SOUTHWEST CHAPTER

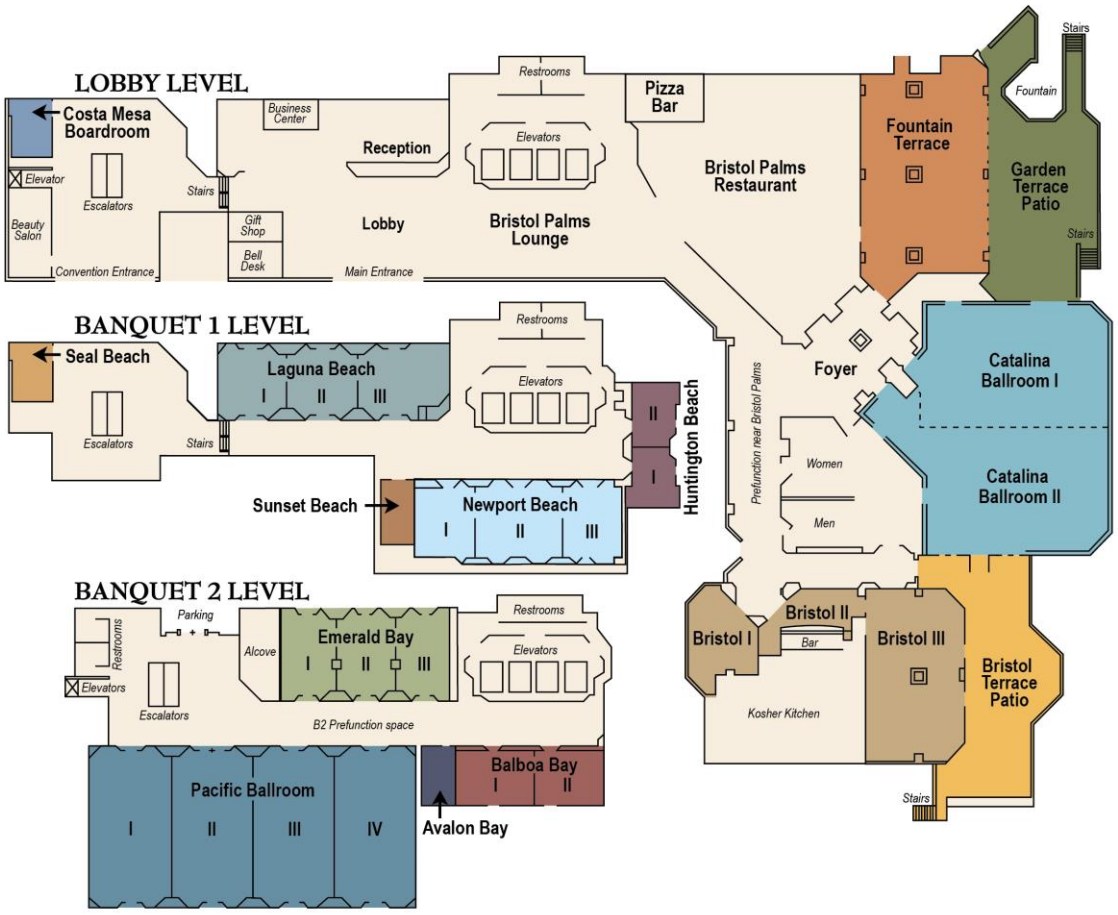
AMERICAN COLLEGE OF SPORTS MEDICINE

2015 ANNUAL MEETING

October 16-17, 2015

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
Lobby
Bristol Palms Lounge
Bell Desk
Convention Entrance
Main Entrance
Stairs
BANQUET 1 LEVEL
Seal Beach
Restrooms
Laguna Beach
I II III
Elevators
Foyer
Catalina Ballroom I
Escalators
Stairs
II
I
Huntington Beach
Prefunction near Bristol Palms
Women
Catalina Ballroom II
Sunset Beach
Newport Beach
I II III
Men
BANQUET 2 LEVEL
Parking
Restrooms
Emerald Bay
Restrooms
Bristol II
Bristol I
Bristol III
Alcove
I II III
Elevators
Bar
Elevators
Escalators
B2 Prefunction space
Kosher Kitchen
Bristol Terrace Patio
Balboa Bay
I II
Pacific Ballroom
I II III IV
Avalon Bay
Stairs

Welcome to the

35th Annual Meeting

of the

Southwest Regional Chapter

of the

AMERICAN COLLEGE of SPORTS MEDICINE SM

October 16-17, 2015

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

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The Southwest ACSM annual meeting has been approved for 14 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, 16 OCTOBER 2015

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

General Session **9:00 am – 10:30 am** **Pacific 1 & 2**

Moderator: Matt Lee, Ph.D., President, SWACSM
San Francisco State University

SWACSM Recognition Award
Dr. Marialice Kern, San Francisco State University

Preview of Meeting: Glenn Gaesser, Ph.D., FACSM
Arizona State University

D.B. Dill Lecture
Critical Power: Defining Human Physiology and Evolution
David Poole, Ph.D., D.Sc.
Kansas State University

Concurrent Colloquia **10:30 am – Noon**

Dieting, Weight Obsession, Stigma, and Health **Pacific 1**
A. Janet Tomiyama, Ph.D., University of California, Los Angeles
Jeff Hunger, C. Phil., University of California, Santa Barbara
David Frederick, Ph.D., Chapman University

Ultra Sound Imaging in Exercise Science Research **Pacific 2**
Wayne Johnson, Ph.D., Brigham Young University
Bill Myrer, Ph.D., Brigham Young University
Kathryn Brewerton, Brigham Young University
Ronald Hager, Ph.D., Brigham Young University
Tiffany deVries, B.S., Brigham Young University

100 Citizens: A Student Driven Program with Kinesiology, Public Health and Parks Partnering for a Healthier America **Emerald Bay**
Steven Loy, Ph.D., California State University, Northridge
Deborah Cohen, M.D., MPH, Rand Corporation
Sloane Burke, Ph.D., California State University, Northridge

LUNCH **Noon - 1:00 PM**

Student Research Award 1:15 pm – 2:30 pm Emerald Bay

Moderator: Trevor Gillum, Ph.D., California Baptist University

1:15 **Muscle Microvascular Blood Flow, Oxygenation, and pH as Potential Diagnostic Parameters in Athletes with Chronic Exertional Compartment Syndrome**
Sravya T. Challa, Amarachi Usozike, Tetsuyuki Kawai, Alan R. Hargens, Brandon R. Macias
Department of Orthopaedic Surgery, University of California San Diego, San Diego, California

1:30 **Skeletal Muscle Inflammation Following Repeated Bouts of Lengthening Contractions in Humans**
Michael R. Deyhle, Amanda M. Gier, Kaitlyn C. Evans, Dennis L. Eggett, W. Bradley Nelson Allen C. Parcell, Robert D. Hyldahl.
Brigham Young University Exercise Science

1:45 **Lower Body Negative Pressure Treadmill Exercise Attenuates Simulated Space Flight Induced Reductions of Balance Abilities in Males but Not Females**
Timothy R. Macaulay[1], Brandon R. Macias[1], Stuart M.C. Lee[2], Wanda L. Boda[3], Donald Watenpaugh[4], Alan R. Hargens[1]
[1]Department of Orthopaedic Surgery, University of California San Diego, San Diego, California
[2]Cardiovascular Laboratory, Wyle Integrated Science and Engineering Group, Houston, Texas
[3]Department of Kinesiology, Sonoma State University, Rohnert Park, California
[4]Department of Integrated Physiology, University of North Texas, Fort Worth, Texas

2:00 **Validity and Reliability of the Hexoskin Bio-Technology Shirt**
Jeffrey Montes, Dr. Jack Young FACSM, Dr. Richard Tandy, Dr Szu-Ping Lee. Jeffrey Montes, Paige Montes, Dr. James Navalta
Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas

