affect the HR-VO_2 relationship. Therefore, the same HR training zones suggested by the ACSM can be used for both males and females.

3. EFFECTS OF GRAPE SEED EXTRACT ON HEMODYNAMIC RESPONSES AND EXERCISE PERFORMANCE IN COLLEGE STUDENTS.

Ruben D. Aguilar, Nelly Sanchez, Ronny Wareh, Bailey Volaski, Geetha Rajendram, Lara Navarro, and Jong-Kyung Kim
California Baptist University

It has been reported that dietary supplementation with grape seed extract (GSE) improves endothelial function and oxidative stress associated with exercise-induced muscle fatigue. These findings led us to hypothesize that GSE could enhance exercise performance partially due to an improvement in O_2 delivery and cardiac output (CO) in healthy male. Subjects completed a cycling exercise at the constant submaximal intensity corresponding to 60% of their predetermined V_{O2peak}. The duration of the workload was 10 min. Following completion of the submax tests, subjects were randomly assigned to either GSE or Placebo group to receive 7 days of dietary supplementation. Subjects exercised at the same workload before and after each supplementation. Then with 5 min rest period, exercise intensity was increased at a rate of 0.5 kp/2 min until exhaustion. The systolic blood pressure, diastolic blood pressure, mean arterial pressure, CO, stroke volume, total peripheral resistance, oxygen uptake, and time to exhaustion were measured. Compared with pretreatment conditions, GSE supplementation increased CO (18.1±2 l/min vs 18.6±2 l/min) and time to exhaustion (16.3±0.6 min vs 17.5±1 min), while oxygen consumption was reduced (44.3±6.6 ml/kg/min vs 42.5±6.6 ml/kg/min). There were no differences before and after placebo supplementation. Our findings suggest that GSE can act as a dietary supplement capable of improving oxygen efficiency and allowing exercise to perform for a longer period of time before the onset of muscle fatigue.

4. THE EFFECT OF THE "LIVING WELL AFTER CANCER PROGRAM" ON QUALITY OF LIFE AND METABOLIC MEASURES

Haley Allen[1], Gabrielle Riazi[1], Sarah Flores[1], Aditi Vyas PhD[1], Mike Alpert[2], Denise Johnson[2], and Jessica Clague DeHart PhD MPH[1, 3]
[1]City of Hope, Duarte,CA, [2]Claremont Club, and [3]Claremont Graduate University, California

Cancer survivors are at an increased risk for developing metabolic syndrome (MetS) and obesity. MetS and obesity are linked to cancer recurrence. Exercise has been known to decrease MetS and facilitate weight loss. The purpose of this pilot study was to investigate the feasibility and effectiveness of the thirteen week Living Well After Cancer (LWAC) exercise program. In particular, we studied the effects of the program in improving the metabolic health and quality of life of cancer survivors. The exercise program consisted of two weekly session, one cardiovascular and resistance session and one specialty session such as aquatics. The study was also intended to investigate if particular groups of cancer survivors benefited more from this exercise program. To test the effects of the intervention, body measurements and biomarkers related to MetS and obesity were measured before and after the program. Paired t-tests were used to detect significant changes in LDL, total cholesterol, fasting glucose, BMI among females, and grip strength. Each of the observed changes indicated improved metabolic health or fitness. BMI stratified paired t-tests revealed that the overweight group benefited the most; they had the greatest reduction in cholesterol as well as fasting glucose. Lastly, linear regressions and positive correlations between grip strength and arm size suggest an increase in muscle mass. Future investigations include analysis on dietary inflammation index, as well as quality of life data. We also aim to include insulin resistance measurements in our future studies with LWAC participants.

5. THE UNIVERSITY FACULTY PHYSICAL ACTIVITY INVENTORY (UFPAI)

Kristianna Altamirano, MS, Brent M. Peterson, PhD, MS, MPH; Kelsey Miller, MS, and Jacob K. Gardner, PhD.
Biola University, California

INTRODUCTION: Physical activity (PA) is decreasing, with the work environment being particularly influential on reduction in PA. However, active lifestyles meeting or exceeding 150 minutes/week have been linked to reductions in multiple deleterious chronic health conditions. University educators are inundated with University work as well as promotional challenges that may inhibit recommended daily PA. Currently, very few research studies have evaluated PA among University faculty. Thus, the purpose of this exploratory investigation was to evaluate self-reported levels of PA among faculty members at Biola University. METHODS: Eligible survey respondents (N = 138) were men (n = 72, 48.7 ± 11.7 years of age, 179.3 ± 8.5cm. in height, 86.3 ± 16.1kg. in weight, and an average body mass index (BMI) of 26.8 ± 4.6 kg/m^2) and women (n = 66, 44.8 ± 11.7 years of age, 166.2 ± 8.2cm. in height, 69.3 ± 13.2 kg. in weight, and an average BMI of 25.1 ± 4.8 kg/m^2) faculty members from Biola University. Participants completed the International Physical Activity Questionnaire (IPAQ), using the Survey Monkey platform. Total daily sitting time and metabolic equivalent (MET) minute activity-specific (leisure, household, occupational, and transport) were calculated. RESULTS: One way ANOVAs revealed significant (p = 0.02) main effects for job title and total minutes of PA per week. Post-hoc analyses revealed that adjuncts were significantly more physically active than full professors. Although, we observed a downward trend in median physical activity across job title. Independent measures t-tests revealed a significant (p = 0.004) difference between men and women for total weekly minutes of PA. Women were significantly more physically active than men. Only 5.1% of faculty reported below 150 min of cumulative PA within a week. Total median PA for faculty was 3,133.5 MET*min/week. Nearly 53% of faculty reported a high categorical score above 3,000.0 MET*min/week of activity with a median of 4,757.0 MET*min/week. Of the four domains, leisure activity had the greatest median at 1,169.5 MET*min/week and active transport had the least at 462.0 MET*min/week. CONCLUSION: Faculty surveyed in this study exceeded the ACSM minimum weekly recommendations for PA and lower faculty ranks were the most active.

6. EFFECTS OF FATIGUE PROGRESSION ON SINGLE LEG SQUAT KINEMATICS AND KINETICS

Jaime Alvarado, Tyler Lindholm, and Michele LeBlanc, Ph.D.
California Lutheran University

Purpose: Previous research has shown that males and females move differently prior to and after fatigue (Weeks et al., 2015) and that females experience injury 4-6x more than males (Hewett et al., 2005). The purpose of this study was to investigate the joint kinematics and kinetics during the single leg squat in males and females during a set of repetitions that evoked fatigue. The progression of fatigue, not just pre and post was determined. Methods: Fifteen males and sixteen females, aged 18-25, participated with eight Vicon Vantage V5 cameras (200Hz) capturing twenty-five reflective markers placed on specific anatomical landmarks along with one Kistler force plate (1000 Hz). Subjects performed repetitions until exhaustion with a low point band being used to identify when the lead leg knee was flexed approximately 90 degrees. A support leg stand was utilized to standardize the non-support leg position. Data was analyzed for the first, middle and last repetitions to determine the progression of fatigue. SPSS v25 was used to determine significance with $p < 0.05$. Results: There was a significant difference in the maximum hip flexion with the lead hip flexing more as fatigue increased (84.3±8.6° vs. 88.7±11.1° vs. 94.4±11.6°; p = 0.005) which produced a greater lead hip ROM (p = 0.005). There was no significant difference in the maximum knee flexion angle or the knee flexion ROM due to fatigue. There were differences in the frontal plane knee kinematics associated with fatigue. Differences between male and female subject movements were investigated. Conclusion: Subjects made adjustments in the sagittal plane at the hip and frontal plane at the knee when experiencing fatigue. Understanding how fatigue affects the movement is important as it may help inform athletes, coaches, trainers and therapists to guide safer and more effective movements during the single leg squat. This research was supported by the Aperture Research Fellowship Program.

7. THREE HOURS OF SEDENTARY SCREEN TIME AFTER SCHOOL REDUCES COGNITIVE CONTROL IN CHILDREN COMPARED TO ACTIVE PLAY: A RANDOMIZED CROSSOVER STUDY

Bruce W. Bailey, Ph.D., Mary White, M.S., Harrison Marsh, Chance McCutcheon, and Hunter LaCouture
Brigham Young University

Statement of the problem: This study examined the effect of three hours of after-school active play vs. three hours of after-school sedentary screen time on executive function in children. Study design: Crossover design with treatment conditions that were randomized and counter-balanced. Intervention: There were two experimental conditions: three hours of active play after school compared to three hours of sedentary screen time after school. Sample size and composition: Thirty-two boys and girls age 8-9 yrs. Measures utilized: Actigraph accelerometer and Stroop color and word test. Analysis method: Mixed model repeated measures analysis of variance. Results: The mean age and BMI were 8.7 ± 0.4 years and 16.9 ± 2.2 respectively. On the active day, children spent 95 ± 28 minutes in MVPA after school compared to 3 ± 3 minutes on the sedentary day ($F = 252.1$, $P < 0.0001$). There was no difference between days in the Stroop Task performance for word reading or color naming. However, there was a significant difference between conditions for the incongruent task, with children performing better on the active day ($F = 6.79$, $P = 0.0150$). Conclusions: The results of this study demonstrate that active play after school improves executive function in children by increasing their ability to inhibit cognitive interference.

8. I CAN RUN MORE BUT AT WHAT COST: THE EFFECTS OF ACADEMY TRAINING ON HIGH AND LOW PERFORMING LAW ENFORCEMENT RECRUITS

Katherine Balfany[1], Joseph Dulla[2], Jay Dawes[3], Robin Orr[4], and Robert Lockie[1]
[1]California State University, Fullerton, [2]Los Angeles County Sheriff's Department, [3]University of Colorado, and [4]Bond University, Queensland, Australia

Academy training is utilized by staff to develop the physical abilities of recruits specific to law enforcement. However, academy training typically follows a paramilitary model with specific programming left to the discretion of staff. Due to large class sizes, long slow distance (LSD) running is often emphasized with training intensity adjustments specific to the individual generally not considered. The goals for this study were to determine whether physical training during academy leads to changes in fitness, and the effect of a "one-size-fits-all" training modality on more and less fit recruits. Retrospective analysis was conducted on pooled recruit data from four academy classes (n=202) from one law enforcement agency. Recruits underwent pre and post-testing of physical assessments consisting of: vertical jump (VJ) (only measured in one class); 75-yard pursuit run (75PR); medicine ball throw (MBT) with a 2 kg medicine ball; and multi-stage fitness test (MSFT). To measure training effects on more and less fit recruits, a tertile split was performed for each assessment, with the top third on each pre-test defined as high performers (HP), and the bottom third as low performers (LP). Multiple repeated measures ANOVA ($p<.05$) were performed to determine any mean differences for the physical assessments between all recruits, and the HP and LP. Significant differences were found between pre- and post-test in select assessments for the combined recruit data, indicating improvements for MBT and MSFT, and a decline in 75PR performance. Further analyses showed significant interactions between time and the HP and LP for the 75PR, MBT, and MSFT. Both HP and LP improved in the MSFT, by 42.26% and 102.15%, respectively. For the 75PR, HP became 3.70% slower, while LP had no significant performance change. In the MBT, LP improved by 12.10%, while HP had no change. No significant interactions were found for the VJ when considering all recruits, HP, and LP. The data suggests that the current one-size-fits-all training approach may inhibit performance improvements in HP recruits during academy, especially limiting adaptations for upper-body power (MBT) and anaerobic performance (75PR, VJ). This is exacerbated by the current practice of emphasizing LSD running. While this approach greatly improves aerobic fitness in recruits, it appears to come at the cost of power and speed. Consideration of injury rates, especially in LP recruits, may also provide insight into performance results. Other modalities, such as strength and power training, should be explored in law enforcement academies, as well as ability-based training models.

9. DO ACTIVITY MONITORS CORRECTLY CLASSIFY DRIVING TIME AS SEDENTARY?

Rachel Barnett, Matthew Nelson, Cami Christopher, Mami Takeda, Julian Martinez, and Sarah Keadle, Ph.D., MPH
California Polytechnic State University, San Luis Obispo

PURPOSE: Driving is a common sedentary activity for many individuals. Previous studies suggest that accelerometers may misclassify driving as a more active behavior due to vehicle vibrations not related to human movement. Therefore, the purpose of this study is to examine how accurately accelerometer processing methods classify driving-specific sedentary time. METHODS: Participants (n=26, mean age=30.5yrs, 16 female, 20 male) wore an ActiGraph wGT3X-BT (AG) on the right hip, an AG on the non-dominant wrist, and an activPAL (AP) accelerometer on the thigh. They were directly observed for two 2-hour sessions using a GoPro Hero 5 to establish the criterion measure of driving time. We used published methods to classify accelerometer data as sedentary, light, and moderate to vigorous physical activity (MVPA). For the AG-hip, we used the Sojourn-3x (S3x), Freedson, Sasaki, and Crouter methods. The AG-wrist was classified using a random forest (RF) and linear model (lm), and the AP used a proprietary algorithm. We isolated the directly observed driving time and determined whether each of the methods categorized the driving time as sedentary, light or MVPA. RESULTS: Nine of the twenty-six participants drove during the observed time, resulting in 24 separate driving bouts with a mean bout length of 8.5 minutes, totaling 3.4 hours of sedentary driving time. For the AG-hip, the Crouter method produced the lowest classification accuracy with 26.5% correctly classified as sedentary, 68.4% classified as light and 7.0% as MVPA. In contrast, using the Sojourn-3X method, 70.2% of driving time was correctly classified as sedentary, 26.9 was classified as light and 2.9% as MVPA. For the wrist, using a random forest method resulted in 44.5% correct classification, while the accuracy of a linear model was 30.2%. The AP classified 100% of the driving time as sedentary. CONCLUSIONS: Existing algorithms to estimate sedentary time for hip and wrist-worn accelerometers do not accurately classify driving time, while the thigh-worn AP is highly accurate. Since the average American spends 46 min/day in the car, there is a need to develop new methods that correctly classify driving time for hip- and wrist-worn devices.

11. THE EFFECT OF LOW-MODERATE INTENSITY STAIR WALKING ON ANTIOXIDANT CAPACITY DURING HYPERGLYCEMIA

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INTRODUCTION: Type-II diabetes (T2DM) affects more than 30 million people in the United States. It has been recently suggested that inflammation and oxidative stress are major causes of T2DM. Normal aerobic metabolism produces unstable free radicals known as reactive oxygen species (ROS). These ROS attack and cause damage to DNA, proteins, and lipids within the body. Various antioxidant systems exist within the body to reduce the damage caused by ROS, this is referred to as total antioxidant capacity (TAC). It is known that acute hyperglycemia increases inflammation and oxidative stress, while exercise is known to mitigate hyperglycemia and increase TAC. PURPOSE: The purpose of this study was to examine the relationship between low-moderate intensity stair stepping exercise, glycemic response, and antioxidant capacity during an oral glucose tolerance test (OGTT). METHODS: 34 participants (women=14) underwent 4 oral OGTTs during seated rest or with stair climbing bouts at self-selected pace of 1, 3, and 10min in randomized order. Arterialized blood was collected at baseline and every 15min during the OGTTs and assessed for glucose while venous blood was collected at baseline and 30min during the OGTTs and plasma analyzed for TAC, insulin, and glucose. Participants also underwent maximal aerobic capacity assessment. Expired gases were collected continuously during VO_2max testing, and during each stair-stepping bout. RESULTS: We observed no change in TAC (p=.132) as a result of the exercise intervention. Blood glucose concentrations were decreased following the 10min (p< .002) and 3min (p< .004) bouts compared to control. Additionally, insulin concentrations were also decreased following the 10min (p< .001) and 3min (p< .012) bouts compared to control. DISCUSSION: The present study provides evidence that low-moderate intensity exercise has no significant effect on TAC during hyperglycemia, while bouts as short as 3min can decrease postprandial blood glucose and insulin levels.

10. THE EFFECTS OF HIGH-INTENSITY INTERVAL VERSUS MODERATE INTENSITY CONTINUOUS TRAINING ON MAXIMAL OXYGEN UPTAKE IN SEDENTARY ADULTS

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The purpose of the current investigation was to evaluate the effects of 8 weeks of moderate-intensity continuous training (MICT) and 8 weeks of high-intensity interval training (HIIT) on VO_2max after completing a 4-week conditioning period of MICT. 24 subjects completed the study. Cycle ergometer VO_2max with verification was measured at baseline and after 5 weeks, 8 weeks, and 12 weeks of exercise training. The exercise intervention consisted of 4 weeks of conditioning via MICT (70-76% HRmax, 30 min/session, 3 sessions/week) for all 24 subjects, followed by randomization into two groups: 8 weeks of high-volume MICT (70-76% HRmax, 30 min/session, 5 sessions/week) or 8 weeks of HIIT (10 1-minute bouts at 90-95% of HRmax with 1-minute recovery intervals, 20 min/session, 3 sessions/week). All participants completed an even mix of cycle ergometer and inclined treadmill walking/jogging. 13 participants (1 male, 12 females) were randomized into the HIIT group [28.0 ± 9.7 yr; BMI = 23.9 ± 3.9 kg/m2; VO_2max = 29.0 ± 6.0 ml/kg/min]. 11 participants (2 males, 9 females) were randomized into the MICT group [26.0 ± 6.9 yr; BMI = 27.4 ± 8.7 kg/m2; VO_2max = 26.2 ± 7.3 ml/kg/min]. There was a significant increase in VO_2max from Week 5 to Week 12 in both groups (Week 5 = 2.09 ± 0.46 L/min, Week 12 = 2.30 ± 0.41 L/min, p < 0.001). There was no group x time interaction (HIIT: Week 5 = 2.08 ± 0.21 L/min, Week 12 = 2.29 ± 0.19 L/min; MICT: Week 5 = 2.18 ± 0.63 L/min, Week 12 = 2.30 ± 0.58 L/min; p = 0.318). 8 weeks of low-volume HIIT (480 total min) and 8 weeks of high-volume MICT (1200 total min) led to similar increases in VO_2max. Therefore, a low-volume HIIT program can increase VO_2max to similar levels as a high-volume MICT program, but with 60% less time spent exercising.

12. THE DRIVING FORCE: RELATIONSHIPS BETWEEN MOTIVATION, PHYSICAL ACTIVITY, RESISTANCE TRAINING, AND YEARS SWORN IN INCUMBENT DEPUTY SHERIFFS

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In addition to the physical and mental benefits of physical activity (PA) and resistance training (RT), deputy sheriffs may also experience job-related benefits. However, incumbent deputy sheriffs and law enforcement officers tend to be less physically fit than recruits. As motivation is a key factor in PA, this lower fitness level may reflect motivation variations whether from a lack of fitness standards or a shift in priorities (i.e. shift work hours, family). To understand these variations, self-determination theory (SDT) characterizes motivation on a continuum ranging from external reasons (e.g. reward & punishment) to intrinsic reasons (e.g. enjoyment of PA). The primary purpose of this study was to explore the relationship between different motivations and participation in both PA and RT in deputy sheriffs. A secondary purpose examined how years sworn was related to PA and motivation. Deputy sheriffs (n=60; years sworn: 4.8±3.5) from one law enforcement agency completed a cross-sectional questionnaire assessing PA using the Godin Leisure Time Exercise Questionnaire with three added items for RT. Motivation was measured using the 24-item Behavioral Regulation in Exercise Questionnaire (BREQ-3) categorizing motivation ranging from external to intrinsic (external, introjected, identified, integrated, and intrinsic regulation) and amotivation. Pearson correlations were conducted to assess relationships between motivation, years sworn, PA, and RT. Spearman's Rho correlations were used for amotivation and identified regulation as normality assumptions were not met. A positive relationship was shown between PA and identified (r=0.33, p=.01), integrated (r=0.32, p=.01), and intrinsic regulation (r=0.30, p=.02). Similarly, a positive relationship was shown between RT and introjected (r=0.29, p=.03), identified (r=0.48, p<.01), integrated (r=0.60, p<.01), and intrinsic regulation (r=0.43, p=.01). Years sworn was negatively associated with external regulation (r=-0.30, p=.02) and PA (r = -0.34, p=.01). In line with SDT, more intrinsic motives (personal satisfaction, alignment with values) were associated with PA. However, the longer time since a deputy sheriff was sworn was associated with lower PA and lower external regulation. These relationships may reflect a lack of fitness standards and absence of external rewards and punishments for fitness maintenance that were present as recruits. Further research should explore how to encourage PA and intrinsic motivation in deputy sheriffs, from how physical training is applied during academy and promoted when deputy sheriffs begin deployment.

13. BREATHING AND PEDALING ENTRAINMENT IN UPHILL CYCLING

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Despite clear differences in economy and muscle activation, cyclists climb uphill in both seated and standing positions. Entrainment (ENT) in regards to cycling are the various ways in which cyclists breathe in conjunction to the pedal cycle and body position on the bicycle. Understanding ENT differences in uphill cycling could elucidate why cyclists choose one climbing position over the other. PURPOSE: Compare entrainment of breathing and pedaling differences between seated and standing positions in uphill cycling. METHODS: Nine male cyclists (28 ± 7 yrs, 69.9 ± 10.7 kg, VO_2 max 62.7 ± 7.7 ml/kg/min) completed a single continuous 6 minute bout of uphill cycling which consisted of 2 minute stages at prescribed speeds of 6, 8, and 10 mph, in which subjects were instructed to alternate between seated and standing positions every minute. Cycling was at a constant 8% grade and 70 rpm cadence on a large treadmill. Flow Rate (FR) including Peak Inspiratory Flow (PIF), and Peak Expiratory Flow (PEF), VO_2, heart rate, power, and pedal cycle accelerometer data were continuously recorded, and the last 20 seconds of each condition were subsequently analyzed. FR and accelerometer data were coupled to assess ENT differences between climbing techniques. RESULTS: FR including PIF and PEF was significantly increased while cycling in a standing position during all three speeds ($p<0.05$). Average PIF and PEF were 3.09±0.06 and 2.21±0.04 L/sec while riding in a seated position, as opposed to 3.44±0.07 and 2.45±0.05 L/sec while riding in a standing position. The ratios of breathing to pedaling frequency were on average 4:1 at 6 mph, 3:1 at 8 mph, and 2:1 at 10 mph while seated and standing, however there was considerable variability between subjects. While not statistically significant, average VO_2, heart rate, and power were 44.0±1.5 ml/kg/min, 149±2.9 bpm, and 197±11.3 watts while seated and 46.1±1.4 ml/kg/min, 156±2.9 bpm, and 195±10.1 watts while standing, respectively. CONCLUSION: Uphill cycling in a standing position leads to increased FR compared to a seated position at the same speeds and grade. The lack of difference in ENT data in seated and standing positions suggest that the increase in FR is not influenced by ENT of breathing and pedaling, but is rather driven by metabolism.

15. ANALYSIS OF ORAL CONTRACEPTIVE USE AND BONE TURNOVER MARKERS IN COLLEGE-AGED FEMALES

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In the U.S., roughly 60% of women of reproductive age are currently using a method of birth control. Of this 60%, 16% use oral contraceptives (OC). Hormones included in OCs may impact bone metabolism and bone mineral density (BMD). Due to the widespread use of OCs, it is important to understand potential negative effects these drugs may have on the female body, especially the skeleton. PURPOSE: The goal of this study was to examine the relationship between OC use and bone metabolism through the analysis of the serum bone turnover markers CTX and P1NP. METHODS: Data was gathered from a larger study that investigated lifestyle and bone health among university students. Participants (n=74, Age = 19.2 + 0.6) reported on their medication use and menstrual history. There were 41 OC users and 33 non-OC users. Using ELISA, serum samples were quantified for CTX and P1NP, which are markers of bone resorption and formation, respectively. BMD was measured using dual energy x-ray absorptiometry (DXA). RESULTS: Independent t-tests and Pearson correlations were used to assess the data. There was no significant difference between non-OC users and OC users in age, height, weight, BMI, or fat mass. Pearson correlations showed no relationship between bone turnover markers and weight, BMI, or number of months using OCs. At baseline, mean CTX levels were significantly lower for non-OC users, 13.79 + 5.26 ng/mL compared to 18.59 + 8.22 ng/mL for OC users ($p<0.01$). Mean P1NP levels for non-OC users were significantly greater, 95.71 + 30.38 ng/mL versus 82.29 + 28.31 ng/mL for OC users ($p<0.05$). The two groups were not significantly different in BMD at the lumbar spine, lateral lumbar spine, femoral neck, or total hip. DISCUSSION: Bone resorption was higher and deposition was lower in OC users compared to non-OC users. OC users in this study display greater bone metabolism which overtime could result in bone loss. Since these results are cross-sectional, we did not see differences in BMD between groups. Prospective work is needed as these markers may influence BMD and long-term risk for osteoporosis. Assessment of potential confounding variables did not expose influence on differences in bone turnover markers between groups. Further research is needed to understand normal values of bone markers in young women and how medications may affect expected values.

14. LONG, HOT SUMMER: A PRELIMINARY INVESTIGATION OF SEASONAL VARIATIONS IN THE PHYSICAL FITNESS PERFORMANCE OF LAW ENFORCEMENT RECRUITS IN SOUTHERN CALIFORNIA

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Law enforcement agencies (LEA) conduct physical testing to assess readiness of recruits prior to academy training. The LEA in this study uses a test battery called the Validated Physical Ability Test+ (VPAT+) on set dates during the year, typically performed outdoors. Warmer ambient temperatures can negatively affect physical performance via increased heat stress and decreased time to muscular fatigue. Differences in performance on these tests due to warmer temperatures could have implications for recruit performance. The purpose of this study was to determine whether seasonal differences in temperature impacted LEA recruit performance in their VPAT+ performance. Retrospective analysis was conducted on data from four classes, which encompassed 375 recruits from one LEA. The classes completed the VPAT+ during four different seasons (Fall (FALL): ♂ = 71, ♀ = 18, temp = 22-28°C, humidity = 20-32%; Winter (WIN): ♂ = 73, ♀ = 11, temp = 18-26°C, humidity = 8-11%; Spring (SPR): ♂ = 75, ♀ = 27, temp = 22-29°C, humidity = 23-50%; Summer (SUM): ♂ = 83, ♀ = 17, temp = 21-25°C, humidity = 39-71%). The VPAT+ occurred in the week prior to the start of academy and included: push-ups and sit-ups completed in 60 s; arm ergometer revolutions in 60 s; 75-yard pursuit run (75PR); seated medicine ball throw with an x kg ball (MBT); vertical jump (VJ); and multistage fitness test (MSFT). To compare groups, a one-way ANOVA was used with a Bonferroni post hoc ($p < 0.05$). There were significant differences between the seasons in certain VPAT+ tests. For push-ups, WIN and SUM performed 16% and 19% better than SPR, respectively. For the MBT, SUM performed 18% better than FALL. For the arm ergometer, SPR and SUM performed 8-9% better than WINTER, and SUMMER performed 11% better than FALL. WIN performed significantly better than SUM, SPR, and FALL in the MSFT, completing 18%, 27%, and 16% more shuttles. No significant differences were found in sit-ups and VJ. Variability in VPAT+ performance across the seasons could be due to class-to-class fitness variations in recruits. However, WIN was significantly better in the MSFT, which is a maximal running test. Warmer temperatures can increase cardiovascular strain, while humidity can decrease sweat evaporation rates. Both factors can result in an increased rate to fatigue and poorer performance on the MSFT. LEA staff may need to consider ambient temperatures and humidity during tests such as the VPAT+ due to potential negative effects on recruit performance, and this is particularly true for maximal running tests.

16. IMPROVEMENT IN SWIMMING ECONOMY FROM USING A PULL BUOY

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Purpose: Many competitive swimmers use a pull buoy during training sessions to improve upper-body strength and technique. These training aids increase a swimmer's buoyancy and, theoretically, should reduce their energy cost of swimming. We hypothesized that using a pull buoy would improve swimming economy. In addition, we hypothesized that swimmers with the lowest body fat percentage would show the greatest improvement in swimming economy with a pull buoy. Methods: Ten proficient swimmers (5 men, 5 women, 22-55 years old) swam at up to five swimming speeds (1.07-1.43 m/s) both with and without a 23.5-N buoyancy pull buoy between their thighs. Oxygen consumption (VO_2) and carbon dioxide production (VCO_2) were measured continuously and averaged for the last 30 s of each 3-min trial. Cost of swimming (Cs) was calculated from VO_2 and VCO_2 measurements. Body fat percentage was assessed via bioelectrical impedance. Body mass index (BMI) and relative fat mass (RFM, height-to-waist circumference) were calculated from anthropometric measurements. Results: Without a buoy, Cs averaged 6.90 J/kg/m at 1.07 m/s and increased with swimming speed to 9.38 J/kg/m at 1.43 m/s. Cs increased with increasing swimming speeds for both buoy and no-buoy trials ($p < 0.001$). The use of a pull buoy reduced swimming cost by an average of 22.3% for all speeds (8.239 vs. 6.411 J/kg/m; $p < 0.001$). Body fat percentage, BMI, and RFM ranged from 13.4-32.2%, 20.0-27.7 kg/m2, and 17.7-34.4, respectively. However, improvement in swimming economy over all speeds was not correlated with body fat percentage ($r = 0.04$, $p > 0.05$), BMI ($r = 0.38$, $p > 0.05$), or RFM ($r = 0.07$, $p > 0.05$). Conclusions: Results from this study support our hypothesis that pull buoy use reduces the energy cost of swimming. However, the improvement in swimming economy from using a pull buoy was not related to the swimmer's body fat percentage. Other factors such as proficiency, experience, distribution of body fat, or another anthropometric measurement may better predict the improvement in swimming economy from pull buoy use.

17. PREDICTING MAXIMAL OXYGEN UPTAKE FROM A 3-MINUTE ALL-OUT TEST IN CROSSFIT® ATHLETES

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Using a metabolic analyzer to measure maximal oxygen uptake (VO_2max) is regarded as the gold standard in measuring cardiorespiratory fitness. However, access to this equipment is limited. The running 3-minute all-out test (3MT) provides an alternative means of determining aerobic power and cardiorespiratory fitness. This the first study to develop a VO_2max prediction equation from the running 3MT in CrossFit® athletes. **Purpose:** The objective of this study was to examine the relationship between VO_2max from a graded exercise test (GXT) and critical speed (CS) and anaerobic capacity (D') from a running 3MT. **Methods:** Twenty-six male and female (mean ± SD; age, 27.23 ± 4.24 years; height, 177.14 ± 17.60 cm; weight, 80.66 ± 13.83 kg; CrossFit® experience 40.96 ± 29.55 months) CrossFit® athletes performed a 3MT with the goal of depleting D' and attaining a CS value by averaging the velocity of the last 30 seconds of the test. On a separate day, participants performed a treadmill GXT to volitional exhaustion, along with a square wave supramaximal verification phase, to determine VO_2max. **Results:** A statistically significant and positive correlation was observed between relative VO_2max and CS values (r = 0.850, p < 0.001), however, not between D' and VO_2max (r = -0.385, p = 0.052). Based on the significant correlation, a linear regression analysis was completed in order to develop a VO_2max prediction equation from CS and D' (Relative VO_2max = 12.020(CV) + 0.037(D') - 2.149; standard error of the estimate [SEE] = 3.11 ml/kg/min). An internal validation analysis was completed by examining observed and predicted VO_2max values with no noticeable difference between the observed VO_2max (48.05 ml/kg/ min) and predicted VO_2max (48.00 ml/kg/min). The typical error, coefficient of variation (%), and intraclass correlation coefficient was 2.11 ml/kg/min, 4.55%, and 0.885, respectively. **Conclusion:** The positive relationship between VO_2max, CS, and D' suggests that the 3MT test may be a practical alternative to predicting maximal oxygen uptake when access to expensive metabolic testing equipment is limited.

18. DO NATIONAL HOCKEY LEAGUE PLAYERS TAKE AND ALLOW DIFFERENT QUALITY SHOTS IN THE SECOND GAME OF BACK-TO-BACK AWAY GAMES?

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Previous research shows differences between teams in the frequency of back-to-back away (BTB) games played in a season. Fatigue associated with these BTB games resulted in fewer goals scored by the fatigued team but did not result in more goals allowed by the fatigued team, in spite of allowing more shots on goal. Therefore, the purpose of this study was to determine if these findings could be explained by differences in shot quality through the analysis of shot distance and shot type frequency. The R package, nhlscrapr, was used to acquire the 2015-2016 National Hockey League play-by-play database. First, the database was filtered for all regular-season, full-strength events with no pulled goalies. Next, all back-to-back games were identified and coded as being either away-away, home-home, home-away, and away-home. Only away-away back-to-back games were analyzed. Finally, the data were filtered to identify all offensive-zone shots on goal, capturing game number (1 or 2), shot distance (feet from goal), and shot type (wrist, backhand, slap, snap, wrap, tip-in, and deflection). All metrics were analyzed using mixed models, with random effects for the fatigued team. Models predicted either shot frequency or shot distance from the main effects of and interaction between fixed effects variables (game number and shot type). These data were quantified for the team playing the BTB games (fatigued team) and their opponents. All models were fit using Gaussian distributions. Alpha was set at 0.05. 186 pairs of BTB games were identified. For shot distance of BTB teams, there was no significant interaction between game number and shot type (p=0.71) or main effect of game number (p=0.81). Similarly, for BTB team opponents' shot distance, there was no significant interaction between game number and shot type (p=0.67) or main effect of game number (p=.97). For shot frequency of BTB teams, there was no significant interaction between game number and shot type (p=0.46). For BTB team opponents' shot frequency, there was no significant interaction between game number and shot type (p=0.57). These data suggest the fatigue-induced decrease in game 2 goals scored cannot be explained by shot selection or distance. Furthermore, the greater number of saved shots by a fatigued team cannot be explained by a change in shot distance or type allowed. Therefore, future research should determine if teams save their better goalie for the second game of a BTB. Finally, researchers should determine what, if anything, can be done to mitigate team performance drop-offs between BTB away games.

19. RELIABILITY OF THE BILATERAL SPIN PASS TEST IN RUGBY

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Introduction: Skill testing helps to determine efficacy of preparation techniques for athletes. The purpose of this study was to measure the reliability of the bilateral spin pass test for rugby players. The secondary aim was to see if there was a learning effect with this test. Methods: Ten rugby players completed six sessions over 5 weeks. Sessions consisted of standard dynamic warm up, 3 minutes of ball passing while jogging, and the bilateral spin pass test. While running, athletes threw five spin passes each direction through a 50 cm diameter target standing 50 cm high located four meters away. Dominant hand, non-dominant hand, and combined accuracy were scored. Intraclass correlation coefficients (ICC) were calculated to evaluate reliability. Mixed effect linear regression models were used to examine learning effects. Results: Players demonstrated fair reliability for combined accuracy (ICC= 0.657, 95% CI 0.173 to 0.902), however poor reliability was observed for dominant (ICC= 0.170, 95% CI -0.013 to -0.531) and non-dominant (ICC= 0.054, 95% CI -0.080 to 0.380) accuracy. A learning effect was observed only for the non-dominant hand. It took all six sessions to improve accuracy by one pass. Discussion: Low ICC scores indicate significant error likely due to a lack of focus, poor kinesthetic differentiation, or wind interference. Conclusion: The bilateral spin pass test is fairly reliable if coaches test both sides. It would be a waste of time for coaches to test a single side since they show poor reliability.

20. PREOPERATIVE OUTCOME EXPECTATIONS ARE RELATED TO FALL RISK FOR TOTAL KNEE REPLACEMENT PATIENTS

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The surgical expectations for total knee replacement (TKR) patients have been shown to be multidimensional and influenced by patient and clinical characteristics. Importantly, pre-TKR patient expectations can predict surgical outcomes. Patients often seek TKR to improve function and independence, which can include reducing the number of falls. The purpose of this study was to investigate the relationship between a patient's TKR outcome expectations and a patient's fall history and fall risk. A convenience sample of twenty-one unilateral TKR patients completed a questionnaire asking about their expectations for time to recovery of 10 items related to activities of daily living, each were measured over a six ordinal time scale: 1 week, 6 weeks, 3 months, 6 months, 1 year, and 'never'. Expectation data was dichotomized by median split (7.8 weeks) of the mean time to recovery into patients with short-term expectations and those above the median as having long-term expectations. Patient's fall history (previous 12-months) was acquired, as well as their Timed Up-and-Go (TUG) times, Activities-specific Balance Confidence Scale (ABC), and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scoring. Correlational analyses determined the relationships between a patient's expectations (short-term v. long-term), number of falls and fall risk measures. A significant and positive (long-term expectations) correlation between expectations and TUG test times (r_s = .60) and numbers of falls (r_s = .86) was observed. Balance confidence (ABC) was significantly and negatively correlated with patient expectation (r_s = -.53). Pre-TKR patient characteristics may be important to evaluate when considering individual patient expectations, in particular, when determining a specific rehabilitation protocols post-TKR to address a patient fall risk.

21. RELATIONSHIPS BETWEEN LEAN BODY MASS AND FAT MASS WITH PHYSICAL FITNESS PERFORMANCE IN DEPUTY SHERIFF RECRUITS

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Law enforcement can be a physically demanding profession, where officers may be required to complete low- and high-intensity efforts at various times while on duty. The purpose of academy training is to prepare recruits for these demands. It could be expected that a greater amount of lean body mass (LBM), and less fat mass (FM), would be beneficial to fitness and job-specific performance in law enforcement recruits. Several studies have analyzed these relationships in law enforcement populations, but not in deputy sheriff recruits at the start of academy. The purpose of this study was to measure the relationships between body composition (LBM and FM) and fitness test performance in deputy sheriff recruits prior to academy. A retrospective analysis was conducted on 284 (230 males, 54 females) recruits from three academy classes. Health and fitness tests included: LBM and FM as a percentage of body mass derived using bioelectrical impedance analysis; grip strength for both left (L) and right (R) hands; arm ergometer revolutions in 60 s; push-ups and sit-ups completed in 60 s; a 75-yard pursuit run (75PR); seated medicine ball throw (MBT) with a 2 kg medicine ball; vertical jump (VJ); and number of shuttles in the multistage fitness test (MSFT). Partial correlations controlling for sex were used to derive relationships between FM, LBM, and the fitness tests ($p < 0.05$). Fat mass had small, but significant, negative correlations with: grip strength (L), VJ, push-ups, sit-ups, and MSFT shuttles ($r = -0.19$ to -0.27). A small, but significant, positive correlation was found between FM and the 75PR ($r = 0.23$). LBM also demonstrated small, but significant, positive correlations with: grip strength (L), VJ, push-ups, sit-ups, and MSFT shuttles ($r = 0.15$-0.25). A negative relationship between LBM and the 75PR was also found ($r = -0.22$). Although correlation strength was generally small, recruits with lower FM and higher LBM tended to perform better on the aerobic and anaerobic fitness tests, while recruits with higher FM and lower LBM tended to perform worse on these measures. Although these relationships may be expected, they have not been documented in a deputy sheriff recruit population. This is important given that the academy training period of 22 weeks, in conjunction with less-than-optimal training methods (high running volumes with restricted recovery), could lead to reductions in LBM. Law enforcement agency staff should monitor changes in FM and LBM over the course of academy.

23. STRENGTH AND CYCLING ECONOMY: THE IMPORTANCE OF SPECIFICITY

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The transfer of adaptations from strength training to sport specific movements has received much attention in sports performance research. It is thought that the velocity specificity of resistance training is important for the transfer of muscular strength to sport performance, where trained portions of the force-velocity relationship exhibit the greatest transfer effects. Strength training has been shown to improve endurance exercise performance, where increases in exercise economy have also been measured. Whether these improvements are explained by increases in exercise economy is not known. Likewise, whether it is maximal strength alone, or force production at sport specific velocities, per se, which plays a role in exercise economy is not known. Therefore, the purpose of conducting this investigation was 1) to determine if muscular strength is related to exercise economy during cycling, and 2) to determine if maximal force production at sport specific velocities has a stronger relationship with exercise economy than other velocities. Thirteen trained male cyclists (VO_2max 59.0 ± 6.9 $ml \cdot kg^{-1} \cdot min^{-1}$, age 33.1 ± 8.8 yrs, 180.9 ± 8.0 cm, 77.8 ± 8.5 kg) performed a 15-minute submaximal graded warm-up, where they maintained workloads of 100W, 150W, and 200W at 90 rpm for 5 minutes each. Cycling economy was calculated from the average VO_2 of the last 2 minutes of each stage. Subjects then performed a maximal exercise test on a cycle ergometer with an initial workload of 70 Watts, increasing by 35 Watts per minute until volitional fatigue. Following a 30-minute rest period, subjects performed 3 maximal isokinetic knee extensions at 60°, 120°, 180°, and 240°$\cdot sec^{-1}$. Peak torque values were normalized for body weight, and univariate analyses were performed to determine if relationships between force production at each velocity and cycling economy at 200w exist. Torque at 60°$\cdot sec^{-1}$ (3.11 ± .18 $Nm \cdot kg^{-1}$) was strongly related to cycling economy ($r^2 = .726$, $p=0.000$). Torque at 120° (2.55 ± .281 $Nm \cdot kg^{-1}$), 180° (2.37 ± .24 $Nm \cdot kg^{-1}$), and 240°$\cdot sec^{-1}$ (2.11 ± .26 $Nm \cdot kg^{-1}$) did not have significant relationships with economy ($p > 0.05$). These results suggest that maximal strength alone, not peak force at cycling specific velocities plays a role in cycling performance, and that strength training for cycling may not need to be velocity specific.

22. DON'T GO BREAKING MY HEART: THE EFFECTS OF ABILITY-BASED TRAINING ON THE HEALTH AND FITNESS CHARACTERISTICS OF CUSTODY ASSISTANT RECRUITS

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Custody Assistants (CAs) are responsible for security in detention facilities, where they may be required to complete high-intensity physical actions to ensure the personal safety of themselves, personnel, and inmates. Due to these job demands, and need for overall fitness, physical training (PT) programs are commonly implemented during academy. A paramilitary one-size-fits-all model, via modalities such as formation runs and bodyweight calisthenics, are a common form of PT. However, this type of training may not be optimal for each individual CA recruit to make positive adaptations. The purpose of this study was to analyze an ability-based approach to PT in a CA academy compared to the traditional approach. Retrospective analysis was performed on data from two CA classes consisting of 39 (23 men, 16 women) and 36 (22 men, 13 women) recruits. Recruits in the first class received 15 PT sessions in the traditional training (TT) model, where recruits were expected to all complete the same exercises and distance runs. Recruits in the ability-based training (ABT) group were subject to 15 PT sessions comprising of an ABT circuit and interval running workouts. Pre- and post-academy training, health and fitness assessments were performed, which included: resting heart rate (RHR); systolic and diastolic blood pressure (BP); push-ups and sit-ups in 60 s; and recovery heart rate from the YMCA step test. Changes in these assessments were compared using 2x2 factorial ANOVA for each measure, and a repeated measures ANOVA for each class ($p < 0.05$). Results revealed significant differences in performance in both classes for both the recovery heart rate for the YMCA (reduced) and push-ups (increased), with no difference between the groups. The ABT group significantly lowered their RHR post academy (6.5 mean reduction in bpm). Systolic BP did not significantly change post-academy for either group, while diastolic BP increased in the TT group (5.8 mmHg mean increase) but not the ABT group. Although TT and ABT achieved similar changes in fitness as measured in this study, the ABT group was able to achieve these while also reducing RHR and maintaining diastolic BP. RHR can be a predictor of cardiovascular and all-cause mortality. Any increases in diastolic BP for the TT group could be a maladaptation to the rigors of academy, including chronic stress and the physical training load. BP is also a factor in predicting the development of coronary heart disease. Given these positive adaptations in heart rate and BP for CAs, further research should be done to confirm these results and investigate the wider and systemic implementation of ABT in CA.

24. UNIQUE CONTRIBUTIONS OF STRENGTH AND METABOLISM TO CYCLING ECONOMY

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Efficient movement has long been known to be an important determinant of performance. Efficiency has been primarily thought of as a metabolic property with little consideration given to the contribution of the mechanical properties of muscle. The purpose of conducting this study was to evaluate the contributions of measures of muscular strength and metabolism to economy of movement. Thirteen trained male cyclists (VO2max: 59.0 ± 6.9 $ml \cdot kg^{-1} \cdot min^{-1}$; Age: 33.1 ± 8.8 yrs; Height: 180.9 ± 8.0 cm; Weight: 77.8 ± 8.5 kg) were recruited for this study. Each subject first performed a 15 minute submaximal exercise test on a cycle ergometer. Each test required subjects to maintain a workload of 100W, 150W, and 200W for 5 minutes at 90 rpm, in ascending order. Economy was calculated using the last 2 minutes of expired air of the 200W stage. A maximal exercise test (GXT) was performed on a cycle ergometer starting at 75W, and progressing by 35W every minute. GXT testing was terminated upon volitional fatigue (a cadence below 70 RPM). After completion of the GXT, subjects rested for a minimum of 30 minutes. Lastly, each subject performed 3 maximal isokinetic contractions at 60°$\cdot sec^{-1}$. The largest peak torque was recorded. For each subject, VO2 at the first ventilatory threshold (VT1), maximal Torque at 60°$\cdot sec^{-1}$, and economy at 200W were assessed. All data was normalized to body mass. To determine the contributions of VT1 and Torque to variations in economy, a multiple regression analysis model was used. The model was created using a simultaneous entry order. The multiple regression model was statistically significant ($R2 = 0.737$, $p = 0.001$). The model also revealed that Torque ($t = 5.079$, $p = 0.000$) significantly explained some of the variance in economy, while VT1 ($t= 0.631$, $p=0.542$) did not enter the model. These findings suggest that muscular strength explains more of the variability in cycling capacity than does the metabolic capacity of muscle.

25. FEASIBILITY OF INSTRUMENTING A GRAPPLING DUMMY TO MEASURE CHOKE FORCE

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Introduction. Mixed martial arts (MMA) has become increasing popular in recent years, with some pay-per-view events gaining more than 1.6mil viewers (mmafighting.com). However, with its ever-growing popularity, little is known about kinetics involved with certain movements or how to measure them. Our team has invented a new method to instrument a grappling dummy commonly used in MMA training with a specialized load cell mat (Loadpad, Novel Electronics USA, St.Paul, MN) to measure forces applied to the dummy. The purpose of this study was to determine the validity of force measures on the grappling dummy. Methods. Two tests were conducted: the first with the load pad placed on the ground and the second with the load pad placed on the grappling dummy. Test 1: Three different known weights (200.16N, 400.34N, and 600.51N) were placed on a support structure placed on the load pad. The support structured ensured the entire weight was placed on the loadpad during collection. Force data were collected for a total of 5 trials of each weight for 10 s per trial. Test 2: The loadpad was fixed in place to the neck of the dummy with the use of elastic bandaging. The three weights were then placed on the load pad with data collected for 10 s. Prior to each collection the loadpad was zeroed. Analysis: Force data were plotted, a 1 s average was calculated in the plateau region of the force profile. For each test, percent difference from true value were calculated and the average and standard deviations were reported. Results. For test 1, averages of 179.00±11.94N, 381.00±8.94N, and 596.00±17.82N were recorded. Test 1 also yielded a total percent difference of 5.38±5.61%. For test 2, averages of 194.00±11.40N, 400.00±28.28N, and 588.00±39.94N were recorded. Test 2 also yielded a total percent difference of 1.75±6.15%. Conclusion. These data show using a Loadpad to acquire force measurements from a grappling dummy amidst MMA specific moves yields valid results.

26. INFLUENCE OF SKELETAL ARCHITECTURE ON BONE MINERAL DENSITY AND MUSCULAR FUNCTION IN ADULTS WITH CEREBRAL PALSY

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Cerebral Palsy (CP) is a neurological disorder caused by lesions in the brain that affect motor development. It is characterized by atypical development of musculoskeletal structures and contracture as well as motor impairment. Individuals with CP develop osteoporosis earlier in their age compared to the general population. Bone weakness has a detrimental effect on the muscular system, which causes the CP population to be more prone to bone fracture and further immobility. To date, whether structural alterations in the skeletal system have an influence on bone mineral density (BMD) and muscular strength is unclear. Thus, the purpose of this study was to determine the influence of skeletal deformity to bony strength via BMD and muscular strength in adults with CP. We studied 20 participants with and without CP. Dual energy X-ray absorptiometry was used to measure regional BMD at the lumbar spine, proximal femur, and forearm regions. Architectural differences were identified as angles from a center line through the various femoral neck regions, and lengths and diameters of femoral neck, socket, and shaft. Leg and forearm muscular strength was assessed by using Humac Norm isokinetic dynamometer and handgrip dynamometer, respectively. Compared to control, adults with CP had significantly lower architectural angles at the top and bottom of greater trochanter (e.g., top, 61±4 CP vs. 74±2 control, degrees, $p<0.05$), smaller femoral neck length (1.4±0.2 CP vs. 2.5±0.2 control, cm, $p<0.05$) and shaft diameter (2.6±0.2 CP vs. 3.0±0.1 control, cm, $p<0.05$), with no difference in diameters of femoral neck and socket. While there is a linear relationship between femoral angle and BMD in control, femoral angle and length did not seem to affect BMD in CP. However, severity of skeletal architecture, not BMD, appear to affect muscular function in CP group. These findings suggest that skeletal architecture has a differential influence on BMD and muscular strength in adults with CP.

27. THE RELATIONSHIP BETWEEN HANDGRIP STRENGTH AND RESPONSE INHIBITION

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Background: Reduced hand grip (HG) strength in older adults has been associated with increased mortality and morbidity. The common assumption is that HG represents a simple marker of physical health, but more recent accounts have suggested that HG actually provides a window into neurological function and brain health. Central to this claim is the finding that grip strength correlates with cognitive performance. The present study aimed to extend upon this idea and determine if HG is correlated with a very specific form of cognitive function, known as Response Inhibition (RI) (i.e. the ability to inhibit a prepotent, yet unwanted action). To assess RI, we used the Stop-Signal Task (SST) which provides a precise estimate of an individual's ability to withhold or suppress an ongoing action. The SST encourages participants to respond to visual cues by pressing a button as fast as possible, however, they must refrain from responding once they hear an infrequent _—…stop' tone. The time (in milliseconds) that gives the participant a 50% success rate of stopping an automatic movement is referred to as the Stop Signal Reaction Time (SSRT). Objective: To examine the relationship between HG and SSRT in older adults. Design: Seventeen older adults, (ages 51-80, 10 females, 7 males) performed a computer-based SST using customized matlab software, and then three maximal voluntary contractions of the dominant hand with a calibrated dynamometer. Results: Mean HG was 30.82±11.45kg, and SSRT was 207.13±39.66ms. There was a trend for a negative correlation between HG and SSTR ($r=-.431$, $P=.084$). Conclusion: These findings showed that 18.6% of the variance in SSTR was explained by HG strength, but present data may lack statistical power to detect this effect. Although preliminary, these results highlight the plausibility that traditional HG testing may offer insight into RI in older adults, specifically the speed at which RI occurs.

28. COMPARING PHYSIOLOGICAL RESPONSES TO SINGLE AND DOUBLE LEG SUBMAXIMAL CYCLING IN NORMOXIA AND HYPOXIA

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INTRODUCTION: It has been well established that exercise intensity as well as exercise performance declines at altitude. However, it has yet to be determined how femoral blood flow and muscle oxygenation kinetics (total tissue saturation, oxy- and deoxygenated hemoglobin, as well as total hemoglobin) are influenced by altitude during submaximal and maximal performances. Furthermore, it has yet to be determined if the utilization of small muscle mass exercise, which allows for greater blood flow to the active muscle, will allow an individual to generate the same muscle oxygenation kinetics in hypoxic conditions that is achieved during larger muscle mass activities in normoxia. PURPOSE: Thus, the purpose of this study was to determine if tissue oxygenation was compromised at altitude during submaximal bouts of exercise and whether reducing the active muscle mass exercise could be used to offset any observed decrement due to increases in blood flow. METHODS: 10 individuals performed double leg cycling for four minutes at 50%, 60%, 70% and 80% of their maximal oxygen consumption, rested for 15 minutes and then performed single leg cycling utilizing the same protocol but at half the double leg work rate in both normoxic and hypoxic conditions (oxygen concentration of 15% which simulated an altitude of 2,740 meters). RESULTS: The amount of blood flow during the single leg trial in hypoxia was significantly higher compared to blood flow during double leg cycling in hypoxia ($p = 0.02$). There was no significant difference between the single leg trial in hypoxia and the double leg trial in normoxia ($p = 0.36$) nor between the two double leg trials in normoxia and hypoxia ($p = 0.87$). No difference was found in the amount of oxygenated hemoglobin when comparing the single leg trial in hypoxia to the double leg trials in normoxia ($p = 0.36$) and hypoxia ($p = 0.13$). CONCLUSION: The results suggest that elevated hemoglobin saturation and femoral blood flow during the single leg condition in hypoxia are similar to that observed during double leg cycling in normoxia and may prove to be a viable training modality that would offset the main disadvantage of living at altitude by enabling an individual to exercise at the same level of intensity achieved at normoxia.

29. DESCRIPTION AND COMPARISON OF PHYSIOLOGICAL CHARACTERISTICS OF PITCHERS AND POSITION PLAYERS FROM A SUCCESSFUL DI BASEBALL TEAM

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Different positions in baseball may require distinctive physiological characteristics to be successful. For example, catchers need to have a strong lower body to meet the demands of their position, while pitchers must generate force quickly in order to deliver the ball to home plate. There has been little analysis of the physiological characteristics of collegiate baseball players, especially those from a successful program that has won conference championships and made College World Series appearances. The purpose of this study was to determine if there were differences in physiological characteristics among the different position players on a Division I (DI) baseball team, while also providing descriptive data from these players. A retrospective analysis of data collated across three seasons from one DI baseball team was conducted. The group consisted of 29 pitchers, 6 catchers, 17 infielders, and 14 outfielders. Data was collected during Fall semester testing and consisted of: height, body mass, 1RM front squat, 1RM bench press, vertical jump, neutral grip chin-ups, and standing broad jump. Testing was conducted multiples times throughout the Fall semesters before each season, and the most recent data was used for each athlete as well the most recent year for each athlete. A one-way ANOVA ($p < 0.05$) with Bonferroni post hoc was used to determine any differences between the positions in each assessment. Pitchers did not complete the 1RM bench press, so a separate one-way ANOVA ($p < 0.05$) with Bonferroni post hoc was run to compare the hitters in the 1RM bench press. There were significant differences between the groups in four of the six variables. Pitchers were significantly taller (1.88 ± 0.05 m) than infielders and outfielders, heavier than outfielders, and had a significantly higher vertical jump (62.14 ± 6.12 cm). Outfielders had a significantly higher vertical jump (64.91 ± 4.02 cm) than catchers and performed significantly better (21.57 ± 5.59 repetitions) than pitchers, infielders, and catchers in the chin-up assessment. No significant differences were seen in the standing broad jump or 1RM front squat, or between catchers, infielders, and outfielders in the 1RM bench press. Pitchers and outfielders appeared to have the highest lower-body power, while outfielders were the strongest players as measured by the chin-up. Since each position is different, it cannot be said that certain players should attempt to match the characteristics from others. Nonetheless, these data provide a description of DI collegiate baseball players that have achieved success.

30. THE EFFECTS OF ACUTE ULTRAVIOLET LIGHT EXPOSURE ON POST-RESISTANCE EXERCISE SERUM TESTOSTERONE IN OLDER MEN

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Introduction: Testosterone deficiency, or hypogonadism, is linked to a multitude of negative side effects including depression, sexual dysfunction, and cognitive impairment. Although synthetic testosterone-boosting pharmaceuticals have gained wide use, recent data suggests that vitamin D, ingested orally, may positively impact serum testosterone. Furthermore, evidence tying ultraviolet (UV) light exposure to endogenous vitamin D synthesis presents an intriguing possibility for naturally enhancing serum testosterone via endogenous vitamin D. Therefore, the purpose of this study was to, 1) determine the effect of an acute bout of UV light exposure on post-resistance exercise serum testosterone in older men and, 2) to investigate whether serum testosterone was influenced by endogenous vitamin D. Methods: Six older adult men (age 62±1.79 yrs., height 179.92±1.12 cm., body mass 83.79±3.12 kg., BMI 25.95±1.15 kg/m2) participated in two identical resistance exercise sessions followed by a 30-minute recovery. Sessions were approximately one week apart and the exercise protocol consisted of 4 sets of 10 repetitions of leg press, chest press, and back row with one minute of rest between sets. After the second exercise session, participants were exposed to an UV light source during the first 10 minutes of recovery. Serum testosterone and vitamin-D were measured pre- and post-resistance exercise in 5-minute increments during the 30-minute recovery. Results: Exercise alone did not significantly affect serum testosterone or vitamin D. Exercise combined with acute UV light exposure significantly increased serum testosterone and the area under the curve ($p<0.05$) but did not significantly alter serum vitamin-D. Conclusion: These findings suggest that acute UV light exposure may positively impact serum testosterone following a single bout of resistance exercise in older adult men.

31. PHYSIOLOGICAL DIFFERENCES BETWEEN ADVANCED AND NOVICE CLIMBERS

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Introduction: Rock climbing, especially bouldering, has increasingly become a mainstream sport. However, there has been little research comparing physiological traits of advanced and novice climbers. The purpose of this study was to determine which physiological traits were different between advanced and novice climbers. Methods: Thirty-two climbers (14 advanced (ADV), 18 novice (NOV)) took part in this study. Anthropometric, body composition, flexibility, force, and EMG measurements were performed. A two-sample t-test was used to compare between groups. Results: ADV climbed harder boulder problems than NOV (V scale – 7.5 ± 1.6 vs 4.4 ± 1.2, $p < 0.05$). ADV were found to have significantly lower body fat percentage (12.3 ± 6.7 vs $17.5 \pm 6.8\%$, $p < 0.05$), grip strength relative to body weight (Normal grip relative to body weight – 1.5 ± 0.3 vs. $1.2 \pm .3\%$, $p < 0.05$, Pinch grip relative to body weight – $0.4 \pm .09$ vs $0.3 \pm .05\%$, $p < 0.05$), hip flexion (122.2 ± 16.1 vs $111.5 \pm 12.3°$, $p <0.05$), hip abduction (65.9 ± 18.8 vs. $49.8 \pm 10.3°$, $p < 0.05$), maximum rate of force development during a pull-up ($.86 \pm .38$ vs $.37 \pm .30$ kg/s/kg, $p < 0.01$), and rectus abdominis maximal muscle activation (0.00036 ± 0.0002 vs 0.00017 ± 0.00015, $p < 0.05$). Discussion: Advanced climbers have a significantly better strength to weight ratio as well as a better ability to generate explosive movements. In order for novice climbers increase their ability to climb harder, it may be beneficial to train in a way to increase their strength to weight ratio, whether by increasing strength or by decreasing fat mass. Additionally, increasing hip flexibility may be beneficial in order to better place the foot while climbing. Finally, the ability to better activate the rectus abdominis while climbing may allow advanced climbers to keep their center of mass closer to the wall, increasing weight on the feet rather than the hands.

32. THE EFFECTS OF LEG DRIVE ON BENCH PRESS PERFORMANCE: RESULTS OF A 5-WEEK TRAINING STUDY

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INTRODUCTION: Among common resistance training exercises, the bench press is often implemented to train upper body strength. Recently, in the public domain, curiosity regarding the potential impact of lower extremity involvement on overall bench press performance has gained in popularity. While the effectiveness of bench press training on strength gains has been shown in the literature, many suggestions as to the importance of leg-drive have been offered. Yet, to our knowledge, there are no studies that have evaluated the impacts of leg-drive technique on bench press performance. PURPOSE: To evaluate the impact of leg-drive on bench press performance following 5 weeks of bench press-only training in recreationally-trained college-age males (N = 23). Pre and post analyses of bench press 1-repetition maximum (1RM), bench press volume, and changes in body fat percentage were conducted. Five weeks of either standard bench press (n = 12) or bench press using leg-drive (n = 11) was completed. Participants completed four sets of bench press (2x/week) to volitional fatigue at 80% of their 1RM. RESULTS: Both groups experienced an approximate 5% increase in 1RM strength (p-values < 0.001), an approximate 4% reduction in body fat percentage ($p = 0.040$), and no change in total volume lifted (between weeks 1 and 5) ($p = 0.154$). No significant main effects were observed between groups for any of the variables (all p-values > 0.05). CONCLUSIONS: Five weeks of bench press training did result in favorable strength outcomes for both groups, but leg-drive focused training did not produce noticeable changes in performance compared to the standard bench press.

33. AN ANALYSIS OF HEALTH AND FITNESS CHARACTERISTICS OF WILDLAND FIRE AID SUPPRESSION RECRUITS ON DAY OF ACADEMY

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Wildland firefighting includes fire suppression and property protection in woodlands, forests, grasslands, or any combination of vegetation that is involved in a fire but is not within buildings or structures. Wildland firefighters may be regularly assigned to a fire for days or weeks; therefore, high levels of physical fitness should aid wildland firefighters in performing their job tasks most efficiently. The purpose of this study was to examine the health and fitness characteristics of incoming wildland firefighter recruits on day one of academy training. A retrospective analysis was conducted on 90 (89 males, 1 female) recruits from four classes. Health and fitness assessments included: body fat percentage measured via bioelectrical impedance analysis; maximum push-ups to a tempo; maximum number of pull-ups; and maximal aerobic capacity (VO_2max) estimated from the multi-stage fitness test. However, for this analysis only two classes had full data sets for body fat percentage (n = 47; 46 males, 1 female), while three classes had data for push-ups and pull-ups (n = 69; 68 males, 1 female). All classes had data regarding for VO_2max. Data from the assessments were compared to American College of Sports Medicine (ACSM) age and sex-related norms for body fat and VO_2max, agency-specific norms for push-ups, or established population norms for pull-ups. With regards to body fat, 40.4% of the recruits were classified as good, 21.3% were excellent, and 8.5% were very lean. For VO_2max, 42.2% were deemed good, 34.4% were excellent, and 8.9% were superior. The agency-specific wildland firefighting agency standard for VO_2max was 45.0 mlÎàkg-1Îàmin-1 and above; 85% of the recruits achieved and/or surpassed that score. Regarding push-ups, 15.9% were considered good and 63.8% were excellent. When considering of pull-ups, 23.2% were good and 29% were excellent. The results of this study revealed that incoming wildland firefighter recruits had superior health and fitness characteristics on day one of their academy. This would suggest that agency standards encouraged recruits to pursue superior physical fitness prior to the start of academy training. This is appropriate given the demands of the occupation. Individuals pursuing wildland firefighting should recognize that higher standards for physical fitness are required for entry to academy, and potentially successful future job performance.

35. THE RELATIONSHIP BETWEEN LEG VASCULAR ENDOTHELIAL FUNCTION AND LEG EXERCISE HYPEREMIA

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PURPOSE: The onset of exercise is accompanied by an increase in blood flow, hyperemia, to exercising muscles. Aided by vasoconstriction and vasodilation, the cardiovascular system is able to direct the flow. The endothelial layer of blood vessels is highly involved in the production of vasodilators to help increase blood flow. The term vascular endothelial function is used to describe this ability of the endothelium and is a major contributor to the regulation of blood flow at rest, however its role during exercise remains unclear. With the endothelium playing an important role in vasodilation, it seems possible this function will play a role during exercise. Therefore, the purpose of this study is to determine if vascular endothelial function is related to active exercise blood flow. METHODS: Vascular endothelial function was assessed using passive-leg-movement-induced hyperemia (PLM) in 10 adult subjects (22.5 ± 0.7 years). The PLM assessment involves passively extending and flexing the knee at a rate of 60 knee extensions per minute, with no muscle contraction by the subject. Active exercise hyperemia was assessed during unweighted knee extensions performed at a rate of 60 knee extensions per minute by subjects. Blood flow was measured using Doppler ultrasound of the common femoral artery. RESULTS: Change in peak hyperemia increased from PLM to active exercise by 1049.94 mL/min (PLM: 955.25 mL/min, Active: 2005.19 mL/min; $P<0.05$). Total hyperemia, area under the curve, was also significantly higher in active exercise than PLM (PLM: 441.07 mL, Active: 1096.15 mL; $P<0.05$). Additionally, there was a strong correlation between vascular function (PLM) and active exercise in both peak hyperemia ($r=0.64$, $P<0.05$) and total hyperemia ($r=0.73$, $P<0.05$). CONCLUSION: With numerous mechanisms involved in regulating blood flow during exercise, it remains unclear exactly how and to what extent the role vascular endothelial function has on blood flow during exercise. However, these data demonstrate that greater vascular endothelial function is associated with greater peak hyperemia during exercise, suggesting that endothelial function may play a role in blood flow during exercise.

34. AN INSIGHT INTO THE EFFICACY OF COMPRESSION SOCKS IN POST-EXERCISE RECOVERY

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Compression garments (i.e. socks, tights, and others) historically have been implemented for the treatment of chronic venous insufficient pathologies (i.e. deep vein thrombosis). Current literature remains inconclusive as to whether compression garments can improve post-exercise recovery. PURPOSE: To determine the efficacy of compression socks after an intense bout of exercise in the following recovery parameters: ankle range of motion (ROM) (i.e. dorsiflexion, plantarflexion, inversion, and eversion), calf muscle pain threshold, and calf muscle perception of muscle soreness. METHODS: Female (n=4, Age= 24 ± 1.83 years, BMI= 22.6 ± 3.53 kg/m^2) and male (n=6, Age= 22.8 ± 3.43 years, BMI= 25.1 ± 2.94 kg/m^2) college students performed six rounds of eccentric calf raises until fatigue on the first day of three consecutive days, in this crossover designed study. Following post-exercise, participants were assigned randomly a compression sock (CEP: 30mmHg (ankle)-20mmHg (calf)) to be wore on one leg (experimental condition), with the other leg acting as the control. Participants wore the compression sock in a seated position for 30-minutes on all three days. Calf muscle pain, ankle ROM, and perception of muscle soreness measurements were taken, respectively, before, and after application of the compression sock on all three days of the study. RESULTS: A positive significant difference within-subjects in time ($p=0.016$; $p<0.05$) was found for ankle eversion only. Non-significant differences between conditions ($p>0.05$), but a positive trend in ankle ROM, pain threshold, and a negative trend in perception of muscle soreness was observed in the experimental vs. control conditions. CONCLUSIONS: The present study did not find compression socks to enhance post-exercise recovery in a healthy population. Future studies may consider assessing if compression socks are only tools suited for clinical populations in the treatment of deep vein thrombosis, and not for post-exercise recovery.

36. THE EFFECTS OF HEAT ACCLIMATION WITH PERMISSIVE DEHYDRATION ON CHANGES IN VO_2MAX AND CYCLING PERFORMANCE IN A TEMPERATE ENVIRONMENT

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Introduction: It is unclear whether heat acclimation (HA) combined with permissive dehydration can improve exercise performance in a temperate environment. The aim of this project was to examine the efficacy of a 7-day HA protocol with permissive dehydration on VO_2max and cycling performance in a temperate environment. Methods: Seven moderately trained men were randomly assigned to either the dehydration (DEH, n=3) or euhydration (EUH, n=4) group. To assess VO_2max, subjects cycled at 60 W for two minutes followed by 30 W increments per minute until volitional fatigue. Cycling performance was assessed by completing a 16 km self-paced time trial (TT) in a temperate environment (23C and 36% RH). One week later, a 7-day HA protocol was initiated which consisted of 90 min of cycling in a hot and humid environment (40C and 37% RH). A controlled hyperthermia protocol was employed which clamped core temperature (Tc) at 38.5C. The EUH group consumed 1500 mL of water in 250 mL boluses every 15 min during each day of HA. In contrast, the DEH group were not allowed to drink water during HA in order to promote dehydration. At least 24-hr after day 7 of HA, VO_2max and TT were repeated following identical procedures. Results: Time to Tc 38.5C increased significantly by the 7th day of HA in both EUH and DEH groups ($p = 0.049$). However, there were no differences between groups ($p = 0.26$). Average Tc in the final 60 minutes of exercise was not significantly different on day 7 of HA versus baseline. The percent body mass loss across 7 d of HA was greater for DEH (2.25 ± 0.26%) compared to EUH (0.77 ± 0.46%) however, the difference between groups was not significant ($p = 0.060$). VO_2max did not significantly change in either group following 7 d of HA. Peak power output increased significantly from 346 ± 1.00 W to 358 ± 7.81 W (DEH) and 352.75 ± 8.22 W to 377 ± 13.74 W (EUH) as a result of HA, with no significant difference between groups. Performance in TT improved significantly ($p = 0.006$) in both EUH (28.23 ± 0.81 min vs. 27.40 ± 0.96 min) and DEH (29.26 ± 0.52 min vs. 28.35 ± 0.84 min) in response to HA. Conclusion: Our preliminary data suggest that HA combined with permissive dehydration does not provide a greater stimulus for improving aerobic capacity or TT performance in a temperate environment.

37. THE EFFECT OF LOAD CARRIAGE ON BIOMECHANICS OF THE UPPER EXTREMITY

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Purpose: Military personnel and day hikers carry loads of 40% or more of their body weight in backpacks while walking at a brisk pace for prolonged periods of time. Our aim was to evaluate how biomechanics of the upper limb are affected by carrying a loaded backpack while walking. We hypothesized that grip strength would not change, but pinch strength would decrease after load carriage and then recover after a 10-minute seated recovery. Methods: Six right-hand dominant male subjects (mean of 26 ± 5.7 years, 172.6±5.7 cm height, 68.8 ± 14.1 kg mass) performed 2 separate 45-minute treadmill walking trials on different days walking at 1.1 m/s. The conditions were no load (control) and carrying a loaded external frame backpack with hip belt totaling 40% of the subject's body weight. Grip strength and lateral pinch strength were measured with handheld dynamometers in both the dominant and non-dominant hands immediately before the trial (PRE), immediately after the trial (POST) and after a 10-minute seated recovery (REC). Two-way RMANOVA was used with Bonferroni post-hoc test to compare between load conditions and among the PRE, POST, and REC measurements. Results: Grip strength showed no significant difference for either hand. Mean (±SD) grip strength for the backpack PRE was 101.0±20.5 kg for the right hand and 98.1±21.6 kg for the left hand and did not change at the POST or REC time points. However, mean pinch strength decreased significantly for the right hand ($F=6.385$, $p=0.016$) from 10.4±2.4 kg to 9.7±2.4 kg in the backpack load condition between PRE and POST treadmill walking. But, pinch strength in the left hand, 9.5±1.8kg, showed no significant change between PRE and POST treadmill walking. Also, there was no change in pinch strength from POST to REC in either hand for either load condition. Conclusion: Walking with a backpack loaded to 40% body weight did affect use of the hands with a significant decrease in pinch strength in the dominant hand.

38. PREDICTING RUNNING TIMES IN 1500M, 3000M, AND 5000M RACES USING THE 3-MINUTE ALL-OUT EXERCISE TEST FOR RUNNING

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The 3-minute all-out test (3MT) is a practical method to determine critical speed (CS) and finite capacity for speeds above CS, D'. CV and D' represent the slope and y-intercept on a distance-time graph when examining a series of time to exhaustion tests. Thus, given this relationship, the 3MT can be a predictor of time over a predetermined race distance. The use of results from the 3MT to predict time trial performance in males and females for distance running events (1500m, 3000m, and 5000m) has yet to be investigated. Purpose: To examine the use of the 3MT field test as a means of predicting race performance in running events: 1500m, 3000m, and 5000m. Methods: Ten healthy and competitive runners (7 male and 3 female; age 20.6 ± 2.1 years) performed a 3MT on a 400m outdoor track while wearing a GPS wristwatch. Participants were instructed to build up to the maximal speed and maintain as fast of a running speed throughout the entire test. Race time predictions for distance events on the track (1500m, 3000m, and 5000m) were determined from results of the 3MT test (CV: 5.12± 0.44 m/s; D':154.1 ± 43.2 m). Results: Findings indicated that results from the 3MT may closely predict race performance for the 1500m, 3000m, and 5000m ($R2 = 0.902$, 0.896 and 0.949 respectively). Predictions yielded low coefficients of variation (%) (1500m: 2.76%; 3000m: 2.51%; 5000m: 2.99%) and strong intraclass correlations values (1500m: 0.902; 3000m: 0.945; 5000m: 0.915). The typical error (TE) of the predicted race performances in the 1500m (TE = 6.78s, 95% CI [4.56s, 14.17s]), 3000m (TE = 14.95s, 95% CI [10.32s, 28.63s]), and 5000m (TE = 35.46s, 95% CI [24.48s, 67.92s]) races indicated minor inconsistencies between observed race performance. The 5000m race had the most accurate predictions of performance time; mean predicted race performance was 960.9 ± 98.2s; compared with the observed race performance that was 1030.8 ± 140.7s. Conclusion: The 3MT may accurately predict race performance in the 1500m, 3000m, and 5000m running races. The practicality of a 3MT provides a significant benefit for coaches to predict time trial performance as well as use the results to prescribe training.

39. SHOULDER TAPS: RELATIONSHIPS BETWEEN A NEW MOVEMENT SCREENING ASSESSMENT WITH PHYSICAL FITNESS IN DEPUTY SHERIFF RECRUITS

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Screening tests (e.g. the Functional Movement Screen; FMS) are used to evaluate movement deficiencies in tactical populations. Poor movement patterns may affect running and jumping and potential risks of injury, which may affect job performance. The overhead squat (OS) has been isolated to analyze total body mechanics, specifically knee valgus and limited hip flexion. Within the FMS, multiple actions (trunk stability push-up, active straight leg raise, rotary stability) assess trunk stability, which is time consuming. A single screen that identifies deficiencies indicated by multiple FMS actions could be useful. The shoulder taps (ST) is a new screen that may provide this. ST incorporates a position similar to the push-up, challenges the trunk along with stability of the shoulders and hips, and is more time efficient. If the ST provides disparate information to the OS, this screen could be useful for practitioners. The purpose of this study was to determine whether the OS correlated with ST, and relationships between the ST to physical fitness tests. Retrospective analysis was conducted on two academy classes (158 males, 44 females). The OS and ST were scored on a scale of 0-3 from the best of 3 repetitions. Next, recruits completed the following: push-ups and sit-ups in 60 s; 75-yard pursuit run; vertical jump; medicine ball throw; and multi-stage fitness test (MSFT). A correlation and bivariate regression was used to predict ST score from the OS ($p < 0.05$). Spearman's correlations ($p < 0.05$) determined relationships between the OS and ST to the fitness tests. A small correlation was found between the OS and ST ($r = 0.23$), but the predictive ability of the OS for the ST score was low ($r2 = 0.05$). The ST did have a significant relationship with the MSFT ($r = 0.15$). Though the OS and ST did correlate, the predictive relationship suggested both tests measured different movement characteristics. Similar to established research, the ST had minimal capacity for associating movement deficiencies to fitness tests. There was a relationship with the MSFT, which incorporates high-intensity running. Poor trunk stability during running could limit performance, which may be indicated by the ST. More research is necessary to determine relationships between ST and fitness, in addition to injury screening capabilities in deputy sheriff recruits.

40. DIFFERENCE IN PHYSICAL CHARACTERISTICS AND FITNESS OF RECRUITS FROM SMALLER VERSUS LARGER LAW ENFORCEMENT AGENCIES

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Larger law enforcement agencies (LEAs) will often hold academy training classes that include recruits hired by the large agency (LA), and recruits hired by smaller agencies (referred to as participating agencies; PA). Ideally, recruits should have adequate levels of physical fitness prior to academy as higher levels of fitness increase their likelihood of completing academy training. However, LA that need to fill more positions may have recruits with a wider range of fitness levels. The purpose of this study was to compare the physical characteristics and fitness of incoming law enforcement recruits from a LA and PA prior to academy. Retrospective analysis was conducted on eight academy classes, with a total of 581 recruits (481 males, 100 females). Physical characteristics measured were: age (LA = 27.47 ± 6.55 years; PA = 27.13 ± 4.79 years), height (LA = 172.54 ± 11.13 cm; PA = 175.77 ± 8.22 cm), and body mass (LA = 80.45 ± 13.51 kg; PA = 81.34 ± 20.57 kg). The fitness tests included: push-ups and sit-ups completed in 60 s; vertical jump (VJ); medicine ball throw with a 2-kg ball (MBT); 75-yard pursuit run (75PR), and multi-stage fitness test shuttles (MSFT). A univariate analysis of variance ($p < 0.05$), with sex as the covariate, was conducted to determine the difference between LA (n = 510) and PA (n = 70) recruits. There was a significant difference in push-ups and sit-ups between LA and PA, with recruits from the PA performing significantly more repetitions in the push-up (47 ± 13 vs. 42 ± 15) and sit-up (41 ± 9 vs. 35 ± 9) tests. There were no significant differences between LA and PA recruits in the other tests. The differences in the strength endurance tests may be indicative of the larger variation within a greater hiring pool to fill vacant positions for the LA in this study, leading to a greater range of fitness levels in their recruits. PA could also be more selective in their hiring if there are more applicants than positions, although this cannot be confirmed from this study. Nonetheless, due to select fitness differences between LA and PA recruits, LEA staff should recognize that differences that may exist in recruits from different agencies prior to training. Future analysis is needed to determine where any fitness differences that may exist between agencies prior to academy is influenced by training advice provided by the agency, or more selective hiring practices.

41. Relationships between the 1.5-mile Run and Multi-stage Fitness Test in Deputy Sheriff Recruits Post-Academy Training

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The most popular method for measuring aerobic fitness within US law enforcement agencies (LEA) is the 1.5 mile run (1.5 MI run). A limitation of the 1.5 MI run is that it relies on the recruits' internal pacing. In contrast, the 20m multi-stage fitness test (MSFT) is more popular globally in tests of LEA recruits and officers, and is externally paced which does not allow the individual to perform at a pace they are comfortable with. Academy training is used to prepare recruits for the rigors of duty and to enhance physical fitness. If training approaches are successful during academy, aerobic fitness as measured by the 1.5 MI run and the MSFT should be relatively similar, in that recruits should be aerobically fit and have the high-intensity running capacity to perform well in both tests. The purpose of this study was to analyze the relationship between the 1.5 MI run and the MSFT of deputy sheriff recruits at the end of academy. Retrospective analysis on 5 academy classes from one LEA was conducted (227 males, 34 females). The 1.5 MI run and MSFT were conducted in the last few weeks of the recruits' 22-week academy. Time was recorded for the 1.5 MI run while total shuttles were recorded for the MSFT; estimated maximal aerobic capacity (VO_2max) was calculated from both tests. Estimated VO_2max from the aforementioned tests was compared with paired samples t-tests. Pearson's correlations and linear regression scatter plots calculated relationships between the 1.5 MI run and MSFT. Each sex was analyzed separately, with $p<0.05$ set for all analyses. The VO_2max calculated from the 1.5 MI run were significantly greater than those for the MSFT for both males (47.04 vs. 40.88 ml/kg/min), and females (43.16 vs. 37.02 ml/kg/min). The VO_2max of the 1.5 MI run significantly correlated with the MSFT for males (r = -0.49) but not females (r = -0.31). The r2 values from the regression equations for males (0.24), and females (0.10) were both low. The results suggest that recruits performed relatively better in the 1.5 MI run compared to the MSFT. The physical training program tended to emphasize calisthenics, interval running circuits that lacked evidence-based work: rest ratios, and distance running; this could have impacted these results. Given the weak relationships between the tests, especially for females, this would suggest recruits still have limitations in high-intensity, externally paced running. Since the job demands of a deputy sheriff are externally paced by nature, this outcome is not ideal. Academy training programs should explore the use of evidence-based high-intensity running programs.

43. PHYSIOLOGICAL ASSESSMENT OF A 16-DAY, 4,385 KM ULTRA-ENDURANCE MOUNTAIN BIKE RACE: A CASE STUDY

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Introduction: Very little is known regarding the physiological toll of ultra-endurance exercise. We had the unique opportunity to characterize a number of physiological variables in 1 athlete before and 36 h following the completion of the Great Divide Race (GDR). The race traces a 4,385-km path along the continental divide from Banff, Alberta Canada to the Mexican border at Antelope Wells, NM, and covers over 60,960 m of elevation gain. **Methods:** Our subject rode an average of 16.3 h per day over 17 consecutive days, covering approximately 160 miles per day. Quadriceps muscle biopsies, blood samples, and a battery of physiological assessments were taken 3 weeks prior to the ride (pre-GDR) and 36 h following its completion (post-GDR). **Results:** Body weight (pre=76.7 kg vs. post=76.6 kg), maximal output on a cycle ergometer and VO_2*max* (pre = 59.1 ml $O_2 \bullet min^{-1} \bullet kg^{-1}$ vs. post = 59.1 ml $O_2 \bullet min^{-1} \bullet kg^{-1}$) were unchanged pre- to post-GDR. Maximal fat oxidation during the graded exercise test was reduced from 0.351 ± 0.052 to 0.198 ± 0.049 gram $\bullet$ min^{-1}, and substrate utilization shifted towards a preference for carbohydrate post-GDR. Resting energy expenditure increased from 1892 Kcal $\bullet$ day^{-1} pre-GDR to 2011 Kcal $\bullet$ day^{-1} post-GDR. Total hyperemic response to passive leg motion, a measure of vascular endothelial function, was reduced by 49% post-GDR. High resolution respirometry of permeabilized *v. lateralis* muscle fibers demonstrated decreases in oxidative phosphorylation capacity (pre = 141.7 pmol $O_2 \bullet s^{-1} \bullet mg^{-1}$ vs. post = 100.6 pmol $O_2 \bullet s^{-1} \bullet mg^{-1}$). A multiplex cytokine array indicated a profound reduction in the quantity of both circulating and intramuscular pro-inflammatory cytokines (. There were no changes in muscle fiber size, nuclear content or fiber type proportions pre- to post-GDR. **Conclusion:** Exercise performance was maintained despite substantial reductions in muscle mitochondrial and vascular endothelial function post-GDR. These reductions may have limited any expected training increase in VO_2*max.* Further, the profound reduction in circulating inflammatory cytokines post-GDR, suggests an immuno-suppressed state that has been shown to accompany prolonged

42. LOWER LIMB PEAK POWER AND CORTICAL AND TRABECULAR BONE STRENGTH IN THE GENERAL POPULATION

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INTRODUCTION: Physical activity is beneficial to both the skeletal and muscular systems. The connection between muscular forces and bone strength is explained by the Mechanostat Theory (bone responds to forces applied to them). Therefore, muscle function tests may provide a non-invasive measure of bone strength. Recent studies report significant correlations between lower limb muscle power and bone strength (Janz, 2015, Yingling, 2017). PURPOSE: To assess the relationship between lower limb power and bone strength in the cortical and trabecular bone of the radius and tibia in a healthy (non-athletic) population. METHODS: 40 females (age (yrs) 31.6 + 12.5, height (cm) 160.7 + 6) and 37 males (age (yrs) 26.8 + 7.7, height (cm) 172.8 + 7.7) performed a vertical jump test. Peak Power (PP) was calculated from vertical jump height (Sayers, 1999). Peripheral Quantitative Computed Tomography (pQCT) was used to quantify bone strength at the radius and tibia for both cortical and trabecular sites. Cortical site measures included Moment of Inertia (J), Cortical Area (Ct.Ar), cortical Bone Mineral Density (cBMD), Strength-Strain Index (SSI). Bone Strength Index (BSIc), Total Area (T.Ar.tb), trabecular volumetric Bone Mineral Density (vBMD.tb), and trabecular volumetric Bone Mineral Content (vBMC.tb) were measured. Pearson's correlation analyses were run $p<0.05$. RESULTS: PP measures were associated with cortical and trabecular bone strength parameters in the tibia and radius. Strong associations were found in cortical bone sites except for cBMD as indicated by the correlation coefficients (r) [tibia - J (0.7374), Ct.Ar (0.7650), SSI (0.7344), radius - J (0.7028), Ct.Ar (0.7830), SSI (0.6788)]. Similar results were found in the trabecular region for both the tibia and radius respectively [BSIc (0.6199), T.Ar.tb (0.5204), vBMc.tb (0.6016), vBMD.tb (0.4415) and BSIc (0.7950), T.Ar.tb (0.5943), vBMc.tb (0.7371), vBMD.tb (0.7188)]. CONCLUSION: PP is associated with cortical and trabecular bone strength parameters in the radius and tibia for a diverse population of healthy adults. PP seems to have the greatest effect on bone strength and structure for both the cortical and trabecular sites, but is not associated with cortical BMD. Lower limb muscle power could provide a means to monitor bone health in a general population.