2:15 **Exercise Induced Alterations in Regulators of the Mitochondrial Network and Genome**
Timothy M. Moore[1], Nareg Kalajian[2], Dr. Zhenqi Zhou[2], Dr. Lorraine Turcotte (FACSM)[1], Dr. Andrea Hevener[2,3]
[1]Department of Biological Sciences, Dana & David Dornsife College of Letters, Arts, and Sciences, University of Southern California. [2] Department of Medicine, Endocrinology, Diabetes, and Hypertension, David Geffen School of Medicine University of California, Los Angeles [3] Davis School of Gerontology, University of Southern California

FRIDAY, 16 OCTOBER 2015, continued

Symposium — **1:15 pm – 2:45 pm**

Efficiency of Muscular Work Across the Lifespan — **Pacific 1**
George Brooks, Ph.D. University of California, Berkeley
Gwenael Layec, Ph.D., University of Utah
Wesley Tucker, M.S., RD, Arizona State University

Concurrent Colloquia — **1:15 pm – 2:15 pm**

Protein Blends Following Resistance Training Promote Muscle Growth — **Pacific 2**
Mark Cope, Ph.D.
DuPont Nutrition and Health, St. Louis, Missouri

The Vegas Experience: What Sin City Can Teach Us About Behavior Change — **Huntington Beach**
Marc Adams, Ph.D., Arizona State University

Concurrent Colloquia — **3:00 pm – 4:00 pm**

The High Impact of Exercise Physiology on the Recovery of Spinal Cord Injury — **Pacific 1**
Paraq Gad, Ph.D., University of California, Los Angeles

Examining Muscle Physiology Using the Experimental Continuum: From Hypertrophy to Atrophy — **Pacific 2**
Kurt Sollanek, Ph.D., Sonoma State University
Robert Hyldahl, Ph.D., Brigham Young University
Bradley Nelson, Ph.D., Ohio Dominican University

ACSM Opportunity Grants Awarded to SWACSM — **Emerald Bay**
Mini Conference on Certification
Lee Brown, Ed.D, California State University, Fullerton
Fitness-4-Finals
Sharon Jalene, M.S., University of Nevada, Las Vegas

FRIDAY, 16 OCTOBER 2015, continued

Gatorade Sports Science Lecture **4:00 PM – 5:00 PM** **Emerald Bay**

Fueling Endurance Athletes
Ellen Coleman, M.A., MPH, RD

Concurrent Colloquia **4:15 pm – 5:15 pm**

Exercise and Sleep: Biobehavioral Synergies, Wearable Technologies, and Behavior Change **Pacific 1**
Jonathan Kurka, M.S., Arizona State University
Shawn Youngstedt, Ph.D., Arizona State University

Using Exercise to Assess Central and Peripheral Cardiovascular Function **Pacific 2**
Joel Trinity, Ph.D., University of Utah
Siddhartha Angadi, Ph.D., Arizona State University

SOCIAL EVENT

Fountain Terrace Patio **4:30 -7:00 PM**

Poster Presentations

No Host Wine/Cheese Reception

SPECIAL EVENT

Pacific 1 **7:00 -8:00 PM**

Student Jeopardy Bowl

SATURDAY, 18 OCTOBER 2014

Registration **Pacific Ballroom Foyer** **7:30 am - 10:00 am**

Student Colloquium
8:00 AM – 9:00 AM **Pacific 3**

Meet the Experts
Career Options in the Field of Exercise Science

Continental Breakfast; Give-a-Ways

Concurrent Symposia **9:00 AM – 10:00 AM**

Biological Variability in Fat Loss in Response to Exercise Training **Pacific 1**
Brandon Sawyer, Ph.D., Point Loma Nazarene University
Catherine Jarrettt, M.S., RD, Arizona State University
Sarah Dunn, University of LaVerne

Lactate and Performance 101: LT, MLSS, Training and Performance **Emerald Bay**
Pat Vehrs, Ph.D., Brigham Young University
Paul Hafen, M.S., Brigham Young University

Colloquium

Effects of Intensive Lifestyle Modification for the Treatment of Chronic Diseases **Pacific 2**
Christian Roberts, Ph.D., Occidental College

Concurrent Colloquia **10:15 AM – 11:15 AM**

Central and Peripheral Mechanisms of Exercise Intolerance **Pacific 1**
Harry Rossiter, Ph.D., Harbor-UCLA Medical Center

SATURDAY, 18 OCTOBER 2014, continued

Concurrent Colloquia **10:15 AM – 11:15 AM**

Exercise for the Prevention of Cardiometabolic Complications of Breast Cancer Chemotherapy **Pacific 2**

Jared Dickinson, Ph.D., Arizona State University
Siddhartha Angadi, Ph.D., Arizona State University

Gait Analysis Workshop **Emerald Bay**

William Burns, Tekscan, Inc.

General Session **11:30 am – 1:30 pm** **Pacific 1 & 2**

Moderator: Matt Lee, Ph.D., President, SWACSM
San Francisco State University

Student Awards – Trevor Gillum, Ph.D., California Baptist University

Recognition of Host School:
Loyola Marymount University

Business Meeting

Founders Lecture

The Real Reason People are Obese
Edward Archer, Ph.D.
University of Alabama at Birmingham

SOUTHWEST ACSM RECOGNITION AWARD

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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

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2015 SWACSM

Annual Meeting

ABSTRACTS

Student Research Award
Poster Presentations

STUDENT RESEARCH AWARD

1. MUSCLE MICROVASCULAR BLOOD FLOW, OXYGENATION, AND PH AS POTENTIAL DIAGNOSTIC PARAMETERS IN ATHLETES WITH CHRONIC EXERTIONAL COMPARTMENT SYNDROME

Sravya T. Challa, Amarachi Usozike, Tetsuyuki Kawai, Alan R. Hargens, Brandon R. Macias
Department of Orthopaedic Surgery, University of California San Diego, San Diego, California

Chronic exertional compartment syndrome (CECS) is a muscle overuse condition defined as elevated intramuscular pressure (IMP) sufficiently high to cause muscle ischemia and pain that occurs in endurance athletes. While the pain typically subsides with rest, patients usually need a fasciotomy performed to continue exercising. Sometimes, acute compartment syndrome (ACS) can result from recurring CECS episodes and needs immediate attention. Current diagnosis for CECS includes clinical signs and invasive IMP monitoring. Risk of infection, pain and lack of agreement about the diagnostic IMP threshold are shortcomings or the current methods. Thus, it is important to explore noninvasive diagnostic parameters. The objective of our study was to evaluate muscle hemodynamics, tissue oxygenation and pH as diagnostic parameters using noninvasive photoplethysmography (PPG) and near infrared spectroscopy (NIRS) devices. We hypothesized that as IMP increases, muscle microvascular blood flow, oxygenation and pH will decrease in a leg at heart-level and significantly more when elevated. Eight healthy subjects were exposed to 40, 50 and 60mmHg of external compression of the experimental leg in a randomized order and 65mmHg venous stasis via a thigh tourniquet for 11 minutes with 11-minute recovery periods in between. Data were collected over the last 6 minutes and analyzed using repeated measures ANOVA with a $p<0.05$. Muscle microvascular blood flow, tissue oxygenation and pH decreased significantly as IMP increased in the leg at heart-level. Tissue oxygenation decreased significantly more in an elevated leg than a leg at heart-level while blood flow and pH did not. Our results, combined with previous findings in our lab that IMP correlates linearly to increasing chamber pressure, show that muscle blood flow, oxygenation and pH are potential noninvasive diagnostic parameters for compartment syndrome that would make the diagnosis of CECS safer, more reliable and would eliminate the risks associated with current invasive methods.