44. SYNCHRONIZATION OF STEP-PHASE WITH CARDIAC CYCLE DURING STEADY-STATE TREADMILL RUNNING

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Synchronizing cardiac diastole with foot strike may maximize the efficiency with which skeletal muscle promotes venous return of blood to the heart. As a result, left ventricular stroke volume may be improved, leading to a decreased heart rate and perceived exertion at a given workload. Purpose: The aim of this study is to assess metabolic responses, heart rate, and perceived exertion to running when foot strike occurs during either cardiac systole (CS) or cardiac diastole (CD). Methods: Eight physically active participants (7 male; 25.3 ± 8 yrs.; BMI 23.6 ± 3.2) performed a single testing session of treadmill running at 2.4 m*s (± 0.22), during which an auditory metronome prompted foot strike to match either CD or CS. Single-lead ECG provided signals for CD and CS conditions, occurring at 45% and 100% of each R-R interval, respectively. Participants performed 5-min stages of both CD and CS stepping in a randomized order, which was blinded to the participants and test administers. Metabolic variables (VE, VO_2, RF,TV) and heart rate (HR) were recorded continuously and averaged over the last 3 minutes of each condition. Perceived Exertion (RPE) was recorded during the final minute of each stage. Paired T-tests were used to compare the dependent variables between conditions. Results: HR was significantly lower (163.0±5 vs. 170.1±4 bpm; $p < 0.05$) when foot strike occurred during CD compared with CS, at equal workloads. Minute ventilation (VE), oxygen consumption (VO_2), respiratory frequency (RF), tidal volume (TV) and RPE were not significantly different between conditions ($p > 0.05$). Conclusion: During relatively short, steady-state running conditions, synchronization of foot strike with CD results in a significantly lower HR when compared to CS. These findings suggest that stepping during CD may be beneficial to running performance.

45. THE EFFECTS OF 21 DAYS OF MENTAL STRENGTH TRAINING ON PERFORMANCE AND PHYSIOLOGICAL VARIABLES

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Introduction: Short-term grit and resilience training, as well as internal self-talk training have increased physical performance. However, little is known about longer mental training. The purpose of this study was to perform 21 days of mental training in order to observe how performance and the physiological variable would change. Methods: Participants consisted of 21 college-aged (11 mental strength, 10 control) individuals (20.9 +/- 0.9 years, body weight 73.1 ± 10.8kg, height 175.7 ± 9.6cm, V_{O2}peak 46.5 ± 9.1mL/kg/min). A V_{O2}peak was performed on a cycle ergometer on day one. Subsequent visits consisted of time trials to exhaustion (TTE) performed at 10% above ventilatory threshold. MS groups watched a 10-minute video each day for 21 days while CON did no training. VO_2, ventilation, heart rate (HR), RPE, VAS scores (0-100) for pain and fatigue, and EMG were recorded during all time trials. Participants took the GRIT-S and CD-Risc psychological studies before the first and last TTE. RM-ANOVA were done to compare group and time differences. Results: TTE significantly increased 13.67 9.9% following MS and decreased by 0.5 11.6 following CON ($p < 0.05$). VO_2, VE, RPE, fatigue, and pain were unchanged following MS. HR was significantly higher following 21 days of MS as compared to CON at 20, 40, 60, 80, and 100% of the TTE ($p < 0.05$). GRIT-S was unchanged following MS, though the Perseverance of Effort subscale had a nearly significant increase (14.0 1.3 to 14.8 1.3, $p = 0.08$). Similarly, with the CD-Risc, MS approached significance with a 1.5 3.0 increase while CON decreased by 1.4 3.5 ($p = 0.08$). Discussion: MS training significantly improved TTE performance, beginning at 14 days into the training perhaps by training participants to have an increased perseverance of effort and/or an increased ability to overcome adversity. The increases in heart that occurred following MS may be due to the longer second time trial and measuring heart rate at a slightly later absolute time. By measuring heart rate later, metabolites would be expected to be slightly higher, increasing heart rate. Finally, there were no changes in RPE for either group suggesting RPE may be a regulator of exercise and contribute to cessation of exercise.

46. MACROPHAGE INFILTRATION AND ACTIVATION IN OLD AND YOUNG SKELETAL MUSCLE FOLLOWING LENGTHENING CONTRACTIONS

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Purpose: Muscle repair following injury is dependent on the timely activity of pro-inflammatory (M1) and anti-inflammatory, pro-regenerative (M2) macrophages. Following acute muscle injury, healthy skeletal muscle experiences a rapid and vigorous inflammatory response. It is known that aged muscle experiences poor regenerative potential following injury, but the cause is not well-understood. There is little evidence examining the differences in response between old and young macrophages. The purpose of this study was to test the hypothesis that biological aging would cause an atypical accumulation of M2-like macrophages in humans. Methods: To induce muscle damage, 11 young (22 ± 2 yrs) and 8 old (71 ± 7 yrs) subjects performed 300 lengthening contractions on a Biodex dynamometer. Strength loss and muscle soreness were used as indirect measures of muscle damage. Muscle biopsies were taken before the exercise bout, and again at 3, 24, and 72 hours post-exercise. Results: There were no significant differences between young and old subjects for anthropometric measures. In both old and young groups, there was an increase in muscle soreness, as well as a decrease in strength. As hypothesized, there was a significantly greater accumulation of anti-inflammatory CD206+/CD68+/DAPI+ macrophages in the old, pre-exercise (1840 ± 1111 M2 macrophages/mm3 vs. 3218 ± 1868 M2 macrophages/mm3) , at 3 hours post-exercise, (2122 ± 1413 M2 macrophages/mm3 vs 2866 ± 1044 M2 macrophages/mm3, at 24 hours post-exercise, (1569 ± 835 M2 macrophages/mm3 vs. 2957 ± 718 M2 macrophages/mm3), and at 72 hours post-exercise (2890 ± 1720 M2 macrophages/mm3 vs. 4066 ± 916 M2 macrophages/mm3). When calculated as a ratio of anti-inflammatory macrophages to total macrophages, the overall proportion of anti-inflammatory (M2) macrophages was significantly higher in the old (group: p=0.0005). Conclusion: Aged muscle appears to have an irregular response following exercise induced muscle damage. This may lead to complications in muscle repair and adaptation. Studies suggest that discrepancies in macrophage activation can lead to impaired adaptation and decreased muscle quality.

47. BASELINE CHARACTERISTICS AND CROSS-SECTIONAL ASSOCIATIONS AMONG YOUNG ADULT CANCER SURVIVORS

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Purpose: Cancer survivors are less active than the general population. Previous research has examined predictors of physical activity among cancer survivors; however, few studies have focused on adolescent and young adult (AYA) survivors. The purpose is to examine cross-sectional relationships between demographic, psychosocial, disease-related characteristics, and measures of physical activity (steps, MVPA, and sedentary time) among AYA cancer survivors. Methods: Eligible participants were diagnosed with cancer between 18-39y, >6 months post-treatment, and engaged in <60 min/wk of exercise. Participants wore an activPAL monitor for 7-days to obtain estimates of physical activity and sedentary time. Participants self-reported their health history (e.g., cancer type and treatment), demographics, psychosocial correlates (e.g., self-efficacy), and symptoms (e.g., fatigue). We used pearson correlations to assess bivariate relationships. For variables with significant correlations, we used linear regression models to assess the relationship between activity variables, demographics, and psychosocial factors. Results: Fifty-four participants were eligible and provided informed consent; of those, 51 completed the baseline assessments and 48 had valid baseline data. Fatigue was significantly correlated with steps per day (R = -0.39), minutes of MVPA (R = -0.38), and percent of time sedentary (R = 0.40). There were no other significant correlations between psychosocial variables and steps, MVPA, or sedentary time. After adjusting for age and gender, breast cancer survivors had significantly higher steps per day than other cancer types (1,651 steps), more minutes of MVPA (13.7 min/day) and less sedentary time (-8.4%) $p<0.05$). The relationship between higher levels of fatigue, less physical activity, and more sedentary time remained significant after adjusting for age, gender, and cancer type ($p<0.05$). Conclusions: Preliminary results indicate a significant relationship between higher levels of fatigue, more sitting time, and less daily physical activity. Future research is needed to determine if increasing physical activity will reduce fatigue in AYA cancer survivors.

48. FITNESS, NOT FATNESS, PREDICTS CARDIOVASCULAR OUTCOMES IN COLLEGE STUDENTS

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Background: 30-50% of college students do not get enough PA and 30% engage in none. Because of this, on campus specifically, physical inactivity has been identified as a pressing health risk factor that urgently needs to be addressed. Additionally, roughly 20% of college aged students have high blood pressure (BP) and physical inactivity is a common cause. Yet in spite of this there is still sparse amount of research within this population. Purpose: The purpose of this correlational study was to assess the impact of cardiovascular fitness and body fat on central hemodynamics of college students. Data collection is ongoing and preliminary data is presented here. Methods: College students were recruited to participate in this correlational study. Subjects had anthropometric measurements, a V_{O2}Peak assessment, and measurements of brachial and central BP along with central pulse wave velocity and pulse wave analysis taken. Results: 43 overweight (26 ± 4 kg/m2) college aged (22 ± 3 yr) subjects are included in the analysis. There were no significant association with age or gender in our population, so these variables were not included in the analysis. V_{O2}peak was significantly associated with decreased body fat percentage (r=-.615, p=0.001), BDBP (r=-.495, p=0.01), CDBP (r=-.472, p=.015), and Aix@HR75 (r=-.417, p=.034). Body fat was only associated with lower Aix@HR75 (r=.443, p=.003), while waist-to-hip ratio was not significantly associated with any outcomes. Conclusion: Our preliminary results suggest that in a population of relatively healthy but overweight college students, fitness, not fatness, may be more important on markers of cardiovascular health. Further subject recruitment is needed to verify these results.

49. EFFECTIVENESS OF CIRCUIT RESISTANCE TRAINING USING ELASTIC BANDS FOR INDIVIDUALS WITH SPINAL CORD INJURY

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Purpose: Exercise can improve the health, fitness, and psychological well-being after spinal cord injury (SCI). In particular, circuit resistance training (CRT) can increase muscle strength and fitness with minimal aggravation of shoulder pain. The purpose of this study was to utilize a CRT protocol modified to be used with elastic bands to determine if levels of exercise intensity that usually correspond to health benefits could be attained. We hypothesized that acute increases in heart rate (HR) and oxygen consumption (VO_2) in response to the activity performed by the SCI group would meet thresholds associated with cardiometabolic health benefits. Methods: Individuals with paraplegia subsequent to SCI (3 males, age 43 ± 7 yrs; 2 females, age 34 ± 11 yrs) and able-bodied (AB) controls (3 males, age 32 ± 7 yrs; 1 female age 30 yr) volunteered for the two-day study. On day 1, peak oxygen consumption (V_{O2}peak) was measured during performance of a maximal exercise protocol with an arm cycle ergometer (Corival, Lode). On day 2, seated resting metabolic rate was measured for 10 minutes, followed by performance of a modified version of the CRT protocol proposed by Jacobs and colleagues (2002). The protocol consisted of three rounds of 6 upper body resistance exercises performed at a 3-0-3 tempo and modified to be performed with elastic bands (Theraband). Intervals of resistance exercise were interspersed with 2-minute bouts of high cadence, low resistance arm cycling. Levels of VO_2, recorded via open-circuit spirometry (CPET, Cosmed), and HR, measured through a chest strap monitor (Tickr, Wahoo Fitness), were collected on both visits. Results: V_{O2}peak was significantly lower in SCI (21.3 ± 10.6 ml/min/kg) compared to AB (36.6 ± 8.8 ml/min/kg). During the CRT activity, raw values of VO_2 in SCI (9.9 ± 2.8 ml/min/kg) were lower than AB (10.5 ± 2.2 ml/min/kg), and raw values of HR in SCI (113 ± 8 bpm) were higher than AB (102 ± 5 bpm); however when normalized to resting and peak levels, the relative intensity of the exercise for SCI (56% ± 14 of V_{O2}reserve, 74% ± 10 of HRmax) was significantly higher than AB values (32% ± 2 of V_{O2}reserve, 66% ± 13 of HRmax). Conclusion: The modified CRT protocol allowed SCI participants to effectively reach moderate levels of exercise intensity that usually correspond to health benefits.
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50. HIGH-FREQUENCY RESISTANCE EXERCISE OVERTRAINING ATTENUATES POWER, BUT NOT FORCE ADAPTATIONS IN RECREATIONALLY TRAINED MALES

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Decrements or stagnation in muscular performance are a criterion for overtraining. Insufficient recovery between training bouts might contribute to overtraining, but it is not clear which muscular performance variables are most adversely affected. PURPOSE: To determine if muscular strength or power are more adversely affected by stressful high-frequency overtraining with insufficient recovery compared to non-stressful training. METHODS: Sixteen resistance-trained males were matched on one-repetition maximum barbell back squat (1RM-BS) and randomized into a control group (Mean±SD; CON; n=8, age=21±1.2yrs, hgt=180±11cm, body mass=83.9±10.7kg) or an overtraining group (OT; n=8, age=21±2.3yrs, hgt=155±63cm, body mass= 77.8±11.3k). CON performed three high power speed-squat training sessions on non-consecutive days, while the OT performed fifteen high power speed-squat training sessions over 7.5 days. 1RM-BS, 1RM knee extension (1RM-KE), and mean power (PWR) of barbell back squats at 60% of 1RM were measured prior to training (BL), immediately after the training intervention (POST), and following one-week of recovery (REC). A 2 X 3 (Group X Time) repeated-measures ANOVA determined differences in performance measures over time and between groups. Alpha was set at $p<0.05$ RESULTS: PWR did not change at any time-point in OT ($p=0.423$). In CON, PWR at REC was higher than baseline (BL) ($p=0.06$). Percent increase in PWR at REC was higher in CON compared to OT ($p=0.03$). 1RM-BS did not display an interaction ($p=0.60$) but tended to show a main effect of time ($p=0.08$) for improvements in strength. 1RM-KE displayed a main effect of time ($p=0.006$), with increased 1RM at POST compared to BL ($p=0.007$). CONCLUSION: Both CON and OT demonstrated strength improvements. Mean PWR was higher in CON at REC compared OT, suggesting that adaptations in PWR occurred only after a period of recovery. Since adaptations in PWR were attenuated but not strength, it suggests attenuation in performance was specific to the overtraining stimulus (i.e. high power). These results suggest power is more adversely affected by a high-frequency stressful training stimulus than indices of maximal strength. Funding was supported through a research grant from the National Strength and Conditioning Association.

51. EFFECT OF HIGH INTENSITY INTERVAL TRAINING ON CARDIORESPIRATORY FITNESS IN BREAST CANCER PATIENTS UNDERGOING ANTHRACYCLINE CHEMOTHERAPY

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Objectives: Anthracycline is a cardio-toxic chemotherapy regimen to treat breast cancer, however, breast cancer patients experience significantly impaired cardiorespiratory fitness (CRF) during and after anthracycline chemotherapy. Exercise, particularly high-intensity interval training (HIIT), appears to be more effective than continuous, steady-state exercise training for increasing CRF in patients with heart failure. It remains unclear whether HIIT improves CRF in breast cancer patients undergoing anthracycline chemotherapy. We sought to determine the effects of HIIT on CRF, measured by VO_2max, in breast cancer patients undergoing anthracycline chemotherapy. Methods: Twenty breast cancer patients were randomized to either the HIIT (n=10) or delayed (DEL; n=10) groups. CRF was assessed at baseline and post-intervention using a maximal cycling protocol to obtain VO_2max. Peak power output (PPO) was obtained at the last stage of testing to prescribe intensity of HIIT. The HIIT group participated in an 8-week HIIT intervention 3 times per week on a cycle ergometer. Each HIIT session included 7 alternating bouts of 90% PPO followed by 10% PPO. The DEL group was offered the same HIIT intervention after the 8 week study period. Paired t-test and repeated measures ANOVA were performed to assess changes in CRF. Results: At baseline, the HIIT and DEL groups did not differ by age (46.9±9.8 yr), BMI (31.0±7.5 kg/m^2), and VO_2max (18.8±6.0 ml/kg/min). Post-intervention, VO_2max significantly decreased (-15.5±8.9%) in the DEL group ($P<.01$). VO_2max did not change post-intervention in the HIIT group (19.5±4.0 to 19.1±6.6 ml/kg/min; -1.2±6.2%; $P>.05$). There was no group (HIIT vs DEL) x time interaction (Pre vs Post) following the 8-week intervention ($P=0.07$). Conclusion: An 8-week HIIT intervention did not significantly improve CRF in breast cancer patients undergoing anthracycline chemotherapy, however HIIT may be an option to maintain CRF during anthracycline chemotherapy.

52. MUSCLE ACTIVITY WHILE SWIMMING IN TRIATHLON WETSUITS

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In a triathlon event, people use various strategies and equipment for enhancing their triathlon performance in each exercise mode (i.e., swim, bike, run). During the swimming portion of a race, triathletes will typically wear a wetsuit that is categorized as either full sleeve or sleeveless. Anecdotally, triathletes may select a sleeveless wetsuit because the full sleeve may increase shoulder movement resistance. Purpose: The purpose of this study was to investigate shoulder muscle activity influenced by wetsuit design. Methods: Seven subjects (5 male and 2 female, age: 45.7 ± 8.0 yrs, height: 174.8 ± 10.5cm, mass: 70.1 ± 9.4 kg) participated in the experiment. Muscle activity of the Anterior Deltoid (AD) and Posterior Deltoid (PD) was measured (2000 Hz) using a water proofed electromyography (EMG) system (MiniWave, Cometa, Italy). After a self-directed warm-up, participants were asked to swim 50m at a _—…somewhat hard' pace that they could maintain the pace for a sprint triathlon distance (750m) for each condition: No wetsuit (NWS), sleeveless wetsuit (SLW), and full sleeve (FSW). PD EMG data were smoothed using a 4th order Butterworth filter (cutoff frequency = 4 Hz). The smoothed data were used to identify the beginning and ending points of a stroke cycle. Five consecutive stroke cycles were then extracted for analysis as well as the time to complete the five cycles. Data analysis was performed using the raw unfiltered EMG data which were reduced by removing any zero offset, full wave rectifying the signal, and calculating the average EMG across the 5 stroke cycles (PDavg, ADavg). Time and average data were compared between conditions using a 1 x 3 (wetsuit condition) repeated measures ANOVA. Results: Muscle activity of both AD and PD were not different among all wetsuit conditions ($p>0.05$). However, time was different among conditions ($p<0.05$) with FSW being shorter than NWS ($p<0.05$), but between the two wetsuits (FSW and SLW) were not different ($p>0.05$). Conclusion: While swimming at a somewhat hard intensity, wetsuit design did not influence muscle activity of the shoulder muscle. However, stroke time was influenced by wearing a wetsuit regardless of design. Triathletes might get a benefit to reduce their swimming race time by wearing a wetsuit regardless of full-sleeve or sleeveless.

53. SEXUAL DIMORPHISM OF HUMAN SWEAT GLAND FUNCTION

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Purpose: Sudomotor control of sweat gland function results in an increase in cytosolic Ca^{++} due to an IP_3–mediated Ca^{++} release from intracellular stores, an influx of Ca^{++} from extracellular fluid, and the opening of Ca^{++}-activated chloride channels. In cultured sweat gland cells the opening of large conductance Ca^{++}-activated K^+ (KCa1.1) channels contributes to this secretory process by providing an electrochemical gradient that supports Ca^{++} and Cl^- conductance. The ability to demonstrate this hypothesis *in vivo* has been difficult. Here we examined the ability of 50 mM TEA, a non-selective KCa1.1 channel blocking agent, to attenuate cholinergic-mediated sweating in 22 healthy adults (8 females, 14 males). **Methods:** TEA was delivered by intradermal microdialysis and local sweat rate (SR) was measured with a small sweat capsule mounted on the skin. The skin was stimulated at a constant current intensity of 2.5 mA for 30 s at frequencies of 0.2, 1, 2, 4, 8, 16, 32, and 64 Hz using two small stainless steel stimulating electrodes. This procedure produced a sigmoid shape stimulus-response curve plotting the area under the SR-time curve versus stimulus frequency. **Results:** Overall, we noted significant variability in the effect of TEA on peak sweat output. We separated the data based on sex and found that male subjects demonstrated a fairly large 35% reduction in peak sweat output (89.2 3.2 to 56.8 ± 3.7 AUC %peak, $p<0.0001$) during application of 50 mM TEA. In contrast, female subjects produced negligible reductions on sweat output (92.2 ± 4.5 versus 87.8 ± 12.2 AUC %peak, $p=0.905$) with 50 mM TEA. **Conclusion:** Blockade of KCa1.1 channels with 50 mM TEA markedly attenuates cholinergic-activated local sweat rate in male subjects. These data support the hypothesis that the opening of KCa1.1 channels in human sweat gland epithelial cells contribute to the formation of primary sweat. In contrast, sweat glands of female subjects do not demonstrate a dependence on KCa1.1 channels to produce primary sweat. It is likely that sweat glands express and use a different K^+ channels to facilitate sweat production. This change in K^+ expression is likely due to the sex hormone estradiol which has been shown to influence expression and translocation of intermediate conductance K^+ channels in a variety of exocrine epithelial cells.

55. THE EFFECTS OF GENDER ON THE HR-VO_2 RELATIONSHIP DURING CYCLING

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A target HR range is often used to prescribe intensity of aerobic exercise based on the linear relationship between HR and oxygen consumption (VO_2) during exercise. This relationship can be expressed either as a percentage of maximal HR (%HRM) and VO_2 ($\%V_{O2}M$) values or a percentage of HR reserve (%HRR) and VO_2 reserve ($\%V_{O2}R$) values. These relationships are presumed to be similar for both men and women. The purpose of this study was to evaluate the HR-VO_2 relationship during cycling in men and women who were cycling as a mode of training. Resting metabolic rate (RMR) and VO_2max were measured in 17 men (25.9 ± 5.2 yr) and 15 women (22.6 ± 5.2 yr). The HR and VO_2 values recorded during the maximal exercise test were used to determine the HR-VO_2 relationship. The RMR in males (3.7 ± 0.4 mL/kg/min) and females (3.4 ± 0.3 mL/kg/min) were significantly different ($p = 0.01$). Likewise, the VO_2max values (53.0 vs 43.5 mL/kg/min) and $V_{O2}R$ values (49.3 vs 40.4 mL/kg/min) were significantly ($p < 0.0001$) higher in males than in females, respectively. The HR-VO_2 relationship was expressed in absolute terms (bpm vs mL/kg/min) as well as %HRM - $\%V_{O2}M$ and %HRR - $\%V_{O2}R$. A mixed model analysis of the data indicated a significant gender effect in the intercept ($p < 0.0001$) and slope ($p < 0.0001$) of the HR-VO_2 relationship when HR and VO_2 were expressed in bpm and mL/kg/min, respectively. The gender differences in the HR-VO_2 relationship were abolished when HR and VO_2 were expressed as a percentage of maximal or reserve values. The results of this study indicate that the HR–VO_2 relationship is similar in males and females when HR and VO_2 are expressed relative to maximal and reserve values. Gender differences in resting VO_2 and maximal VO_2 values do not affect the HR-VO_2 relationship. Therefore, the same HR training zones suggested by the ACSM can be used for both males and females.

54. EFFECTS OF SALIVARY CORTISOL RESPONSES TO A MAXIMAL 2000M ROWING ERGOMETER TEST WITH COLLEGIATE ROWERS

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Introduction: Cortisol, often referred to as the "stress hormone," is elevated in response to anxiety or anticipated stress. Post-exercise serum cortisol concentration has been correlated to rowing performance on a 2,000 m (2k) test. Therefore, the purpose of the present study was to examine salivary cortisol levels of collegiate club rowers before, immediately and 20 minutes after a 2k ergometer test. Methods: Seventeen collegiate club rowers from a single university (11 males, 6 females), age 21.4 ± 2.43 yrs., height 170.8 ± 10.51 cm and weight 105 ± 16.14 kg performed a maximum 2k test. VO_2 max average between male and females was 42.8 ml/kg/min. Salivary samples were collected by the passive drool method into a sterile container. Samples were taken prior to, immediately after and twenty minutes (recovery) after finishing the 2k test. Participants were instructed to try and obtain their personal record. No type of encouragement was given throughout the trial. Alpha-level was set a priori at 0.05. Results: The results indicate a significant difference in salivary cortisol between pre/post ($p=0.01$) and pre/recovery ($p= 0.001$) but no difference between post and recovery ($p=0.211$). Conclusion: These findings suggest that cortisol levels rise immediately after a physically demanding event (max 2k). However, salivary cortisol was unable to recover to baseline levels following 20 minutes of recovery. Further analysis should examine the relationship between the participants VO_2 max, fatigue as assessed by oxygenation levels of the prefrontal cortex and locally at the skeletal muscle with cortisol levels and perception of stress levels.

56. RELATIONSHIP BETWEEN HIP FLEXION ANGLES DURING SUPINE RANGE OF MOTION AND BODYWEIGHT SQUATS

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Purpose: The squat is a common movement pattern in activities of daily living as well as strength and conditioning programs. During the lowering phase of a squat, it has been observed that when an individual is no longer capable of increasing hip flexion (HF), a posterior pelvic tilt (PPT) may occur. The purpose of this study was to determine whether there is a relationship between HF angles at the point of PPT during passive, supine HF and during a bodyweight squat. Methods: 28 participants, 14 male and 14 female, [Age:20.89±1.47 years; Height:1.70±0.11m; Mass:67.63±10.37kg] performed bodyweight squats and underwent assessments of passive, supine HF while outfitted with 32 retroreflective motion capture markers. Kinematic data were sampled at 240 Hz via an eight camera motion capture system (Qualisys AB, Gothenburg, Sweden). Marker position data were filtered and utilized to calculate joint angles using Visual 3D software (C-Motion Inc., Rockville, MD, USA). All joint angles were calculated as motion of the distal segment relative to the proximal using Euler/Cardan angles (x-y-z rotation sequence). Results: Shapiro-Wilk's test ($p>0.05$) identified all variables as normally distributed, and there were no outliers. A Pearson's product-moment correlation indicated a statistically significant, strong positive correlation between left hip joint angle at supine PPT and left hip joint angle at squat PPT, $r(28)=0.746$, $p<0.01$. A significant, strong positive correlation was also indicated between right hip joint angle at supine PPT and right hip joint angle at squat PPT, $r(28)=0.819$, $p<0.01$. Conclusion: These findings suggest that hip joint angles at supine PPT are highly associated with the hip joint angles at which PPT occurs during a squat. Application in future studies may assist with further knowledge regarding the potential risks associated with PPT during a squat, as well as methods for increasing squat depth prior to PPT.

57. MTOR SIGNALING IN HUMAN SKELETAL MUSCLE FOLLOWING ACUTE AEROBIC AND RESISTANCE EXERCISE

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Aerobic (AE) and resistance exercise (RE) training are known to elicit unique adaptions in skeletal muscle. However, the precise molecular mechanisms mediating these unique adaptations remain to be completely resolved. The purpose of this study was to investigate the response of the mammalian/mechanistic target of rapamycin (mTOR) signaling pathway, a known regulator of muscle protein synthesis and fiber size, during the immediate hours following acute AE and RE. In a counterbalanced, crossover design, six healthy, recreationally active young men (27±3 yr) completed acute AE (40 min of cycling, 70% maximal HR) and RE [8 sets, 10 reps, 65% 1-repetition maximum (1RM)], separated by 1 wk. Muscle biopsies (vastus lateralis) were obtained before and at 1 and 4h postexercise and western blot analyses were used to examine changes in the phosphorylation of mTOR signaling proteins. Skeletal muscle mTOR phosphorylation (ser2448) was increased in both groups at 4h, however, this response was greater in RE vs. AE (6.2±1.7 vs. 3.7±0.68 fold, P<0.05). S6K1 phosphorylation (thr389) was also increased in both groups at 4h (RE, 9.91±4.0; AE, 10.2±3.6 fold, P<0.05). In addition, S6K1 phosphorylation was also greater in RE vs. AE at 1h (4.45±0.42 vs. 1.93±0.78 fold, P<0.05) and there was a trend (P=0.08) for increased S6K1 phosphorylation in RE at 1h. 4E-BP1 phosphorylation (thr37/46) was unaffected by exercise, however, postexercise 4E-BP1 phosphorylation was greater in RE vs. AE (P<0.05, main effect of group). No time or group differences were observed for eEF2 phosphorylation (thr56). These data indicate that both acute RE and AE appear to stimulate mTOR signaling. However, our findings suggest that acute RE may target mTOR signaling slightly more than acute AE, at least during the immediate hours postexercise. Further research is warranted to determine whether these subtle differences relate to exercise-mode specific skeletal muscle adaptations. Supported by funding from the GPSA and ASU.

59. RUN TO THE HILLS: THE EFFECTS OF ACADEMY TRAINING ON THE PHYSICAL FITNESS OF LAW ENFORCEMENT RECRUITS ACROSS THREE CLASSES

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Law enforcement agencies (LEA) use the academy period to train recruits in the skills needed to undertake the demands of their job. Exercise programming is the responsibility of staff who tend to follow a paramilitary model, with emphasis on calisthenics, running circuits that lacked evidence-based work:rest ratios, and distance running. Programming is typically not targeted towards individuals or ability based, which could be problematic if recruits within a class have different physical fitness. The purpose of this study was to compare the effects of physical training across three academy classes. Retrospective analysis was conducted on three classes from one LEA (Class 1: ♂ = 62, ♀ = 6; Class 2: ♂ = 47, ♀ = 7; Class 3: ♂ = 51, ♀ = 8). Recruits performed pre- and post-testing in the following assessments: 75-yard pursuit run (75PR), medicine ball throw with a 1.82 kg ball (MBT), and multi-stage fitness test (MSTF). Academy training was conducted over 22 weeks; pre-testing occurred in the week prior to academy, while post-testing occurred in the last few weeks. Multiple repeated measures ANOVA (p<.05) investigated differences in assessment results between classes and pre/post academy training. Due to the nature of LEA academies, each of the classes began their academy training with different fitness levels in at least one assessment. Class 1 (~16.71 s) was significantly faster than Class 3 (~17.42 s) in the 75PR. MBT data showed that Class 3 (~5.40 m) performed poorer than Class 1 and 2 (~6.28-6.60 m). Class 2 (40.79 ± 12.40 shuttles) performed fewer shuttles than Class 1 (48.28 ± 13.61) and 3 (50.00 ± 14.05) in the pre-test MSFT. Following academy, Class 2 was 5% significantly slower on 75PR, while the other two classes showed no improvement. Classes 1 and 3 significantly improved their MBT distance (by 8% and 16%, respectively), while Class 2 showed no change. All three classes completed significantly more shuttles on the MSFT (Class 1: 33%; Class 2: 75%; Class 3: 74%). Given the major improvements in the MSFT, lack of improvement in MBT for one class, and lack of change or decrease in performance in the 75PR (even for Class 3 which started with a lesser 75PR), the data suggests that the physical training programs implemented by staff did not develop recruit's anaerobic capacities in a consistent manner. Given the majority of law enforcement job tasks tend to be anaerobic in nature, physical training programs should consider an increased focus on anaerobic training during academy to optimize job readiness for recruits. Future research should investigate the performance benefits of training programs that include anaerobic and aerobic development.

58. PRELIMINARY RESULTS FROM A PILOT STUDY OF CHARITY-BASED INCENTIVES TO INCREASE PHYSICAL ACTIVITY AMONG YOUNG ADULT CANCER SURVIVORS.

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Purpose: This pilot study aims to determine the feasibility and acceptability of a remotely-delivered eHealth intervention that links physical activity and charity-based incentives to motivate adolescent and young adult (AYA) cancer survivors to initiate and maintain physical activity. Methods: Inactive cancer survivors who were diagnosed between ages 18-39 years were recruited through hospital support groups and online forums across the western United States. Screening and informed consent were done online; activity was measured via activPAL for 7-days at baseline and again at 12-weeks. Participants were randomized into either a Physical Activity (PA) only or Physical Activity +Charity Incentive group. Participants in the PA only group received a Fitbit One, personalized step goals, and weekly behavioral change content via email. PA +Incentive participants received the PA intervention plus donations to a cancer charity of their choice if daily step goals were attained. The primary aim was to evaluate feasibility and acceptability and the primary outcome was 12-week between-group changes in steps per day as measured by the ActivPAL. Results: Seventy-six participants were screened; of those, 54 (71%) were eligible and provided informed consent and 51 (94%) completed the baseline assessments and were randomized. Those randomized were 88% female, 54% with prior breast cancer, 56.9% Non-Hispanic White, 27.5% Hispanic, 15.7% other; and had a mean age of 36.8 years. Of those eligible to date to complete the 12-wk measure (N= 47), retention was high for the PA only (22/25) and PA +Charity (23/26) groups. The majority of participants reported they were "satisfied or very satisfied" with the overall intervention experience. There was some evidence that the PA + Incentive group was more satisfied with the overall experience as a study subject compared to the PA only group (42.9% vs 31.6% reporting "very satisfied or satisfied"). This also holds true for the level of contact with staff (81.0% versus 68.4%) and content of emails (90.5% versus 73.7%). There were some technical issues with the Fitbits and some participants (23%) wanted more contact with study staff or other participants. Conclusions: These preliminary findings show that a low intensity, mail-based intervention among young adult cancer survivors appeared feasible and acceptable to participants. The next step will be to evaluate if there were a significant change in daily steps as a result of the intervention.

60. THE ASSOCIATION BETWEEN SAGITTAL PLANE TRUNK KINEMATICS AND LOADING CHARACTERISTICS IN COMPETITIVE DISTANCE RUNNERS

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Introduction: The annual injury rate among competitive distance runners is over 50%. Vertical loading rate (vLR) and posterior ground reaction force (GRF) are linked to running related injuries. The knee joint and lower limb are the most common injury sites, and knee joint loading is lower in runners with a more forward trunk lean. Therefore, the purpose of this study was to determine the association between forward trunk lean, GRF, and knee joint loading characteristics in competitive distance runners. Methods: Thirty-six competitive distance runners were recruited for this study (male 26, forefoot strike 21, height 1.74 ±0.02, mass 61.6 ±1.4kg, 1500m personal best 83.3 ±3.5% world record). 3D biomechanics were recorded during 5 running trials at their self-selected speed (±5%) over 1 force plate. Forward trunk lean was calculated as the angle of the trunk segment relative to the vertical world axis. GRF characteristics include instantaneous vLR, and peak vertical and posterior GRF. The peak internal knee extensor moment and knee joint stiffness were used to determine knee joint loading. Partial correlations, controlling for gait speed, were used to assess the association between trunk lean and gait kinetics. Results: Trunk lean at foot contact (r -0.39, p=0.02), Peak trunk lean (r=-0.43, p=0.01), and average trunk lean (r=-0.50, p<0.01) were negatively associated with vLR. Peak trunk lean angle was positively associated with vertical GRF (r=0.36, p=0.04). Trunk lean angles were not associated with posterior GRF, knee extensor moment, or knee joint stiffness. Discussion: Runners with a greater trunk lean at initial foot contact exhibit a lower vLR. Forward lean may allow runners to position their foot under their center of mass and improve attenuation of the vertical GRF. The majority of runners in this investigation were forefoot strikers. The combination of a forward trunk lean and forefoot strike may contribute to lower vLR. Peak trunk lean was associated with greater vertical GRF. Greater forward lean may allow the runner to increase the total force they are imparting to the ground to propel themselves off the ground. Forward trunk lean is a modifiable gait characteristic that may be useful for injury prevention and performance enhancement.

61. RELIABILITY OF THE POLAR T31 UNCODED HEART RATE MONITOR IN FREE MOTION AND TREADMILL ACTIVITIES

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The Polar T31 uncoded heart rate monitor (T31) is currently accepted by many researchers as a precision measurement device that can be used in lieu of electrocardiography. However, minimal literature exists to verify reliability and validity when used for this purpose. PURPOSE: The goal of this study was to evaluate the reliability of heart rate (HR) measurements obtained from the T31. METHODS: Forty volunteers participated in a three-day test-retest protocol. Participants gave anthropometric data on the first day. On the second day, they performed two 5-minute self-paced free motion walks (FMW) and two 5-minute self-paced free motion jogs (FMJ). Finally, on the third day, they performed two 5-minute treadmill walks (TW) and two 5-minute treadmill jogs (TJ). Treadmill speeds for each TW and TJ were determined by the distances traveled during the FMWs and FMJs on day 2. HR values at rest (HRR) and while in motion (minutes 1-5) were evaluated (HRM). Values calculated used Cronbach's $\alpha \pm$ (0.70) for reliability with significance accepted at $p<0.05$. FMW HRR ($\alpha\pm=0.96$, $p<0.001$), FMJ HRR ($\alpha\pm=0.98$, $p<0.001$), TW HRR ($\alpha\pm=0.96$, $p<0.001$), TJ HRR ($\alpha\pm=0.97$, $p<0.001$), FMW HRM ($\alpha\pm=0.93$, $p<0.001$), FMJ HRM ($\alpha\pm=0.93$, $p<0.001$), TW HRM ($\alpha\pm=0.95$, $p<0.001$), TJ HRM ($\alpha\pm=0.94$, $p<0.001$). CONCLUSION: The T31 provided reliable measures at rest and for walking and jogging in both a free motion and treadmill settings. These results are important as verified evaluations of the T31 for HR measurement is necessary to ensure investigators are able to obtain reliable HR measurements.

62. METABOLIC SYNDROME AND PHYSICAL ACTIVITY LEVELS IN COLLEGE STUDENTS

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Background: Metabolic syndrome (MetS) has been used as an indicator of risk of cardiovascular disease. It is estimated that greater than 30% of young adults attending college are overweight or obese. MetS is becoming a rising epidemic in younger populations. Many of the known risk factors that are often associated with obesity also place an individual at risk of developing MetS. Purpose: The purpose of this study was to examine the relationship between MetS risk factors and levels of physical activity (PA) in college students. Methods: This study was a descriptive analysis wherein 95 college students (age: 23 ± 4.9 years; BMI: 26.1 ± 4.9 km/m2) volunteered to participate in the study. The following information was obtained from each participant: body anthropometrics, fasting glucose and lipoproteins, and accelerometry measured physical activity levels. Participants wore, at the waist, a wireless activity monitor (wGT3X-BT, ActiGraph, Pensacola, FL) for seven consecutive days. MetS was determined if the participants met three of the five criteria utilizing the NCEP guidelines. Results: There was a decrease in physical activity levels in participants as the number of MetS criteria increased. Participants without MetS averaged 50.02 minutes of moderate to vigorous physical activity (MVPA) per day. While, participants with MetS (at least three of five criteria) averaged 36.6 minutes of MVPA per day. Conclusion: Participants who did not meet the criteria for MetS were more active than those who met the criteria. Current activity levels in college students do not meet the established guidelines for total steps/day, elevating the risk of acquiring metabolic disorders. In order to reduce the increasing prevalence of MetS, increasing the total number of steps/day in conjunction with a focus on moderate-to-vigorous PA levels may reduce the risk factors associated later in life.

63. TARGETED EXERCISE THERAPY TO ENHANCE NEURAL ACTIVATION

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Various types of exercise therapies, including high and low intensity aerobic exercise, along with mind-body exercise (e.g., yoga) have been implemented into treatment for those suffering from psychological disorders and traumatic brain injury. The prefrontal cortex (PFC), which houses key cognitive constructs is responsive to exercise, and is commonly measured using functional near infrared spectroscopy (fNIRS). Evidence suggests that exercise mediates neural adaptation through increased blood flow and neurogenesis, which enhances neural activation leading to improved cognitive performance. However, the type and intensity of exercise that has the most robust impact on brain blood flow is currently unknown. Purpose. Therefore, the primary aim of the study is to compare PFC activation during cognitive tasks performed after low-intensity, high intensity, and yoga exercises. We also aim to determine if markers of cardiovascular and metabolic stress influence brain activity after each exercise bout. Methods. Eight subjects (4 male, 4 female), aged 35 ± 5 years completed a control, high intensity, low intensity, and yoga exercise trial followed by administration of a cognitive task (NIH Toolbox Fluid Cognition). Left and right PFC oxygenation were measured during the post-exercise cognitive assessment using fNIRS technology. Results. Oxygenation during the cognitive task was higher in the left PFC region after low intensity exercise compared to all other trials (control, high intensity, yoga). Regression model analysis showed that a 10% increase in %HRmax up to 70% intensity predicts an increase in left PFC oxygenation by 2.11 umol. Conclusion. Acute exercise below 70% aerobic intensity increased brain blood flow during a post-exercise cognitive task. Therefore, it may be beneficial for those who engage in any cognitive related activity to perform a brief bout of low intensity exercise prior to the task. This may include people who participate in academic-based testing, cognitive behavioral therapy, or motor training.

64. LIKABILITY AND ENERGY COST OF NINE EXERCISES TO POTENTIALLY REDUCE SEDENTARINESS IN AN OFFICE ENVIRONMENT

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Background: Modern office environments tend to promote sedentariness. Active workstations have been proposed as a strategy to combat sedentary behavior. Often, active workstations require expensive or disruptive equipment. There may be enjoyable and effective alternatives that increase energy expenditure and minimally disrupt workflow. Purpose: To determine likability and energy cost of 9 exercises reasonable for an office setting. Methods: 20 participants (n=11 men; n=9 women, 21.95±2.31 y) who sat an average of 6.05±1.10 hours during the workday completed this study. Personal information was collected during the 1st laboratory visit. During the 2nd visit, pre-exercise resting metabolic rate (RMR) was assessed followed by completion of 9 exercises, including: slow walking, leg cycling, stepping, biceps curl-to-overhead press, arm cycling, body squats, chair squats, standing, and marching-in-place. Each exercise lasted 2 minutes with 5 minutes of rest between. The order of exercises was determinedly randomly. Oxygen consumption, via indirect calorimetry, was assessed throughout the pre-exercise RMR period, exercises, and rest periods between exercises. During each rest period, participants completed a visual analog scale to rate enjoyment, difficulty, practicality, and likeliness to do for each exercise. Results: Energy cost was lowest for standing (1.45±0.39 kcal/min) and highest for body squats (4.69±1.60 kcal/min). METs ranged from 1.11 (standing) to 3.43 (body squats) and was different across exercises ($F=54.11$; $p<0.0001$). Enjoyment, perceived difficulty, and practicality of the exercise was highest for walking, biceps-to-overhead press, and standing, respectively. Enjoyment, perceived difficulty, and practicality of the exercise was lowest for marching-in-place, standing, and arm cycling, respectively. Differences across exercises were significant for enjoyment, perceived difficulty, and practicality of the exercise ($p<0.05$) but not for likeliness to do ($F=0.85$; $p=0.559$). Discussion: There may be reasonable and likable alternatives to increase energy expenditure with application to an office setting. Additional research could test if personalizing activity preferences based on likability could improve adherence to a program to reduce sedentariness.

65. VALIDITY OF THE SENSORIA FITNESS BIOMETRIC SPORTS BRA IN MEASURING HEART RATE DURING EXERCISE TRANSITIONS

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Wearable technology is becoming commonplace, and has many different applications. PURPOSE: The current investigation aimed to evaluate the validity of a heart rate sensing bra during transitions from rest to self-paced running and walking. METHODS: Nine females completed a 14-min protocol while concurrently wearing the Sensoria Fitness biometric sports bra and Polar H7 heart rate monitor (criterion measure). The protocol involved 1-min standing rest on the treadmill, 3-min walking warm up, 5-min run, 5-min walk. Validity was evaluated by comparing second-to-second data and determined through three methods: mean absolute percent error (MAPE), Bland-Altman bias and limits of agreement (LOA), and intraclass correlations (ICC) with a value greater than 0.7 and significance <0.05. RESULTS: When all conditions were considered (6728 data points), MAPE = 1.08%, bias = 0.17±2.35 and LOA range = -4.43 to 4.78, and ICC = 0.996 ($p<0.001$). For the resting condition (448 data points), MAPE = 1.52%, bias = 0.27±1.97 and LOA range = -3.59 to 4.13, and ICC = 0.994 ($p<0.001$). The transition from rest to a walking warm up (1440 data points) yielded MAPE = 35.93%, bias = -28.99±24.39 and LOA range = -76.81 to 18.82, and ICC = 0.089 ($p<0.001$). With respect to the transition from warm up to running (2400 data points) MAPE = 0.95%, bias = -0.59±3.07 and LOA range = -5.43 to 6.62, and ICC = 0.086 ($p<0.001$). When the transition from running to walking was considered (2400 data points) MAPE = 1.02%, bias = -0.24±1.67 and LOA range = -3.51 to 3.03, and ICC = 0.96 ($p<0.001$). CONCLUSION: These preliminary results indicate that the Sensoria Fitness biometric sports bra is valid for most conditions (rest, running, walking). Transitioning from rest to an active warm up should be viewed with caution, as heart rate measurements were not valid in this condition.

66. RESTING AND EXERCISE INDUCED MAPK PHOSPHORYLATION FOLLOWING HIGH-FREQUENCY RESISTANCE EXERCISE OVERTRAINING

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Stressful training with insufficient recovery can attenuate performance adaptations. Mitogen-activated protein kinases (MAPK) mediate skeletal muscle adaptations to exercise. Resting expression of MAPK have been reported following stressful training but acute resistance exercise (RE) responses remain to be elucidated. PURPOSE: To investigate changes in resting and post-exercise MAPK phosphorylation following a period of stressful training. METHODS: 16 men were matched on one-repetition maximum (1RM) strength and randomized into a control group that performed non-stressful training (CON; n=8, age=20.7±1.2yrs, hgt=180±10cm, body mass=83.9±0.7kg) or high-frequency with insufficient recovery stressful training group (OT; n=8, age=21.3±2.3yrs, hgt=155±62cm, body mass=77.8±11.3kg. Prior to (T1) and after (T2) the training intervention both groups performed an acute RE bout consisting of 5 sets of 5 repetition back squats at 60% 1RM and 3 sets of 10 repetition knee extensions. Skeletal muscle biopsies were obtained at rest (BL) and 10 minutes post-RE (POST). CON performed 3 speed-squat training sessions on non-consecutive days, while OT performed 15 speed-squat training sessions over 7.5 days. Muscle samples were analyzed for total and phosphorylated MAPKs (ERK, JNK, and p38) via western blotting. Wilcoxon sign-rank tests determined pairwise differences from BL to POST and between time points (T1 vs T2). Mann-Whitney U compared differences in resting and exercise responses between CON and OT at T1 and T2. Statistical significance was determined at $p < 0.05$. RESULTS: ERK, JNK, and p38 increased at POST in CON and OT groups, however only p38 phosphorylation POST RE was attenuated at T2 in OT. BL p38 phosphorylation was decreased in CON and increased OT at T2. CONCLUSION: Resting and post-exercise p38 phosphorylation is differentially regulated after stressful training. Mechanosensitive ERK and JNK signaling are maintained following high-frequency RE training. However, p38 phosphorylation is elevated at rest, but attenuated post-exercise. Thus, RE with insufficient recovery may impair adaptation via dysregulation of anabolic and inflammatory signaling during the resting recovery period.

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67. AN NHANES STUDY OF THE RELATIONSHIP BETWEEN STRENGTH TRAINING AND INSULIN RESISTANCE IN 6,589 U.S. ADULTS

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The present study was conducted to determine the extent to which levels of insulin resistance (IR) differ across categories of strength training (ST) in non-diabetic adults. METHODS: A total of 6,589 adults were randomly selected as part of the National Health and Nutrition Examination Survey (NHANES), so results are generalizable to all U.S. adults. Those reporting no regular ST formed one category (No ST), and the rest, those reporting regular ST, were divided into sex-specific quartiles: Low, Moderate, Moderately High, and High, reflecting minutes of ST per week. Insulin resistance was indexed using HOMA-IR (homeostatic model assessment of insulin resistance). Age, sex, race, and year of assessment were used as demographic covariates. Smoking, participation in 47 physical activities other than ST, and BMI were used as lifestyle covariates. RESULTS: Average age (±SE) was 44±0.4 years. Approximately 90% of the sample reported no regular ST. The 10% who performed some ST were divided into quartiles with 2.5% of the sample in each quartile (n~165 each). After adjusting for the demographic covariates, there were significant differences in IR across the ST categories ($F=12.6$, $P<0.0001$). Mean levels of HOMA-IR did not differ between adults with No ST and those in the Low ST category. Moreover, those in the Moderate, Moderately High, and High ST categories did not differ. However, adults in the No ST category had a significantly higher insulin resistance mean than those in the Moderate, Moderately High, and High ST categories. These differences persisted after controlling for all the demographic and lifestyle covariates simultaneously ($F=8.9$, $P<0.0001$). Additionally, with time spent ST treated as a continuous variable, rather than categorical, the linear relationship between ST and HOMA-IR was significant after adjusting for differences in the demographic covariates ($F=20.4$, $P<0.0001$) and all the potential confounders together ($F=18.4$, $P<0.0001$). CONCLUSIONS: In a random sample representing all U.S. adults, Moderate, Moderately High and High levels of ST were related significantly to less insulin resistance compared to adults engaging in No ST. The linear association between time spent ST and HOMA-IR was also significant, suggesting that the more adults participate in ST, the less insulin resistance they tend to have.

68. INTRAMUSCULAR TEMPERATURE CHANGES IN RESPONSE TO TWO DIFFERENT WARM-UP PROTOCOLS

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INTRODUCTION: Dynamic exercise drills of 5 to 10 minutes have shown to be effective as a warm up prior to team sports. A new exercise device, the Bullfrog, has been suggested to be beneficial for warm-up, however, no published data exists. Thus, the purpose for this study was to compare Intramuscular temperatures (IMT) in both the upper and lower extremity between 2 different warm-up protocols (Dynamic (DYN) and FROG) to a control (C) condition. METHODS: 10 resistance trained males (24 ± 2.1 yrs) participated in this study. Subjects reported to the lab on three separate days. Baseline IMT was established each day followed by IMT measures following 5 and 10 minute bouts of each condition using Physitemp intramuscular temperature needles inserted to 1.5 cm depth. The four muscle groups of interest were: medial head of the gastrocnemius, vastus lateralis, middle deltoid, and long head of the triceps. RESULTS: After running multiple one way analysis of variance between similar muscle groups, we found significant differences between treatments for each muscle group analyzed. Post hoc analysis, revealed all baseline temperatures for each muscle group were not significantly different. After 5 and 10 minutes of treatment, the following significant differences were found: Gastroc: both the FROG and DYN increased IMT significantly more than C ($P<.001$), but DYN was significantly greater at both 5 and 10 min than FROG ($p<.001$). Vastus lateralis: Both treatments significantly greater than C ($p<.001$) but no difference between treatments at 5 min ($p=.791$) and 10 min ($p=.734$). Tricep: Both treatments significantly greater than C ($p<.001$) with greater IMT in the FROG as compared to DYN at both 5 and 10 minutes ($p<.001$). Deltoid: Both treatments significantly greater than C ($p<.001$) but no difference between treatments at 5 min ($p=.990$) and 10 min ($p=.305$). CONCLUSION: Both the FROG and DYN prove to be effective warm-ups as demonstrated by increased IMT's. Interestingly, DYN had clinically relevant higher mean increases in the gastroc. However, for the upper extremity, the raw means show the Bullfrog demonstrated around a one degree greater IMT after both 5 and 10 minutes compared to DYN, possibly making the Bullfrog a more rapidly effective upper extremity warm-up option if that part of the body is important address before a specific activity

69. THE EFFECTS OF A PLYOMETRIC EXERCISE ON THE POST-ACTIVATION OF POTENTIATION OF CHANGE-OF-DIRECTION PERFORMANCE

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Change-of-direction (COD) performance is essential for field and court sport athletes. Post-activation potentiation (PAP) uses the muscle's contractile history to improve performance. Typically, a strength exercise is used to potentiate a power-based activity, including jumps, linear sprints, and COD performance. Plyometric exercises (i.e. lateral bounds) can enhance jump and linear sprint performance, and this method could be adopted for COD actions. The purpose of this study was to determine whether a plyometric exercise could potentiate COD performance measured by the 505, which involves a 180° direction change. Twenty males and 20 females were recruited for this study and attended a familiarization session (involving a maximal vertical jump, and lateral jumps from each leg) followed by 3 testing sessions completed in a randomized order. The testing sessions used 3 different conditioning activities (CA): lateral bounds (LB; 3 x 5, 30 bounds total); weighted lateral bounds (WLB; 3 x 5, 30 bounds total; 10% body mass supplied by a weighted vest); and a control condition (CC; participant sat for 4 min). Participants performed the 505 on each leg at 5 and 2.5 min before the selected CA, and post-CA at 15 s, 4, 8, 12, and 16 min to determine whether PAP occurred. A 3 (condition) x 6 (time) repeated measures ANOVA was used to measure any changes in 505 time relative to baseline for each CA. Best potentiated 505 time was investigated by a 3 x 2 (baseline and best potentiated) repeated measures ANOVA ($p < 0.05$). Partial correlations controlling for sex ($p < 0.05$) were used to calculate relationships between power measured by vertical jump height, and dominant and non-dominant leg lateral jump distance, with the degree of potentiation for each 505 time. No significant changes occurred in 505 performance post-CA across all time points for each CA. Best potentiated 505 time was significantly faster compared to baseline for all CA; no significant between-CA differences were found. There was only one significant correlation, which was between non-dominant leg lateral jump and degree of 505 potentiation at 16 min ($r = -0.386$). The data suggested that LB and WLB may not provide enough stimulus to potentiate 505 relative to a CC of rest. Although 505 performance was not consistently potentiated, to improve training efficiency athletes could perform LB or WLB followed by the 505 knowing that COD performance should not decrease if appropriate rest times are adopted.

70. METABOLIC AND PHYSIOLOGICAL RESPONSES TO UNWEIGHTED MAXIMAL RUNNING

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The purpose of this study was to examine the metabolic and physiological effects of running at three different percentages of body-weight (BW): 100, 75, & 50 on a lower body positive pressure treadmill (LBPPT). Twelve healthy college aged students, 6 male and 6 females, on a current training regimen and current/previous competitive experience participated in the study. The participants performed three graded exercise tests (GXT) using a custom protocol following a Latin Square design. Variables analyzed in the study included absolute VO_2max (L/min), HRmax (bpm), maximal oxygen saturation (%), maximal RPE, test performance (minutes), and VT1 & 2. A 3 x 2 mixed-model RM-ANOVA along with a Tukey post-hoc analysis was used to compare main effects of within-subject differences (BW-3) and between-subject differences (gender-2). No significant differences were seen in VO_2max and VT1 & 2 (bpm) between the BW percentages ($p>0.05$). HRmax was significantly different between the 100-75 & 100-50 BW comparisons. Average HRmax at 100%: 186±7.8, 75%: 183±7.5, & 50%: 182±7.7. Maximal RPE showed significance in the 100-50 & 75-50 comparisons. Average maximal RPE at 100%: 18.2±1.2, 75%: 17.9±0.9, & 50%: 17.1±0.7. Maximal oxygen saturation showed significance in the 100-75 & 100-50 comparisons. Average SaO_2 at 100%: 96±1.5, 75%: 97.7±1.2, & 50%: 97.9±0.9. Significant differences were also seen in performance between 100-75, 100-50, & 75-50 comparisons. Average performance at 100%: 11.4±1.5, 75%: 14.1±1.8, & 50%: 16.6±1.5. Based on the percent of their HRmax, VT1 was significant in 100-75 & 100-50 comparisons while VT2 was significant in men only at 100-50 comparison. Based on these results, it appears that training at a lower percentage of BW can lead to similar cardiopulmonary adaptations achieved at 100%, without the same level of stress applied, supporting the rationale behind conducting the study. Increased pressure from the lbppt applied to the lower extremity may have acted as a mechanism in increasing venous return which in turn increased the stroke volume and caused the decreased HRmax in the participants. Lower HRmax and increased performance time may also indicate training at a lower percent of BW may allow individuals to sustain a prolonged steady-state at a similar intensity at 100% BW potentially allowing for an extended stimulus applied to the working musculature improving overall performance.

71. SKELETAL MUSCLE FIBER TYPE AFTER 10-DAYS OF SIMULATED MICROGRAVITY WITH CONCURRENT EXERCISE TRAINING

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Introduction: Myosin heavy chain (MHC) isoform composition determines skeletal muscle fiber classifications. MHC types can shift in response to different stimuli or environmental conditions (e.g., microgravity and exercise). Minimal data on short-duration simulated microgravity exposure exhibits transitioning effects on MHC fiber types from slow-to-fast in as little as 11 days, while greater exposure can lead to more pronounced shifts. Conversely, concurrent exercise (CE) training can elicit a MHC shift in the opposing direction. The former shift could negatively impact astronauts' ability to perform endurance movements during extra-vehicular activities or emergency egress. Purpose: This study aimed to determine the effects of 10-days of simulated microgravity (unilateral lower limb suspension, ULLS) vs. 10-days of ULLS+CE on soleus muscle MHC fiber type. Methods: Nineteen healthy adult participants (10 men, 9 women) were separated into two groups, 10-day ULLS (n=9) and 10-day ULLS+CE (n=10). Participants underwent pre- and post- intervention soleus muscle biopsies. MHC isoform composition (MHC I, I/IIa, IIa, IIa/IIx, IIx, I/IIa/IIx) was determined via SDS-PAGE (589 total fibers). Results: The mean MHC fiber type for both groups (pre-) was: MHC I, 76.9%; I/IIa, 3.1%; IIa, 17.9%; and IIa/IIx, 2.1%. No significant differences in MHC fiber type were observed between groups or over time ($P>0.05$). Conclusion: With growing interest in space exploration, it is imperative that effective countermeasures are implemented to minimize deconditioning responses to microgravity. Short-duration unloading did not yield a shift in fiber type, but longer exposure (11-days) increases probability of fiber types shifting, potentially degrading performance. With upcoming plans to regularly send astronauts back to the Moon (~10-days round trip) further analyses on short-duration unloading are needed to determine how much exposure to microgravity leads to fiber type alteration.

72. IMPACT OF COLLEGE WEIGHT GAIN ON CARDIOVASCULAR HEALTH

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Background: The transition from high school to college is a transitional point in life where risk for weight gain is higher than at other periods. Weight gain for freshman women has been reported to be .75 kg/month, significantly higher than community dwelling women. Often missed in the college weight gain research is that this rapid weight gain may precede the development of hypertension. Purpose: The purpose of this correlational study was to assess the impact of college weight gain on cardiovascular outcomes of college students. Data collection is ongoing and only preliminary data is presented here. Methods: College students were recruited to participate in this correlational study. Subjects had anthropometric measurements, a V_{O2}Peak assessment, and measurements of brachial and central blood pressure (BP) along with central pulse wave velocity and pulse wave analysis taken. Subjects were given a questionnaire that asked about past weight history from early teenage years until present. Subjects were then dichotomized into one of two groups, gainers (>10 lb.), and non-gainers (<10lb). Results: 14 non-gainers (21±1yr, 23±3 kg/m2) and 27 gainers (23±4yr, 27 ±3 kg/m2) are included in the analysis. Gainer had a significantly higher BMI ($P<0.001$), body fat percentage (18 ± 9% vs 27 ± 9%, $P =0.009$), and central diastolic BP (70 ± 6 vs. 74 ± 7 mmHg, $P = 0.046$). There was a trend for gainers to have higher brachial diastolic BP ($P = 0.070$). Conclusion: Our preliminary results suggest that in a population of relatively healthy students, those who gain more weight are at increased risk for elevated BP. Further subject recruitment is needed to verify these results.

73. THE EFFECTS OF HIGH INTENSITY INTERVAL TRAINING VERSUS MODERATE INTENSITY CONTINUOUS TRAINING ON ENERGY COMPENSATION

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To determine the effects of high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) on energy compensation in response to 12-weeks of supervised aerobic exercise. All 24 subjects engaged in MICT at 70-76% max HR 3x/wk for 4-wks. Subjects were randomly assigned into one of the two groups: HIIT or MICT. Subjects in the HIIT group completed 8-wks of a 10x1 min protocol at 90-95% max HR 3x/wk. Subjects in the MICT group completed 30 min at 70-76% max HR 5x/week for 8-wks. All participants completed an even mix of cycle ergometer and inclined treadmill walking/jogging. Resting metabolic rate (RMR), body composition, and maximal oxygen uptake (VO_2max) were measured at baseline and after 4 and 12 wks. Physical activity was measured for 7-day periods before the intervention and during the 5th and 12th wks. After the intervention, compensation was calculated through caloric equivalents of fat and lean mass compared to total exercise energy expenditure. 13 participants (1 M, 12 F) were randomized into the HIIT group (28.0 ± 9.7 yr; BMI = 23.9 ± 3.9 kg/m2; VO_2max = 29.0 ± 6.0 ml/kg/min). 11 participants (2 M, 9 F) were randomized into the MICT group (26.0 ± 6.9 yr; BMI = 27.4 ± 8.7 kg/m2; VO_2max = 26.2 ± 7.3 ml/kg/min). 5 of 11 in MICT and 6 of 13 in HIIT were categorized as compensators after 12 wks. Change in fat mass (MICT: -0.59 ± 1.89, HIIT: -0.03 ± 1.72 kg, p=0.453), change in weight (MICT: +0.66 ± 2.11, HIIT: -0.54 ± 1.45 kg, p=0.115), and overall compensation (MICT: 3111 ± 17220, HIIT: 3870 ± 15911 kcal p=0.910) were similar between exercise groups. Actual weight loss was further from predicted weight loss in the MICT group (-1.61 ± 2.15 kg) compared to the HIIT group (-0.07 ± 1.45 kg, p=0.049). Potential compensatory variables including change in RMR, change VO_2max, change in daily steps, and change in sedentary time were compared between the compensator and non-compensator groups, but no significant differences were found (P > 0.05). Both HIIT and MICT led to a similar percentage (~45%) of participants compensating for the exercise intervention. Despite the large difference in exercise time (480 vs 1200 min, HIIT vs MICT), body fat and weight changes were similar between groups. Finally, our data suggests that HIIT may elicit weight loss that is closer to that predicted by exercise energy expenditure when compared to MICT.

75. THE PHYSIOLOGICAL EFFECTS OF ACUTE TAI CHI STANCE EXERCISE

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Introduction: Hypertension is a serious health risk world-wide. Isometric exercise has shown to reduce resting blood pressure (RBP) in hypotensive and normotensive individuals. Since they are isometric in nature, Tai Chi stances may also show RBP improvements using similar exercise protocols. Purpose: The purpose of this study was to evaluate acute blood pressure responses in two isometric stances commonly practiced in Tai Chi. Methods: 20 normotensive subjects (13 females and 7 males, Age: 25.4 ± 4.5 years, Height: 171.1 ± 10.1 CM, Weight: 70.1 ± KG) performed two different stances, separated by at least 24 hours, for two 2-minute bouts with a 1-minute break in between. Systolic and diastolic blood pressure (SBP, DBP) were taken at rest 10 minutes before exercise, during the break, immediately post, 5 minutes post, and 10 minutes post exercise. Muscle activity of the vastus lateralis (VL) and biceps femoris (BF) was measured via EMG and reported as %MVC. Results: Ten minutes after performing the front stance (FS), average SBP changed -2 ± 5.5 mmHg and DBP changed 0 ± 6.7 mmHg. The empty stance (ES) showed changes of -4 ± 5.0 mmHg and -3 ± 6.7 mmHg (SBP, DBP). Strong correlations with BP changes and muscle activity were not found in either stance. Conclusions: While the mechanisms remain unclear, the changes in RBP are significant considering that only four minutes of exercise was performed in total and that these were normotensive individuals. As these reductions were similar to those noticed after several weeks of other forms of isometric exercise, longer term training studies are warranted to determine the full benefits of Tai Chi stance training.

74. THE EFFECTS OF FIVE WEEKS OF BENCH PRESS TRAINING ON SALIVARY BIOMARKERS OF INFLAMMATION IN RECREATIONALLY-TRAINED COLLEGE-AGE MALES

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INTRODUCTION: Improvements in immunosenescence have been reported to be associated with regular exercise and physical activity. Multiple investigations have elucidated the effectiveness of aerobic exercise on the attenuation of biological markers of systemic inflammation. However, few studies have evaluated the impacts of resistance training on inflammation, and even fewer have examined the effects of resistance training on salivary biomarkers of inflammation. PURPOSE: To evaluate the impacts of 5 weeks of bench press-only training on salivary biomarkers of inflammation in trained college-age males (N = 23). Pre and post analyses of salivary biomarkers (IL-1α, IL-6, IL-8, TNFα, CRP, and Testosterone) were conducted. Five weeks of either standard bench press (n = 12) or leg drive focused bench press (n = 11) was completed. RESULTS: No significant ($p > 0.05$) main effects between groups were observed. Within groups measures did reveal that testosterone significantly decreased by 17.0% in the standard bench press group from pre to post ($p = 0.02$). CONCLUSIONS: Five weeks of bench press training did not alter pre-training levels of inflammation measured in saliva. Subjects were required to be currently training and have completed a minimum of 6 months of resistance training (including bench press) prior to starting this study. Since the bench press was the only training exercise, the intensity of training administered may not have been sufficient to elicit notable alterations in overall inflammatory status in this sample.

76. THE IMPACT OF PLAYGROUND GREENING ON SOCIAL BEHAVIORS OF URBAN SCHOOLCHILDREN

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Purpose: Recess is an opportunity for children to to be physically active and to engage in social interactions with minimal adult interference. The purpose of this study was to analyze the effects of large-scale playground greening renovations on the frequency of prosocial and antisocial behavior in urban elementary schoolchildren. Methods: Physical activity and social interaction behaviors were recorded for a total of 608 elementary school students during recess and lunch at experimental (green playground renovation) and control (no renovation) locations using the validated SOCARP observation tool pre-, immediately post-, 4-month post-, and 16-month post-greening. Data was analyzed with linear mixed models and Pearson correlation at a significance value of 0.05. Results: Verbal and physical prosocial interactions were on average 11.7% more frequent at the experimental compared to the control location during post and follow-up periods, $F(1,1706) = 6.25$, $p<.05$. Prosocial interactions were positively correlated with time spent in small groups (2-4 people) ($r=.239$, $p<.001$) and negatively correlated with time spent in large groups (10+ people) ($r=-.123$, $p<.001$). Experimental students were more likely to spend time in large groups on hardscape surfaces compared to greenspace, $F(1,915) = 5.35$, $p<.05$. A main effect of sex ($F(1,1706) = 18.10$, $p<.001$) and an interaction effect between location and study phase ($F(3,1706) = 4.24$, $p<.01$) was discovered for antisocial interaction frequency. Boys engaged in an average of 87.3% more verbal and physical conflict-based interactions than girls. Antisocial interactions were similar between groups at baseline and did not change throughout the study at the control location ($p>0.05$). Antisocial interactions at the experimental location, however, were significantly lower than baseline at 4-month (-54.4%) and 16-month (-43.1%) follow-up ($p<0.05$). Conclusions: The data suggests that replacing large areas of asphalt with greenspace may improve social cohesiveness and decrease inter-student conflict in urban elementary school playgrounds. Additionally, data suggests that social interactions inspired by green playground renovations are not temporary.

77. DIFFERENTIAL IMPACT ON MUSCULAR STRENGTH TO POSTURAL STABILITY IN ADULTS WITH CEREBRAL PALSY

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Cerebral Palsy (CP) is a type of neurological disorder caused by damage to the brain during fetal development or shortly after birth. Although it is a non-progressive disorder, adults with CP experience degradation of muscular coordination or mobility with age. In fact, individuals with CP are highly subjected to fall risk and high fracture rate from the early presence of senile sarcopenia and osteoporosis, respectively. The lower state of balance and functional mobility is also related to higher fall risk factors, and it is impacted by muscular strength and bone mineral density in the general public. Thus, the purpose of this study was to determine the influence of muscular strength on balance in adults, who already developed sarcopenia and osteoporosis, with CP. Twenty adults with and without CP underwent muscular strength tests using Humac Norm isokinetic dynamometer, and postural stability tests using Biodex balance system and Berg Balance Test. The CP participants had significantly lower scores in all directions for limited stability test [e.g., forward/left (34.1±21.6 CP vs. 65.5±18.6 control $P<0.05$) overall results (22.0±15.0 CP vs. 59.7±12.7 control, $P<0.05$)] and Berg Balance Test (14±19 CP vs. 56±0 control, $P<0.05$) compared to the control. The CP group had significantly lower muscular strength at 90, 150, 210 degrees/sec during knee extension and flexion [e.g., extensor peak torque (21.6±16.2 CP vs. 76.8±39.1 control, $P<0.05$), and flexor peak torque (8.0±5.0 CP, vs. 52.6±25.3 control, $P<0.05$)]. While there was no relationship detected between leg muscular strength and balance (i.e., time to complete and overall balance) in the control, there was a linear relationship between leg strength and balance in the CP group. Our findings suggest that adults with CP use muscular strength from the lower extremities to support postural stability (via balance) while the control participants tend to have a limited relationship between leg muscular strength to balance.

78. ABNORMAL ANATOMICAL ETIOLOGY AND THE RESULTANT BILATERAL THORACIC OUTLET SYNDROME: AN EXPLORATION CASE REPORT

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Case: A thirty-two-year-old female with bilateral thoracic outlet syndrome (TOS) was highlighted in this report. The patient presented with debilitating, yet different symptoms between her right and left arms. Intervention: After seeking assistance from medical professionals utilizing multiple different diagnostic tools and following failed alternative and conventional treatments, bilateral transaxillary first rib resections were performed. In addition, subtotal subclavius and scalene resections, brachial plexus neurolyses, subclavian artery lyses, right pectoralis minor division were completed in order to decrease the patient's symptoms of TOS. The right arm needed an additional surgery and scalenectomy to decrease symptoms. Comparative Outcome: Immediately following surgery; pain, numbness and tingling were reduced, but returned less than a year post-op on the right side only. Interpretation: TOS is an extremely rare and multifaceted disorder which may result in substantial diagnostic challenges for practitioners. Various disorders and injuries were first ruled out prior to diagnosis. Each arm presented with abnormally unique symptoms and etiology which impacted post-surgical outcomes and rehabilitation. Case Management: Standard and alternative treatments ineffectively reduced TOS symptoms, which resulted in the patient eventually requiring a right side full scalenectomy. In a clinical setting, TOS diagnoses and treatments prescribed by the physician should be based on individual symptom presentations to ensure that appropriate and timely treatment is completed. As a result, the rehabilitation process may be started earlier, thereby improving patient outcomes.

79. CAFFEINE INCREASES WORKLOAD VOLUME DURING UPPER BODY RESISTANCE EXERCISE

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Purpose: This study examined the acute effect of caffeine supplementation on an upper body resistance training strength workout. Methods: Fifteen college-aged men (M ± SD, age: 23.1 ± 1.9 years; body mass: 89.1 ± 13.9 kg; height: 175 ± 6.1 cm), volunteered to complete three laboratory visits. During visit one, 1RM values were determined for barbell bench press (BBP), and incline bench press (IBP). For visits two and three, subjects consumed either 800 mg of caffeine (CAFF), or a stimulant-free placebo (PLAC) in a counterbalanced order 60 minutes before exercise commenced. After 60-min, subjects then completed three sets of each exercise to failure at 80% 1RM. Total repetitions for each exercise were recorded. Volume was calculated by multiplying sets by reps by weight lifted (kg). Data was analyzed using paired samples t-Test with significance accepted at $p<0.05$. Results: The results indicate a larger total volume of weight was lifted with caffeine compared to placebo for barbell bench press (BBP CAFF 1231.66 ± 652.71, BBP PLAC 1138.48 ± 649.03 kg, $p=0.019$), and incline bench press (CAFF IBP 1105.45 ± 557.95, PLAC IBP 986.05 ± 498.18 kg, $p=0.025$). Conclusion: The caffeine condition lifted a higher volume of weight, demonstrating the ergogenic effect of caffeine on upper body resistance exercises.

80. THE ACUTE EFFECT OF MODERATE INTENSITY STAIR-CLIMBING ON POSTPRANDIAL BLOOD GLUCOSE LEvels

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Rising blood glucose levels after a meal are independent predictors of cardiometabolic disease. Cardiometabolic disease is on the rise in the United States creating a significant need for widespread treatment options. Moderate exercise has been shown to decrease postprandial glucose levels, which can mitigate the aforementioned risk factors. Stair climbing is a moderate exercise requiring no equipment that is perceived as low intensity, making it an ideal exercise for general application. The purpose of this study was to analyze the effects of various stair stepping bouts on postprandial blood glucose levels in 13 adults. Participants consumed a 650 kilocalorie "real meal" with the macronutrient composition of the typical American diet; ~32.7% fat, ~52.7% carbohydrate, and ~14.2% protein. The first session was a control followed by three randomized sessions of a one, three, and 10 minute stepping bout. Stepping bouts were completed at the same self-selected, moderate pace for all sessions. Results indicated a decrease in postprandial glucose from control following exercise for the one minute (14±14 mg/dL, $p=.005$), three minute (14±21mg/dL, $p=.038$), and 10 minute (30±23 mg/dL, $p=.001$) bouts. Incremental area under curve values were reduced compared to control for the one minute (348±763mg*min/dL, $p=.126$), three minute (23±720 mg*min/dL, $p=.912$), and ten minute (625±1015 mg*min/dL, $p=.047$) bouts. These results indicate very short bouts of self-selected moderate intensity stair climbing can reduce postprandial glucose immediately following the bout, but at least 10 minutes are necessary to reduce the postprandial response over the course of an hour.

81. RELATIONSHIPS AMONG SKELETAL MUSCLE SATELLITE CELLS, CAPILLARIZATION, AND VO_2 PEAK IN OLDER ADULTS

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A reduction in satellite cells has been reported to contribute to muscle loss with aging. Exercise presents a powerful strategy to stimulate satellite cells, however, to what extent various forms of exercise stimulate skeletal muscle satellite cells in older adults is less understood. The purposes of this study were to 1) examine relationships among satellite cell density, capillary density, and V_{O2}peak in older adults, and 2) identify changes in satellite cell density following two different intensities of aerobic exercise. In a counter-balanced, cross-over design, six older adults (4M, 2F; 67±2yr; BMI: 26.6±2.0 kg/m^2) completed an acute bout of high-intensity interval (HIIE; ten, 1-min intervals, 85-95% heart rate max, 1-min rest between intervals) and moderate intensity continuous cycling (MOD; 30-min, 60-65% V_{O2}peak), separated by ~1 week. Muscle biopsies (vastus lateralis) were obtained before exercise and 24h after each exercise bout. Immunofluorescence was utilized to identify myosin heavy chain (MHC), satellite cells, and capillaries. A significant relationship between baseline capillary density and baseline satellite cell density (P=0.018; R2=0.789) was observed. Significant correlations were also found between baseline satellite cell density and V_{O2}peak (P<0.001; R2=0.99), capillary density and V_{O2}peak (P=0.019; R2=0.785), satellite cells/MHC I fiber and V_{O2}peak (P=0.026; R2=0.750), and satellite cells/MHC II fiber and V_{O2}peak (P=0.002; R2=0.93). Total satellite cells/fiber and fiber type-specific satellite cells/fiber were unchanged in response to acute MOD or HIIE (P>0.05) and no differences were observed between exercise trials (P>0.05). These data reveal a positive relationship between capillary and satellite cell density in the skeletal muscle of older adults. Further, while no changes in satellite cell density were observed 24h following acute MOD or HIIE, our preliminary findings suggest an association between satellite cell density and V_{O2}peak in older adults. Thus, future research is needed to examine whether these exercise strategies differentially impact changes in the proliferation or differentiation of satellite cells in older adults, and to what extent capillary density may be related to chronic adaptations in satellite cell density and V_{O2}peak. Supported by a JumpStart grant, College of Health Solutions, ASU.

82. PLANTAR FLEXOR FUNCTION IN ADULTS WITH AND WITHOUT PRADER-WILLI SYNDROME

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Muscle weakness is common in individuals with Prader-Willi Syndrome (PWS), which may contribute to impaired gait mechanics. The purposes of this study were to (1) compare neuromuscular function of the plantar flexors between individuals with and without PWS, and (2) evaluate the relationship between plantar flexor function and propulsion during gait. Nine participants with PWS were compared to 9 obese control, and 9 lean control participants. Hoffman (H) reflex from the soleus assessed spinal motor neuron excitability and was normalized to a maximal M wave. Plantar flexor strength was assessed using an isokinetic dynamometer to find peak torque (PT), early (RTD100) and late (RTD200) rate of torque development. Strength measurements were normalized to lean mass. Ultrasound imaging was used to quantify soleus fascicle length (FL), pennation angle (PA), muscle thickness (MT), and subcutaneous fat thickness (SFT). Propulsive force (PF) was extracted from 5 walking trials at a self-selected speed as participants walked across a 10m runway over a two force plates and normalized to body weight. One-way ANOVA was used to compare dependent variables between groups, and Pearson r correlations were computed to evaluate possible relationships among all factors. There were differences between groups in H:M ratio (p=0.02), PF (p=0.01), and RTD100 (p=0.01), and no differences in: PT, RTD200, FL, PA, MT, and SFT (p>0.05 for all). Post hoc comparisons indicated that individuals with PWS had a lower H:M ratio compared to obese controls (p=0.03). The PWS group (p=0.01) and obese controls (p=0.02) had lower propulsive force compared to the lean controls. The PWS group had lower RTD100 compared to the obese (p=0.02) and lean controls (p=0.01). RTD100 was associated with PF (r=0.52, p=0.01). No correlations were found between PF and MT, PA, FL, SFT, H:M ratio, RTD100, or PT for all groups. The lower RTD100 and H:M ratio in the group with PWS compared to controls, suggests impaired neurological function in PWS. RTD100 was also related to lower PF during gait. PF is a contributor to walking speed, which is commonly lower in adults with PWS. Interventions that increase RTD100 may be useful to increase PF and gait speed in adults with PWS.

83. NOS INHIBITION ON HUMAN SWEAT GLAD FUNCTION: ROLE OF KCA 1.1 CHANNELS

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Purpose: Local cholinergic-activated sweating is reduced in response to intradermal delivery of 50 mM tetra-ethylammonium chloride (TEA) a non-selective blocking agent for large conductance Ca^{++}-activated K^+ (KCa1.1) channels. In addition, inhibition of nitric oxide synthase (NOS) enzymes with 10 mM L-NAME also reduced sweat output. Intracellular nitric oxide (NO) can act to open KCa1.1 channels. We tested the hypothesis that the effect of NOS inhibition on sweat gland out is mediated through KCa1.1 channels. **Methods:** To evaluate this hypothesis, we examined sweating induced by intradermal electrical stimulation in 6 healthy adults in three successive trials at the same skin site in the following order: 1) Saline control, 2) 50 mM TEA, and 3) a cocktail of 50 mm TEA and 20 mM L-NAME. Local sweat rate (SR) was measured by passing dry gas through a small sweat capsule mounted on the skin. The skin was stimulated at a constant current intensity of 2.5 mA for 30 s at frequencies of 0.2, 1, 2, 4, 6, 8, 12, 16, 32, and 64 Hz using two small stainless steel stimulating electrodes. This procedure produced a sigmoid shape stimulus-response curve when we plotted the area under the SR-time curve versus stimulus frequency. All data were expressed as the area under the local SR-time curve (AUC) and normalize to the peak AUC response during Saline control trials (% AUC peak). **Results:** During Ringers perfusion, peak local sweat output averaged 99.6 ± 5.7 AUC % peak which was significantly (p<0.0001) reduced by application of 50 mM TEA to 61.7 ± 22.7 AUC %peak. Addition of 20 mM L-NAME to the 50 mM TEA solution produced an additional 20% reduction in peak SR to 42.5 ± 21.1 %AUC peak (p <0.05). **Conclusion:** These data support the hypothesis that sudomotor control of sweat gland activity is modulated by the presence of TEA sensitive K^+ channels and the activity of an intrinsic NOS enzyme in the epithelial cells of the human sweat glands. Further, the ability of L-NAME to produce an additional reduction in peak SR following 50 mM TEA indicates that the influence of NOS on local SR is not likely mediated via a modulation of TEA sensitive K^+ channels.

84. THE EFFECTS OF ALTERING THE COACTIVATION RATIO OF THE AGONIST AND ANTAGONIST MUSCLE GROUPS ON SKELETAL MUSCLE MOTOR RECRUITMENT PATTERN FOLLOWING ACL SURGERY

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During functional movement, both agonist and antagonist muscle groups are equally important in completing an exercise. When an agonist muscle is fatigued, the corresponding antagonist muscle compensates in the joint action and force production; this might pose a concern following anterior cruciate ligament (ACL) injuries that lead into quadriceps atrophy. If the antagonist muscle groups dominate the movement of that joint, it might further extend the rehabilitation process. Therefore, the purpose of this study is to investigate the impact of pre-fatigued antagonist muscle groups on agonist motor unit recruitment patterns in post-ACL-surgery and healthy subjects. 24 healthy males or and females (12 post-ACL-surgery) with no orthopedic limitations participated in this study. Following standardized warm-up, subjects' vastus medialis and biceps femoris muscle activity was monitored via EMG as they performed 1 set of 10 repetitions of modified Peterson step-up in a random order. They performed 30 maximal repetitions of voluntary knee flexion at 60°/s on both the affected and non-affected leg (ACL subjects) and dominant and non-dominant leg (healthy subjects) and again 1 set of 10 repetitions of Peterson step-up technique in an identical manner prior to isokinetic knee flexion. The 30 repetitions of isokinetic knee flexion at 60°/s resulted in a significant drop in peak torque in all groups (P<0.05). Although there were no significant changes in EMG activity of vastus medialis and biceps femoris from pre- to post- fatiguing isokinetic knee flexion, the vastus medialis to biceps femoris EMG activity ratio was significantly elevated in the affected leg in ACL-injured and non-dominant leg in healthy participants (P<0.05). Our hypothesis was partially supported by the limited number of subjects, indicating that in a physical therapy setting, manipulating antagonist muscle groups might improve the activity of atrophied muscle.