2. SKELETAL MUSCLE INFLAMMATION FOLLOWING REPEATED BOUTS OF LENGTHENING CONTRACTIONS IN HUMANS

Michael R. Deyhle, Amanda M. Gier, Kaitlyn C. Evans, Dennis L. Eggett, W. Bradley Nelson Allen C. Parcell, Robert D. Hyldahl.
Brigham Young University Exercise Science

Skeletal muscle responds to exercise-induced damage by orchestrating an adaptive process that protects the muscle from damage by subsequent bouts of exercise, a phenomenon called the repeated bout effect (RBE). The mechanisms underlying the RBE are not understood. We hypothesized that an attenuated inflammation response following a repeated bout of lengthening contractions (LC) would be coincidental with a RBE, suggesting a potential relationship. Fourteen men (n=7) and women (n=7) completed 2 bouts of lengthening contractions (LC) separated by 28 days. Muscle biopsies were taken before the first bout (B1) from the non-exercised leg, and from the exercised leg 2- and 27-d post-B1 and 2-d following the second bout (B2). A 29-plex cytokine array identified alterations in inflammatory cytokines. Immunohistochemistry quantified inflammatory cell infiltration and major histocompatibility complex class I (MHC-I). Muscle soreness was attenuated in the days following B2 relative to B1, indicating a RBE. Intramuscular monocyte chemoattractant protein (MCP1) and interferon gamma-induced protein 10 (IP10) increased following B2 relative to the pre-exercise sample (7 pg/ml to 52 pg/ml, and 11 pg/ml to 36 pg/ml, respectively $p<0.05$). Interleukin 4 (IL4) decreased (26 pg/ml to 13 pg/ml, $p<0.05$) following B2 relative to the pre-exercise sample. Infiltration of $CD68^+$ macrophages and $CD8^+$ T-cells were evident following B2, but not B1. Moreover, $CD8^+$ T-cells were observed infiltrating necrotic muscle fibers. No changes in MHC-I were found. We conclude that inflammation is not attenuated following a repeated bout of LC and that $CD8^+$ T-cells may play a role in muscle adaptation following LC.

3. LOWER BODY NEGATIVE PRESSURE TREADMILL EXERCISE ATTENUATES SIMULATED SPACE FLIGHT INDUCED REDUCTIONS OF BALANCE ABILITIES IN MALES BUT NOT FEMALES

Timothy R. Macaulay[1], Brandon R. Macias[1], Stuart M.C. Lee[2], Wanda L. Boda[3], Donald Watenpaugh[4], Alan R. Hargens[1]
[1]Department of Orthopaedic Surgery, University of California San Diego, San Diego, California
[2]Cardiovascular Laboratory, Wyle Integrated Science and Engineering Group, Houston, Texas
[3]Department of Kinesiology, Sonoma State University, Rohnert Park, California
[4]Department of Integrated Physiology, University of North Texas, Fort Worth, Texas

BACKGROUND: Spaceflight causes sensorimotor adaptations that significantly impair standing and walking balance abilities upon return to Earth's gravity. PURPOSE: The purpose of this study is to determine the efficacy of lower body negative pressure (LBNP) treadmill exercise as a balance countermeasure during simulated spaceflight. We hypothesize that LBNP treadmill exercise prevents losses in balance abilities in both males and females during 30 days head down tilt (HDT) bed rest. METHODS: Fifteen (8M and 7F) identical twin sets participated in 30 days of HDT bed rest. Within each twin pair, one was randomly assigned to an exercise group that performed 40mins of LBNP exercise, followed by 5mins static LBNP, 6 days per week, while their sibling was assigned to a non-exercising control group. Before and immediately after bed rest, subjects completed standing and walking rail balance tests for time (plus distance and velocity for the walking condition), with eyes open and eyes closed. RESULTS: In both male and female controls, HDT bed rest significantly decreased standing rail balance times (Males: 42%, Females: 40%), rail walk distances (Males: 36%, Females: 31%), and rail walk times (Males: 30%, Females: 28%). As compared to controls, LBNP exercise significantly attenuated losses of standing rail balance abilities by 60% in males, but not significantly in females (40%). CONCLUSION: LBNP treadmill exercise significantly attenuates losses in standing balance abilities in males during 30 days of simulated spaceflight. Therefore, this countermeasure that provides 100% body weight loading and simulates an Earth-like hydrostatic pressure gradient during simulated spaceflight may protect and facilitate balance control when entering a gravitational environment.

4. VALIDITY AND RELIABILITY OF THE HEXOSKIN BIO-TECHNOLOGY SHIRT

Jeffrey Montes, Dr. Jack Young FACSM, Dr. Richard Tandy, Dr Szu-Ping Lee. Jeffrey Montes, Paige Montes, Dr. James Navalta
Department of Kinesiology and Nutrition Sciences, University of Nevada, Las Vegas

Wearable and wireless technology can open up new realms of medical evaluations and athletic training. Hospital stays can be minimized and athletes can monitor training intensities in real time. PURPOSE: To investigate heart rate (HR), respiratory rate (RR), energy expenditure (EE), and step count (SC) measurements of the Hexoskin shirt during two walking protocols. METHODS: 49 volunteers (male, N=26, female N=23; mean age 23.43 years, SD=6.57; mean height (m) 1.72, SD = 0.11; mean mass (kg) 76.15, SD = 18.46) walked protocol one and 46 (male, N = 24, female N = 22 mean age 23.39 years, SD=6.69; mean height (m) 1.73, SD = 0.10; mean mass (kg) 77.95, SD = 21.52) walked protocol two. 31 (male, N=18, female N=13; mean age 24.39 years, SD=6.57; mean height (m) 1.72, SD = 0.11; mean mass (kg) 76.15, SD = 18.46) paired walking protocols were used for reliability. Subjects walked for 3 minutes at 1.5, 2.5, and 3.5 mph at 0% grade for each protocol. Measurements were taken at 1, 2, and 3 minute mark for each speed and compared to a Polar T-31 monitor, a MOXUS respiratory cart, and a manual count of steps. RESULTS: HR measurements fluctuated or were not seen at times both between and within stages and subjects. All Hexoskin RR means with one exception were significantly lower. Because HR is used to estimate RR, false EE values were obtained. SC was highly correlated only at the 3.5 mph stage for both protocols. DISCUSSION: There were issues with the Hexoskin and its ability to collect accurate data. This affects any training or medical applications that rely on consistent and up-to-date measurements. Future research should concentrate on measurements under high intensity circumstances and under real life conditions.

5. EXERCISE INDUCED ALTERATIONS IN REGULATORS OF THE MITOCHONDRIAL NETWORK AND GENOME

Timothy M. Moore[1], Nareg Kalajian[2], Dr. Zhenqi Zhou[2], Dr. Lorraine Turcotte (FACSM)[1], Dr. Andrea Hevener[2,3]
[1]Department of Biological Sciences, Dana & David Dornsife College of Letters, Arts, and Sciences, University of Southern California. [2] Department of Medicine, Endocrinology, Diabetes, and Hypertension, David Geffen School of Medicine University of California, Los Angeles [3] Davis School of Gerontology, University of Southern California

Mitochondria are intracellular organelles responsible for the production of the overwhelming majority of ATP. It is beginning to be understood that these organelles are part of a larger highly dynamic network that is able to adapt to the ever changing needs of its cellular host. A mitochondrial life cycle theory has been proposed that describes new mitochondria being formed through biogenesis, moved around as the energetic status of the cell changes through fission and fusion dynamics, and degraded after they become dysfunctional through autophagy. Exercise is known to significantly alter the intracellular energetic status and also the formation of new mitochondria through biogenesis. However, it is not known if exercise alters the other aspects of the mitochondrial life cycle. We sought to determine if a single bout of endurance exercise alters all four aspects of the mitochondrial life cycle. We randomly divided female mice into four groups and subjected them to a single bout of endurance exercise (5º Incline, 18-20 m/min): no running (SED), 45 minutes of endurance exercise (EX45), 90 minutes of endurance exercise (EX90), and 90 minutes of endurance exercise with 3 hours of rest (POST90). Our results indicate that regulators of mitochondrial fission and fusion are altered during exercise but return to baseline in the post exercise phase. Furthermore, mitochondrial biogenesis and regulators of mitochondrial DNA are slightly elevated during exercise and significantly elevated in the post exercise phase. Lastly, our data shows that mitochondrial degradation through autophagy is down regulated during exercise but upregulated in the post exercise phase. In conclusion, these results indicate that a single bout of moderate intensity endurance exercise is sufficient to induce changes in the mitochondrial life cycle as the cell attempts to adapt to meet its energetic demands.

6.