85. INCREASED SPATIOTEMPORAL GAIT ASYMMETRY IN OLDER ADULTS IS RELATED TO FALL RISK AND FALLS

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Increased fall risk and declining mobility threaten the health and independence of older adults. Falling is a multifactorial problem, but often falls occur during walking, suggesting that walking patterns may contribute to falls. Gait asymmetry has been shown to increase with age and be an independent factor related to falling in older adults. The purpose of this study was to investigate the relationship between spatiotemporal gait asymmetry, fall risk and falls in older adults. Twenty-two healthy older adults (79.6 years; SD 7.9) walked at comfortable (108.8 steps/min; SD 14.4) and fast (129.2 steps/min; SD 21.1) speeds to calculate asymmetry ratios for step length, stance time, and swing time. Falls (total number reported in the previous 12-months), as well as fall risk measures of function mobility (Timed-up to Go Test) and balance confidence (Activities-specific balance confidence scale) were also collected from each participant. Correlational analyses determined the relationships between gait asymmetry, number of falls and fall risk measures. At comfortable and fast walking speeds, numbers of falls were significantly correlated with step length and swing time asymmetries (r = 0.50-0.84). Functional mobility times were significantly correlated with step length and swing time asymmetries (r = 0.36-0.53). Balance confidence scoring was significantly correlated with step length, swing and stance time asymmetries (r = -0.68 - -0.57). Spatiotemporal gait asymmetry was more closely related to falls and fall risk at fast walking speeds, suggesting that gait asymmetry and the consequence of a fall may be more likely when older adults are forced to deviate away from their comfortable walking patterns. Knowing that gait asymmetry is correlated with specific risk factors for falling, further study should be made to investigate if interventions can be implemented, targeting these risk factors and specifically during altered gait patterns, to reduce gait asymmetry and ultimately reduce the number of falls for older adults.

87. THE EFFECTS OF MODE OF EXERCISE (RUNNING VS CYCLING) ON THE HR-VO_2 RELATIONSHIP

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There is a linear relationship between heart rate (HR) and oxygen consumption (VO_2) during incremental aerobic exercise. Thus, HR is a practical measure of intensity. Organizations such as the ACSM recommend a target HR range to prescribe intensity of aerobic exercise. The target HR range can be determined using a percentage of maximal HR (%HRM) or a percentage of HR reserve (%HRR) which have linear relationships with percent VO_2max (%V_{O2}M) and percent VO_2 reserve (%V_{O2}R), respectively. The purpose of this study was to test the hypothesis that these relationships are similar during running and cycling. Resting metabolic rate (RMR) and VO_2max were measured in 17 men (25.9 ± 5.1 yr) and 15 women (22.2± 5.2 yr) who were currently training using both modes of exercise. VO_2max was measured during treadmill running and during cycling. The HR and VO_2 values recorded during the maximal exercise tests were used to determine the HR-VO_2 relationship during running and cycling. The RMR in males (3.7 ± 0.4 mL/kg/min) and females (3.4 ± 0.3 mL/kg/min) were significantly different (p = 0.01). As expected, running VO_2max values (55.8 vs 46.3 mL/kg/min) and V_{O2}R values (52.0 vs 42.8 mL/kg/min) were significantly (p < 0.0001) higher in males than in females, respectively. Likewise, cycling VO_2max values (53.0 vs 43.5 mL/kg/min) and V_{O2}R values (49.3 vs 40.4 mL/kg/min) were significantly (p < 0.0001) higher in males than in females, respectively. A mixed model analysis of the data indicated that in both males and females, the HR–VO_2 relationship is similar during treadmill running and cycling when HR and VO_2 are expressed relative to maximal values or relative to reserve values. Therefore, the same target HR ranges expressed as a percentage of maximal or reserve values can be used in running and cycling.

86. EFFECTS OF BICYCLE CRANK LENGTH ON ELITE CYCLING PERFORMANCE

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The length of a bicycle's crank could impact several biomechanical and physiological variables which may affect cycling performance. Standard cranks are typically between 170 mm and 175 mm, but the optimal crank length for cyclists has yet to be determined. The purpose of this study was to examine the effects of six different crank lengths (150, 165, 170, 172.5, 175, and 180 mm) on gross efficiency (GE), heart rate (HR), maximum power, and optimal pedaling rate (cadence at maximum power). Elite level cyclists (n = 14) participated in two visits to the Cal Poly Cycling Lab. The purpose of the first lab session was to obtain VO_2 peak and participant characteristics (62.4 ± 7.4 ml/kg-min, 28.1 ± 5.5 yrs, 176.4 ± 8.1 cm, 71.7 ± 5.3 kg, 278 ± 83 km/week) and complete familiarization trials with four different crank lengths. These practice trials consisted of 4 second seated maximal sprints on the participant's original crank length (170, 172.5, or 175 mm) and three other crank lengths (150, 165, and 180 mm). The second test session was a single-blind randomized crossover design with the six different crank lengths. After a 5 minute warm up, participants performed a 3 minute steady state effort at 65% VO_2 peak and 90 rpm. This was followed by two maximum effort 4 second seated sprints with 90 seconds rest prior to each sprint. Participants rested for 5 minutes before the next crank length trial. During steady state cycling, shorter cranks (GE: 22.2%, HR: 143.5 bpm, 150 mm) appear to be more efficient compared to longer cranks (GE: 21.6%, HR: 146.2 bpm, 180 mm). During the 4 second sprints, there was a higher maximum power and an increase in optimal pedaling rate with shorter cranks (1014 W, 132 rpm, 150 mm) compared to longer cranks (994 W, 123 rpm, 180mm). Although shorter cranks resulted in a higher power and optimal pedaling rate, along with a greater GE and lower HR, more extensive statistical analysis comparing physiological and biomechanical changes between the six different crank lengths needs to be performed.

88. PAC-12 INJURY SURVEILLANCE SYSTEM (PAC-12 ISS): DEVELOPMENT AND IMPLEMENTATION

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Background: Sports injury and illness surveillance is an ongoing, systematic collection of data specifying the characteristics of sports injuries. Sports epidemiology plays a critical role in monitoring sports injuries, identifying risk factors for sports injuries, and developing effective prevention strategies for sports injuries. Over the past two years, the Pac-12 Conference has been dedicated to developing a robust, conference-wide sports injury and illness surveillance system (Pac-12 ISS). To our knowledge, this is the only conference-wide injury and illness surveillance system in existence. Purpose: To describe the development and implementation of the Pac-12 ISS. Methods: Development of the ISS began in February, 2015, with a limited number of schools, and has been scaled up to include all 12 Conference schools for the 2018-2019 academic year. Researchers at Pac-12 schools can request de-identified injury and illness data for the purpose of sports medicine research. The Pac-12 ISS database includes demographics (e.g., gender and sport), injury parameters (e.g., diagnosis and body part), injury-related event variables (e.g., arena/stadium and surface), and injury outcome information (e.g., return to play, medication use, and surgery/testing performed). It now includes comprehensive sports concussion outcome variables as well. We conducted missing data analysis using data collected in 2016-2018 as quality improvements. Results: There have been a total of 20,287 encounters recorded in the database since the implementation of the system. Overall, missing data for most variables were less than 5%, with the exception that the data fields for injury recurrence (new, recurrence, or pre-existing) and for injury outcome (status of returning to activity) had 8.6% and 11.5% missing data, respectively. The rate of missing data was consistent across the three years, 3.7% in 2016, 3.1% in 2017, and 3.5% in 2018. Conclusion: The Pac-12 ISS has potential to serve as a robust, longitudinal athlete injury and illness database, which will expand sports injury research to promote the health and wellness of student-athletes. The Pac-12 plans on integrating mental health variables into the system in the near future. The Pac-12 ISS can serve as a model for other conferences.

89. ESTIMATION OF RUNNING AND CYCLING VO_2MAX USING THE HEART RATE RATIO METHOD

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Although the direct measurement of VO_2max during an exercise test provides the most accurate assessment of cardiorespiratory fitness, estimates of VO_2max are often more practical. Prior research suggests that VO_2max obtained during a treadmill maximal graded exercise test can be accurately estimated in men using the Heart Rate Ratio Method. This method estimates VO_2max using the following equation: VO_2max (mL/kg/min) = (HRmax / HRrest) x 15. The validity of this equation to estimate VO_2max has not been established in women or in other modes of exercise, such as cycling. The purpose of this study was to compare VO_2max values measured during running and cycling to estimates of VO_2max using the Heart Rate Ratio Method. Thirty five men (21) and women (14) between 19-39 years of age completed the following tests: a) resting metabolic rate, b) treadmill maximal exercise test, and c) cycling maximal exercise test. Each subject's running and cycling VO_2max was estimated using the Heart Rate Ratio Method and their resting HR measured during the resting metabolic rate test and their actual maximal HR achieved during the maximal exercise tests. The average running and cycling VO_2max values for males (54.54 ± 7.13; 50.22 ± 9.12 mL/kg/min) were higher ($p<0.0001$) than in females (42.82 ± 6.58; 39.04 ± 8.43 mL/kg/min), respectively. Resting HR values for males (55 ± 7 bpm) and females (58 ± 7 bpm) were similar as were the maximal HR values during running (186 ± 12; 189 ± 12 bpm) and cycling (180 ± 11; 182 ± 14 bpm), respectively. The estimates of running and cycling VO_2max under-predicted actual values in males (51.31 ± 8.11; 49.71 ± 8.31 mL/kg/min) and overestimated actual values in females (49.54 ± 7.12; 47.84 ± 6.99 mL/kg/min). Although the overall mean difference between the actual and predicted running VO_2max values was only 0.75 mL/kg/min, regression and Bland Altman analysis yielded an R2 = 0.104, an SEE = 8.61, and a 95% limits of agreement (LOA) of ±19.08 mL/kg/min. Likewise, the overall mean difference between the actual and predicted cycling VO_2max values was 3.22 mL/kg/min, but regression and Bland Altman analysis yielded an R2 = 0.219, an SEE = 9.28, and a 95% LOA = ±18.82 mL/kg/min. The high SEE and LOA precludes this method for predicting running and cycling VO_2max.

90. A COMPARISON OF VERIFICATION PHASE INTENSITY FOR DETERMINATION OF VO_2MAX IN OLDER ADULTS

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Accurate assessment of maximal oxygen uptake in older adults is important given VO_2max is highly predictive of morbidity and mortality risk. The use of a verification phase and/or identification of appropriate verification phase work rates may enhance the accuracy of these measures in older adults. The purpose of this study was to examine the agreement between peak VO_2 values obtained from a ramp test and from two different verification phase intensities in older adults. Ten healthy older adults (66±6y) completed two testing sessions in a randomized, counterbalanced, single-blind fashion. Each session consisted of a traditional ramp protocol on a stationary cycle ergometer, and after 10 min of active recovery, the ramp was followed by a verification phase performed at either 85% (VF85) or 110% (VF110) of the peak work rate achieved during the ramp. Peak VO_2 was determined for each phase using the highest 30-second average, and heart rate (HR) was monitored via telemetry (Polar, Inc.). There was no difference in peak VO_2 between the ramp phase and the verification phase performed at 85% (P=0.51; Ramp, 1.90±0.93; VF85, 1.91±0.91 L/min) or 110% (P=0.18; Ramp, 1.91±1.0 vs. VF110, 1.82±0.87 L/min). Similarly, no difference was found for peak HR between the ramp and verification phase performed at 85% (P=0.42; Ramp, 153±20 vs. VF85, 155±20 bpm) or 110% (P=0.54; Ramp, 150±19 vs. VF110, 148±20 bpm). In addition, no difference was found for peak VO_2 (P=0.19) or HR (P=0.75) between the ramp test performed during the first or second session. These preliminary data indicate that in otherwise healthy older adults, a verification phase intensity of 10% above and 15% below peak work rate produces similar peak VO_2. In addition, these data also suggest that VO_2max on a stationary cycle ergometer may be obtained using a traditional ramp protocol in older adults. However, further research is needed to confirm these findings across a larger number of subjects and in clinical populations of older adults.

91. AUTOPHAGY IS STIMULATED BY ACUTE HIGH-INTENSITY INTERVAL EXERCISE IN HUMAN SKELETAL MUSCLE

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Autophagy is an evolutionary conserved cellular degradation system implicated in maintaining health and promoting longevity. Few human data exist investigating the autophagic response to exercise; however, acute moderate-intensity, continuous exercise (MICT) has been shown to stimulate autophagy in skeletal muscle. Presently, it is unknown whether high-intensity interval training (HIIT) exercise induces autophagy. The purpose of this study was to compare the autophagy response of an acute bout of HIIT exercise (treadmill running) to MICT exercise in skeletal muscle. Using a crossover design, ten recreationally-active males (n=5) and females (n=5) performed a bout of MICT (60 minutes at 55% of max velocity [Vmax]]) and HIIT (6 bouts of 1 minute at 100% Vmax and 1 minute at 3 MPH, followed by 5 minutes at 3 MPH, followed by 6 bouts of 1 minute and 100% Vmax and 1 minute at 3 MPH). Muscle biopsies from the vastus lateralis were taken pre- and 3 hours post-exercise. Exercise bouts were separated by 72 hours and performed in a fasted state. Muscle tissue was analyzed for protein expression of markers of autophagy (LC3I, LC3II) and autophagy signaling (p38MAPK) via western blot analysis. No differences were detected for LC3I, LC3II, and p38MAPK protein content measured 3 hours post-exercise compared to pre-exercise in both HIIT and MICT bouts ($p>0.05$). LC3II:LC3I ratio increased 3 hours post-exercise in HIIT (162.4 ± 45.9%), which was significantly higher than MICT at 3 hours post-exercise which decreased from pre-exercise (48.8± 9.4%; $p<0.05$). Our findings suggest HIIT stimulates autophagy, however, in a distinct fashion compared to MICT.

92. EFFECTS OF A 16-WEEK AEROBIC AND RESISTANCE EXERCISE INTERVENTION ON LEPTIN/ADIPONECTIN RATIO IN OVERWEIGHT AND OBESE BREAST CANCER SURVIVORS

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INTRODUCTION: Overweight and obese breast cancer survivors (BCS) are at greater risk of developing type II diabetes (T2D) than non-cancer populations due, in part, from adipose tissue-induced modulations to the adipokines, leptin and adiponectin. Leptin upregulates inflammatory cytokines associated with insulin resistance (IR) while adiponectin inhibits inflammation and regulates glucose uptake. The Leptin/Adiponectin Ratio (LAR) has been used as an indicator for the diagnosis of T2D, due to its ability to measure both inflammatory and glucose abnormalities. In overweight and obese BCS, an elevated LAR induces IR, which contributes to the development of T2D. Exercise may be an effective strategy to reduce the LAR to target the risk of T2D in BCS.**OBJECTIVES:** The purpose of this study was to determine whether a 16-week aerobic and resistance exercise intervention reduces the LAR in overweight and obese BCS.**METHODS:** Sedentary, overweight/obese (BMI ≥ 25 kg/m^2) BCS (Stage I-III) were randomized to the Exercise (EX; n=50) or Control (CON; n=50) groups. The EX group underwent supervised moderate-vigorous intensity aerobic and resistance exercise sessions 3 times per week for 16 weeks. Leptin and adiponectin were measured from fasting blood samples using enzyme-linked immunoabsorbant assays. Paired t-tests and mixed-model repeated measures ANOVA were used to examine the within and between group differences in mean changes in LAR.**RESULTS:** On average, women were 53.5±10.4 years old, postmenopausal (60%), Hispanic (55%) with a BMI 33.5±5.5 kg/m^2. Post-intervention, leptin was significantly reduced (-8.0ng/mL±0.3) in the EX group compared to CON group (+4.8ng/mL±0.5; p=0.001). Adiponectin was significantly increased (+7.5µg/dL±1.0) in EX group compared to CON group (-1ng/mL±0.3; p=0.001). Post-intervention, LAR was significantly reduced (-1.23±0.21) in the EX group compared to CON (0.66±0.11; p<0.01). There was a significant increase in LAR in the CON group (P<0.01). **CONCLUSION:** A 16-week aerobic and resistance exercise intervention is an effective approach to reduce the LAR in overweight and obese BCS. This finding supports the utilization of exercise to reduce the risk of T2D following the completion of cancer treatment in overweight and obese BCS.

SATURDAY POSTER PRESENTATIONS

1. EFFECTS OF A HIGH INTENSITY GO4LIFE PROGRAM IN PEOPLE WITH PARKINSON'S DISEASE

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INTRODUCTION: Parkinson's disease (PD) has significant effects on physical function with negative consequences related to fall prevention, independent living, and quality of life. Current exercise recommendations from the National Institutes on Aging (NIA Go4Life) and National Parkinson's Foundation include cardiovascular endurance, strength, flexibility, balance training. While these are prudent, they neglect the potential benefits of high intensity exercises that target the central nervous system. A growing body of literature supports the safe use of high intensity exercise in PD to improve physical function. Additionally, it is speculated that high intensity exercise elicits a more profound effect on brain neuroplasticity than low intensity exercise. The purpose of this project was to combine recommendations from the NIA Go4Life program with speed to improve physical function in people with PD. METHODS: Nine people with PD participated in pre- and post-intervention tests. The intervention was an eight week speed-based exercise program (2 days per week) that included components of endurance, strength, flexibility, and balance. Results from a previous study demonstrated physical and cognitive improvements in a group of older adults. RESULTS: There were improvements in the following functional tests upon completion of the eight week program: 10 meter walk and number of steps taken, timed up and go, and four square step test ($p<.05$). Reaction time and grip strength did not change. CONCLUSIONS: Results from this study support the addition of speed-based exercises to improve physical function in people with PD.

2. PILOT STUDY: CORE TEMPERATURE DURING SWIMMING IN TRIATHLON WETSUITS

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Swim-related fatalities have raised safety concerns in the sport of triathlon. As the safety of the athlete is imperative, athletes must adhere to the rules related to water temperatures for racing and the use of wetsuits in triathlon events governed by USA Triathlon (USAT). Athletes can select from a wide variety of wetsuit models. Two main categories of wetsuit models are sleeveless and full sleeve. However, to our knowledge, there are no data regarding whether or not wetsuit design influences core temperature. PURPOSE: The purpose of this study was to examine the influence of wetsuit design on core temperature responses during swimming. METHODS: Three participants (43 ± 11.53 years, 1.83 ± 0.06 m, 77.20 ± 5.63 kg) swallowed an ingestible core temperature pill (BodyCap) 6-8 hours before completing the swim protocol. The protocol began with a self-directed warm-up swim followed by a 500 m swim for each condition (no wetsuit, sleeveless wetsuit, and full sleeve wetsuit). Participants were instructed to swim at a self-selected pace at a somewhat hard intensity. Pool temperature was 25.5°C. Upon completion of the swim for each condition, average core temperature was recorded. Furthermore, participants were required to rest between conditions to allow core temperature to return to baseline. RESULTS: Core temperature was not different between the three conditions ($p>0.05$). Core temperatures for no wetsuit, sleeveless wetsuit, and full sleeve wetsuit were 37.57 ± 0.06 °C, 37.60 ± 0.36 °C, and 37.60 ± 0.20 °C, respectively. CONCLUSION: These pilot results indicate that wetsuit design does not significantly influence core temperature responses.

3. EFFECTS OF EXERCISE INTENSITY ON AUDITORY PROCESSING SPEED AND FLEXIBILITY, AND CALCULATION ABILITY

Bruce Bailey, PhD, Hunter LaCouture, Harrison Marsh, and Chance McCutcheon
Brigham Young University

Purpose: This study examined the impact of exercise intensity on auditory processing speed and flexibility, and calculation ability. Methods: The study used a randomized crossover design. We recruited 136 men and women between the ages of 18-45 years. There were three exercise conditions, moderate (35% VO_2 max), vigorous (70% VO_2 max), and sedentary (no exercise). Each condition was separated by exactly 1 week. After each 40 min exercise condition, we administered the Paced Auditory Serial Addition Test (PASAT) to measure the relationship between exercise intensity and cognitive performance. About forty minutes after each condition, participants completed the PASAT. Results: Eighty one men (age=23.2, BMI=23.9 ± 3.2) and 55 women (age=20.9, BMI=22.4 ± 2.8) completed the study. There was no main effect of condition for the number of problems answered correctly ($P=0.2900$) or the number attempted ($P=0.2291$). There was a main effect for gender for both the number of problems answered correctly and the number of problems attempted. On average, men attempted more problems and answered more problems correctly compared to women (Ps <.0001). However, there was no significant gender by condition interaction for either the number of problems answered correctly or the number attempted. Conclusion: The results of this study show that there is no impact of exercise on auditory processing speed and flexibility, and calculation ability 40 minutes post-exercise. Neither exercise intensity nor gender modified this outcome.

4. LOWER-BODY POWER RELATIONSHIPS TO LINEAR SPEED, CHANGE-OF-DIRECTION SPEED, AND HIGH-INTENSITY RUNNING PERFORMANCE IN DI COLLEGIATE WOMEN'S BASKETBALL PLAYERS

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Collegiate basketball players are reliant on the ability to sprint and change direction at high speeds, which are necessary qualities to play the game effectively. Although lower-body power should contribute to this, power can be measured in different ways. Jump tests are commonly used to indirectly measure this quality, although power can then be calculated from these measurements. How different jump assessments relate to linear sprinting, change-of-direction (COD) speed, and high-intensity running has not been analyzed in detail in collegiate women's basketball players. The purpose of this study was to determine to what extent of lower-body power as measured via jump tests relates to linear speed, COD speed, and high-intensity running performance in Division I (DI) collegiate women's basketball players. Twelve DI female collegiate basketball players completed several tests of lower-body power. These included the vertical jump (VJ), standing broad jump (SBJ), and two-step approach jump (AppJ). Harman equations were used to calculate average power and peak power from VJ height. Players also completed: 10-m and ¾ court sprint to measure linear speed; the pro-agility shuttle, which measured COD speed; and the Yo-Yo Intermittent Recovery Test Level 1 (YYIRT1), with the number of shuttles completed providing a measure of high-intensity running. Pearson's correlations ($p<0.05$) were used to calculate relationships between the jump and power tests with the linear and COD speed tests, and the YYIRT1. AppJ negatively correlated to ¾ court sprint ($r=-0.66$) and the pro-agility shuttle ($r=-0.81$). AvgP positively correlated to the 10-m sprint, ¾ court sprint, and pro-agility shuttle ($r=0.66$-0.77). PeakP was positively correlated to the ¾ court sprint ($r=0.61$) and pro-agility shuttle ($r=0.59$). AvgP ($r=-0.81$) and PeakP ($r=-0.77$) were negatively correlated with the YYIRT1. No significant correlations were found for VJ or SBJ. A higher AppJ related to a faster ¾ court sprint and pro-agility shuttle. The AppJ requires the use of the stretch-shortening capacities of the legs, and this quality is also important for faster linear and COD speed. AvgP and PeakP are influenced by body mass, and while larger athletes produce higher amounts of power, they also may display slower 10-m sprint and pro-agility shuttle times, and lesser YYIRT1 performance. These relationships suggest that strength and conditioning staff should ensure that even though larger players should be able to generate high amounts of power, they should also be able to move their body mass quickly when running.

5. HIGH-INTENSITY INTERVAL TRAINING AND MODERATE-INTENSITY CONTINUOUS TRAINING EFFECTS ON ENERGY INTAKE AMONG COMPENSATORS

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In spite of well-documented health benefits of exercise, not everyone who begins an exercise program loses weight as expected. A person who does not change body mass as much as expected based upon calories expended during exercise and body composition changes is considered a compensator. The objective of this study was to compare the effects of exercise at different intensities and volumes on energy intake among compensators. Twenty-four healthy, sedentary participants ages of 18-55 (2 M, 22 F; 25 ± 6 yr.) completed the 12-week study. Energy intake, weight, and body composition were assessed 3 times by 7-day food logs. All participants completed an introductory 4-week moderate-intensity continuous (MICT) exercise intervention (70-76% of heart rate (HR) max) for 30 min./session, 5 sessions/week. Twelve compensators (1 M, 11 F) were identified and randomized into either continuing the MICT program, or a high-intensity interval-training (HIIT) program (10 1-min. bouts at 90-95% of HR max with 1-min. recovery intervals, 20 min/session, 3 sessions/week) for 8 weeks. There was no significant group x time interaction for energy intake (MICT Week 5 = 1786 ± 314 kcal, Week 12 = 1872 ±575 kcal; HIIT Week 5 = 1694 ± 487 kcal, Week 12 = 1814 ± 453 kcal; p=0.618), weight (MICT Week 5 = 83.4 ± 39.1 kg, Week 12 = 83.2 ± 37.6 kg; HIIT Week 5 = 63.5 ± 10.3 kg, Week 12 = 62.9 ± 10.7 kg; p = 0.781), or body fat percent (MICT Week 5 = 36.2 ± 16.2%, Week 12 = 36.2 ± 15.8%; HIIT Week 5 = 29.6 ± 6.6%, Week 12 = 29.4 ± 7.9%; p = 0.401). There was, however, a strong negative correlation (r = -0.741, p=0.009) between the change in energy intake and change in total body mass among compensators. Further research is warranted to understand the effects of energy intake on energy balance among compensators exercising at different intensities and volumes to discover other possible causes of compensation.

7. CARDIOVASCULAR RESPONSE TO LEVEL OF APPLIED EXTERNAL PRESSURE

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Environmental and tissue pressures can have large effects on arterial and venous blood flows. For example, application of positive pressures in the range of 20 to 40 mmHg to a small area of the lower leg can increase local muscle, skin and bone microvascular flows, while negative pressures between -20 and -40 mmHg have been shown to decrease microvascular blood flow. Additionally, large LBNP devices create foot-ward venous fluid shifts and decrease stroke volume and blood pressure at -20 and -40 mmHg. Diverse patient populations benefit from these phenomena, including astronauts and individuals with chronic wounds. Astronauts experience cardiovascular and skeletal muscle deconditioning, worsening vision, cerebral changes, and bone loss during long space flight due to the head-ward distribution of the venous blood volume and musculoskeletal unloading. Large, Lower Body Negative Pressure (LBNP) devices can mitigate these changes by altering the macrovascular hemodynamics and returning more venous volume to the lower limbs, and creating a ground reaction force under the feet that loads the musculoskeletal system.[2,3] Patients with chronic wounds, such as venous stasis ulcers or diabetic ulcers, have underlying microvascular changes that increase the difficulty of wound healing. Compression bandages and negative pressure wound therapies both apply external pressures over small areas, leading to decreased wound healing time and increase microvascular blood flow. But in one population that requires an external pressure driven macrovascular effect and another that requires a microvascular effect, how do you ensure that adverse microvascular macrovascular effects are limited, respectively? Additionally, what is the dose threshold needed to achieve a negative pressure driven venous fluid shift in astronauts or the dose threshold needed to achieve microvascular flow increase in patients with chronic wounds? Despite extensive literature on the many effects of external pressure on microvascular or macrovascular blood flow, no study exists to examine the relationship between the blood flow in the cardiovascular system, bone microvasculature, skin microvasculature and muscle microvasculature and the dose of applied external pressure. The purpose of this trial is to examine the effect of different doses of external pressure exposure, defined in terms of pressure exposure magnitude and area, on the bone, skin and muscle microvasculature and systemic blood flow. This abstract deals with the preliminary cardiovascular data of this trial.

6. A COMPARISON OF THE PHYSIOLOGICAL AND PERFORMANCE CHARACTERISTICS OF A DIVISION I NCAA BASKETBALL TEAM AND NBA DRAFT COMBINE PLAYERS

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The National Basketball Association (NBA) Combine is a multi-day showcase event for young college basketball players that takes place every May, a month before the draft to help scouts and teams compare the abilities of different players. A large part of the combine is anthropometric and physical fitness testing. For players from smaller schools that may not be as heavily scouted, it is important to ascertain whether they have fitness characteristics comparable to players featured at the combine. The purpose of this study was to determine whether there were differences in the physiological characteristics of potential NBA Players and a sample of Division I (DI) players from one school, to ascertain whether there are certain characteristics college players should strive to develop. A successful (NCAA Tournament Bid) mid-major DI team completed the NBA Combine tests, including: anthropometric measures of body mass, height, standing reach, and wingspan; maximum repetitions of a 185lb bench press; ¾ court sprint; and vertical countermovement and a two-step approach jump. Data from the 2018 NBA combine was acquired from the official NBA website. Independent samples t-tests ($p < 0.05$) were used to compare the two populations' respective playing positions which were divided into frontcourt (power forwards and centers) and backcourt (guards and shooting forwards) groups for the different tests. For the anthropometric measures, there was a significant difference in favor of the combine players compared to both frontcourt and backcourt groups in terms of wingspan and reach, as well as body weight for the backcourt group. The performance characteristics of both groups were similar, with the DI frontcourt players having lesser performance in the ¾ court sprint and approach jump. The mean differences between these performance measures for the frontcourt players (approach jump = 6.35 cm, ¾ sprint = 0.17 s) may reflect the relative scarcity of athletic frontcourt male players available at the D1 level. These data also provide support to the assumptions that even though players at a mid-major level college may have similar performance qualities relative to combine players, longer players (as measured by reach and arm span) may receive more opportunities via NBA Combine invitations. If mid-major level college players do not have these anthropometrics, they should consider excelling at performance characteristics in order to get noticed by NBA scouts and coaches.

8. THE EFFECT OF MOVEMENT SPEED ON PASSIVE LEG MOVEMENT INDUCED HYPEREMIA

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Purpose: Passive leg movement (PLM) is a method used in measuring vascular endothelial function. While the magnitude of the hyperemic response to PLM is indicative of the health of the vascular system, the impact of changes in passive leg movement speed has not previously been documented. This study sought to provide insight into the effect of movement speed on PLM-induced hyperemia. Methods: Vascular endothelial function was measured in 11 young (22.5 ± 0.7), healthy adults (3 female, 8 male) via ultrasound Doppler measurements on the right common femoral artery during varied speeds (20, 40, 60, and 80 CPM) of passive leg movement. The magnitude of hyperemia was quantified in terms of the Peak Change in blood flow elicited by each trial and by the Total Hyperemia elicited by each trial. Results: A significant effect due to speed was measured in Peak Change in Flow and Total Hyperemia in 60 seconds and Total Hyperemia in 60 movements ($P<0.05$), such that a linear relationship between movement speed and Peak Change in Flow ($r=0.47$, $P<0.05$), Total Hyperemia in 60 seconds ($r=0.61$, $P<0.05$), and Total Hyperemia in 60 movements ($r=0.34$, $P<0.05$) was found in trials. Conclusion: Results clearly indicate the greater the movement speed, the greater the hyperemic response. While 80 CPM results in a greater hyperemic response than the traditional 60 CPM, personal experience indicates that it is rather difficult to move the participant's leg at such a rapid cadence. Therefore, we recommend future studies to continue to use the traditional movement speed of 60 CPM to assess vascular endothelial function with PLM.

9. EFFECT OF EXTRINSIC FEEDBACK ON MAXIMAL ANAEROBIC PERFORMANCE

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Introduction: Extrinsic factors, such as verbal feedback, have been shown to improve aerobic performance prior to a VO_2max test. The purpose of this investigation was to determine if similar feedback, given prior to an anaerobic test of power, elicits a similar effect. Methods: Healthy college aged males and females were recruited to take part in a two-day investigation (n=30). The participants were randomly assigned to one of three groups: positive feedback, negative feedback, or no feedback control. On day one height, weight, and seat height were recorded and the participants were familiarized with the Wattbike Pro. This consisted of a two-minute warm up with two, five-second sprints to simulate a maximal effort. The participants were then given two-minutes to recover from the warm up. Participants' weight and sex were inputted into the Wattbike Pro software which then yields a given resistance. The participants were informed to cycle as hard and as fast as possible for the duration of the 30-second test. Verbal encouragement was given throughout the test among all conditions. Following the test participants were given a two minute cooldown. On day two following the warm-up, but before the 30-second test, participants were told they: performed better than their weight and sex matched peers, performed worse than their weight and sex matched peers, or given no feedback. Results: No group difference exists for peak or average power from day one to day two (p=0.813, p=0.808 respectively). No sex difference exists for peak or average power from day one to day two (male p=0.579, p=0.651; female p=.993, p=0.97). Conclusion: Positive and negative feedback does not influence performance over the no-feedback control. There is no influence of extrinsic factors on a 30-second maximal anaerobic test of power.

10. RELATIONSHIP BETWEEN VO_2, HEART RATE, RATE OF PERCEIVED EXERTION AND GROUND REACTION FORCES, VELOCITY, AND POWER WHILE WALKING ON A NON-MOTORIZED TREADMILL IN DII CROSS COUNTRY ATHLETES

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To maintain or improve an athlete's physical performance, bodily physiology and as well as external forces both contribute to how an athlete performs. A low intensity activity such as walking measures voluntary oxygen consumption (VO_2), heart rate (HR), and rate of perceived exertion (RPE) and external factors acting on movement such as ground reaction force (GRF), velocity, and power output. Purpose: The purpose of this study is to identify a relationship between VO_2, HR, RPE and GRF, velocity, and power during walking on a NMT in D2 Cross-Country Athletes. Methods: Thirteen Cross Country Division II female athletes volunteered to participate in two sessions. On familiarization day, participants signed an IRB approved informed consent and performed the testing protocol consisting of a 5-min warm-up walk, 5-min testing walk at steady-state, and 5-min cool down. Walking pace was determined by participants self-selected pace. Day two, participants performed testing procedures on NMT where RPE, HR, VO_2, horizontal and vertical GRF, velocity, and power output were recorded every minute during the walk trial and steady-state minutes were averaged for analysis. Pearson's R correlations were used to analyze the relationship between VO_2/HR/RPE and GRF/velocity/power. Results: There was a significant strong positive correlation between HR and velocity (p= 0.003; r= 0.75), horizontal force (p= 0.004; r= 0.73), and power (p= 0.002; r= 0.76). There was no significant ($p > 0.05$) correlation for all other variable. Discussion: These results determine that during each subject's individual steady-state walking pace, if the self-selected velocity was higher, then their GRF should be higher compared to someone with a lower velocity who would have a lower GRF. This may suggest, collegiate cross-country runners require a higher intensity activity to attain higher VO_2 consumption. Thus, the steady-state walk intensity was too low to show a relationship between GRF and VO_2.

11. HOW BEST TO USE YOUR LIMITED CARDIOVASCULAR SYSTEM TRAINING EQUIPMENT BUDGET: A UTAH VALLEY UNIVERSITY CASE STUDY

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PURPOSE: The Student Life and Wellness Center (SLWC) at Utah Valley University (UVU) spent $300,540 on its current fleet of 46 pieces of cardiovascular system training equipment (cardio equipment). UVU students pay for gym equipment from student fees. SLWC managers want to know how to use their cardio equipment budget and gym space efficiently to benefit students most. **METHODS:** All the cardio equipment was purchased from Life Fitness (Rosemont, IL). The equipment reports usage data to Life Fitness, and we retrieved that data from their Halo Fitness Cloud. All the equipment has been in use for 24 months except the treadmills which have only been in use for 3 months. **RESULTS:** Overall use (distance, hours, and workouts) was compared. Use/month/dollar was compared, in order to best understand the value and popularity of each device.

Equipment	Price	Distance/month	Distance/ month/dollar	Hours/month	Hours/ month/dollar	Workouts/ month	Workouts/ month/dollar
Number	$	Miles	Miles	Hours	Hours	Number	Number
Treadmill (15)	$6,880.23	261.722♦♥*•	.038♦♥*•	54.662#♦*•	.008•	231.267#♦*•	.034+#*•
Elliptical (12)	$5,710.30	211.143♦♥*•	.037♦♥*•	37.699+*•	.007*•	133.333+*•	.023*•
Upright Bike (6)	$5,999.00	513.352+#•	.086+#•	35.400+*•	.006*•	148.667+*•	.025*•
Recumbent Bike (7)	$6,499.00	534.197+#•	.082+#•	41.834*•	.006*•	180.286*•	.028*•
PowerMill Climber (4)	$6,999.00	569.440+#•	.081+#•	77.990+#♦♥•	.011+#♦♥•	402.000+#♦♥•	.057+#♦♥•
FlexStrider Trainer (2)	$9,665.00	31.580+#♦♥*	.003+#♦♥*	5.415+#♦♥*	.001+#♦♥*	31.500+#♦♥*	.003+#♦♥*

+, p<.05 compared to Treadmill
#, p<.05 compared to Elliptical
♦, p<.05 compared to Upright Bike
♥, p<.05 compared to Recumbent Bike
*, p<.05 compared to PowerMill Climber
•, p<.05 compared to FlexStrider Trainer

DISCUSSION: Powermills are the most used equipment in our sample: whether measured as distance, hours, or workouts. They are also the best overall value. FlexStriders cost the most money and were used the least. **CONCLUSION:** Through simple analysis of automatically-recorded data, UVU can use student money effectively. Students will have the equipment they like to use, and less student fees will be needed as costly unpopular equipment will not be purchased in the future. Gym managers should be able to serve their clientele better with similarly-simple analyses.

12. CORRELATION BETWEEN VO_2MAX AND ANAEROBIC POWER IN LAW ENFORCEMENT SWAT TEAM MEMBERS

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PURPOSE: The purpose of this investigation was to examine the relationship between maximal oxygen uptake (VO_2max) and anaerobic power in Special Weapons and Tactical (SWAT) team members of law enforcement. METHODS: Fourteen healthy men and one healthy woman (age: 33 ± 6 y, height: 179.6 ± 6.7 cm, body mass: 89.6 ± 10.4 kg) performed a graded exercise test to measure VO_2max and a Wingate Anaerobic Test to measure anaerobic power on two separate occasions. VO_2max was determined with a graded exercise test on a motorized treadmill using the Costill-Fox protocol. Anaerobic power was determined using the Wingate Anaerobic Test where participants cycled against a resistance of 9% of body mass (8 ± 1 kg) on a Wingate cycle ergometer. Pearson's r correlations were conducted to analyze the relationship between absolute VO_2max and absolute power as well as relative $V\dot{O}_{O2}$max and relative power. RESULTS: Absolute VO_2max (4.24 ± 0.60 L·min-1) was significantly positively correlated to absolute peak power (1060 ± 176 W; r = 0.60; p = 0.02) and absolute average power (758 ± 105 W; r = 0.75; $p < 0.01$). Moreover, relative VO_2max (47.5 ± 5.5 mL·kg-1) was significantly positively correlated to relative peak power (11.9 ± 1.8 W·kg-1; r = 0.56; p = 0.03) and relative average power (8.5 ± 0.9 W·kg-1; r = 0.64; p = 0.01). CONCLUSIONS: There are moderate-to-strong positive correlations between $V\dot{O}_{O2}$max and anaerobic power. It is possible that adaptations that occur with high intensity anaerobic exertions might be related to changes in aerobic metabolism. Future research might consider examining the effectiveness of anaerobic power training on aerobic fitness among the tactical athlete populations.

13. VALIDATION OF GARMIN FITNESS TRACKER BIOMECHANICS

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Purpose: As fitness trackers become more available, the need for independent validation has become more important to drive accuracy in training decisions and physiologic research. Therefore the purpose of this study was to find the reliability and accuracy of the data collected from the Garmin Fenix HR3 Fitness Tracker. Methods: 17 healthy, recreational runners (9 male, 8 female, 28.11 ± 7.38 yrs, 70.26 ± 10.76 kg, 173.77 ± 5.96 cm) performed three running conditions (flat, incline (5%), and decline (-5%)) on an instrumented treadmill (Bertec, Inc., Columbus, OH) used to collect ground reaction force data. Infrared markers were placed on the foot and trunk and tracked with a 16 camera Vicon Nexus 2.3 (Vicon, Inc., Oxford, UK) system. The data was processed using Visual 3D software (5.0, C-Motion, Inc., Germantown, MD,USA) and variables extracted were compared to data collected by the Garmin Fenix HR3 (Garmin Ltd., Olathe KS). Results: Statistical analysis was done via a paired T-test comparing the data taken from the Vicon Nexus system and Bertec treadmill to the data collected by the Garmin watch. There were no differences between the Garmin and the treadmill for flat stride length, declined stride length, inclined run cadence, declined run cadence, and inclined ground contact time. Differences ($p < 0.05$) were observed in inclined stride length, flat run cadence, flat vertical oscillation, inclined vertical oscillation, declined vertical oscillation, flat ground contact time, and declined ground contact time. Conclusion: Overall the Garmin Fenix HR3 fitness tracker was found to be reasonably reliable for certain variables, such as stride length and run cadence, but not reliable for vertical oscillation and ground contact time. Certain considerations should be taken as to the accuracy of the variables when using this data to drive training adaptations.

14. COMPARING ESTIMATES OF SEDENTARY, LIGHT AND MODERATE-VIGOROUS PHYSICAL ACTIVITY BETWEEN ACTIVITY MONITORS

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Introduction: Accelerometers are widely used in research, but studies use different monitors, attachment sites, and/or data processing methods, making it difficult to compare results across studies. Therefore, the purpose of our study is to compare data collected at the hip, wrist, and thigh to determine if estimates of sedentary time (ST), light physical activity (LPA) and moderate-vigorous physical activity (MVPA) are comparable over a 7-day wearing period. Methods: Participants wore an ActiGraph (AG) on the hip and non-dominant wrist, and activPal on the thigh 24 hours/day for 7-days. Intensity was categorized using the following methods: AG-Hip 3x, Freedson, Sasaki, Matthews, and Crouter; AG-wrist random forest (RF), linear model (LM) and GGIR; and activPal software. Across the different methods, we compared mean estimates and pearson correlations for ST, LPA and MVPA. Results: Average ST ranged from 461 min/day (Hip-Crouter) to 610 min/day (Hip-Freedson), the lowest correlation was between Hip-3x and Wrist-GGIR (R= 0.14) and the highest was between Hip-Freedson and Hip-Sasaki (R=0.94). Average LPA ranged from 201 min/day (Hip-Matthews) to 338 min/day (Hip-Sasaki), the lowest correlation was between Hip-3x and Wrist-LM (R=0.46) and the highest was between Hip-Freedson and Hip-Matthews (R=0.94). Average time in MVPA ranged from 53 min/day (Hip-Freedson) to 186 min/day (Wrist-LM) , the lowest correlation was between Wrist-LM and Wrist-GGIR (R= 0.30) and the highest was between Hip-3x and Hip-Matthews (R= 0.93). Discussion: Estimates of ST, LPA and MVPA are heterogeneous across different processing methods and attachment sites, particularly when comparing hip and wrist attachment sites. There is a need to identify which procedures will result in equivalent methods to facilitate data pooling and ensure coherent public health translation of prospective cohorts that are using accelerometers.