POSTER PRESENTATIONS

1. ELECTROMYOGRAPHIC ANALYSIS OF ABDOMINAL MUSCLE EXERCISES

Abbott Pat, Aliza Sirkin, Ruben Solis, Derek Nishikawa, Miguel Favaro, Christopher George Berger
College of Health Solutions, School of Nutrition and Health Promotion, Exercise Science and Health Promotion, Arizona State University, Phoenix AZ

This study examined the effectiveness of three abdominal exercises in muscle activation of the upper rectus abdominis (URA), lower rectus abdominis (LUA), internal obliques (IO), and external obliques (EO) as measured by surface electromyography (EMG). Exercises included the prone plank, an ab roller performed to full extension, and a low-cost alternative using paper plates. Subjects were 18 healthy men (n=10) and women (n=8) whose mean ($\pm$ SD) percent body fat was 12.56 $\pm$ 6.93 and 29.49 $\pm$ 4.73 respectively. Peak EMG activity was recorded for each muscle and normalized as a percent of maximum voluntary contraction (MVC) for analysis. Data were analyzed using two-factor repeated measures analysis of variance (ANOVA) with post-hoc paired comparisons. ANOVA within-subjects demonstrated a main effect for exercise type ($F_{2, 34}$ = 39.99, p<.001), a main effect for muscle group ($F_{3, 51}$ = 4.59, p=.006), and interaction effect for muscle group x exercise ($F_{6, 102}$ = 3.64, p=.003). In post-hoc pairwise comparisons of exercise, there was no significant difference between roller and paper plate exercise (p=.412), but there were significant differences between roller or paper plate and plank (p<.001) with significantly lower EMG activation for the plank exercise. For the muscle group main effect, the activation of the IO was significantly higher than the lower RA (p=.005) and the EO (p=.035); upper RA had greater activation than lower RA (p=0.29).Findings of this study suggest that dynamic exercise for abdominal/core muscle activation can be performed effectively without the use of costly equipment. In addition, this research suggests that dynamic muscle actions may be superior for the recruitment of abdominal skeletal muscles when compared to static exercise such as the plank.

2. NEUROVASCULAR COUPLING CONTRIBUTION TO THE EFFECT OF EXERCISE ON COGNITION

Acosta G., Dy C., Ramirez J., Benavidez J., & Keslacy, S.
School of Kinesiology and Nutritional Sciences, California State University Los Angeles

Acute exercise has been recognized to have beneficial effect on cognition, but to what extend exercise intensity contribute to cognitive improvement is unclear. **Purpose:** (i) To assess the effects of exercise intensity on a range of cognitive tasks and (ii) to determine the relationship between exercise-induced changes in cerebral blood flow and cognition. **Methods:** 8 right handed college-aged adults participated in a crossover pilot study and performed a light (20% of power max) and moderate (65% of power max) constant-load cycling exercise for 10 minutes. Middle cerebral artery (MCA) blood flow velocity (CBFv), peak and pulsatility index (PI) was continuously monitored bilaterally during exercise and cognitive test using transcranial Doppler ultrasonography (TCD). Cognition was assessed using the Cogstate brief battery test: detection task (for psychomotor function / speed of processing), identification task (for visual attention),one card learning (for visual Learning & memory), one back task (for working memory) and Groton maze (for visuospatial memory) before and immediately after exercise. **Results:** Following light exercise, maze completion speed improved (p=0.03) while moderate exercise improved time completion of the one card learning (p=0.01), the one back task (p=0.01) and maze speed (p=0.03). Neurovascular changes were not observed following light exercise, but CBFv decreased (p=0.04) and PI increased (p=0.04) following moderate intensity exercise. The decreased PI correlated with the OCL test (p=0.05). **Conclusion:** An acute exercise bout may improve specific cognitive task in an intensity-dependent manner. It may be linked to CBFv and PI in particular.

3. THE INFLUENCE OF CEREBELLAR TRANSCRANIAL DIRECT CURRENT STIMULATION ON SKILL ACQUISITION IN PARKINSON'S DISEASE

Albuquerque LL, KM Fischer, S Jalene, MR Landers, and B Poston
University of Nevada Las Vegas

Cerebellar transcranial direct current stimulation (c-tDCS) is a non-invasive brain stimulation technique that has been shown to acutely increase motor performance in young and old adults. Since the cerebellum contributes to Parkinson's disease (PD) pathology through increased activation (compensation), excitatory c-tDCS could enhance this process and improve motor function. The purpose was to determine the influence of c-tDCS has on motor skill acquisition in Parkinson's disease. The study was a double-blind, sham-controlled, cross-over experimental design. Twelve individuals with PD participated in two experiments that were separated by a 7 day washout period. Each session involved performance of both a rapid, goal-directed arm movement task (AMT) and a precision grip task (PGT) (practice tasks) performed during either c-tDCS or SHAM stimulation. For the AMT, 4 blocks of 20 trials were performed, whereas the PGT involved matching a target sine wave (target force range: 5-25% of maximum) for 10 trials of 30 seconds each. These two practice tasks were completed over a time course of 25 minutes, which corresponded to the c-tDCS or SHAM stimulation period. c-tDCS was applied over the cerebellum ipsilateral to the primarily affected hand using accepted guidelines (anode 3 cm to the right of the inion, cathode on the ipsilateral buccinator muscle, current strength 2mA). SHAM stimulation was applied in the same fashion using accepted blinding procedures. The dependent variables were endpoint error (AMT) and force error (PGT). Endpoint error was quantified as the final positional error relative to the target, whereas force error was quantified as the average error in force relative to the target force. There were no significant differences between the two stimulation conditions for either the AMT or PGT. These findings indicate that a single session of c-tDCS does not elicit improvements in motor skill acquisition in hand and arm tasks in PD.

4. EFFECT OF STANCE ON BALANCE IN SURFERS

Anthony Chantel C.,[1] Lee E. Brown, FACSM[1], Jared W. Coburn, FACSM[1], Andrew J. Galpin[1], & Tai T. Tran[2]
[1]Human Performance Laboratory, Center for Sport Performance, Department of Kinesiology, California State University, Fullerton, CA. [2]Canadian Sport Institute Pacific, High Performance Center, Whistler, BC, Canada

Surfing is a dynamic sport and is performed in a highly unstable and changing environment, making balance a vital surfer characteristic. It might be expected that repeated practice of particular movements in a specific stance, such as surfing, would lead to specific balance adaptations. **PURPOSE**: To assess dynamic balance within surfers while also evaluating the influence of stance. **METHODS**: Balance was assessed using the Biodex Stability System (BSS) in an upright bipedal stance in twenty adult male surfers (age 24.10±2.40 yrs, mass 74.95±8.26 kg, ht 177.11±6.13 cm). Three 20s balance trials were performed and the degree and direction of tilt from level were recorded. **RESULTS**: Regular stance surfers spent a significantly (p<0.05) greater percentage of time (66.18%±26.28) in horizontal balance compared to goofy stance surfers (44.03%±18.96). Regular stance surfers spent a significantly greater percentage of time (38.81%±14.77) in a posterior direction compared to goofy stance surfers (20.09%±7.25), while goofy stance surfers spent a significantly greater percentage of time in an anterior direction (40.50%±21.61) compared to regular stance surfers (16.04%±8.84). **CONCLUSIONS**: Surf stance appears to play a large role in horizontal and directional balance. These findings suggest the repetition of particular movements relative to stance may induce specific balance adaptations.

5. EFFECTS OF SHORT TERM JUMP SQUAT TRAINING WITH AND WITHOUT CHAINS ON VERTICAL JUMP: A PILOT STUDY

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INTRODUCTION: The use of chains in resistance training is a way to alter the strength curve. The jump squat exercise has been shown to increase vertical jump height and short-term training has been shown to increase performance when a novel exercise is performed. **PURPOSE**: The purpose of this study was to investigate the effects of short-term jump squat training with and without chains on vertical jump performance. **METHODS**: 10 resistance-trained men volunteered (age=24±1.94 years, ht=175.5±7.35cm, mass=93.13±19.94kg) to participate and were randomly assigned to one of three groups (Control(C)=3, No Chain(NC)=4, Chain(CH)=3). Participants were pre-tested for vertical jump height and 1RM back squat. The C group did not perform any training while the NC and CH groups performed 3 training sessions separated by 48hrs. Each training session consisted of 5 sets of 3 reps of jump squats at 30% 1RM with 30s rest between sets. The CH group had 20% of the weight added by chains. They were then post-tested for the same measurements. **RESULTS:** Repeated measures ANOVA revealed that there were no significant interactions or main effects for vertical jump height (C pre=59.9±6.03cm, post=59.06±6.05cm; NC pre=67±10.69cm, post=69.53±10.63cm; CH pre=62.66±7.93cm, post=65.19±9.21cm). **CONCLUSION:** Possible explanations as to why the training did not elicit a response could be a low sample size, the training was not long enough, or training intensity was not sufficient to create the proper stimulus for adaptations to occur.

6. BILATERAL DIFFERENCES IN LEG MUSCLE FIBER TYPE OF RESISTANCE TRAINED MEN

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Structural and functional asymmetries are known to exist between limbs. Previous research on cadavers and sedentary individuals indicates a possible link between performance asymmetry and muscle fiber type composition. However, no study has utilized the highly accurate method of single fiber sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), nor has the question been addressed in exercise-trained humans. **PURPOSE**: Compare the fiber type percentage of the left and right vastus lateralis (VL) of resistance-trained men. **METHODS**: Five resistance-trained men (age=23.5±3.4yrs; height=180.2±8.7cm; mass=82.9±12.2kg) volunteered for a muscle biopsy at the identical location of their left and right VL. Myosin heavy chain (MHC) isoform composition (MHC I, I/IIA, IIA, IIA/IIX, IIX, I/IIA/IIX) of 141.9±36.2 isolated muscle fibers (per leg) was determined via SDS-PAGE. **RESULTS:** Complete MHC profiles are presented in Table 1. Four participants displayed no difference in MHC IIA distribution between the left and right VL. However, two participants showed a ≥13% difference in MHC I distribution, with one of the two also showing a 12% difference in MHC IIA/IIX (hybrids). This individual displayed a greater preponderance for MHC I in the right VL with more hybrids being present in the left VL. **CONCLUSION:** These initial observations indicate some individuals possess substantial differences in muscle fiber type composition between their left and right VL, yet others do not. Unimportant anomalies in data are normally washed out with appropriate sample sizes. However, the demands of human muscle biopsy research typically force scientists to perform their studies with less than ideal participant sample sizes (often n≤8-12). Thus, our findings may have important bearing on studies that use biopsies from the left and right VL interchangeably. Further investigation is needed to accurately estimate the frequency in which

7. PHYSIOLOGICAL CONCENTRATIONS OF CAFFEINE DO NOT AFFECT INSULIN STIMULATED MTOR PATHWAY ACTIVATION

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The mechanistic target of rapamycin (mTOR) is a protein kinase involved in the control of cell growth, protein synthesis and muscle differentiation. Previous research showed that caffeine might stimulate or inhibit the mTOR pathway at higher than physiological concentrations. In this study, we investigated the effects of physiological concentrations of caffeine on C2C12 myoblast cells. Differentiated myotubes were incubated for 30 minutes in serum-free media with 0–5 mM caffeine followed by an additional 30 minutes with or without 100 nM insulin, then harvested. Phosphorylation of Akt (upstream of mTOR), p70S6k, 4E-BP1 and ribosomal protein S6 (downstream of mTOR) was measured by western blotting. Insulin induced phosphorylation of Akt, p70S6k, and 4E-BP1, but not S6. Caffeine treatment at high concentrations (> 0.6 mM), but not physiological concentrations (<0.15 mM) inhibited insulin-stimulated Akt, p70S6k and 4E-BP1 phosphorylation. Our results indicate that caffeine does not affect insulin-stimulated mTOR pathway activity at physiologically relevant concentrations.

8. IDENTIFYING PREDICTORS OF INDIVIDUAL VARIABILITY IN THE VO_{2MAX} RESPONSE TO SHORT-TERM HIGH INTENSITY INTERVAL TRAINING

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Data from the HERITAGE STUDY (Bouchard et al. 1999) document individual responses to aerobic exercise training in that the increase in VO_2max observed in response to training widely varied across individuals, although the mean improvement was equal to 400 mL/min. Individual responses have also been demonstrated in response to high intensity interval training (HIIT) (Astorino & Schubert 2014). **AIM:** To identify predictors of individual variability in VO_2max in response to short-term HIIT. **METHOD:** Twenty six active men and women (mean age and VO_2max = 21.5 ± 2.4 yr and 40.5 ± 6.0 mL/kg/min) completed 10 sessions of progressive HIIT on a cycle ergometer at intensities ranging from 90 – 110 percent peak workload (%Wpeak). Before and after training, gas exchange data were obtained during progressive exercise starting at 30 – 40 W for 7 min followed by 20 W/min increases in work rate until volitional fatigue. VO_2max incidence was confirmed with verification testing performed 10 min after exercise. Multiple regression was used to identify predictors of the change in VO_2max in response to HIIT. **RESULTS**: Mean change in VO_2max was equal to 5.5 ± 4.6 % and 0.14 ± 0.12 L/min, with 23 % of participants (6/26) showing non-response to training (≤ 3 % increase in VO_2max). No 3-predictor model was significant, although baseline VO_2max ($r = -0.36$, $p = 0.035$), BMI ($r = -0.46$, $p = 0.009$), and FFM ($r = -0.31$, $p = 0.06$) were inversely related to percent change in VO_2max. **DISCUSSION:** These results corroborate recent findings from chronic HIIT and low-volume sprint interval training (Astorino and Schubert 2014) showing that baseline VO_2max is significantly and inversely related to the VO_2max response to training. Practitioners and scientists should identify sources of variability in VO_2max response to training and attempt to construct individualized exercise programming for exercise “non-responders”.

9. SKELETAL MUSCLE PHENOTYPE AND PERFORMANCE OF AN ELITE MIXED MARTIAL ARTIST

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Purpose: Mixed martial arts (MMA) requires a unique combination of muscular strength, power, and endurance. However, little is known regarding elite MMA athlete's muscle characteristics at the cellular level. The purpose of this study was to determine the myocellular phenotype [fiber type, size, and myonuclear domain (MND) size] and whole muscle performance of an elite MMA fighter. **Methods**: One male MMA athlete [Record: 8 wins, 2 losses; Ranked: top 10 in the Ultimate Fighting Championship (UFC) Light Heavyweight Division] volunteered to participate in this study [Age:33 y, Height:1.89 m, Mass:102.1 kg (competes at 93.0 kg)]. The participant underwent a *vastus lateralis* muscle biopsy to analyze myocellular characteristics, which included myosin heavy chain (MHC) fiber type distribution (via SDS-PAGE), fiber size (cross-sectional area; CSA), and MND size (via confocal microscopy). Whole muscle performance measures included hand grip dynamometry, peak isometric mid-thigh pulls, vertical jump (measured with no countermovement), and the Wingate Anaerobic Test (WAnT). **Results**: Muscle fiber type composition was 29% MHC I (pure slow-twitch fibers), 66% MHC IIa (pure fast-twitch fibers) and 5% hybrid fibers (containing multiple MHC types). Mean±SE fiber CSA and MND size were 3,183±225 μm^2 and 11,008±1,331 μm^3, respectively. His grip strength was 78.4 kg, isometric mid-thigh pull peak force was 37.7 $N \cdot kg^{-1}$, and vertical jump was 57.2 cm. Additionally, the WAnT determined his peak power (PP): 1,075.89 W, relative PP: 10.45 $W \cdot kg^{-1}$, average power (AP): 838.87 W, relative AP (8.14), and fatigue index: 43.39%. **Conclusion**: This elite MMA fighter exhibited a homogenous muscle fiber type (i.e. predominantly fast-twitch with few hybrid fibers) with relatively large muscle fibers and small MND sizes. These cellular characteristics may help partially explain the athlete's elevated whole muscle performance characteristics. This case study provides initial insight into the muscle physiology of elite mixed martial artists.