15. RELATIONSHIP BETWEEN CARDIOVASCULAR, METABOLIC, PERCEPTUAL, GROUND REACTION FORCES, AND POWER DURING RUNNING CONDITIONS ON A NON-MOTORIZED TREADMILL IN D2 CROSS COUNTRY ATHLETES

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The purpose of this study was to examine the relationship between cardiovascular, metabolic, perceptual, ground reaction forces (GRF), and power measures during running on an NMT in Division II cross-country athletes. Methods: Thirteen female cross-country Division II athletes volunteered to participate in two sessions. Day one, participants read and signed IRB approved informed consent and performed the treadmill protocol which consisted of a 5-min warm-up walk, 5-min run, and 5-min cool-down on the NMT. The participant's velocity was recorded every minute to determine their average self-selected pace for running. Day two (testing day) consisted of performing the treadmill protocol. Heart rate (HR), rate perceived exertion (RPE), voluntary oxygen consumption (VO_2), vertical and horizontal GRF, power, and velocity was recorded and steady-state minutes were averaged and used for analysis. A Pearsons-R correlation was used to determine the relationship between HR, RPE, VO_2, GRFv, GRFh, power, and velocity. Results: There was a significant positive strong correlation between HR and running velocity ($p= 0.002$; $r= 0.76$), power ($p= 0.002$; $r= 0.76$). There was a significant positive strong correlation between VO_2 and running velocity ($p= 0.006$; $r= 0.71$), hGRF ($p= 0.008$; $r= 0.69$), and power ($p= 0.005$; $r= 0.72$) between VO_2 and power. There was no significant ($p> 0.05$) correlation for all other variables. Discussion: The results indicate that VO_2 has strong correlations with running velocity, force, and power, and that HR has strong correlations with running velocity and power. VO_2 and HR are indicators of exertion in running conditions. Since the runners were in a steady-state condition, these results indicate that an increase in exertion in cardiovascular and metabolic measure also requires an increase in kinetic measures, which may be due to the NMT requiring the user to self-propel, we can assume that these correlations are due to the machine being non-motorized.

16. AN ANALYSIS OF FOOT TO GROUND INTERACTIONS WHILE RUNNING BEHIND A JOGGING STROLLER

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Purpose: Many adults with young children have difficulty finding time to exercise. Stroller running (SR) is a popular solution. Some research has explored the effects that SR has on run cadence, stride length and energy. To our knowledge, no studies have explored the effects of SR on the impact forces and shock attenuation on the major joints of the lower limb. Increased impact peaks and lessened shock attenuation have been linked to lower limb injuries in runners. The purpose of this study is to explore impact forces and shock attenuation differences in SR compared to regular running. Methods: 13 participants (Height: 1.8m ± 0.08M Weight: 82.6kg ± 11 kg) were asked to run behind a Thule Urban Glide 2 (Thule Group, Inc, Malmö, SE) jogging stroller suspended over an instrumented treadmill (Bertec, Inc, Columbus, OH). The study involved four different running conditions: BH both hands on the handlebar, RH the right arm swinging with the left hand on the handlebar and left arm swinging, LH left hand swinging and NS without the stroller. Biomechanical data was collected with Vicon Nexus 2.3 (Vicon, Inc., Oxford, UK) and processed through Visual 3D (5.0, C-Motion, Inc., Germantown, MD, USA). Differences in ground reaction force and loading variables were compared between the four different conditions. Results: The impact peak of the vertical ground reaction force, occurring immediately after footstrike, was reduced in the BH condition (1107 N) compared to both the RH condition (1263 N, $p=0.017$) and the NS condition (1276 N, $p=0.04$). There were no differences observed between conditions for the overall peak vertical ground reaction force or the loading rates of the vertical ground reaction force. Discussion: Running injuries on the lower extremity generally occur from recurring force impacting it's joints. Immediately after footstrike the BH condition lessened the impact peak vertical ground reaction force, this could result in a reduced risk of injury. However, there was no change in overall impact force or loading rates, regardless of condition we tested. There is no evidence to suggest that RH or LH appear to increase nor prevent risk of potential injury. While this study is one of the first to quantify force and loading rates during SR, future studies should consider how the propulsion of the stroller would compare to the current findings.

17. PLAYGROUND GREENING RESULTS IN PERSISTENT IMPROVEMENTS IN PHYSICAL ACTIVITY LEVELS AMONG LAUSD ELEMENTARY SCHOOL STUDENTS

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Purpose: Playgrounds serve as promising settings to improve moderate-to-vigorous physical activity levels for school-aged children. This study aims to examine the impact of large-scale playground greening renovations on student sedentary and physical activity behaviors over the course of 16-months. Methods: Physical activity and social interaction behaviors were recorded for a total of 608 elementary school students at experimental (green playground renovation) and control (no renovation) locations using accelerometers and SOCARP observations pre-, immediately post-, 4-month post-, and 16-month post-greening. Data was analyzed with linear mixed models and Pearson correlation at a significance value of 0.05. Results: Although non-sedentary activity did not change throughout the study at the control location, activity levels increased by 17.0% pre-to-post at the experimental location, a change that was maintained at both follow-up periods $F(3,1359) = 3.91$, $p<.01$. Non-sedentary activity on hardscape was greater for boys than girls during recess (12.8±0.3 vs. 9.0±0.3 minutes) throughout the study at the experimental location whereas activity levels on greenspace were similar between sexes and higher relative to hardscape for girls at 4-month (12.1±0.7 vs. 8.4±0.6 minutes) and 16-month (10.5±0.7 vs. 8.1±0.6 minutes) follow-up, $F(3,915) = 3.59$, $p<.05$. Accordingly, time engaged in locomotion not associated with sport or traditional playground games was positively correlated with vigorous activity ($r=.149$, $p<.001$) and negatively correlated with time spent in large groups ($r=-.277$, $p<.001$). Experimental students were more likely to spend time in large groups playing sports or traditional playground games on hardscape surfaces $F(1,915) = 5.353$, $p<.05$. Conclusion: These results suggest that playground greening initiatives are a stimulus for sustained increases in physical activity levels among urban schoolchildren. Furthermore, this study highlights the value of nature in bridging the activity gap between the sexes.

18. ASYMPTOMATIC SHOULDER PATHOLOGY IN PROFESSIONAL VOLLEYBALL PLAYERS

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To evaluate the shoulder of asymptomatic elite-level volleyball players. Design: Twenty-six professional volleyball players underwent MRI's (0. 27 Tesla) of their asymptomatic dominant shoulders and physical examinations of both shoulders. Asymptomatic was defined as being able to play volleyball without restrictions. The MRI's were reviewed by two blinded, fellowship-trained musculoskeletal radiologists. Range of motion, strength, UCLA and American Shoulder and Elbow Society (ASES) outcome scores were also measured. Results: On physical exam, dominant-side shoulders were found to have increased external rotation and decreased internal rotation compared to the non-dominant side, but range of motion was otherwise similar. One athlete had positive apprehension and relocation tests, eight had positive Sulcus signs, two had decreased rotator cuff strength, four had positive Neer's tests, four had positive Hawkins's tests, and four had positive Jobe's tests of their dominant shoulders. Seven athletes had visible muscle atrophy and scapular dyskinesis upon physical examination. MRI revealed rotator cuff tendinosis in 23 of 26 athletes. Among the 23 athletes with tendinosis, 17 had evidence of partial rotator cuff tears: 13 supraspinatus, two infraspinatus, and two subscapularis. Six athletes had labral tears, and six athletes had evidence of labral fraying. Thirteen athletes had degeneration of the capsule, 18 had arthritis of the AC joint, and 13 had chondromalacia. There were no MRIs without pathology. Conclusions: The dominant shoulder of an elite overhead athlete is at risk for damage due to significant repetitive stress. MRI findings in these athletes are highly likely to include abnormalities that could be considered surgical; however, these findings are often asymptomatic. We recommend that operative management on overhead athletes only be utilized following significant non-operative treatment as patient symptoms may not correlate with MRI findings.

19. THE EFFECT OF MOVEMENT RANGE OF MOTION ON PASSIVE LEG MOVEMENT INDUCED HYPEREMIA

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PURPOSE: The passive leg movement (PLM) technique has proven to be an insightful new method to measure muscle vascular function. While there is evidence from PLM-induced hyperemia that demonstrates the cardiovascular system is sensitive to changes in knee joint angle or movement range of motion (ROM), the impact of changes in ROM has not been previously documented. This study sought to provide insight into the effect of ROM on PLM-induced hyperemia. METHODS: Vascular endothelial function was measured in 11 young (22.5 ± 0.7), healthy adults (3 female, 8 male) via ultrasound Doppler measurements of the right common femoral artery while moving the leg through 30°, 60°, 90° or 120° of knee flexion/extension. The magnitude of hyperemia was quantified in terms of the peak change in blood flow elicited by each trial and by the total hyperemia elicited by each trial. RESULTS: A significant effect due to ROM was measured in Peak Change in Flow, Total Hyperemia in 60 seconds and Total Hyperemia in 60 movements ($p<0.05$). ROM exhibited a significant quadratic relationship with Peak Change in Flow ($R=0.55$, $p<0.05$), Total Hyperemia in 60 Seconds ($R=0.46$, $p<0.05$) and Total Hyperemia in 60 Movements ($R=0.50$, $p<0.05$), such that increasing ROM up to 90° was associated with a proportionally increased hyperemic response, while increasing ROM from 90° to 120° resulted in either a plateaued or severely attenuated response compared to 90°. CONCLUSION: Results clearly indicate that 90° ROM produces a significantly greater hyperemic response than smaller knee joint angles with no significant increase in hyperemia beyond 90°. We recommend future studies to continue to use the traditional ROM of 90° to assess endothelial function with PLM.

20. THE EFFECTS OF A LIFESTYLE BEHAVIOR CHANGE PROGRAM ON PHYSICAL FUNCTION IN OVERWEIGHT OLDER ADULTS WITH ARTHRITIS

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Guidelines for osteoarthritis (OA) management advise weight loss through diet and physical activity for overweight individuals. The Group Lifestyle Balance Program (GLB) is designed to promote a 5-7% weight loss through healthy eating and physical activity in individuals with prediabetes or metabolic syndrome but has not been evaluated in people with OA specifically. The purpose of this study was to examine the effects of the GLB Program on measures of physical function in overweight and obese (BMI > 27) individuals with OA (N=15). The study used a single-group, quasi-experimental design with repeated measures. All participants received the GLB program. Physical function was assessed with the Short Physical Performance Battery (SPPB), grip strength (GS), the 30-second chair stand test (CS30), and the Long Distance Corridor Walk (LDCW). The SPPB includes the time to 5 repeated chair stands (5CS), balance testing (side-by-side stand, semi-tandem stand, and tandem stand), and the 8-foot walk. Outcome variables were obtained at baseline, three, six, and 12 months. The Friedman test was used to examine differences in SPPB scores and one-way repeated measures analysis of variance (RM ANOVA) was used to examine mean differences in scores for all other outcomes. Participant mean age was 70.20 ± 3.95 years and were primarily white (93%), female (80%) and college educated (67%). There were no significant differences in SPPB scores (χ^2 (3) = 7.318, p = .062) at any time point. There were no significant differences over time for GS ($F(3, 42) = 2.144$, $p = .109$) or the LDCW ($F(3, 42) = 1.094$, $p = .362$). There was a significant effect of time for both the 5CS ($F(3, 42) = 3.190$, $p = .033$) and CS30 ($F(3, 42) = 6.956$, $p = .001$). Post hoc analyses indicated scores for the CS30 were significantly better at 3 months ($p = .016$) and 12 months ($p = .007$) compared to baseline. Findings suggest the GLB may be effective at improving some aspects of physical function. However, additional research is need to evaluate the effectiveness of the program with more robust measures of physical function.

21. EFFECT OF LOAD ON SINGLE LEG SQUAT BIOMECHANICS

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Single leg squats are an effective way to strengthen knee and hip musculature and are also used to determine safe knee mechanics in a clinical setting. Previous research has reported differences in knee and hip angles with varying loads during a back squat (McKean et al., 2010). Purpose: The purpose of this study was to determine the effect of load on single leg squat kinematics and kinetics. Methods: 15 Male subjects who engage in lower body resistance training two or more times a week for at least the two months prior to data collection participated in this study. In the first session, each subject's one repetition maximum (1RM) was determined for each leg by having them lift progressively heavier weights. A leg stand was used to standardize the non-support leg position and an elastic band was used to determine when the subject reached approximately 90 degrees knee flexion with their lead leg. The second session, held at least 72 hours after the first, involved the subject performing 5 repetitions at body weight, 5 repetitions at 40% 1RM, and 3 repetitions at 80% 1RM. Subjects rested between loads. Kinematics and kinetic data were collected using an 8-camera Vicon motion capture system (200 Hz) and a Kistler force plate (1000 Hz), respectively. Results: There was a significant difference in the maximum knee flexion angle due to load. In particular, subjects flexed their lead leg a smaller amount when the load increased from 0%1RM to 40%1RM to 80%1RM (106.7±11.8° vs. 102.2±11.0° vs. 97.5±9.9°; $p = 0.001$). This greater knee flexion created a significantly smaller lead leg knee flexion ROM at 80%1RM than both of the other conditions ($p = 0.028$ and $p = 0.002$, respectively). There were no significant differences in the lead leg hip ROM in the sagittal or frontal planes. Likewise, there was no significant difference in the lead leg ROM in the frontal plane. Conclusion: Subjects adjusted for the larger load by flexing their lead leg less which contradicts what has been reported in the back squat. The isolation of the lead leg in this movement appears to be linked with less flexion with greater loads. This project was funded by the Swenson Summer Research Fellowship Program

23. PERCEIVED VS. ACTUAL REPORTED PEACE OFFICER PHYSICAL JOB DEMANDS: WHAT THREE POINTS IN TIME TELL US

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A common perception among incumbents and some trainers is that muscular endurance and aerobic capacity are the most prevalent and important components of occupational fitness as they relate to the regular tasks of California Peace Officers assigned to daily patrol duties. The purpose of this study was to review job demand studies, and present the most recent data from a job task analysis for peace officers in California. In 1983, the California Commission on Peace Officer Standards and Training conducted a statewide physical job task-demands study. The data of 1,625 officers showed that the underlying fitness components of agility, anaerobic capacity, anaerobic power, and strength were more predominant in daily peace officer tasks than muscular endurance and aerobic capacity. As a result, a five event Work Sample Test Battery (WSTB) was developed and validated. With the exception of a 500-yard run, the other four WSTB events (99-yard obstacle course, chain link fence climb, solid wall climb, dummy drag) assessed components of agility, strength, power, and anaerobic capacity. In a 2008-2010 survey of Los Angeles County Sheriff's Deputies assigned to patrol duties, components of fitness reported as important by Deputies (n=162) were: 15% strength; 15% muscular endurance; 13% power; 13% anaerobic power; 12% trunk strength; 11% equilibrium; 11% flexibility; and 10% aerobic capacity. An even larger 2018 statewide survey of California peace officers assigned to patrol duties (question responders = 2,874-3,937) provided the following data pertaining to components of fitness required for patrol officer tasks: 17.9% stability; 14.4% flexibility; 13.3% power; 13.3% agility; 12.3% anaerobic capacity; 10.3% muscular strength; 8.25% muscular endurance; 5.6% balance; and 4.6% aerobic capacity. Taken together, the results from these large-scale job demand studies indicate the reported importance by those assigned to patrol duties of anaerobic qualities (e.g. strength and power). Training programs used to develop future peace officers that are weighted toward muscular endurance and aerobic capacity may limit the adaptive responses actually required officers. To increase effectiveness and optimize job-relevant in the day-to-day physical tasks of patrol performance, physical training programming should more closely target and reflect the actual components of fitness of stability, power, agility, muscular strength, muscular endurance, balance, and aerobic capacity.

22. HOW PRIMARY STRESS APPRAISAL INFLUENCES PERFORMANCE IN COLLEGIATE CLUB ROWERS DURING A 2,000 METER ROWING ERGOMETER TEST

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Primary stress appraisal is an individual's perception of the level of stress induced by a physically demanding event (Folkman, 2010). The three main facets of primary stress appraisal, which include viewing the event as a challenge, threat, or harm/loss, have been shown to influence a change in sport performance (Jones, et al., 2009). Understanding how athletes appraise stressful events should be an area of focus for coaches and practitioners in who are attempting to maximize athletic performance. This study was conducted to understand how primary stress appraisal influences performance in collegiate club rowers during a 2,000 m ergometer test (2k test). Twenty-one collegiate club rowers (14 men; 7 women) from a single university completed the Primary Appraisal Secondary Appraisal measure prior to completing a 2k test. On average, males finished the 2k test in 444.21 seconds; while females on average finished the 2k test in 519.80 seconds. Due to gender differences on performance outcome, data was analyzed separately for both males and females. For female rowers, there was a significant inverse relationship between appraising the event as a challenge and the athlete's finishing time, $r = -0.82$, $p = 0.02$. For male rowers, there was no significant relationship between appraising the event as a challenge or threat and the athlete's performance time. Females who appraised the stressful athletic event as a challenge were able to perform better on the 2k test, while there was no difference in performance based on how males appraised the stressful athletic event. Findings within our study suggest dissimilarity between genders in their appraisal and its implications on subsequent performance. Future studies should aim to investigate how different psychological variables like coping strategies, motivation, and self-efficacy influence primary stress appraisal, in addition to how they may differ between genders.

24. EXAMINING THE RELATIONSHIP BETWEEN STRESS HORMONES AND ACUTE IMPROVEMENTS IN EXECUTIVE FUNCTIONING FOLLOWING EXERCISE IN PREADOLESCENTS

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Single bouts of acute, moderate-intensity aerobic exercise (60-70% of VO_2max) have demonstrated beneficial effects on aspects of executive functioning such as working memory and attention/inhibition in preadolescent children. However, the physiological mechanisms underlying the effect of exercise on executive function remain unclear. One proposed mechanism by which exercise may improve executive function is through the hormonal response to stress. Exercise produces changes in the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system that could either augment or deter executive functions. However, there are no studies that have investigated the relationship between changes in stress hormones and improvements in executive functioning following exercise in preadolescent children. The objectives of this study were to examine the following in a population of preadolescent children: 1) the effect of a single 30-minute bout of aerobic exercise on executive functioning compared to a bout of rest in and 2) potential relationships between changes in stress hormones and improvements in executive functioning following exercise. Immediately before and after each condition, participants completed a cognitive battery consisting of tests of attention (Flanker Test) and working memory (List Sorting Working Memory Test). There was a significant effect of time*condition on working memory ($F = 3.371$, $p = .038$). Compared with pre-rest, children performed better on the working memory task post-rest (.833 ± .379, $p = .038$) and post-exercise (1.292 ± .476, $p = .012$). While not statistically significant, there was a possible trend towards improvements in working memory post-exercise compared to post-exercise (1.208 ± 631, $p = .068$). These findings suggest that both exercise and rest improved working memory to a similar degree, and that these improvements were not related to changes in stress hormones. However, interpretations of our findings are limited by an underpowered sample size. Collection of enough data to achieve significant statistical power may yield more insight into the relationship between stress hormones and improvements in executive functioning following exercise in preadolescents.

25. POSTURAL STABILITY IN ADULTS WITH AND WITHOUT PRADER-WILLI SYNDROME

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Individuals with Prader-Willi Syndrome (PWS), a rare neurodevelopmental disorder, typically display poor lean mass, obesity, growth hormone deficiency, hypotonia, poor muscle strength and greater postural sway. This study determined differences in postural stability and sensory reception and integration in adults with PWS compared to lean and obese controls. Participants included 10 adults with PWS [7 men, 3 women; ages 22.7±5.2 years; Body Fat % 40.61±7.79]; ten obese (OB) adults [7 men, 3 women, ages 22.96±2.40; Body Fat % 42.40±5.62] and ten normal weight (NW) adults [7 men, 3 women, ages 23.02±2.82; Body Fat % 23.42 ±7.0]. After a familiarization trial, each participant completed the Sensory Organization Test (SOT) using the Neurocom Sensory Organization Platform. In brief, each participant completed six conditions with three trials each which assessed their balance capacity using feedback from the visual, somatosensory and vestibular systems. A composite equilibrium score (CES) was calculated across all trials and all conditions (maximum=100). One participant with PWS did not complete the test due to fear. Because of an invalid trial in one condition, data for one male NW participant was also omitted. A one-way ANOVA indicated significant differences in the CES among the groups (p=.005). Post-hoc tests demonstrated the PWS group had a lower CES (69.44±13.99) compared to the NW (83.89±4.81) and the OB (81.90±6.30) groups, p=0.007 and p=0.018, respectively. There were no significant differences between the NW and OB groups (p=0.885). Additionally, in Condition 5 (eyes closed, sway-reference support) and Condition 6 (sway-referenced vision and support), 44.4% and 33.3% of participants with PWS fell during at least one trial. In comparison only 10% of the NW group fell only once. As expected, individuals with PWS showed lower postural stability compared to controls. Specifically, it appears that individuals with PWS have more difficulties with posture when they receive conflicting information from the sensorial systems. It is suggested that individuals with PWS participate in activities that require the engagement of the somatosensory and vestibular systems for maintaining balance.

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26. ATHLETIC OBESITY AND LONG-TERM HEALTH

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Purpose: Obesity in athletes is closely correlated with many comorbidities such as hypertension, dyslipidemia, osteoporosis, diabetes mellitus, left ventricular hypertrophy, and lower self-esteem; all of which can lead to decreased quality of life both during an athlete's career and after. It is the objective of this systematic review to compare the long and short-term health risks associated with athletes who are clinically overweight or obese. Methods: Studies were obtained using online databases such as PubMed, Google Scholar, and Scopus. Search terms included obese, obesity, athletes, body composition, health risk, anthropometry, adult, American Football, rugby, professional, athletes, BMI, female, women, overweight, BF%, body image, sumo wrestling, unhealthy, left ventricular hypertrophy, health, retired, and NFL. To be included in this review, articles needed to meet a list quality assessment. Results: Active collegiate and professional level athletes, regardless of their BMI, are shown to have healthier BF% than those of comparable BMI. These findings are consistent with linemen, rugby players, and lightweight sumo wrestlers. However, when comparing football players and non-athletes of comparable BMI it was concluded that linemen had an even greater risk for developing CVD and metabolic syndrome (metsyn) than non-athletes. Little information could be found on the effects of obesity among female athletes. Retired Athletes who were obese due to the nature of their professional sport and maintained obesity status were more likely to have sustained cognitive impairment during their career and cardiovascular diseases (CVD). Furthermore, a significant increase in mortality due to CVD has been directly linked to athletes who retire from a career in professional football. Discussion: In conclusion, athletes that compete at a high level generally have a healthier body fat percentage (BF%) and cholesterol vitals than comparable non-athletic populations. However, due to their excessive amount of muscle mass, these athletes are susceptible to high BP and other cardiovascular risks putting them at greater risk for LVH. This is consistent with observations that athletes who maintain high BMI after their career will develop and sustain cardiovascular-related diseases and other severe health risks.

27. BODY FAT COMPOSITION AMONG COLLEGE DRINKERS AND NON-DRINKERS

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The caloric content of alcoholic beverages has been theorized to increase body fat. Terms such as "beer belly" perpetuate the idea that drinking directly correlates to an increased percent body fat. Adiposity gained in different areas of the body have varying health implications and may increase risk of diabetes and cardiovascular disease. Purpose: This study analyzed body composition and alcohol consumption among healthy college students. Methods: 89 male and 90 female students (average age: 19 ± 0.6 yrs) volunteered to be a part of this study and from these subjects 78 were classified as drinkers (2 binge drinking episodes in the last two weeks). Dual energy x-ray absorptiometry was used to determine adipose composition in participants. The collected data was analyzed using SPSS v.24 to determine differences between groups. Results: Male drinkers (n=32) had an average android fat of 21.7±6.3% and a gynoid fat of 25.2±5.8%, while male non-drinkers (n=57) had an average android fat of 20.4±5.8% and an average gynoid fat of 24.1±5.2%. Female drinkers (n=46) had an average android fat of 30.5±6.6% and an average gynoid fat of 38.0±4.7%, while female non-drinkers (n=44) had 28.2±6.9% and 36.8±4.6% average percent fat respectively. Male drinkers had an average visceral fat of 274.3±78.2 grams compared to 248.5±60.3 grams. Female drinkers had an average visceral fat of 219.3±102.6 grams and female non-drinkers had an average visceral fat of 180±72.6 grams. None of the differences between groups were statistically significant. Conclusion: Not surprisingly, women generally exhibited a higher adiposity than men, except when male drinkers showed significantly greater grams of fat in the visceral area compared to females. In this young, healthy population, drinkers and non-drinkers had similar body composition. It is possible that this Los Angeles population is more physically active than the typical American.

28. MOTS-C PLASMA LEVELS FOLLOWING A SINGLE SESSION OF MICT AND HIIT

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Acute moderate intensity continuous training (MICT) and high intensity interval training (HIIT) result in increased mitochondrial transcriptional activity. The mitochondrial open reading frame of the 12S rRNA-c (MOTs-C) is a mitochondrial derived peptide capable of regulating skeletal muscle glucose uptake and fatty acid beta-oxidation. However, it is not known if MOTs-C concentrations are altered following an acute bout of MICT or HIIT. The present study investigated the effects of acute MICT and HIIT on MOTs-C levels in plasma pre- and 3 hours post-exercise. Using a crossover design, ten recreationally active males (n=5; age 25.2 ± 1.1, VO_2max 48.0 ± 4.9 ml/kg/min) and females (n=5; age 21.6 ± 3.6, VO_2max 39.4 ± 7.7 ml/kg/min) performed an acute bout of MICT and HIIT exercise on a treadmill. The MICT bout consisted of 60 minutes at 55% of maximum velocity (Vmax) achieved during the VO_2max test and the HIIT trial required two sets of 6 bouts of 1 minute at 100% Vmax, with 5 minutes recovery at 3 MPH between sets. Trials were conducted at least 72 hours apart in randomized order and in a fasted state. Plasma MOTs-C was measured from samples obtained pre- and 3 hours post-exercise using an enzyme-linked immunosorbent assay. There were no significant changes in plasma MOTs-C ($p = 0.17$) from pre to post-exercise for MICT (220.4 ± 63.0 vs 248.4 ± 45.2 ng/ml, respectively) or HIIT (227.99 ± 62.45 vs 246 ± 75.99 ng/ml, respectively). Our findings show plasma MOTs-C does not increase in response to a single session of MICT or HIIT.

29. THE EFFECT OF MOVEMENT SPEED ON PASSIVE LEG MOVEMENT INDUCED HYPEREMIA

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PURPOSE: The risk of cardiovascular complications in the elderly increases with acute elevations in ambient, fine particulate matter air pollution ($PM_{2.5}$), and may be related to pollution-induced vascular dysfunction. Therefore, the purpose of this study was to utilize the large, episodic swings in ambient PM2.5, typical of the Wasatch Front in Utah, as a natural experiment to determine the extent to which acute exposure to ambient $PM_{2.5}$affects vascular function in healthy, older adults. METHODS: Vascular function (flow-mediated dilation, FMD; passive-leg-movement-induced hyperemia, PLM), and pulmonary function were measured in 10 old subjects (70.5±2.3 years) during acute episodes of >120 hours of low (3.4±0.8 $\mu g/m^3$) and 24-96 hours of high (50.0±1.2 $\mu g/m^3$), naturally-occurring ambient $PM_{2.5}$(Figures A and B). Markers of systemic inflammation were also assessed in venous blood during each visit. RESULTS: Notably, high ambient $PM_{2.5}$exposure was associated with a 34% reduction in vascular function assessed by FMD (Low $PM_{2.5}$: 8.9±1.0%; High $PM_{2.5}$: 5.9±1.0%; P<0.05; Figure C), and a 78% reduction in vascular function assessed by PLM (area under the curve: Low $PM_{2.5}$: 145±38 ml, High $PM_{2.5}$: 31±25 ml; P<0.05, Figure D). Additionally, acute exposure to high ambient $PM_{2.5}$was accompanied by an increase in markers of systemic inflammation (e.g. Plasma C-Reactive Protein, Low $PM_{2.5}$: 872±143 ml, High $PM_{2.5}$: 1365±220 ng/ml; P<0.05), which may contribute to the decrease in vascular function. Interestingly, natural exposure to high levels of $PM_{2.5}$did not significantly affect pulmonary function (FEV1/FVC: Low $PM_{2.5}$: 74±2%; High $PM_{2.5}$: 72±2%; P>0.05). CONCLUSION: Despite a lack of detectable changes in pulmonary function, acute, natural exposure to elevated ambient $PM_{2.5}$results in markedly impaired vascular function in older adults, possibly a consequence of pollution-induced systemic inflammation.

30. VASTUS LATERALIS CROSS-SECTIONAL AREA CORRELATES STRONGLY WITH TASK-SPECIFIC ISOMETRIC IMPULSE WINDOWS IN A HETEROGENOUS GROUP OF ATHLETES

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BACKGROUND: Ground reaction forces during sporting movements are temporally constrained, and impulse during these critical windows has been correlated with performance in sprint, jump, and change-of-direction tasks. A better understanding of relationships between these task-specific impulse windows and skeletal muscle architecture (SMA) may allow coaches to direct training stimuli toward improving specific morphological underpinnings of sport performance. PURPOSE: The purpose of this analysis was to determine relationships between components of SMA and critical isometric impulse windows corresponding to sprint, jump, and change-of-direction performance in a large heterogenous group of trained athletes. METHODS: Pennation angle (PA), fascicle length (FA), and anatomical cross-sectional area (ACSA) was determined for the vastus lateralis muscle via β-mode ultrasonography in a group of male (n = 95) and female (n = 60) collegiate, club, and international athletes. Net isometric impulse at 50, 90, 200, and 250 ms was measured during an isometric mid-thigh pull (IMTP) administered pre-season as part of an ongoing athlete monitoring program. RESULTS: Pearson product-moment correlation revealed moderate relationships between ACSA and impulse at 50, 90, 200, and 250 ms ($r = 0.61, 0.61, 0.64$, and 0.66, $p < 0.5$), weak relationships between PA and impulse at 200 and 250 ms ($r = 0.19, 0.20$, $p < 0.5$), and weak relationships between FL and impulse at 50, 90, 200, and 250 ms ($r = 0.17, 0.19, 0.21$, and 0.20, $p < 0.5$). CONCLUSION: These results indicate that vastus lateralis muscle size correlates more strongly with impulse during task-specific time windows than PA or FL. Furthermore, ACSA shows a stronger relationship with longer impulse windows than shorter impulse windows, indicating that muscle size may be more strongly related to change-of-direction than sprinting tasks. Further research should investigate whether these relationships are altered by changes in fatigue, trained state, or SMA of the athlete.

31. EFFECTS OF SMALL SIDED GAMES ON SPORT-SPECIFIC PHYSICAL FITNESS IN HIGH-SCHOOL FEMALE BASKETBALL PLAYERS

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This study examined the effectiveness of 3 versus 3 small-sided games in maintaining/improving fitness levels following traditional basketball conditioning. High-school female basketball players (n=5, age =15.8 ± 0.84 yrs; height =1.71± 0.06 m; weight = 64.41 ± 6.53 kg) participated in an 8-week training program, consisting of 4-weeks of traditional conditioning and 4-weeks of small-sided games. Fitness level was assessed during three testing sessions (baseline, mid, and post-training) using the following methods: Yo-Yo Intermittent Recovery Test Level 1, Line Drill Test, Reactive Agility Test, and Vertical Jump Test. The Yo-Yo distances, vertical jump heights, and line drill times did not differ significantly between baseline, mid-, and post-testing. Reactive agility significantly improved relative to baseline at mid and post-training ($p < 0.05$). However, there were no other significant differences observed. Traditional conditioning and small-sided games maintained Yo-Yo distances, vertical jump heights, and line drill times. Furthermore, traditional conditioning improved reactive agility, and small-sided games maintained improvements. It appears that 3v3 is an adequate training mode to maintain overall fitness. However, further research with more participants is needed to establish more definitive findings.

32. CLINICAL TELEHEALTH TRIAL PRODUCES IMPROVEMENTS IN SOCIAL COGNITIVE MEASURES OF DIETARY QUALITY

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INTRODUCTION: Self-efficacy and social support for dietary quality are predictors of dietary behavior change and maintenance of weight loss. Individuals that have low self-efficacy in dietary quality are at higher risk of engaging in unhealthy eating behaviors. Previous studies have revealed the importance of dietary quality self-efficacy for successful weight management. The objective of this study was to evaluate the relationship between participating in a weight loss intervention and social cognitive measures of dietary quality. METHODS: Nineteen obese participants (BMI> 30 kg/m2, 41.5+/-13.6 yrs) were randomized into Intervention (INT), n=11, and Control (CON), n=8. INT group underwent a 12-week telehealth-based multi-disciplinary weight loss program with weekly health coaching. All participants received a wireless scale to track changes in body weight. A validated 37-item survey was implemented at pre- and post-intervention to assess changes in social-cognitive measures of dietary behaviors. Scale variables were created to assess changes in responses for each of seven scales. Wilcoxon signed rank tests were used to compare pre-and post-test scale scores within each group. Mann Whitney U-tests were used to compare changes in mean scale scores from pre-to post-test by treatment category. RESULTS: Participants in the intervention group had a significant change in self-efficacy scale score from pre to post study (3.18+/-.66 vs 4.22+/-.73, respectively, p=.02), there was no significant change in the control group. Also, the intervention group had a significant change on the social support scale from to pre to post study results (3.02+/-.73 vs 3.97+/-.67, respectively) in comparison to the control group (5.5+/-.72 vs 5.35+/-.40, respectively) p<0.05. CONCLUSION: In conclusion, this study suggests participating in a telehealth weight loss program may increase social cognitive measures of dietary quality.

33. SYSTEMATIC REVIEW ARTICLE: ISOMETRIC MID-THIGH PULL PERFORMANCE IN RUGBY PLAYERS

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Introduction: The isometric mid-thigh pull (IMTP) is a multi-joint exercise tested to determine peak force development and rate of force development. Rugby is a collision sport consisting of prolonged activity interspersed with bouts of high-intensity. Data from the IMTP test is relevant to rugby's high force requirements. The purpose of this review was to (1) summarize the IMTP data collected in rugby players, with the goal of creating normative data for this test for coaches and players to use; and (2) critically appraise the literature in question. Methods: "Rugby AND mid-thigh pull," "rugby AND midthigh pull," and "rugby AND mid-thigh pull" were searched in PubMed, Sportdiscus, Academic Search Premier, CINAHL Plus with Full Text, and Google Scholar. Data extraction included peak force and details of the IMTP testing. Studies were appraised using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies and a custom rating system of IMTP testing procedures. Results: 23 descriptive, associational, and intervention studies were included. Studies included schoolboy, high school, academy, college, professional and Olympic level subjects. The average rating of literature was XX. Ranges, per population, of peak forces reported are as follows: (1) Schoolboy Rugby: (U15-U18) 118.5-156.4kg. (2) English Academy (U16-U21): 2157.9-3104.5N (3) American College-level Rugby: 1654.6-2244.6N. (4) Professional and Olympic-level Rugby: 2254.5-3851N and 28.87N/kg, respectively. Conclusions: Overlap between various populations is present, yet data collected trends towards an increase of strength with age. However, this cannot be concluded with certainty due to limitations and non-standardization between studies of how the IMTP test was conducted. Greater uniformity in IMTP testing procedures is needed.

34. VALIDITY OF THE ADIDAS SMART BRA IN MEASURING HEART RATE DURING EXERCISE TRANSITIONS

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Wearable technology is becoming very popular; offering a variety of applications for it. PURPOSE: The current investigation was designed to evaluate the validity of a heart rate sensing bra during transitions from rest to self-paced running and walking. METHODS: Nine females completed a 14-min protocol while simultaneously wearing the Adidas Heart Rate Monitoring Smart Bra and Polar H7 heart rate monitor (criterion measure). The protocol involved 1-min standing rest on the treadmill (to determine resting heart rate), 3-min walking warm up, 5-min run, and 5-min walk. The validity of the sports bra was determined by three methods: mean absolute percent error (MAPE), Bland-Altman bias and limits of agreement (LOA), and intraclass correlations (ICC) with a value greater than 0.7 and significance <0.05.Those three methods were used to compare second to second data. RESULTS: When all conditions were considered (7569 data points), MAPE = 3.11%, bias = 0.44±11.34 and LOA range = -21.75. to 22.63, and ICC = 0.902 ($p<0.001$). For the resting condition (549 data points), MAPE = 2.07%, bias = 0.08±3.46 and LOA range = -6.69 to 6.86, and ICC = 0.977 ($p<0.001$). The transition from rest to a walking warm up (1621 data points) yielded MAPE = 0.047%, bias = 94.38±13.88 and LOA range = 67.16 to 121.59, and ICC = 0.923 ($p<0.001$). With respect to the transition from warm up to running (2700 data points) MAPE = 5.60%, bias = 0.47±18.38 and LOA range = -35.55 to 36.49, and ICC = 0.768 ($p<0.001$). When the transition from running to walking was considered (2700 data points) MAPE = 1.09%, bias = 0.11±1.97 and LOA range = -3.74 to 3.96, and ICC = 0.995 ($p<0.001$). CONCLUSION: These pilot results indicate that the Adidas Heart Rate Monitoring Smart Bra is valid for most conditions (rest, warm-up, walking). Progressing from active warm-up to run should be viewed with caution, as heart rate measurements were not all valid in this condition.

35. DOES FITNESS PREDICT SKILL?

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Sport and strength and conditioning coaches seek ways to better inform their athletes' preparation for performance on the field. Testing athletes' skill and fitness levels provides an objective measure of performance-related attributes, which can be used to inform training protocols, lineup selection and other coaching decisions. The purpose of this study was to investigate whether an athlete's fitness level predicts or enhances his or her sport-specific skill level. METHODS: Club rugby players completed three testing sessions over 5 days: Counter-movement jump, T-test, 40-yard dash and beep test on Tuesday; bilateral throwing accuracy on Wednesday; isometric mid-thigh pull and reaction time test on Friday. Additionally, age, height, weight, and rugby and weightlifting experience were captured. Stepwise regressions were conducted to predict passing accuracy from all other measures. RESULTS: No factor regressed with passing accuracy. However, rugby experience correlated with passing left ($r=.403$, $p=.043$). Passing right correlated with peak isometric force production (PF) ($r=.488$, $p=.064$). Overall accuracy only correlated with PF ($r=.538$, $p=.045$). DISCUSSION: Performance on measurements of fitness does not seem to predict passing accuracy. Limitations for this study include small sample size, omission of recording each athlete's dominant hand, and lack of tests performed at game speed. Future research should employ testing that will mimic in-game situations and take fatigue into account in order to provide a measure of passing accuracy whose findings will be most relevant and applicable to game action.

36. PROPOSED METHODS FOR AN INVESTIGATION INTO WHETHER USER EXPERIENCE WITH MYOELECTRIC CONTROL DEPENDS ON MOVEMENT HISTORY AND SKILL LEVEL

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Myoelectric prosthetics increase function and livability among amputees, and is a growing field of study. The term myoelectric signifies electrical properties within muscles and prosthetics are artificial replacements for a lost body part. These advanced prostheses allow amputees to regain many innate biological abilities and motor control functions using their own myoelectric output. Although this seems like the indisputable option, it does raise concerns of problematic and complex operation. It is possible that a lack of motor confidence and/or knowledge in a patient would decrease their motor exploration with such sophisticated control capabilities. Therefore, the purpose of this project is to test and observe the user experience of college students with different skill sets to aid in understanding the kind of patients that would best enjoy and benefit from a myoelectric prosthetic. Participants will be 18 years or older and in one of the three groups; pitchers, non-pitcher athletes, and non-athletes. These groupings were made assuming pitchers will show increased manual dexterity compared to the other participants. Preliminary tests will be completed to determine the validity of this assumption. Our proposed methods will begin by examining the manual dexterity of our participants by asking them to complete four quick preliminary tests including a grip test with a dynamometer, a box and block test, a motor sensory coin selection test, and finally a computer based reaction time test. This will help determine the dexterity differences between our groups. Participants will then use the myoelectric armband to complete a variety of computer based tasks. We hope to provide evidence of a correlation between differing motor abilities and initial skill level with the myoelectric device. We will then test their tolerance to error by having them control a 3D printed myoelectric prosthetic, wherein we have embedded systematic delays and movement errors through our software interface. By running participants through this set of tasks, we will help to determine the kind of background and skill that is required in order to control a myoelectric prosthesis both quickly and comfortably. This will in turn create a foundation of knowledge on the kind of improvements that can be made to the device and training protocols for patients.

37. KNEE MECHANICS OF ADULTS WITH PRADER-WILLI SYNDROME: IMPLICATIONS FOR KNEE OSTEOARTHRITIS

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Prader-Willi Syndrome (PWS) is a form of syndromic obesity that occurs in 1 in every 25,000 births. In adults with PWS, there is a greater risk of co-morbidities such as osteoarthritis (OA). Progressive obesity, muscular hypotonia and scoliosis may contribute to abnormal gait mechanics that may contribute to OA development. The purpose of this study was to compare gait mechanics that are associated with knee OA between adults with and without PWS. 10 individuals with PWS participated in this study (7 male, 22.0±2.8 years,1.7±.09m, 71.9±16.1kg), and were compared to 10 controls with (1.74±.0.08m, 108.0±13.2kg) and 10 controls without (1.67±0.06m, 65.3±7.16kg) obesity. 3-dimensional gait biomechanics were collected as participants completed 5 walking trials across 2 force plates on a 10-m runway at self-selected speed. Peak knee adduction angle (KAA), knee flexion angle (KFA), excursion (KFE), early and late stance knee adduction moment (KAM1 & 2), knee flexion moment (KFM), linear (LLR) and instantaneous loading rate (ILR) were extracted from the first 50% of stance. Loading rates and moments were normalized to body weight (BW), and a product of BW and height, respectively. One-way multivariate analysis of variance covarying for gait speed was used to compare gait variables between groups. After accounting for speed, there was an effect of group on gait variables ($F(26,30=4.376$, $p<.001$). There were group differences in LLR ($F(2,26=3.964$, $p=.031$), ILR ($F(2,26)=4.968$, $p=.018$), KFM ($F(2,26=3.624$, $p=.041$), peak KAA ($F(2,26=4.704$, $p=.018$), and KAM2 ($F(2,26=6.823$, $p=.004$). Post hoc analyses showed that individuals with PWS have higher ILR ($p=.016$) compared to obese controls and lower KAM2 ($p=.003$) than normal weight controls. Individuals with PWS exhibit greater loading rates and lesser late stance KAM. Habitual reductions in KAM may contribute to underloading of the articular cartilage. However, the instantaneous application of a large forces over a short time interval due to higher ILR in PWS may contribute to cartilage stiffening and early deleterious metabolic changes within the joint. Hence, adults with PWS may benefit from gait modification that limits high ILR.