11. REEXAMINING SKELETAL MUSCLE FATIGABILITY AND FIBER TYPE IN RESISTANCE TRAINED MEN: 40 YEARS AFTER THORSTENSSON AND KARLSSON

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INTRODUCTION: Nearly 40 years ago Thorstensson and Karlsson developed an equation (THOR) allowing a fatigue test to estimate the percentage of fast-twitch muscle fibers (%FT) in an individual's vastus lateralis (VL). Fiber-typing methodologies have advanced considerably since this time. Moreover, THOR was developed from a heterogeneous group of habitually active men. **PURPOSE:** Reexamine THOR using modern muscle fiber-typing techniques and in resistance-trained men. **METHODS:** Fifteen resistance-trained males (strength/power-trained ≥3d/wk for ≥6months; age=24.8±1.3y, height=1.79±0.05m, mass=82.2±8.0kg) performed 60 maximal knee extensions at 180°/s on an isokinetic dynamometer, returning on a separate day for a VL muscle biopsy. Approximately 200 individual fibers (per participant) were isolated and analyzed for fiber type using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). Individual muscle fibers were identified as either expressing myosin heavy chain (MHC) I, I/IIa, IIa, IIa/IIx, IIx, or I/IIa/IIx. %FT was determined as a combination of MHC IIa, IIa/IIx, and IIx. **RESULTS:** The original correlation between FT% and percent decline in peak torque ($r=0.86$, $p<0.01$) was not reproduced here ($r=0.11$, $p>0.05$). Moreover, a Bland-Altman plot suggested THOR overestimated %FT by an average of 6.91%, with a range of -27.62% to +41.44% (limits of agreement, 95% Confidence Interval) in our participants. Also, the data were heteroskedastic (correlation coefficient, $R^2 = 0.53$, $P = <0.01$), indicating THOR underestimated FT% in participants with less fast-twitch fibers, and overestimated FT% in participants with more fast-twitch fibers. **CONCLUSIONS:** This collectively suggests fiber phenotype alone does not predict performance during a fatigue test in strength-trained men. These findings likely differ from Thorstensson and Karlsson because we utilized the highly precise single fiber-typing method that allowed differentiation of fibers into 6 isoform categories (as opposed to only 2 in THOR). However, THOR may still be valid when examining across heterogeneous exercise backgrounds or "habitually active" participants.

10. EFFECTS OF STRIDE FREQUENCY PERTURBATIONS ON KINETICS DURING TREADMILL RUNNING

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As a runner changes stride frequency, ground reaction forces likely change. There is a large body of research on ground reaction forces during running overground; however, there is very little research of ground reaction forces while running on a treadmill. **Purpose:** To investigate the effect of stride frequency perturbations on kinetic events during treadmill running. **Methods**: Participants (n=8; 24.9±4.2 yrs; 1.73±0.09 m; 73.3±13.4 kg) determined preferred treadmill running speed while running on an instrumented force treadmill (Bertec, OH). Preferred stride frequency (PSF) was measured and participants ran a total of 7conditions, each representing a different stride frequency perturbation (PSF, PSF±5%, ±10%, ±15%). Run conditions were 5 minutes with 4-30 second data collection occurring every other 30 seconds after 1 minute. Data were processed via custom Matlab code identifying 15 right foot stance periods for analysis. Kinetic variables (active peak (FZ2), percent of stance phase of FZ2 (FZ2%) and peak loading rate) and stance period were analyzed using repeated measure ANOVAs across perturbation conditions (α=0.05). Due to the reduced frequency of occurrence of impact peak (FZ1) during the higher stride frequency perturbations (+5%,+10%&+15%), FZ1s were analyzed comparing PSF to reduced SF perturbations (-10% & -15%) with multiple paired sample t-tests . **Results:** Magnitude related variables (peak loading rate and FZ2) were not significantly different across SF perturbations ($p>0.05$). Stance time was significantly different across perturbations ($p<0.001$). Stance time during PSF was longer (0.260s) than both PSF+10% (0.235s) and PSF+15% (0.228s) ($p<0.001$). Impact peak during PSF (1.44BW) was significantly less than PSF-15% (1.58BW, $p=0.004$). Impact peak during PSF-15% was also significantly greater than PSF-10% (1.47BW, $p=0.005$) and PSF-5% (1.47BW, $p=0.033$). **Conclusion:** During treadmill running, SF perturbations affected running kinetics by reducing the occurrence of FZ1 during increased SF perturbations and increases in FZ1 magnitude at reduced SF.

12. ALTERATIONS IN MUSCLE FORCE AFTER RESISTANCE TRAINING ON CONSECUTIVE DAYS

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Background: Resistance training increases muscle strength, power, anaerobic capacity, and hypertrophy and improves health status. Popular workout regimens recommend alternating exercise of specific muscle groups in order to give the muscle group adequate time for repair and growth after exercise. **Aim:** To determine if a recovery period is necessary by evaluating changes in muscle force before and after consecutive days of lower-body resistance training. **Methods:** Before and after consecutive sessions of resistance training**,** voluntary muscle force was measured in 3 men and 3 women (mean age = 23.0±2.0 years) who were resistance trained using an isokinetic dynamometer. Initially, one repetition maximum (1-RM) on the leg press, knee extension, and knee flexion was assessed to determine load for subsequent resistance training sessions. At least 2 d later at same time of day, participants completed 3 sets of each exercise at a load equal to 75 %1-RM, and repeated this regimen 24 h later after which muscle force was determined. **Results:** Peak knee extension torque was not different ($p=0.053$) between baseline (193.0±47.5 ft.lb) and after 2 d of exercise (178.15±56.8 ft.lb). Peak knee flexion torque was not different ($p=0.269$) between baseline (102.1±19.2 ft.lb) and after 2 d of exercise (92.0±17.4 ft.lb). Women exhibited a much larger decrease in peak knee extension/flexion torque compared to men. In addition, repetitions completed in the leg press, knee extension, and knee flexion were not different ($p=0.562$) between day 1 and day 2 of resistance training. **Conclusion:** The results displayed no decrease in force production when lower-body resistance training was performed on consecutive days, potentially due to participants' familiarity with rigorous training. Further studies in trained individuals are needed to reveal potential decreases in peak torque in response to consecutive days of resistance training.

13. WINGATE POWER CORRELATES WITH HIGH INTENSITY SPRINTING AS DISTANCE INCREASES

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INTRODUCTION: Cycling tests are often used to measure power. However, it is unknown if cycling power is correlated with high intensity sprinting. **PURPOSE:** To investigate the relationship between cycling and sprinting power. **METHODS:** Fourteen males (age= 23.3 ± 1.5 yrs.; height= 176.0 ± 12.5 cm; mass= 78.6 ± 15.5 kg) completed two power tests, a 20-meter sprint (20MS) & a modified 10-second Wingate test (10W). Timing gates were utilized to determine 20MS time. In addition, split times were collected at 5, 10, 15, and 20 meters. 10W power was measured with a breaking weight of 9% body mass. Subjects were verbally encouraged and instructed to give all out maximal effort for both tests. **RESULTS:** There were significant strong positive relationships between 20MS and 10W average power (r = 0.879) and 10W peak power (r = 0.872). In addition, the relationships became stronger as distance increased by 5 meters (5M r = 0.808: 10M r = 0.874: 15M r = 0.885: 20M r = 0.901). **CONCLUSIONS:** Cycling power correlates with sprint power as distance and speed increase. Maximal leg speed is achieved at the beginning of the cycle test, but at the end of the sprint test. Therefore, measuring sprint power at top speed from 15 to 20-meters may be used as an alternative to cycling power.

14. TECHNICAL ABILITY OF FORCE APPLICATION BETWEEN VARIOUS STRIDE FREQUENCIES AT CONSTANT VELOCITY

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Technical ability of force application during running can be described as a ratio of horizontal force to resultant force ($EFA=F_H/F_{Res}$), where EFA is the effectiveness of force application. EFA has been measured in sprinting, but not running at submaximal constant velocities and/or various stride frequencies. **Purpose.** Therefore, the purpose of this study was to examine EFA at preferred velocities under 7 different stride frequencies. **Methods.** Participants (n=5, age: 24± 1.22 yrs; Height: 173.1± 10.34 cm; Mass: 74.96± 14.07 kg) ran at their preferred running speed at ±5%, ±10%, and ±15% of their preferred stride frequency on a force instrumented treadmill (Bertec, Columbus, OH). Participants ran for 5 minutes at each stride frequency (intermittently directed by metronome), where 4-30s trials were collected with the metronome off for each trial collection. EFA was calculated for 20 consecutive strides with the average EFA over stance phase identified for analysis. A repeated measures ANOVA was performed to analyze the differences in EFA (α=0.05). **Results.** EFA was not significantly different ($p>0.05$) between any stride frequencies. Mean EFA of 0%, +5%, +10%, +5%, -5%, -10%, -15% EFA values were 6.81 ±2.20, 6.32 ±1.21, 5.77 ±1.47, 5.56 ±1.47, 6.23 ±1.41, 6.44 ±1.73, 5.95 ±1.79, respectively. **Discussion.** These results demonstrate that the ratio of F_H/F_{Res} was not influenced by stride frequency changes during constant velocity. Therefore, we can assume that any changes in the magnitude of the resultant force vector are accompanied by a proportionate increase in horizontal force production. These results could have implications for the endurance athlete seeking to optimize their stride frequency during running. **Conclusion.** EFA will always be low at constant velocities because there is no horizontal acceleration. EFA did not change with respect to stride frequency changes. More studies are required to determine if EFA can be manipulated to optimize performance.

15. A COMPARISON OF PLETHYSMOGRAPHY AND HELIUM DILUTION IN THE MEASUREMENT OF FUNCTIONAL RESIDUAL CAPACITY IN HUMANS

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Functional Residual Capacity (FRC) lung volume following passive exhalation. Standard methods, such as spirometry, cannot be used due to its limitations of only being capable of measuring expired volumes. Two methods used to measure FRC are helium dilution and plethysmography. The plethysmograph measures pressure and volume inside an enclosed cabinet to find lung volume through pressure changes. Helium dilution uses a rebreathing technique, in which helium is diluted by the FRC. Previous work in our laboratory showed that while the plethysmograph accurately measured most lung volumes, its measurement of FRC was highly variable compared to helium dilution. The purpose of this study was to more carefully control the techniques to determine whether there was a difference between the two. We measured FRC in 10 subjects using the plethysmograph and rebreathing techniques. Subjects had FRC measured 3-4 times per day using both techniques on two occasions separated at least one day. Care was taken to ensure that the same body position was used in all measurements. Our results showed that helium dilution consistently produced smaller measurements of FRC (Plethysmograph 3.6 $\pm$ 0.2 L; Helium dilution 3.3 $\pm$ 0.2 L $P=0.002$). One reason for the difference may be small closed airways that were not opened by the volume breathed in the helium dilution technique, but which would be seen using the plethysmograph method, which depends on expanding and compressing the chest against an occluded airway. Other researchers have found similar variance between techniques, indicating that this is likely a true physiological variation.

16. RELATIONSHIP BETWEEN LEG DOMINANCE AND MUSCLE FIBER TYPE COMPOSITION OF THE VASTUS LATERALIS

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INTRODUCTION: Leg dominance can be defined in a multitude of ways, but in general is considered the preferred leg for activity. Skeletal muscle fiber composition is an important determinant of whole muscle performance. **PURPOSE:** The purpose of this project was to determine if a relationship exists between leg dominance and muscle fiber type profile of the vastus lateralis. **METHODS:** Five participants (age= 23.4±23.40y, ht= 1.80±.09m, mass=82.92±12.91kg) answered a questionnaire consisting of six questions relating to leg dominance. Additionally, each participant underwent a bilateral vastus lateralis muscles. Fiber type profile was determined by sodium dodecyl sulfate polyacrylamide gel electrophoresis. Individual muscle fibers were identified as either myosin heavy chain (MHC) I, MHC I/IIa, MHC IIa, MHC IIa/IIx, MHC IIx, or MHC I/IIa/IIx. The percentage of each fiber type was taken as the participant's muscle fiber type profile. **RESULTS:** Paired sample T-tests revealed a significantly higher percentage of MHC I fibers in the right leg compared to the left leg (right=33.43±9.72% vs. left=25.01±14.31%). Additionally, split file paired sample T-tests revealed a significantly higher percentage of MHC I fibers in the dominant leg when dominance was identified as "Which leg do you prefer to kick a ball with?". All participants identified as right leg dominant while kicking. No other significant differences were found between the other fiber types and dominance questions. **CONCLUSION:** The right leg showed a higher proportion of MHC I fibers compared to that of the left leg. Also, a higher percentage of MHC I fibers were found in the dominant kicking leg. However, it is difficult to conclude a relationship between MHC I fiber percentage and dominant kicking leg as all participants answered the question uniformly (right leg). These data suggest leg dominance can only partially be explained by muscle fiber type composition.

17. DETERMINING THE OPTIMAL WORK RATE FOR CYCLE ERGOMETER VERIFICATION PHASE TESTING IN FEMALES

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Use of the verification phase (VP) following a graded exercise test has been shown to be superior to using secondary criteria to determine if a "true max" has been reached. The optimal work rate for VP testing on a cycle ergometer has not been established. Twelve healthy females (Age: 21.5 ± 1.62 years, BMI: 23.65 ± 3.45) first completed a ramp VO_{2max} test then on 4 subsequent days in random order completed VP tests at 80, 90, 100, and 105% of the wattage achieved on the initial ramp test. The test durations for the ramp, 80, 90, 100, and 105% were 10.93 ± 0.97, 10.03 ± 5.05, 5.68 ± 3.12, 3.07 ± 1.12, 2.26 ± 0.48 min, respectively. The VO_{2max} values for each test were 2.44 ± 0.33 L/min (ramp), 2.34 ± .036 L/min (80 %), 2.40 ± 0.32 L/min (90%), 2.43 ± 0.32 L/min (100%), 2.41 ± 0.29 L/min (105%). The VO_{2max} achieved on the VP at 80% was significantly lower than that achieved on the ramp test (P=0.03). Ten of the 12 subjects achieved their highest VO_{2max} during either the 100% VP (5) or the 105% VP (5) while only 1 subject on the 80% VP and 1 on the 100% VP achieved their highest VO_{2max} values. There were no significant differences in RPE, blood lactate, RER, or maximal heart rate between the VP tests. Our results suggest that maximal and supra-maximal VP work rates may be superior to sub-maximal work rates for achieving the highest VO_{2max} in young healthy females using cycle ergometry. The 80% VP may be too low of a work rate to elicit a "true max" VO_2. The longer test durations in the sub-maximal VP tests may be insufficient in some individuals to elicit VO_{2max}.

18. ANTERIOR TIBIAL MICROVASCULAR FLOW CHANGES COMPARED TO TIBIAL MICROVASCULAR FLOW CHANGES WITH INDUCED TILT PROTOCOL

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Purpose: The purpose of this study was to determine whether microvascular bone blood flow in the tibia is proportional to macrovascular blood flow in the feeding anterior tibial artery (ATA), during various positions using tilt protocol to alter input arterial pressure into the tibialis anterior, which feeds into the tibia. We hypothesize microvascular bone blood flow will be linearly proportional to macrovascular arterial blood flow in the feeding anterior tibial artery. **Methods:** Using tilt protocol of 15°, 6°, 0°, -6°, and -15°, we measured macrovascular blood flow of the anterior tibial artery and microvascular bone blood flow of the tibia with ultrasound technology and a customized photoplethysmography device. Eighteen healthy subjects (10 females and 8 males) participated in this study. All positions were randomized. **Results:** Both microvascular and macrovascular blood flow increase significantly between various positions during tilt protocol. Furthermore, we found microvascular bone blood flow increases more significantly than macrovascular arterial blood flow in various positions of tilt protocol ($P<0.001$). **Conclusions:** The findings of this study support the idea that microvasculature is more highly regulated than microvasculature. The results of this study have the possibility to contribute to future studies that focus on the pathway of blood flow from the artery to bone to regulate various skeletal processes such as bone healing and bone maintenance.