39. THE EFFECT OF HIBERNATION ON CIRCULATING HORMONE LEVELS IN AMERICAN BROWN BEARS (URSUS ARCTOS)

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Purpose: The purpose of this study was to determine whether the concentration of circulating hormones and metabolites change during hibernation in inland North American brown bears (Ursus arctos). Brown bears go through a yearly cycle of hyperphagia and hibernation which is associated with systemic stress. Research has shown that stress induced by a prolonged reduction in caloric intake triggers changes in blood metabolite and hormone levels; including a rise in circulating cortisol and β-hydroxybutyrate. Hypothesis: Given its role as a stress hormone, we hypothesized that cortisol would increase with hibernation (5-7months) in brown bears. We further hypothesized that β-hydroxybutyrate would increase and become an alternate fuel source. Methods: Blood samples (n=9) were collected during the summer and winter periods (2014-2016) from brown bears of the Bear Center at Washington State University. All samples were batch analyzed in duplicates for adiponectin, insulin, glucose, cortisol, glucagon, free fatty acids, glycerol, and growth hormone using appropriate ELISA kits and assays. Data were analyzed using a ANOVA and an $\alpha \pm$ value of 0.05 was used to determine significance. Results: Body weight decreased by 3-8% with hibernation. The hibernation period induced a 200% rise in serum glycerol concentration indicating that lipolysis was stimulated. Hibernation also induced a 366% rise in the stress-induced hormone cortisol. There was no significant change in blood glucose and serum levels of insulin, β-hydroxybutyrate, glucagon, growth hormone and adiponectin with hibernation. Conclusion: Our results suggest that a rise in lipolysis is an important adaptation during hibernation; however the lack of change in serum fatty acid and β-hydroxybutyrate levels suggest that this process is tightly regulated. The rise in serum cortisol levels indicates that hibernation stimulates this stress-induced signaling cascade. More research will be needed to decipher the cellular mechanisms that regulate substrate supply during hibernation in brown bears.

38. FEELING SAFE: EXPLORING PERCEPTIONS OF PSYCHOLOGICAL CLIMATE IN GROUP EXERCISE CLASSES

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Psychological climate (PC) reflects feelings of safety and meaningfulness in a specific setting such as the workplace. Recently, PC has been related to effort exerted by both elite athletes and exercisers. As PC was originally studied in the work setting, it is important to examine how these feelings of safety may emerge within the exercise setting. The purpose of this study was to explore perceptions of psychological safety in college exercise classes and compare differences across gender and class type (aerobic fitness & resistance training (RT) classes). Undergraduate students (N= 400; 67.8% female, mean age: 21.5 years, SD=3.3) completed a cross-sectional survey on their experiences in one of 14 exercise classes. Participants answered an open-ended question that asked …what is it about this class that makes you feel safe or comfortable? These responses were coded into common themes and the number of participants reporting each theme calculated. A chi-square analysis examined differences in gender and class type (aerobic or RT). Most participants reported aspects of the leader (36.8%) or interactions with fellow exercisers (37.8%) as contributing to their feelings of safety. Feeling safe was associated with leaders being professional ("that the professor has knowledge"), supportive ("leader is encouraging") and accepting ("I can ask the teacher any questions that I have"). Participants also reported feeling safe when they were "surrounded by similar minded individuals," "everyone is working towards the same goal" and "everyone is doing their own thing with no judgements." For gender differences, females (42.8%) were more likely to report aspects of the leader than males (24.0%); $p=.001$. There was no difference in class type for overall responses about leaders ($p=.749$) or social environment ($p=.893$). Those in the aerobic classes were more likely to refer to similarity with their fellow exercisers (14.3% vs 5.7%; $p=.004$) and supportive leaders (14.3% vs 8.1%, $p=.047$) than those in the RT classes. Those in RT classes were more likely to mention a supportive environment (8.1% vs. 2.1%, $p=.008$) than the aerobic classes. Findings suggest that across gender and class types, individuals perceive exercise classes as safe when fellow exercisers and the instructor are supportive, accepting and encouraging. These are in line with the conceptualization from organizational psychology that included supportive management and self-expression as components of psychological safety.

40. RELATIONSHIPS BETWEEN MINUTES PLAYED AND PHYSIOLOGICAL CHARACTERISTICS DETERMINED BY THE NBA COMBINE TEST IN DIVISION I MALE COLLEGIATE BASKETBALL PLAYERS

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The best players on a basketball team tend to play the most minutes, as they should have the greatest impact on team success. At the collegiate level the amount of playing time and on-court experience is also an important determinant of a basketball athlete's ability and skill to potentially play at the professional level. Strength and conditioning coaches attempt to prepare players such that they are all physically capable of playing, regardless of their skill levels and subsequent coaches decisions about playing time. However, there have been few analyses of the relationships between fitness and playing time in collegiate basketball players. The purpose of this study was to determine if there was a relationship between the amount of playing time of male Division I (DI) basketball players and physiological characteristics derived from the National Basketball Association (NBA) combine test. A retrospective analysis of data from the 2017-18 season for a men's DI collegiate basketball team (N=12) was conducted. Minutes played were collated by the team's coaching staff over the course of the season. Physiological characteristics were measured via the NBA combine test, which was conducted post-season by the team's strength and conditioning coach, and included: wingspan; countermovement jump; two-step approach jump; ¾ court sprint; and maximum bench press repetitions with 185 lb. Pearson's correlations were used to calculate relationships between playing time and the NBA combine test data ($p < 0.05$). The result indicated there were no significant relationships between any of the NBA combine tests and minutes played for the season analyzed ($r=-.74$ to $.22$). The results suggest that for a DI college basketball team, tests of physical fitness may not determine minutes played. This would further suggest that skill and the ability to play the game of basketball and experience most likely will have a larger impact on the amount of minutes played. Nonetheless, if physiological characteristics as measured by the NBA combine test did not relate to playing time, then strength and conditioning staff may have prepared all players such that their physical fitness was similar across all players regardless of minutes played. Future research should investigate the skills that embody the game of basketball and determine a proper measurement of those skills. This may provide a broader perspective of determinants for playing time at the DI college level.

41. NOVEL SKILL ACQUISITION USING VIRTUAL REALITY: IMPLICATIONS FOR TRANSFER OF TASK PERFORMANCE AND KINEMATICS TO THE REAL WORLD

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Virtual reality (VR) is currently branching out beyond the video game industry. Many opportunities now exist to use VR as a tool to train individuals to acquire new motor skills, including high-level athletes and medical surgeons. However, it is currently unknown whether learning a task in VR translates to real-world performance. PURPOSE: The purpose of this study was to compare the kinematic and performance effects of VR training during the learning of a novel dart-throwing task compared to learning the same task in the real world. METHODS: A cohort of novice dart players were recruited and randomly assigned into either a control group, which involved dart-throwing practice in the real world, or the VR group, who acquired this skill in a virtual environment using an HTC Vive headset. A pre-test of two sets of five throws, where participants were instructed to try and hit the bullseye, was conducted. Both groups were then instructed to perform 100 dart throws within 30 minutes for training. A post-test, identical to the pre-test procedure, ended each session. The distance of the darts thrown from the bullseye was measured to gauge the participants' accuracy. Three-dimensional marker coordinate data were collected using an 8-camera motion capture system. These data were used to quantify shoulder, elbow, and wrist kinematics of the throwing limb before, during, and after training for both groups. RESULTS: Pilot data indicates that, following training, the control group exhibited greater average peak shoulder and elbow flexion angles during the throw group (69° and 131°, respectively) compared to the VR group (53° and 117°). Early results also indicate that the VR group utilized a much different throwing strategy at the wrist joint where, after training, they utilized almost no ulnar deviation (-0.5°), while the control group demonstrated peak ulnar deviation angles (25°) similar to what expert dart throwers have demonstrated in previous studies (18°). Furthermore, the control group improved their throwing accuracy post-training by 7 cm, while the VR group only improved by 2 cm. CONCLUSION: Results from pilot data indicate that VR training may not be an equivalent alternative to real-life training for learning of some new skills as exhibited by the differences observed in throwing arm kinematics and accuracy.

43. ASSESSING EXPLOSIVENESS USING A RANGE OF MEDICINE BALL WEIGHTS FOR THE BACKWARDS OVERHEAD MEDICINE BALL THROW

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Athletic performance can be assessed by determining whole-body explosive power; one test often used is the backwards overhead medicine ball (BOMB) throw. Little is known about the effect that different medicine ball (MB) loads have on the kinetics and kinematics of this test. The purpose of this study was to determine the effect of different MB loads on force, power, and velocity output of the athlete during the BOMB throw. 31 Division II female collegiate softball and rugby players participated in this study (age: 20.7±1.5 y, height: 165.1±7 cm, weight: 116.8±54 kg). Subjects completed prior familiarization in two sessions (at least 2 sets of 5 BOMB throws in each session). On the third and final session, after a standard full-body dynamic warmup and 5 practice throws with an 8lb ball, subjects performed the BOMB throw on a force plate using 4 different loads (6, 8, 10, 12 lb). Subjects performed three maximum effort trials with each load, with the order of each load randomized. 30 seconds of rest were given between each trial. Peak force (PF), peak power (PP), and peak velocity (PV) of the athlete's center of mass were compared using repeated measures ANOVA. No differences were found in PF, PP, or PV between load conditions. Loads within the range of 6-12 lb do not appear to alter the biomechanics of female athletes during the BOMB throw. Using different loads likely elicits similar stress on the body; therefore adaptations from training with medicine ball loads in this small range are likely be similar in this population.

42. RELATIONSHIP BETWEEN THE PERCEIVED TRAINING LOADS OF DIVISION II SWIMMERS AND COACHES

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Coaches are taking a scientific approach to the creation and monitoring of athlete training to optimize performance, manage fatigue and avoid potential injuries. Training load is comprised of the external load (work completed by the athlete) and internal load (physiological or psychological stress from that work). The outcome of a coach's training plan is the consequence of both the external and internal training loads. However, the difference in perception in training load between coach and athletes is also important to consider to prevent overtraining and injury in athletes and optimize performance. Purpose: To compare the training loads between the coach and its athletes in a Division II women's swimming team. Methods: Three athletes with the most complete data set were chosen out of twenty six swimmers (mean ± SD, age 20.2 ± 1.2 years; height 169.03 ± 6.2 cm; mass 68.7 ± 8.9 kg). The expected training loads of the coach and perceived training loads of the athletes were monitored for one season. A survey link was sent to the coach and players to report the date, the duration of training in minutes and the rate of perceived exertion (RPE) for each practice and competition. Training load (TL) was calculated as the product of the rate of perceived exertion (RPE) and training session duration in minutes and labeled arbitrary unit (AU). The relationship between the coach's expected training loads and the athletes' perceived training loads were examined using paired t-test and Pearson correlation. Results: The swimmers average TL over the 40 sessions was 610 ± 293 AU which was significantly larger than the average TL for the coach, 544 ± 267 AU (p=.0102). A strong correlation was found between the TL of the coach and the athletes (average TL of the 3 athletes) (r=.85, CI=.7337 to .9188, p=<.0001). Conclusion: On average, the athletes perceived the training sessions to be harder than what the coach expected. Differences in training expectations and perception could be due to fitness levels among athletes, sleep (quantity and quality), academic stress or illness. However, the differences in TL expectation and perception could result in fatigue and injury and/or suboptimal training adaptation. Monitoring planned and perceived training load is critical to optimize performance and reduce injury.

44. INTRALIGAMENTOUS SYNOVIAL CHONDROMATOSIS OF THE ANTERIOR CRUCIATE LIGAMENT

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Background: Synovial osteochondromatosis (SOC) is a rare disease caused by metaplasia of the synovium into chondrocytes. There have been several case reports of SOC surrounding the cruciate ligaments, but to date there has only been one case report of SOC within the anterior cruciate ligament (ACL). In that study, diagnosis was only possible after arthroscopic removal of the chondral bodies. We present a case report that is the first of its kind to share details about the imaging features used to diagnose intraligamentous SOC, the surgical approach, and the course of recovery. Case Description: A 65-year-old male presented for evaluation of left knee pain. His range of motion (ROM) was 2-90 of flexion and he received a cortisone shot, which helped his ROM for 6 weeks. He obtained a sagittal oblique intermediate-weighted fat-suppressed MRI (1.5T Avanto, Siemens, Erlangen, Germany) which showed irregular loculations within the ACL. When his stiffness and pain returned, we decided to operate. Arthroscopy of left knee revealed an ACL had edema and a large bulbous encapsulated mass that was hard and cartilaginous, rather than gelatinous. There was significant synovitis in the anterior aspect of the knee as well as one loose body in the suprapatellar pouch area. The posterior cruciate ligament (PCL) was normal. The lateral meniscus was intact, and the medial meniscus had a posterior horn tear. The left knee was then addressed surgically with medial meniscus resection and meniscal debris removal. The space between the ACL and PCL was identified and there was bulging material in the triangular space between the two ligaments. The ACL was incised and multiple blocks of tissue were removed, with the remaining portions of the ACL left intact. Together, the pieces measured approximately 2 cm x 1 cm. The loose body was removed as well. Pathology confirmed SOC. Physical therapy was started a week after surgery and at 3 months he was pain-free and had regained normal range of motion. Conclusion: SOC is a rare disease of unknown etiology that can be destructive and debilitating. In our patient, MRI revealed irregular loculations within the ACL, which aided in the diagnosis of SOC by arthroscopy and pathology.

45. CAN I SAVE YOU? A PILOT ANALYSIS OF THE BODY DRAG TEST IN LAW ENFORCEMENT ACADEMY RECRUITS

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An essential job task for law enforcement officers is a body drag (BD), where they must drag a civilian or fellow officer from a hazardous environment to safety. In California, a BD with a 165-lb dummy is a test within the Work Sample Test Battery (WSTB). Completed by a recruit before they graduate academy, the BD must be completed within 28 s in order to attain points towards the WSBT. However, current US population data indicates that an adult male has a mean body mass of ~196 lb, while females equal ~169 lbs (which does not include any additional loads that may be worn if the victim is an officer). This would suggest that the dummy mass should be increased to prepare recruits for this task. However, before increases to the dummy mass are considered, there should be an analyses of how recruits who have yet to undergo specific law enforcement training complete this test. If they are strong enough to achieve state standards with a 165-lb dummy before academy, this would imply that staff should be able to improve recruit strength to any new BD standards. The purpose of this study was to measure the BD performance for incoming recruits (INC), detail how many achieved the current state standard, and compare their results to data from recruits who graduated academy (GRAD). A cross-sectional, retrospective analysis of data from one law enforcement agency was conducted. One class of INC (67 males, 23 females) was compared to GRAD from nine classes (542 males, 100 females). The INC completed the BD in the week prior to the start of their 22-week academy; the GRAD in the final weeks of their academy. The BD required the recruit to lift the dummy and drag them 32 feet. Recruits were instructed to lift the dummy and stand stationary before initiating the drag; timing commenced once the dummy began to move. Independent samples t-tests ($p < 0.05$) compared BD differences between the INC and GRAD groups, with data combined for the sexes. INC were compared to the state standard to ascertain passing rate. GRAD (5.24 ± 2.71 s) performed the BD significantly faster than INC (7.83 ± 4.02 s). However, only one recruit from the INC did not complete the BD in 28 s. Most recruits from this class had sufficient strength and technical ability to successfully drag a 165-lb dummy fast enough to achieve state standards prior to specific training. The strength of recruits should not be considered a barrier to increasing the dummy mass to be reflective of the US population. Moreover, the use of a strength test (e.g., hex bar deadlift) should be considered for inclusion in the hiring process to indicate a potential recruit's strength relative to the BD if the dummy mass increases.

47. EFFECTS ON SHORT-TERM MEMORY AFTER MODERATE AND VIGOROUS EXERCISE

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Purpose: This study examined the effect of different intensities of acute exercise on short-term memory function. Methods: In this experimental study we are researching the effect that exercise intensity has on cognitive function. One of the purposes of the study is to determine what effects different intensities of exercise have on the efficacy of the working memory. The alternative hypothesis is that a direct significant relationship will be seen between performance on the Rey Auditory Verbal Learning Test (RAVLT) memory test after the moderate intensity exercise condition. The method of testing this hypothesis is by recruiting one hundred men and women for the study (in roughly equal numbers). Participants will be between the ages of 18-45 years, and native English speakers. Each participant's maximum fitness capacity is tested (VO_2 Max Test) and after 40 minutes of moderate (walking on a treadmill at 35% of their objectively measured maximal oxygen uptake (VO_2 Max)), vigorous intensity of exercise (running on a treadmill at 70% of their objectively measured maximal oxygen uptake (VO_2 Max)), or no exercise (watching a preselected documentary) the RAVLT memory test is performed. Results: The study included 55 women with an average age of 20.9 ± 2.9 years and 81 men with an average age of 23.2 ± 4 years. The women weighed 60.6 ± 9.9 kg and the men weighed 76 ± 13.3 kg. The average height of the women was 164.2 ± 5.7 cm and average height of the men was 178.2 ± 7 cm. The RAVLT results were analyzed after each condition for all participants. There was no significant difference between RAVLT 1-8 results within genders after all three exercise conditions. There was a significant difference found in the results of RAVLT 8 between genders after the moderate exercise condition ($P = 0.07$) which measure short term memory word recognition after a 20-minute delay period. The male RAVLT 8 after moderate exercise resulted in a higher (12.7 ± 2.4) correct response than the female correct responses (11.87 ± 2.8). However, the RAVLT 1-7 results were not significantly different. Conclusion: The results of this study shows that there is not sufficient evidence to support the claim that working memory is significantly impacted following forty minutes of moderate exercise for males or females. The results also show that there is also no significant relationship between short term memory following forty minutes of vigorous exercise. However, the results did show a slight improvement in short-term memory involving word recognition after a 20-minute delay period for males compared to females after forty minutes of moderate exercise.

46. NO EFFECT OF FED STATE ON PHYSIOLOGICAL RESPONSES TO HIGH INTENSITY INTERVAL EXERCISE (HIIE)

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Background: Amongst the adult population, participation in physical activity is low, often due to lack of time (Trost et al. 2002) which compromises health status and augments chronic disease risk (CDC 2016). There is growing interest in the potential of high intensity interval training (HIIT) to improve health and fitness in adults (Weston et al. 2014, Milanovic et al. 2015). HIIT is a type of intermittent exercise consisting of brief bursts of near-maximal to maximal effort followed by periods of recovery. Low volume HIIT is a useful strategy to enhance VO_2max (Gurd et al. 2016; Astorino et al. 2017), insulin sensitivity (Jelleyman et al. 2015), and fat oxidation (Astorino et al. 2013) which overall attenuate risk or severity of chronic disease. Previous data show marked glycogen degradation in response to acute bouts of interval training (McCartney et al. 1986; Hargreaves et al. 1998) which suggests that carbohydrate (CHO) availability may limit performance of these bouts. However, previous data are equivocal regarding effects of CHO status on performance of high intensity interval exercise (HIIE). Aim: The aim of this study was to observe the effects of fed state on physiological responses to self-selected HIIE. Methods: 17 young men and women (ages = 26 + 6 yr) completed a VO_2max test followed by 2 bouts of self-selected HIIE, whose order was randomized. Subjects arrived after an overnight fast or ingestion of a small meal (Zone bar and banana, 315 kcal and 63% CHO) 2 h pre-trial. Subjects performed 10 bouts of HIIE consisting of 1 min efforts at a self-selected power output (RPE > 7), followed by a 1 min recovery period. Throughout exercise, VO_2, blood lactate concentration (BLa), heart rate (HR), and blood glucose (BG), were measured. Results: Oxygen uptake increased ($p < 0.001$) with initiation of HIIT and peaked at 2.51 ± 0.53 and 2.54 ± 0.53 L/min in the fed and fasted state. However, no main effect ($p = 0.14$) or mealXtime interaction ($p = 0.38$) was shown. Peak power output was similar across fed and fasted state (239 ± 62 W vs. 245 ± 64 W, $p = 0.33$). No difference was shown in mean ($p = 0.25$) or peak HR ($p = 0.82$) in the fed and fasted state. BLa increased ($p < 0.001$) from 1.5 ± 0.6 mM to 12.7 ± 1.8 mM, but there was no effect of meal ($p = 0.11$) or mealXtime interaction ($p = 0.79$). Blood glucose increased ($p < 0.001$) but there was no effect of meal ($p = 0.39$) or mealXtime interaction ($p = 0.11$). Conclusion: Physiological responses to self-selected HIIE were unaltered by manipulation of fed state suggesting that this mode of exercise can be performed in the fasted state without deleterious effects on metabolic or cardiorespiratory responses.

48. KINETICS OF THE HIP, KNEE, AND ANKLE WHILE JOGGING WITH A STROLLER

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Purpose: Exercise is a necessity to adults that strive to live healthy lives. Many find it difficult to find time in their busy schedules, especially in families with children. Some adults with young children use stroller running (SR) as a form of exercise. However, little is known about how SR alters lower extremity joint moments during running. The purpose of this study was to compare sagittal plane moments of the lower extremity during SR with traditional running. Methods: 13 recreational runners were asked to run behind a Thule Urban Glide 2 jogging stroller suspended over an instrumented treadmill (Bertec, Inc, Columbus, OH). The study measured running in four different conditions: one with the participants right hand on the handlebar, another with left hand on the handlebar, one with both hands on handlebar, and running without the stroller. The first three conditions were randomized between participants, but the final condition was always performed without the stroller. Biomechanics data was collected with Vicon Nexus 2.3 (Vicon, Inc., Oxford, UK) and processed through Visual 3D (5.0, C-Motion, Inc., Germantown, MD, USA) Results: There were no differences observed between conditions for any of the variables under consideration. The peak plantar flexion moment at push off, peak knee extension moment at weight acceptance, and both the peak hip flexion and extension moments were similar between all conditions. It is worth noting that the standard deviations in the conditions between subjects were always reduced by half in the traditional running condition compared to all SR conditions. Discussion: The data collected showed no difference between moments of the lower extremities joints in all conditions. These result show similar demands to the lower extremity musculoskeletal system for stroller running. This research provides insight to some of the differences during SR, but does not include the propulsion of the stroller. This propulsion forward of the stroller, could provide more insight on alterations of moments of the lower extremities during SR.

49. SLEEP PATTERNS OF WILDLAND FIRE SUPPRESSION AID RECRUITS DURING FSA ACADEMY TRAINING

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Academy for wildland fire Suppression Aid (FSA) recruits lasts for 21 days and consists of various training exercises and drills. Each day in academy lasts approximately 8.5 hours, and includes both mental and physical tasks. Sleep in tactical populations is often interrupted and erratic due to job tasks and job-related stress, and this process starts during academy training where cadets will have early morning starts intermixed with night operations. The optimal amount of sleep for a healthy adult is 8 hours per night. If an individual loses sleep over an extended period of time, the body accumulates "sleep debt", which has been shown to decrease cognition and performance, as well as increase morbidity rates. Sleep debt, in conjunction with the typical overtime work involved in wildland firefighting, could lead to an increase in on-the-job injuries and illnesses. Sleep patterns in wildland firefighters has not been extensively analyzed, and this process begins in academy. The purpose of this study was to analyze sleep patterns during academy in wildland firefighter cadets. Wearable technology was provided to 15 recruits to measure duration of sleep, quality of sleep, and alertness across the 21-day academy period. Repeated measures ANOVA was used to compare sleep hours per day of academy ($p < 0.05$). Pearson's correlations ($p < 0.05$) were utilized to calculate relationships between average alertness and sleep quantity. During academy, cadets received less than optimal amounts of sleep (mean = ~6.82 hours/night), and it was atypical to get more than 8 hours per night. Sleep on Day 6 was significantly greater than 9 of the 18 days (1-4, 7, 8, 10, 14, 18). Day 9 sleep was significantly greater than 12 of the 18 days (1-4, 7, 8, 10, 14-18), while Day 10 was significantly lower than 8 of the days (5, 6, 8, 9, 11, 15-17). Sleep on Day 11 was significantly greater than 11 of the 18 days (1-4, 7, 8, 10, 14-16, 18). The days where an increased amount of sleep was achieved either fell on weekends or around the FSA recruit's night operations, for which sleep was imperative. A possible reason for more accumulated sleep on the days surrounding night operations could be a later report-by time on the day of this training, and an earlier sleep onset time the day after. The data also indicated that alertness significantly related to greater sleep quantity ($r = 0.91$), which may not always be possible for wildland firefighters. Nonetheless, accumulating sleep debt could negatively influence alertness during job-specific tasks, and increase the chance of on-the-job injuries.

50. PREDICTORS OF EXERCISE INDUCED BODY MASS LOSS IN MALES AND FEMALES

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A gold standard to assess hydration has not yet been established, however acute body mass loss (BML) seems to provide an accurate indication for measuring changes in hydration status. Further, a lack of research has made it unclear if men and women differ in their responses to dehydration. PURPOSE: The purpose of the present study was to observe which method (urine specific gravity (UrineSG), saliva osmolality (Sosm), plasma osmolality (Posm), or plasma volume change (PV Δ) best predicted BML in both males and females, and to observe any differences that might exist between sexes. METHODS: 12 males (age 23±4 years, 57.8±6.97 ml/kg/min, 11.29±5.29% body fat) and 12 females (age 22±4 years, 49.92±8.02 ml/kg/min, 15.16±6.11% body fat) exercised at 65% of VO_2max in a heated room (30°C). BML, UrineSG, Sosm, Posm, and PV Δ were assessed every 30 minutes during exercise. Multivariate regression was used to analyze the data. RESULTS: Females lost 2.40 ± 0.48% of BM, while males lost 2.97 ± 0.15% of BM. Urine SG, Saliva Osm, and Plasma Osm all significantly predicted BML ($p<0.05$) for both males and females, while PV Δ did not predict BML for either sex ($p>0.05$). UrineSG best predicted BML for men (β=-0.46), while saliva osm best predicted BML for women (β=-0.42). CONCLUSION: Urine, saliva, and plasma independently and accurately predicted BML. These data show that men and women respond similarly to a dehydration protocol. Additionally, they provide framework toward further understanding which method best predicts BML.

51. DIABETES RISK MARKER CORRELATES OF ORAL BISPHENOL A CONSUMPTION

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Purpose: The purpose of this secondary analysis study was to examine whether varying doses of oral BPA consumption is correlated with these diabetes risk markers. Methods: Eleven healthy, college students (21.0 ± 0.8 yrs; 24.2 ± 3.9 kg/m2) were randomized in a double-blinded, cross-over fashion separated by >1 week to oral consumption of Placebo (PL), deuterated BPA at 4 B-g/kg-BW (BPA-4), and deuterated BPA at 50 B-g/kg-BW (BPA-50). Total BPA, glucose, insulin, and C-Peptide were assessed at baseline, minutes 15, 30, 45, 60, and every 30 minutes for 2 hours in response to a glucose tolerance test. Results: There was a significant condition x time interaction for total BPA such that BPA-50 was higher at minutes 15 to 180 compared to BPA-4 and PL ($P<0.01$), and BPA-4 was higher than PL at the same timepoints ($P<0.01$). There was a significant glucose main effect for condition such that BPA-50 was significantly lower than PL ($P=0.036$) and nearly significantly lower for BPA-4 vs. PL ($P=0.056$). Total BPA was significantly negatively correlated with glucose concentrations ($P= 0.039$, $R= -0.360$). There was no significant correlation between total BPA and insulin ($P= 0.834$, $R= -0.038$) or C-peptide ($P= 0.31$, $R= -0.184$) concentrations. Conclusion: Varying doses of oral BPA consumption was negatively correlated with glucose concentrations. These data indicate a potential causal relationship between consumption of BPA and glucose concentrations.

52. SEX DIFFERENCES IN THE ACUTE EFFECTS OF STAIR-CLIMBING ON POSTPRANDIAL BLOOD GLUCOSE LEVELS

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Purpose: To examine differences in postprandial glucose (PPG) during moderate intensity stair climbing of various durations following consumption of a mixed meal. The PPG response is strongly associated with cardiometabolic disease risk and women remain understudied in biomedical science. Methods: Five males (24.0±3.9y) and eight females (23.4±.2.4y) consumed a mixed meal containing 650 kcal (33% fat, 53% carbohydrate, 14% protein) and glucose levels were monitored for 1 hour. On three subsequent visits, participants consumed an identical meal combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after subjects finished the meal. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour. Results: All results were normalized for body weight. No difference in post-exercise PPG at 30min following the 1 min bout was seen in men (α-0.022±0.112mg/dL/kg, $p=0.86$) but a trend for a decrease was seen in women (α-0.180±0.090mg/dL/kg, $p=0.09$). For the 3min bout no change was seen in men (α0.049±0.142mg/dL/kg, $p=0.75$) but a trend towards an increase was seen in women (α0.153±0.081mg/dL/kg, $p=0.10$). Following the 10min bout, the decrease trended towards significance in men (α-0.359±0.138mg/dL/kg, $p=0.06$) and was significant in women (α-0.513±0.130mg/dL/kg, $p<0.01$). iAUC for the 1min bout was not different in men (α-8.79±4.72mg/dL/kg, $p=0.14$) nor women (α-2.46±3.81mg/dL/kg, $p=0.54$). For the 3min bout a significant decrease in iAUC was seen in men (α-4.63±1.30mg/dL*kg, $p<0.03$) but not women (α3.79±4.46mg/dL*kg, $p=0.42$). A trend towards a significant decrease in iAUC was seen in the 10min bout in men (α-13.23±6.03mg/dL*kg, $p=0.09$) but not women (α-4.74±3.92mg/dL*kg, $p=0.265$). No interaction was seen between trial and sex for post-exercise PPG at 30min ($p=0.273$, η_p^2 =0.11) or iAUC ($p=0.635$, η_p^2 =0.05). Conclusion: Men and women showed a similar reduction in PPG with moderate intensity stairclimbing of various durations.

53. FIT FOR DUTY, FIT FOR LIFE? AN ANALYSIS OF THE HEALTH AND FITNESS OF DEPUTY SHERIFFS AFTER WORKING IN CUSTODY

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Deputy sheriffs are typically required to work in custody prior to patrol. The sedentary job demands of custody, and lack of a mandated fitness standard, may influence the general health of deputies and their ability to perform patrol job tasks. The purpose of this study was to examine fitness characteristics of deputies after working custody. A retrospective analysis was conducted on 60 (♂ = 48, ♀ = 12; age = 33 ± 6.3 years) deputies from one patrol school class. Health and fitness assessments included: fat mass; body mass index (BMI); resting blood pressure; grip strength; sit and reach; push-ups and sit-ups in 60 s; and recovery heart rate from a YMCA 3-min step test as a measure of aerobic fitness. Data were compared to ACSM age and sex-related norms, or law enforcement norms for push-ups and sit-ups. Analyzing body fat, 1.69% of the deputies were classified as good, 10.17% as fair, 28.81% as poor, and 59.32% as very poor. For BMI, 18.33% were normal, 45% were overweight, 26.67% were class I obesity, and 10% were class II obesity. For blood pressure, 13.33% of the deputies had normal blood pressure, 13.33% had elevated blood pressure, 30% were considered stage 1 hypertension, 41.67% were considered stage 2 hypertension, and 1.67% in a hypertensive crisis. Considering grip strength, 12.07% were above average, 12.07% were average, 15.52% were below average, while 60.34% were poor. For the sit and reach, 1.72% were excellent, 10.34% were very good, 18.97% were good, 25.86% were fair, and 43.1% were deemed as needing improvement. When comparing push-ups to other law enforcement officers, 13.04% were in the 76th-100th percentile, 34.78% in the 51st-75th, 21.74% in the 26th-50th, and 30.43% in the 1st-25th percentile. The same comparison for sit-ups resulted in 10.64% of the class in the 76th-100th percentile, 8.52% in the 51st-75th, 36.18% in the 26th-50th, and 44.69% in the 1st-25th percentile. For the YMCA step test, 5% were above average, 6.67% were average, 21.67% of the deputies were below average, 40% poor, and 26.67% very poor. Post custody assignments, deputy sheriffs exhibit health and fitness trends that were below the general population and other law enforcement officers. Agency staff should encourage, and facilitate, the maintenance of health and fitness of deputies working in custody to ensure deputies are fit for life and duty.

55. DOES BODY FAT PERCENTAGE INFLUENCE PERIPHERAL BLOOD PERIPHERAL BLOOD MONONUCLEAR CELLS?

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Purpose: Autophagy, an evolutionarily conserved proteasomal degradation pathway, is known to play a complex role in various disease states including cardiovascular disease and type II diabetes, where it is deficient in some tissue and overactive in others. Recently, it was shown that autophagy was upregulated in the adipocytes of obese individuals. However, it is not known if individuals with different body fat percentages will have different regulation of autophagy markers in immune cells. Therefore, the purpose of this study was to investigate markers of autophagy in peripheral blood mononuclear cells (PBMCs) of individuals with distinct body fat percentages. We hypothesized that autophagy would be higher in individuals with greater body fat compared to those with less. **Methods:** Sixteen men (*n* = 8) and women (*n* = 8) were recruited for this study. Body fat percentage (% BF) was calculated from hydrostatic weighing and the participants separated into two groups: one below (*n* = 8, 37.1 ± 3.7 years old, 13.3 ± 3.3 % BF) and one above (*n* = 8, 36.9 ± 3.6 years old, 27.1 ± 8.1 % BF) the 50th percentile of body fat according to the age- and sex-specific norms outlined by the ACSM guidelines. Venous blood was drawn from each participant and PBMCs were isolated. Markers of autophagic flux, LC3II and p62 were measured in PBMCs via Western blot analysis **Results:** There was a significant difference in body fat % between the two groups (p<0.0001). When matched for age and sex, both p62 (p=0.129) and LC3II (p=0.205) were not different between groups. There was no significant correlation (p>0.05) between p62 and body fat % when all participants were analyzed as a whole. **Conclusion:** In this preliminary study, markers of autophagy flux were not different between individuals above and below the 50th percentile of body fat.

54. BASELINE POSTURAL CONTROL MEASURES: AN INDICATOR FOR INCREASED INJURY FREQUENCY FOLLOWING SPORT-RELATED CONCUSSION

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Recent research indicates that within 1 year following sport-related concussion (SRC), those who have experienced a SRC are 1.97 to 3.5 times more likely to sustain an acute lower extremity (LE) injury with a risk rate that ranges from 2.88 to 6.22 per 1000 athlete exposures. These studies suggest that an association between SRC and LE injury exists, however, no known research has examined the potential cause. It has been suggested that lingering postural control deficits as a result of SRC, may play a role in the increased prevalence of injury. The purpose of this study was to investigate the potential relationship between baseline postural control metrics and acute LE injury frequency in NCAA Division I athletes with a prior history of SRC. Eighty-four NCAA Division I athletes (42 with a history of SRC [CONC]; 42 without a history of SRC [CTRL]) performed three trials of 30 seconds eyes open (EO) and eyes closed (EC) quiet upright stance during pre-participation baseline screening on a force platform (1000Hz). Acute and chronic LE injuries were prospectively tracked for a single athletic season following baseline. Raw center of pressure (CoP) data were further analyzed using a custom MATLAB code to obtain Root Mean Square (RMS), Mean Velocity (MEV), and Multiscale Entropy's Complexity Index (CI) for both anteroposterior (AP) and mediolateral (ML) directions. The results indicated that over the course of the season, 27.4% of the athletes reported an injury (n=23) with a significant association between prior SRC history and incidence of injuries (p=0.043, relative risk=1.88 [CI95% 1.09, 3.95]). In EO condition, RMS (p=0.049; CONC=5±0.28mm, CRTL=4.1±0.22mm: Cohen's d=3.6) and CI (p=0.021; CONC=10.25±0.52, CRTL=11.80±0.57: Cohen's d=2.9) in the ML direction were significantly different between groups. Furthermore, in the EC condition, CI (p=0.026; CONC=14.08±0.63, NORM=15.93±0.52: Cohen's d=3.2) in the ML directions was significantly different between groups. No other significant differences were observed. These results indicate that a prior history of SRC is associated with a greater incidence of LE injury and postural control differences can be detected prior to injury occurrence. These results suggest that postural control variability may be an indicator of LE injury risk following full recovery from SRC.

56. A PILOT ANALYSIS OF THE EFFECTS OF CUSTODY SHIFT LENGTH ON THE HEALTH AND FITNESS CHARACTERISTICS OF DEPUTY SHERIFFS

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Within law enforcement agencies deputy sheriffs are primarily responsible for maintaining order and protecting a community by enforcing laws. Deputy sheriffs may work in custody facilities, where the primary job tasks are inmate supervision and if necessary, restraint. Following custody, deputy sheriffs may be assigned to patrol, where job tasks include the prevention of illegal activities, emergency response, and ensuring the safety of citizens. Depending on the position, shift hours can range from 8-16 hours (or longer with overtime). Longer shifts may allow for more days off, which in some ways is preferable for some individuals, as it could allow for more family and recreational time. However, long shifts may contribute to greater fatigue and insufficient sleep. The purpose of this study was to provide a pilot analysis as to the potential impact shift length could have on the health and fitness of deputy sheriffs who have been working in custody. A retrospective examination was conducted on 60 deputies. The deputies self-reported their average shift length per week, which provided a split of deputies who typically had custody shift lengths of 12 hours or less (32 males, 5 females), or shifts greater than 12 hours (15 males, 7 females). Health and fitness assessments included: resting heart rate (RHR); resting blood pressure; fat and lean body mass measured via bioelectrical impedance; waist and hip circumference; waist-to-hip ratio (WHR); grip strength; push-ups and sit-ups in 60 s; and recovery heart rate from a YMCA 3-min step test. To compare any differences between the groups, univariate repeated measures ANOVA with sex as a covariate was utilized ($p < 0.05$). After evaluating the information, it was apparent that there were few differences between the groups. However, the RHR of deputies who worked shift hours longer than 12 hours had a significantly lower RHR (80.73 ± 9.47 bpm) in comparison to those deputies working 12 hours or less (94.03 ± 12.36 bpm). Deputies working more than 12 hours also had a significantly lower WHR (0.84 ± 0.07) than those working more than 12 hours (0.89 ± 0.06). Although this is a pilot analysis, working longer shifts had a more favorable RHR and WHR; these longer shifts could have allowed for more time off and the opportunity to make better lifestyle choices. Nonetheless, no other health or fitness characteristics differed between the groups. More investigation is required as to the impacts shift length can have on deputy sheriffs, and strategies to alleviate any negative effects.

57. A SELF-GUIDED APPROACH TO IMPROVING NECK POSTURE

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In regards to the cervical and upper thoracic spine, one of the most commonly recognized types of poor posture is forward head posture (FHP). FHP is exhibited when the head is positioned anteriorly to a vertical reference line passing through the shoulder joint. Poor postural alignment varies the normal distribution of biomechanical stresses, and prolonged FHP can alter thoracic muscle activities, impair respiratory function, and lead to musculoskeletal pain. The goal of this study was to investigate the effectiveness of a self-guided approach to improve neck posture. Eighteen participants with FHP were recruited and given a handout containing posture improving information, as well as a 6-week exercise program composed of exercises shown in previous literature to improve FHP. The participants were asked to follow and complete the exercise regimen on their own for 4 days per week, for 6 weeks. The participants were asked to track which days their exercises were completed. Craniovertebral angle (CVA) was obtained pre (41.7±5.6°) and post (48.4±6.9°) intervention; the increase in mean CVA was 6.6±5.0°. Using a paired sample t-test, the difference in CVA pre and post intervention was statistically significant ($p<0.05$). The results of this study show that a self-guided approach, such as a handout and exercise regimen, has the potential to be an effective tool in improving cervical posture.

58. COMPARISON OF THE ERROR OF THE MEASUREMENT OF THE SIZE OF THE TIBIALIS POSTERIOR MUSCLE VIA ULTRASOUND IMAGING IN OLDER AND YOUNGER INDIVIDUALS

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Purpose: The tibialis posterior (TP) is a key muscle in controlling foot function and is associated is with several lower extremity pathologies. Being able to assess the strength, activity and size of the muscle across ages plays an important role in treating and understanding these pathologies. It may be more difficult to image older individuals due to fatty infiltration and fibrosis, such as that seen in diabetics. Methods: Legs of 23 individuals (older (O) n=7, younger (Y) n=16) were imaged via ultrasound (6-15ML probe, GE Logiq S8) and the cross-sectional area (CSA) and thickness of the TP was recorded. To measure the TP the probe was held at the 30% and then the 50% point from the knee joint line to the inferior tip of the lateral malleolus. Subjects inverted their foot and videos of the contraction cycle were recorded. 2 separate still-shots of the muscle at rest were saved from the recorded videos to make size measurements. This process was performed on both anterior and posterior sides of the leg. To assess reliability intraclass correlation coefficients (ICC) and the standard error of the measurement (SEM) were calculated. An independent t-test was used to determine differences in the measurement error between groups. Results: Excellent reliability was seen when comparing repeated measurements for anterior and posterior area and thickness measurements for both younger and older individuals (ICC=.937-.999), however, there was a significant difference in the SEM (thickness O=.06 ±.02cm; Y=.035±.01cm, p=.008; CSA O=.11±.07cm; Y=.046±.01cm, p=.02). Conclusion: Repeated measurements showed excellent reliability in both groups. There was a greater error in the measurement in the older adults. Despite showing excellent reliability, these results show that age does affect the accuracy of the measurement of the TP muscle size assessed by ultrasound imaging; however, it would also be beneficial to be able to assess quality of muscle tissue.

59. OBESITY CONTRIBUTES TO A REDISTRIBUTION OF JOINT MOMENTS DURING GAIT

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Slow gait speed is associated with morbidity. Gait speed is attributable to propulsive force (PF) from the plantar flexor (PFM), knee extensor (KEM), and hip extensor moments (HEM). Body mass index (BMI), sex, and speed independently influence propulsive characteristics during gait, but the interaction between these factors is unclear. The purpose of this study was to examine the influence of BMI, sex, and gait speed on PF, PFM, KEM, and HEM; and to assess PF, PFM, KEM, and HEM as predictors of gait speed. 48 individuals with and 48 without obesity participated and were matched on age and sex. Kinematic and kinetic data were obtained from 5 gait trials at both self-selected (SS) and pre-determined (PD) speeds (1 m/s). Peak PF, PFM, KEM, and HEM were extracted from the second half of stance. PF was normalized to bodyweight (N) and moments were normalized to a product of bodyweight and height. 2(sex) x 2(BMI) x 2(speed) mixed-model ANOVA was used to compare propulsive kinetics. Tukey's HSD was used for *post hoc* comparisons. Multiple regression was used to predict SS speed from PF, PFM, KEM, and HEM (α=0.05). There was an interaction between sex, BMI, and speed on PF ($F_{1,92}$=6.86, p=0.01). Non-obese males at SS had more PF than non-obese males at PD speeds, obese males at SS speeds, and non-obese females at SS speeds. Males and females with obesity, and females without obesity had more PF at SS compared to PD speeds. There was no interaction on peak PFM, KEM, or HEM. There was a main effect of speed on peak PFM ($F_{1,92}$=42.81, p<0.001), KEM ($F_{1,92}$=43.49, p<0.001), and HEM ($F_{1,92}$=97.92, p<0.001). There was a main effect of BMI group on peak PFM ($F_{1,92}$=9.98, p=0.002) and KEM ($F_{1,92}$=4.93, p=0.02); and a main effect of sex on HEM ($F_{1,92}$=6.96, p=0.01). Main effects indicated larger PFM, KEM, and HEM during SS compared to PD speeds. Individuals with obesity had less PFM but more KEM compared to individuals without obesity. Females had more HEM compared to males. The linear combination of PF, PFM, KEM, and HEM explained 72% of the variance in SS gait speed in individuals with obesity ($F_{3,43}$=26.94, p<0.001), and 25% of the variance in SS gait speed in individuals without obesity ($F_{3,43}$=3.65, p=0.012). Adults with obesity exhibit altered propulsive characteristics that are accommodated by a distal-to-proximal shift in joint moments to maintain habitual gait speed.

60. IS THERE AN ASSOCIATION AMONG PHYSICAL INACTIVITY AND FOOD DESSERTS?: A STUDY OF THE EFFECTS OF PHYSICAL INACTIVITY AND FOOD ACCESS ON HEALTH OUTCOMES BY GENDER IN CALIFORNIA

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Background: Previous research has shown that food deserts (FD) [e.g., low-income & limited access to nutritious food] may contribute to rates of obesity and chronic diseases. However, other variables, such as physical inactivity (PI), are also strongly related to negative health outcomes. That is, a recent review article concluded that FD alone may not explain chronic disease prevalence. Similarly, much of the research focused on associations among FD and health outcomes has overlooked the potential contribution of PI. Purpose: Therefore, the purpose of our study was to examine the potential association of PI with FD on chronic disease. We hypothesize that PI will significantly contribute to health outcomes commonly associated with FD. Design/Methods: We used an archival research design to examine publicly available databases from the USDA and the University of Washington that quantifies PI, health and FD by gender. We limited our study to California; therefore, our data was aggregated by each county. Multiple regressions were run to examine the associations of FD and PI on several health outcomes for females and males. Results: For females, PI, but not FD, was significantly associated with life expectancy [β =-.528 (p <.001)], mortality rate [β =.500 (p <.001)], heart disease [β =.597 (p<.001)], stroke [β =.311 (p=.024)], diabetes [β =.523 (p <.001)], and obesity [β =.716 (p <.001)]. Similarly, for males, PI, but not FD, was significantly associated with life expectancy [β =-.631 (p <.001)], mortality rate [β =.606 (p <.001)], heart disease [β =.617 (p <.001)], stroke [β =.419 (p=.001)], cancer [β =.510 (p <.001)], diabetes [β =.426 (p=.001), and obesity [β =.718 (p <.001)]. Discussion: Our study suggests that PI may be an important variable to consider when examining the association among FD and health. We observed a significant association between PI and several negative health outcomes when compared to FD. These results support previous suggestions that FD alone may not be the best predictor of health outcomes. Results from this study may help inform policy regarding the need for physical activity resources in FD. Conclusion: These results suggest that the relationship among FD and health is more complex than previously reported. More research and policy work is needed to increase physical activity rates in FD.

61. GLYCEMIC RESPONSES TO OVERGROUND BIONIC AMBULATION FOR SPINAL CORD INJURY

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Purpose: Walking is a common way to stimulate cardiorespiratory and metabolic activity. Many individuals with spinal cord injury (SCI) have ambulatory deficits and are prone to elevated postprandial blood glucose (PBG), which is an independent predictor for cardiometabolic diseases such as diabetes. Low-moderate intensity exercise such as walking reduces PBG in able-bodied individuals. Overground bionic ambulation (OBA) acutely increases metabolic rate and cardiorespiratory responses, with unknown glycemic effects. The purpose of this study is to determine if OBA is effective in blunting PBG in individuals with SCI. Methods: Two female participants with chronic motor-incomplete SCI. Participant 1 (P01) was 31 years old, 170 cm, 57 kg, with a T2 injury for 15 years. Participant 2 (P02) was 26 years old,157cm, 45 kg, with a C5 injury for 4 years. Participants completed an upper-extremity maximal exercise test and four two-hour oral glucose tolerance tests. Fasted participants ingested 75g of dextrose solution and sat quietly (control) and exercised in one of 3 different modes for 20 minutes each (OBA, OBA with functional electrical stimulation (FES-OBA) and stationary arm cycling), all on separate days. Respiratory gases were continually collected during the exercise period. Standard glucometer measurements were taken at baseline, 30, 45, 60, 90, and 120 min. Results: For P01, arm cycling resulted in the smallest incremental area under the curve (iAUC, 4886 mg*min/dL) and incremental peak (66 mg/dL). Peak BG occurred at 45min for cycling and 30min for all other conditions. %VO_2max for OBA (45%), FES-OBA (61%), and arm cycling (69%) corresponded to light, moderate, and vigorous intensity, respectively. For P02, FES-OBA resulted in the smallest iAUC (7226 mg*min/dL) and incremental peak (81 mg/dL). Peak BG occurred at 90min for OBA and FES-OBA, and at 60min for cycling and control. %VO_2max for OBA (76%) and FES-OBA (70%) corresponded to vigorous intensity, whereas arm cycling (42%) was light intensity. Conclusion: 20 minutes of FES-OBA decreased PBG for both participants while OBA alone had little effect on PBG. Arm cycle results were mixed, likely due to level of injury differences (i.e., cervical vs thoracic) in upper extremity strength and function. FES-OBA has the potential to improve PBG in people with SCI.

63. MUSCLE ACTIVITY MAGNITUDE AND PATTERNS DURING PLYOMETRIC EXERCISE ON LAND AND IN SHALLOW WATER

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PURPOSE: The aim of this study was to compare muscle magnitude and patterns of key lower extremity muscles while performing plyometrics on land and in shallow water. METHODS: Subjects (n=10; age:33.7 ±10.2 yrs, height:69.14 ±2.8 in, mass:74.65 ±14.3 kg) performed two plyometric exercises (countermovement jump (CMJ), drop jump (DJ)) while in two different environments (on land, in shallow water). A water proof electromyography (EMG) system (Cometa Miniwave Infinity, 2000 Hz) was used to record the signals of the muscle activity. Each sensor measured EMG as well as accelerations (3 dimensions). Four muscles (rectus femoris (RF), bicep femoris (BF), gastrocnemius (GA) and tibialis anterior (TA)) were used to capture EMG. DJ trials were initiated from a 30.5 cm platform and order of conditions was always land followed by water. Depth of water was set to go no higher than xyphoid process level and no lower than the navel while standing. DATA ANAYLSIS: Resultant acceleration was calculated for each sensor with a composite score calculated as the sum of the resultant acceleration for all sensors. This signal contained a peak upon initiating movement and a peak upon landing to end the movement. These peaks were identified, and EMG data were extracted 0.25 s before and after these discrete events to represent beginning and ending of analysis. Average (AVG), root mean square (RMS) and movement time were each calculated between the two extraction points. AVG, RMS, and movement time were each analyzed using a 2 (jump type) x 2 (environment) repeated measures ANOVA (α=0.05). RESULTS: EMG (AVG or RMS) was not influenced by the interaction of environment and jump type ($p>0.05$); nor was there a main effect for jump type or environment for any muscle that was measured ($p>0.05$). However, BFAVG was different for jumps regardless of environment ($p>0.05$). CONCLUSION: Muscle activity magnitudes appears to not be influenced between environments for CMJ and DJ for any of the four muscles measured.

62. EFFECTS OF ACUTE CARBOHYDRATE SUPPLEMENTATION ON PERFORMANCE FOR FEMALE, DIVISION I, COLLEGIATE CHEERLEADERS

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This study was designed to investigate carbohydrate supplementation during cheerleading training and its effect on performance. Seventeen participants in four trials; one to gather anthropometric data and 1-repetition maximums, one familiarization trial, a carbohydrate trial, and a placebo trial. The exercises used were power snatches from a hang position, push jerks, front squats, and box squats. The exercises most mimicked a standard strength and conditioning practice for cheerleaders. Performance was measured by calculating the difference between pre- and post-training values in vertical jump repetitions, peak power, average power, peak velocity, and average velocity in a power snatch, and a 200-m shuttle sprint. Performance values for carbohydrate and placebo trials were analyzed using a paired sample t-test, which found no significant difference between the carbohydrate and placebo trials.

64. AN ANALYSIS OF BODY COMPOSITION CHARACTERISTICS OF WILDLAND FIRE SUPPRESSION AID (FSA) RECRUITS DURING FSA ACADEMY TRAINING

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Wildland firefighters have an exceedingly challenging profession, and academy training is used to prepare wildland fire Suppression Aid (FSA) recruits for the numerous physical job demands. To be safe and successful in their often arduous tasks in extreme environments, FSA's must maintain sufficient hydration levels. This is true during training and when the FSA is deployed. Along with adequate hydration, the performance of wildland firefighters can be dependent on the presence of lean muscle mass in the body. Greater lean body mass will positively contribute to both anaerobic (e.g. cutting line, moving heavy objects) and aerobic (e.g. prolonged hiking carrying equipment) performance in FSA's. In conjunction with hydration, preserving lean tissue during a strenuous training program should be beneficial to FSA recruit's performance in wildland academy. The purpose of this study was to track body composition characteristics (intracellular water [IW], extracellular water [EW], fat mass [FM], dry lean body mass [DLBM]) of FSA recruit's during 15 days of a 21-day academy. Retrospective analysis was conducted on 15 male recruits from one wildland firefighter academy class. IW, EW, FM, and DLBM body composition components were typically measured between 0600-0700, using a research-grade bioelectrical impedance and body water analyzer. Day-to-day changes in IW, EW, FM, and DLBM were evaluated by a repeated measures ANOVA ($p < 0.05$). Apart from Day 2, IW, EW, FM, and DLBM were relatively stable among cadets for the 15 days. Indeed, all of these variables were significantly different from Day 2 on Days 4-6 and 15 (IW, EW, and DLBM were higher; FM was lower). Average Day 2 body composition values were: IW = 31.54 ± 1.29 kg; EW = 18.42 ± 0.79 kg; FM = 11.16 ± 1.07 kg; and DLBM = 18.38 ± 0.80 kg. After Day 2, the ranges for these measures were: IW 31.83-32.50 kg; EW 18.52-19.12 kg; FM 9.51-10.63 kg; and DLBM 18.41-18.96 kg. The greater variation in body composition characteristics for Day 2, including lower IW and EW, is conceivably due to recruit's being exposed to an unfamiliar training process, with limited knowledge on how to stay effectively hydrated. Following this, the procedures adopted by the staff for this firefighting agency (e.g. education, hydration supplements, readiness monitoring) maintained hydration and DLBM. Education and appropriate interventions during wildland firefighter academy training could generally maintain healthy body composition levels (IW, EW, FM), and preserve the DLBM of cadets.

65. EFFECT OF LEG STRENGTH AND LEAD LEG PREFERENCE ON DROP JUMP SYMMETRY

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Functional asymmetries have been linked to an increased risk of injury in a variety of different movements, including those that are symmetrical in nature (Markou et al., 2006; Zifchock et al., 2006; Drid et al., 2009; Pappas, 2012; Malder, 2013). Drop jumps are used in training, as well as in clinical studies that are interested in assessing knee injury risk, especially of the anterior cruciate ligament. The purpose of this study was to determine how each leg's hip and knee joint kinematics compare when considering lead leg preference and leg strength. Twenty intercollegiate athletes (10 male, 10 female) involved in symmetrical sports participated in the study. Subjects were instructed to step off a 45 cm box, land simultaneously with each foot on a Kistler force plate, and then jump vertically as high as possible, landing again on the force plates. Six Vicon MX 40 cameras captured 3-dimensional coordinates of 16 reflective markers to determine lower extremity kinematics. Lead leg was alternated and three trials per lead leg were used for analysis. Leg strength was determined using a Biodex isokinetic dynamometer at 60°/s and leg preference was determined by each subjects' lead leg comfort. Joint kinematics were compared between the subjects' legs during the absorption phase of the first and second landings (Abs1 and Abs2, respectively). SPSS v. 25 was used to determine significance at $p < 0.05$. There were no differences in sagittal plane angles for the hip or knee during Abs1. However, the right hip and knee were significantly more flexed during Abs2 than the left hip and knee (51.8±18.5° vs. 50.3±18.6°; p=0.005 and 72.9±15.6° vs. 69.6±15.1°; p<0.001, respectively). Additionally, the sagittal plane hip and knee ROM values were greater for the right leg (p<0.001 and p=0.002, respectively). In the frontal plane, there were differences during both Abs1 and Abs2. The left hip was more abducted and had greater ROM than the right hip during both phases. The left knee had more extreme varus values than the right knee which became valgus during both phases. The left leg was stronger for 12 of the 20 subjects and was the non-preferred leg for 12 of the 20 subjects. It appears that the subjects exhibited less stability in the frontal plane on their stronger and non-preferred leg.

67. EFFECT OF FED STATE ON PERCEPTUAL RESPONSES DURING ACUTE BOUTS OF SELF SELECTED HIGH INTENSITY INTERVAL EXERCISE (HIIE)

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Introduction: Exercise adherence is difficult for most individuals because of the substantial time commitment, a lack of motivation or appeal, and lack of enjoyment. Less than 5% of adults achieve 30 minutes of physical activity per day (Trost et al., 2002; Troiano et al., 2008). High intensity interval exercise (HIIE) has been viewed as a more pleasant mode of exercise because of the recovery periods and reduced total exercise time (Jung et al., 2014). However, imposed exercise eliminates autonomy which can negatively affect the exerciser's overall experience (Kellogg et al., 2018). Previous studies have examined the effects of fed vs fasted-states on performance and metabolism during exercise (Aird et al., 2018; Peacock et al., 2012); however, no research has explored the change in perceptual responses during high intensity interval exercise (HIIE) with manipulation of fed state. Aim: The purpose of this study was to examine the effect of fed state on perceptual responses during acute self-selected HIIE. Methods: 17 healthy individuals (age=26 ± 6yr) participated in a baseline assessment followed by two separate sessions of self-selected HIIE. Fed and fasted states were randomized. Perceptual responses were measured using the feeling scale, physical activity enjoyment scale, and rating of perceived exertion. Results: Affect gradually declined during exercise ($p < 0.001$) compared to rest (3.59 ± 1.90 and 3.28 ± 1.82) in the fed and fasted state. End-exercise affect was equal to -0.35 ± 2.60 and -0.53 ± 2.60 in response to HIIE in the fed and fasted state. No significant effect of meal ($p = 0.79$) or mealXtime interaction ($p = 0.85$) was shown. RPE increased during exercise ($p < 0.001$) and peaked at values equal to 9.1 ± 0.9 and 9.3 ± 0.6 in the fed and fasted state, yet there was no effect of meal ($p = 0.44$) or mealXtime interaction ($p = 0.32$). There was no difference in PACES ($p = 0.77$) between the fed (103 ± 14) and fasted state (101 ± 13). Conclusion: There was no effect of fed state on RPE, affect, or enjoyment; however, 11 of 17 participants preferred performing HIIE in the fed versus fasted state.

66. THE EFFECTS OF THE HIGH- VERSUS LOW-INTENSITY RESISTANCE EXERCISE ON ACUTE HYPERGLYCEMIA IN YOUNG HEALTHY MALES

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Decreasing levels of physical activity coupled with ever-increasing obesity rates have been linked to risk factors that include abdominal adipose tissue accumulation, peripheral insulin resistance, sarcopenia, and dysfunctional glucose metabolism such as Type 2 Diabetes Mellitus (T2DM). Purpose: The purpose of this study was to compare the impact of an acute bout of high-intensity (HI) versus low-intensity (LO) on resistance exercises (RE) on acute of equal work volume in resistance-trained males. Methods: Thirteen recreationally trained males (age, 23.43 ± 2.18 yrs.; height, 175.16 ± 10.44 cm; body mass, 77.02 ± 8.91 kg) completed three randomized testing sessions separated by 96 hours: 1) no exercise control (CON), 2) HI (5x4, 90% 1-RM), and 3) LO (3x14, 65% 1-RM). Following an overnight fast, all sessions began with oral ingestion of a high glucose drink (2 g glucose/kg body weight). Thirty minutes post-glucose ingestion HI and LO RE protocols were initiated. Plasma glucose was measured immediately pre-, thirty, sixty, ninety and 120-minutes post-glucose ingestion. Results: A two-way ANOVA revealed a significant ($p < 0.015$) time main effect for plasma glucose concentrations throughout the 120 min testing duration, however, glucose values did not differ between conditions at any of the individual time points. One-way ANOVA showed the total glucose response in the HI condition, as assessed by AUC, was significantly greater ($p < 0.012$) than in both CON and LO. Moreover, no statistical significance was found within the plasma insulin concentrations, as assessed by a two-ANOVA. Strong negative correlations existed between total body mass and lean body mass ($r = -0.78$) as well as for lean body mass and LO glucose AUC ($r = -0.78$). Conclusions: This study illustrated a significant increase in post-exercise plasma glucose levels and this increase was significantly greater for the HI compared to the LO.

68. DISAGREEMENT BETWEEN TWO POPULAR METHODS FOR ASSESSING HUMAN SKELETAL MUSCLE FIBER TYPE COMPOSITION

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Introduction: Human skeletal muscle expresses multiple fiber types that exist across a spectrum from slow- to fast-twitch. The amount of each fiber type (FT%) present in a muscle greatly influences its function. Accurately assessing FT% is therefore important for both health and sport performance outcomes. A common approach is to homogenize (HG) samples and assess relative expression of the three myosin heavy chain (MHC) isoforms (I, IIa, & IIx) via densitometry. Alternatively, isolation of single fibers (SF) for distribution analysis allows resolution of the pure and "hybrid" (I/IIa, IIa/IIx, I/IIa/IIx) fiber types. Unfortunately, no studies to date have directly compared the two approaches (HG vs. SF). Purpose: Compare two common methods of assessing FT% in human skeletal muscle. Methods: Resting vastus lateralis biopsies were performed on 21 highly resistance-trained participants (15 women, 6 men; age = 26±2 y, height = 166±9 cm, body mass = 76±25 kg). Each sample was partitioned into ~10 mg section and stored in solution at -20°C for at least seven days before being analyzed for MHC content via SDS-PAGE. HG samples were diluted between 1:20 and 1:100 while SF samples (N = 2,147; 102 ± 3 fibers per person) were mechanically isolated. All other conditions (gel density, running time, staining methods, etc.) were similar between HG and SF. Results: HG overestimated MHC I (23±9 vs. 31±9%, p=0.005) and IIx (0±0 vs. 3±6%, p=0.046) distribution. HG likely misclassified MHC IIa/IIx fibers as IIx as the two were highly correlated ($r=0.96$, $p<0.001$). The heaviest five participants accounted for 91% of the MHC IIa/IIx fibers, thus body mass was also correlated to IIa/IIx content for both the women ($r=0.46$, $p=0.04$) and men ($r=0.76$, $p=0.080$). Conclusion: These data 1) highlight the rarity of pure MHC IIx fibers in healthy men and women, 2) indicate a potential link between IIa/IIx frequency and body mass, and 3) question the fidelity of HG as a measure of FT% distribution.

69. PEAK FORCES ON PROFESSIONAL ACROBATIC PERFORMANCE

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Acrobatic performers have been used in the entertainment industry for a vast amount of time, but limited research has examined these particular skills that are executed through a biomechanical lens. Investigators have mostly examined certain single element skills that give some relevance to overall performance. Research is limited on the wide range of skills and the number of skills performed in one bout of movement. This would suggest that more research should be performed on different types of skills and a combination of skills performed during one bout of exercise. The purpose of this study was to analyze peak forces during certain acrobatic movements performed by a professional artist using specialized equipment. A professionally trained male subject (weight = 65.8 kg) participated in this study. The subject visited the laboratory on one occasion where he performed seven different acrobatic movements. The data collection consisted of using two force plates, the Vicon 3D Motion Capture System, and placing reflective biomarkers on specific bony landmarks. The seven movements performed were the one hand hop, air chair, maximum vertical jump, flare, front flip, back flip, and single leg hop on both legs. Each movement was performed twice. The average peak force was collected for each movement. The means were: one hand hop = 4645.75 N, air chair = 4340.55 N, maximum vertical jump = 3911.15 N, flare = 2038.74 N, front flip = 6535.95 N, back flip = 7194.95 N, single leg jump (right leg) = 2545.95 N, and single leg jump (left leg) = 2688.80 N. The peak forces that were collected were on applicable movements to this athlete's performance routine. The collection of this data could be helpful for these types of athletes for injury prevention, enhance performance of these skills or overall performance.

71. COLLEGE STUDENTS, SEDENTARY BEHAVIOR, AND CARDIOMETABOLIC RISK?

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While increased physical activity and reduced sedentary behavior are known to independently impact central obesity, cholesterol and glucose, it is not clear if one has a greater impact on cardiometabolic risk factors than the other. Multiple associations have been considered in adults and children, but studies of college students are lacking. It is estimated that college students spend approximately 35 hours of their typical week sitting in class, using computers and studying. Therefore, the purpose of this study is to examine the relationships between physical activity, sedentary behavior, aerobic fitness and cardiometabolic risk factors in college students. Twenty-one college students volunteered and completed the study. Risk factors were measured across three separate lab visits. During the first visit, each subject completed an online health history questionnaire, height and weight was recorded for body mass index (BMI) and they began wearing a research grade accelerometer for 7 days to determine sedentary behavior, and physical activity. During subsequent visits, subjects completed a graded exercise bike test (GXT) to exhaustion to determine VO_2 peak and an underwater weighing session to determine body composition. Resting blood pressure was recorded prior to the GXT. Blood Cholesterol and Glucose measurements were analyzed, using a 40ul blood sample, by the Alere Cholestech LDX analyzer. Self-Reported Screen Time was assessed using the Screen Time Survey. No significant relationships were noted between sedentary behavior, physical activity, and cardiometabolic risk factors. However, a significant relationship between self-reported work sitting time and stress levels ($r = .582$, $p < .05$), as well as a significant relationship between systolic blood pressure (SBP) and BMI ($r = .439$, $p < .05$) were shown. Although the data, in regards to total sedentary behavior and physical activity, were inconclusive relevant to cardiometabolic risk, the amount of sedentary behavior across the subjects was lower than anticipated. The lack of truly sedentary subjects has complicated early findings regarding cardiometabolic risk factors. In the future, finding sedentary subjects willing to volunteer for this area of research is imperative to finding more conclusive results.

70. THE RELATIONSHIP OF NONLINEAR METRICS OF POSTURAL CONTROL FOLLOWING SPORT-RELATED CONCUSSION

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Postural control is a cardinal sign of sport-related concussion (SRC) and can be quantified via center of pressure (CoP) data using linear and nonlinear metrics. Recently, nonlinear metrics such as approximate (ApEn), sample (SampEn) and complexity index (CI) have been proposed as methods of analyzing the neurological organization or health of the postural control system. This is partially due to the properties of the signals being analyzed. Currently, research is divided about which of these nonlinear metrics are appropriate to use to quantify postural control deficits in neurological disorders, such as (SRC). However, these metrics have not been compared within the same sample of SRC. The purpose of this study was to examine the relationship between ApEn, SampEn, and CI in a group of healthy match controls (CON) and sport-related concussion (SRC). Sixteen Division 1 athletes with SRC and 16 CON performed 3 trials of feet together quiet upright stance in the eyes open (EO) and eyes closed (EC) conditions for 30 seconds on a force platform (100Hz) at 24-48 hours post-injury. SRC was diagnosed by the head team physician and verified by the presence of 2 or more vestibular/ocular symptom scores on Vestibular Ocular Motor Screening (VOMS) test. CON data were collected at pre-participation physicals. Raw CoP data were analyzed using ApEn and SampEn (m=2, r=0.2, N=300), and MSE (m=2, r=0.15, S=1-10, N=300-3,000). The data were analyzed using independent samples t-tests and Pearson's Product Correlations. A significant decrease in ApEn ($p=0.024$; SRC=0.59±0.11, CON=0.68±0.10 Cohen's d= 0.86) SampEn ($p=0.022$; SRC=0.65±0.14, CON=0.76±0.13, Cohen's d= 0.81), and MSE ($p=0.025$; SRC=41.86±8.79, CON=48.69±7.55, Cohen's d= 0.83) was noted in the EC AP direction for SRC. No other significant differences were noted. A significant relationship was noted between ApEn and SampEn ($p<0.001$, $r=0.99$), ApEn and MSE ($p<0.001$, $r=0.99$), and SampEn and MSE ($p<0.001$, $r=0.99$) in the EC AP direction for both SRC and CON. These results may indicate that ApEn, SampEn, and MSE are highly related to one another and may be viable in determining deficits postural control following SRC.

72. B-2 ADRENERGIC RECEPTOR PHOSPHORYLATION AND EXPRESSION IS AUGMENTED FOLLOWING ACUTE RESISTANCE EXERCISE

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Caffeine containing pre-workout supplements (SUPP) increase resistance exercise (RE) performance. B-2 adrenergic receptors (B-2-AR) may be affected by SUPP, since we previously reported greater post RE epinephrine (EPI) response after SUPP. In vitro studies indicate phosphorylation of B-2-ARs regulates receptor function. B-2-AR may also activate anabolic signaling via extracellular signal-regulated kinase (ERK). PURPOSE: To determine the effect of SUPP on total and phosphorylated B-2-AR after RE, and elucidate relationships between EPI, B-2-AR, and ERK signaling. METHODS: In a randomized, counter-balanced, double-blind, within-subject crossover study, ten resistance-trained males (X ± SD, n=10, age=22±2.4 yrs, hgt=175±7 cm, body mass=84.1±11.8kg) performed four sets of 8 repetitions of barbell back squats at 75% of their 1-repetition maximum (1-RM) with two minutes of rest between sets and a fifth set of barbell back squats at 60% of 1-RM until concentric failure. A SUPP or flavor and color matched placebo (PL) was consumed 60-minutes prior to RE. Blood samples were obtained pre- and immediately post-exercise. Muscle biopsies were taken from the vastus lateralis prior to supplementation at rest (BL), and ten minutes post-exercise (POST). Biopsy samples were analyzed for total and phosphorylated (ser346 & ser355) B-2-AR, and ERK via western blotting. Wilcoxon sign-rank tests determined pairwise differences from BL to POST and between conditions. Significance was set at $p < 0.05$. RESULTS: p-B-2-AR at ser346 increased at POST after SUPP and PL ($p<0.05$). p-B-2-AR at ser355 increased at POST in PL and SUPP ($p<0.05$). Total B-2-AR expression decreased at POST after both conditions ($p<0.05$). The percent change from BL in the PL condition indicated relationships between EPI and p-B-2-AR ser346 ($n=9$; $R2=0.656$; $r=-0.810$; $p=0.008$). In SUPP there was a correlation between the change in pERK and the change in p-B-2-AR ser346 ($n=9$; $R2=0.886$; $r=0.941$; $p<0.001$). CONCLUSION: B-2-AR are phosphorylated and downregulated early after RE. The correlations between pERK, B-2-AR ser346, and EPI depended on whether SUPP or PL was consumed. The relationships between pERK, B-2-AR ser346, and EPI suggest potential cross-talk between these pathways following RE. Funding provided by the International Society of Sports Nutrition and MusclePharm.

73. RUNNING SPEED, POWER, AND AEROBIC FITNESS RELATE TO WORK SAMPLE TEST BATTERY PERFORMANCE IN DEPUTY SHERIFF RECRUITS

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Many law enforcement recruits complete a state-specific physical test before graduating from their respective academies. In California, this is known as the Work Sample Test Battery (WSTB). The WSTB is comprised of tests related to job-related tasks. Certain agencies also conduct assessments to measure physical fitness; one example is the Validated Physical Abilities Test+ (VPAT+). The VPAT+ was developed to measure a recruit's power as well as general fitness. This study aimed to identify relationships between VPAT+ and WSTB performance. Retrospective analysis on data from four academy classes (203 males, 35 females) from one law enforcement agency was conducted. The VPAT+ and WSTB were completed in the last weeks of a 22-week academy training program. The VPAT+ is comprised of: a vertical jump (VJ) and seated 2 kg medicine ball throw (MBT) to indirectly measure lower- and upper-body power, respectively; a 75-yard pursuit run (75PR), which was a simulated foot pursuit involving sprinting and direction changes; and the multi-stage fitness test (MSFT), where the number of shuttles indicated aerobic fitness. The WSTB comprised five tests completed for time: agility run around a 99-yard obstacle course (99OC); 32-foot body drag (BD) with a 165-lb dummy; climb over a six-foot chain link fence (CL) and six-foot solid wall (SW); and 500-yard run (500R). Partial correlations controlling for sex calculated relationships between the tests from the VPAT+ and WSTB. A greater VJ related to faster 99OC, CL, SW, and 500R scores (r = -0.23 to -0.38). Greater MBT distance correlated to quicker 99OC and CL performance (r = -0.21 to -0.27). Faster 75PR performance was associated with a faster 99OC, CL, SW, and 500R (r = -.025 to -0.50). A higher number of MSFT shuttles correlated to faster 99OC and 500R (r = -0.27 to -0.410). No VPAT+ tests related to the BD. The VJ and 75PR related to the running and barrier-clearing WSTB tests, which may display the need for lower-body power and high-intensity anaerobic performance in these tasks. Superior MSFT performance related to the OC99 and 500R times, which highlights high-intensity running capacity needs for law enforcement. Better MBT scores correlated with the 99OC and CL, which provide some indication of the value of upper-body power in occupational tasks. However, no VPAT+ tests related to the BD. The BD is strength-intensive, which is an attribute not usually tested in recruits. The use of strength testing in recruits should be explored, as this quality could relate to job-specific tasks.

75. THE ACUTE EFFECTS OF STATIC AND DYNAMIC STRETCHING ON SHORT AND MEDIUM PASSING SKILLS IN INTERCOLLEGIATE SOCCER PLAYERS

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Across sporting events and athletic levels, a warm-up routine including stretching is often considered an important component that complements both training and competitive athletic efforts. Soccer in particular requires athletes to regularly perform static stretching (SS) and/or dynamic stretching (DS) as part of their warm-up. Previous research examining SS has suggested SS results in deficits in speed and power. The same mechanisms that lead to these deficits could also impair movement, but precision of movement has not been considered. The purpose of this investigation was to examine the effect of both SS and DS on passing accuracy in soccer players. Utilizing a within subjects' experimental design,15 male DI collegiate soccer players volunteered to participate. The volunteers were divided into three groups and systematically assigned to a group and performed each intervention in a counter-balanced order. Each visit volunteers performed a five-minute jog followed by one of three stretching protocols: SS, DS, or no stretching (NS). Immediately following the intervention the Loughborough Soccer Passing Test (LSPT) was administered, which translates performance to total elapsed time to assess the accuracy of their short and medium passes. Each trial was separated by a week. The data were analyzed with a one-way repeated measures ANOVA. All data are presented as means ±SD. Among the three stretching protocols, no statistically significant differences were found (SS: 52.10 ± 9.06 s, DS: 54.34 ± 9.72, NS: 57.91 ± 6.34) (P = 0.13); although there was a small trend toward SS improving passing accuracy, it is not large enough to expand on. The data from this study does not support the use of DS or SS as a means of improving soccer passing accuracy. In addition the use of either of these modes of stretching also does not impair passing performance.

74. MUSCLE DISUSE-INDUCED ALTERATIONS IN VASCULAR ENDOTHELIAL FUNCTION: THE POTENTIAL THERAPEUTIC ROLE FOR HEAT THERAPY

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Purpose: The purpose of this experiment was to determine if heat, a major product of exercise, could be used to lessen the negative cardiovascular effects of muscle disuse or inactivity. Methods: 16 subjects underwent 10 days of quadriceps disuse with right leg immobilization and crutches. 8 of the subjects were then treated daily with 2 hours of shortwave diathermy to raise the muscle temperature to temperatures similar to that achieved during intense exercise (39°C). The remaining 8 subjects received 2-hour daily control treatments with the shortwave diathermy machine placed over their legs, however, the machine was not turned on. Vascular endothelial function was assessed with the Doppler ultrasound of the femoral artery and the passive leg movement (PLM) technique before beginning their assigned treatment and after the treatment was completed. Results: Analysis of these measurements showed 10 days of muscle disuse with leg immobilization resulted in a 7.3 ± 1% ($P<0.05$) reduction femoral artery diameter and 29± 10% ($P<0.05$) reduction in vascular endothelial function. Importantly, daily heat therapy significantly attenuated the impact of immobilization on the femoral artery diameter to a 4.5 ± 1% ($P<0.05$), which was significantly less than that observed in the control group ($P<0.05$). Additionally, daily heat therapy completely prevented the vascular endothelial dysfunction associated with immobilization, with the heated group exhibited a 8 ± 1% increase in endothelial function. Conclusion: Muscle inactivity induced by leg immobilization is associated with altered vascular function in the leg. Daily heat therapy with shortwave diathermy, which raises the muscle to temperatures similar to those achieved during exercise, blunts the vascular alterations associated with muscle inactivity. This information suggests that populations that undergo prolonged limb inactivity, such as those restricted to prolonged periods of bed rest and inactivity may benefit from the use of heating techniques to prevent the decline of their cardiovascular function.

76. CORRECTION FACTOR TO IMPROVE THE ACCURACY OF ISO-EFFICIENT TREADMILL VELOCITY DURING INCLINED TREADMILL RUNNING

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As inclined treadmill running becomes more popular among trained runners, the ability to maintain a metabolic iso-efficient velocity has gained importance. Treadmill velocity (TMV) for a specific incline and intensity can be determined by solving the ACSM running equation for speed as opposed to relative VO_2, but this may underestimate iso-efficient TMV in trained runners as they may respond to speed and grade differently from the general population. Purpose: The purpose of this study was to identify an appropriate correction factor to improve iso-efficient TMV identification during inclined running in trained runners. Methods: 11 collegiate distance runners (7 male, 4 female; 63.2±9.5 kg; 174.8±7.5 cm; 64.6±6.5 $mlO_2/kg/min$) completed 3 x 4 min treadmill runs at 0%, 4%, and 8% incline, with a 4 min recovery period between runs. Expired gases were collected during the final minute of each run to determine relative VO_2. Actual TMV at 0% was inserted into the ACSM running equation to determine predicted VO_2 for the 0% run (VO_2=(Sx0.2)+(SxGx0.9)+3.5). That value was then divided by the actual VO_2 measured at 0% to develop a correction factor. TMV for the 4% and 8% trials was determined by inserting the measured 0% VO_2 value into the ACSM equation ($S=(VO_2-3.5)/(0.2+0.9G)$) and multiplying the resultant velocity by the correction factor to maintain iso-efficiency. Differences within 0%, 4%, and 8% values were assessed using a paired sample t-test, while a one-way ANOVA compared VO_2 values between grades ($p<0.05$). Results: Actual VO_2 at 0% grade was 15% lower than predicted by the ACSM equation (55.2±2.7 vs. 46.8±5.0 $mlO_2/kg/min$; $p<0.05$), resulting in a correction factor of 1.2±0.1. Predicted TMV at 4% (183.6±21 m/min) and 8% (159.3±18.3 m/min) was 18% lower ($p<0.05$) than the corrected velocities for each grade (216.9±2 and 188.2±10.4 m/min). VO_2 values for each grade were 46.8±5, 46.6±4.8, and 48.0±4.9 $mlO_2/kg/min$, respectively, with the 8% VO_2 being greater than 4% ($p<0.05$). Conclusion: The ACSM running equation may underestimate TMV when attempting to maintain metabolic iso-efficiency during incline running. These data suggest that application of a correction factor to the TMV derived from the ACSM equation may provide a closer approximation of TMV to maintain iso-efficiency during incline running.

77. COACHES USE OF OBSERVATION IN ADAPTIVE SPORTS: A PRELIMINARY ANALYSIS

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The use of visual cues as a means to convey information is evident throughout the area of sport. It is common for a coach to ask their athlete to observe either them self or a model in an effort to provide the necessary knowledge to reproduce the observed action: This is known as observational learning. The Functions of Observational Learning Questionnaire (FOLQ) was developed by Cumming and colleagues (2005) which determines three reasons why people use observation: (a) skill, (b) strategy, and (c) performance. Hancock and colleagues (2008) investigated coaches uses of observational leaning in able-bodied sport however, to our knowledge, the use of observation by coaches in adaptive sports has yet to be investigated. Thus, a goal of the proposed research is to examine and quantify the functions of observational learning in adapted sport coaches. This will be determined through the use of the FOLQ (Cumming et al., 2005). Descriptive analysis of 10 participants (Mage = 43.6; SD = 19.36), indicated similar results from previous research in that coaches use observation for the purpose of skill most often, followed by strategy, and lastly performance. These preliminary results will be presented and a discussion on limitations, practical applications, and future directions will be included.

78. THE RELATIONSHIP BETWEEN FITNESS AND ACADEMIC PERFORMANCE IN COLLEGE STUDENTS

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Preadolescent aerobic fitness has been found to be positively related to academic achievement. Specifically, evidence has shown that children with higher aerobic fitness may exhibit better cognitive function and academic performance. However, research on its relationship with college students has been limited. To date, only few studies have been conducted using indirect physical activity measurement (i.e., online survey or questionnaire). The purpose of this study was to examine the relationship between fitness measures (i.e., cardiovascular endurance, muscular strength/endurance, and flexibility) and academic performance in college students. Cardiovascular endurance was positively associated with academic performance, while no such correlation was found for other fitness components. Therefore, these findings indicated there may be a selective relationship between fitness components and GPA in college students. Future randomized control trials are needed to investigate the effects of different type of physical activity or exercise training on academic performance in college students.

79. THE SEARCH FOR A MEASURE OF AUTOMATIC ASSOCIATIONS WITH EXERCISE: THE CRITERION VALIDITY, INTERNAL CONSISTENCY, AND TEST-RETEST RELIABILITY OF THE SINGLE-CATEGORY IMPLICIT ASSOCIATION TEST

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Theories traditionally used to promote physical activity and exercise behavior have largely ignored constructs such as automatic associations with exercise. Automatic associations with exercise are the immediate, appraisal-independent reaction to approach or avoid exercise. Recently proposed theories, however, have included these automatic associations as a central construct and predictor of exercise behavior. To further advance this theoretical development, researchers must have measurement techniques with strong psychometric properties, including criterion validity, internal consistency, and test-retest reliability. Purpose: To test the criterion validity, internal consistency, and test-retest reliability of the Single-Category Implicit Association Test in the exercise context using online data collection. Methods: A nationally representative sample of 198 adults from 40 states (mean age: 36 SD: 10 years; 39% women) completed the Single-Category Implicit Association Test (SCIAT; Karpinski & Steinman, 2006) that was administered using the internet. Upon completion, participants were invited to complete a second measurement (N = 113) and third measurement (N = 91), with each measurement separated by one week. In addition, measures of self-reported moderate-to-vigorous exercise behavior (MVPA), exercise intentions, and exercise frequency were administered during the first measurement to estimate criterion validity. Internal consistency was calculated using equivalent halves and the Spearman-Brown prophecy formula; criterion validity and test-retest reliability were assessed using bivariate correlations. Results: The internal consistency of the SCIAT was acceptable for all measurements (inter-half correlation = .72 - .77). Test-retest reliability was low (rs < .110). The SCIAT was weakly correlated with exercise intentions (r = .07), exercise frequency (r = -.06), and MVPA (r = -.03). Conclusions: Internal consistency of the SCIAT was acceptable in this sample. However, estimates of test-retest reliability and criterion validity were low. This raises questions about using the SCIAT in the exercise domain, especially using online administration. Measure refinement and testing of psychometric properties is needed before researchers choose to adopt this measure.

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