19. EFFECT OF BODY POSITION ON FORCE PRODUCTION DURING THE ISOMETRIC MID-THIGH PULL

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Varying body positions have been used in the literature when performing the isometric mid-thigh pull. We evaluated force production in the isometric mid-thigh pull in bent (125° knee and 125° hip angles) and upright (125° knee, 145° hip angle) positions in participants with (>6 months) and without (< 6 months) substantial experience with weightlifting. A mixed-design ANOVA was used to evaluate the effect of pull position and group on peak force, force at 50ms, 90ms, and 250ms, and impulse 0-50ms, 0-90ms, 0-250ms. There were statistically significant main effects for group and pull position for all variables tested, and statistically significant interaction effects for peak force, force at 250ms, and impulse at 250ms. Calculated effect sizes were small to large for all variables in participants with weightlifting experience, and were small to moderate between positions for all variables in participants without weightlifting experience. Results from this study suggest that the position used in the isometric mid-thigh pull directly impacts the force produced during the test. Based on these findings it is essential that the body positions used are standardized and reported in research publication in order to allow for data to be correctly reported. A central finding of the study is that the upright body position (125° knee and 145° hip) should be used given that forces generated are highest in that position. Actual joint angles during maximum effort pulling should be measured to ensure body position is close to the position intended.

20. EFFECTS OF REDUCED EXERTION HIGH-INTENSITY INTERVAL TRAINING (REHIT) ON BLOOD PLASMA VOLUME

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PURPOSE: High-intensity Interval Training has been shown to impact health and fitness parameters. REHIT, a relatively new training program, has been shown in our lab to result in decreased blood volume due to plasma displacement. It is hypothesized that the displaced plasma may enter major limbs following exercise. The purpose of this study was to examine the effects of a single, 20-second "all-out" cycling bout on plasma volume and limb circumference. METHODS: Seven untrained subjects (age 19.7±0.76) completed a REHIT protocol on a cycle ergometer consisting of a three-minute warm-up, a 20 second bout of maximal effort cycle sprinting at a resistance relative to body weight, and a three-minute cool-down. Circumference of the thigh, calf, and upper arm were taken coinciding with finger-prick blood samples at times t=0, t=5, t=11:20, t=18:20, and t=38:20. Changes in plasma volume and limb circumference were recorded for statistical analysis. Blood samples were analyzed for hematocrit and hemoglobin, which were used to calculate plasma volume. RESULTS: Following cool-down, plasma volume significantly decreased three minutes and ten minutes ($p<.001$) after exercise, but had returned to baseline at 30 minutes post-exercise. Thigh circumference significantly increased at 3 and 10 minutes post-exercise ($p<.001$), with an effect that equates to an approximate 3% increase in thigh volume. Arm and calf circumference were stable throughout the trial. DISCUSSION: The hypothesis that the plasma displaced by REHIT training enters the limbs utilized in the exercise protocol was supported, as plasma volume decreased significantly and thigh volume increased significantly. It has been shown that as muscle glycogen breaks down during exercise, a shift in osmolality causes plasma volume to decrease. However, the increase in thigh circumference was not substantial enough to account for the displaced plasma. Further research is necessary to determine where the remaining plasma is taken up in the body.

21. COMPARISON OF BLOOD FLOW CHARACTERISTICS DURING HIGH INTENSITY INTERVAL EXERCISE AND MODERATE CONTINUOUS EXERCISE

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High-intensity interval exercise (HIE) and moderate continuous exercise (MOD) have been shown to elicit different vascular adaptations, but blood flow characteristics during each type of exercise have not been described. Eleven healthy males (Age: 22.5 ± 3.4 years, BMI: 25.67 ± 3.66, VO_{2max}: 42.91 ± 4.62 ml/kg/min) completed 2 separate exercise visits consisting of either HIE (10, 1 min intervals at 90-95% of HR_{max} with 1 min of recovery between) or MOD (30 min at 70% of HR_{max}) on an electronically braked cycle ergometer. We compared brachial artery diameter, blood flow velocity, and shear rate during HIE and MOD as well as flow-mediated dilation (FMD) before and after each exercise bout. There were no differences in artery diameter between the protocols (HIE: 4.19 ± 0.35 mm, MOD: 4.24 ± 0.51 mm, P=0.75). Both anterograde velocity (HIE: 19.13 ± 6.37 cm/sec, MOD: 23.80 ± 7.52 cm/sec, P=0.02) and anterograde shear rate (HIE: 182.92 ± 56.50 sec^{-1}, MOD: 227.18 ± 76.09 sec^{-1}, P=0.02) were higher during MOD compared to HIE. Both retrograde velocity (HIE: -8.29 ± 2.69 cm/sec, MOD: -5.57 ± 2.06 cm/sec, P<0.01) and retrograde shear rate (HIE: -80.14 ± 27.23 sec^{-1}, MOD: -52.74 ± 19.41 sec^{-1}, P<0.01) were of greater magnitude during HIE compared to MOD. The changes in FMD elicited by the two exercise protocols were not significantly different (MOD- Pre: 6.54 ± 2.55%, Post: 4.91 ± 4.04%; HIE- Pre: 4.41 ± 4.20%, Post: 6.04 ± 6.63%, P=0.17). We showed that brachial artery anterograde blood flow velocity and shear rate are greater during MOD, but retrograde blood flow velocity and shear rate are more pronounced during HIE. These differences in blood flow characteristics may in part explain differences observed in acute and chronic adaptations to these distinct exercise protocols.

23. 90 MINUTES OF MODERATE EXERCISE DOES NOT ATTENUATE POSTPRANDIAL TRIGLYCERIDES IN OLDER ADULTS

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Purpose: To determine if 90 minutes of moderate exercise, prior to a high fat meal, attenuates postprandial triglycerides (PPT) in older adults.
Methods: 8 sedentary older adult volunteers (58±8 years, BMI 26.5±4.2), completed 2 trials. The exercise trial performed 90 minutes of moderate exercise of 60% heart rate reserve (HHR). Following exercise an overnight fast of 12-16 hours was performed. They were given a high fat meal that consisted of 146 grams of CHO, and 92 grams of fat and instructed to rest. Lipid levels were collected at 1, 2, 3, and 4 hours post feeding. The control trial underwent no exercise, performed an overnight fast of 12-16 hours, and was given the high fat meal followed by four hours rest and data collection. Results: There was no difference in PPT between the control and exercise trials (p<0.05). Triglycerides (TG) increased from pre-exercise in both trials (pre-feeding 123.13±65.03 con. 111±53.9 ex., 1hr 161.50±83.77 con. 149±71.03 ex., 2hrs 208.25±120.69 con. 177±97.29 ex., 3hrs 228±146.99 con. 147.25±87.64 ex., 4hrs 211.75±140.15 con. 169.5±68.14 ex). Glucose followed a predictable trend consisting of peaked post-feeding values followed by a gradual return to baseline in both trials (p<0.05) (pre-feeding 90.38±8.88 con. 87.25±9.29 ex., 1hr 119.5±22.14 con. 120.63±17.86 ex., 2hrs 112.13±14.07 con., 121.38±26.41 ex., 3hrs 100.13±11.21 con., 108±20.27 ex., 4hrs 100.13±22.2 con., 88.88±6.96 ex). Conclusion: Minimal research has been done among older adult populations. PPT attenuation has been observed among younger populations who underwent similar conditions. This may be attributed to a decrease in lipoprotein lipase (LPL) activity among older adults.

22. INFLUENCE OF AEROBIC FITNESS ON POSTEXERCISE CARDIAC AUTONOMIC CONTROL

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PURPOSE: To determine the influence of aerobic fitness level on cardiac autonomic control, as assessed by heart rate recovery (HRR), heart rate variability (HRV), and baroreflex sensitivity (BRS) in response to maximal exercise. METHODS: Participants (n=26; age: 25.7±4 yr) were assessed for beat-to-beat blood pressure and an electrocardiogram (EKG) in the seated position for 20 minutes. Spectral analysis was performed on the EKG and HRV was reported as high (HF)-, low-(LF), and total spectral power. BRS was reported as the slope of systolic blood pressure versus RR interval during the performance of a Valsalva maneuver. Subsequently, maximal oxygen consumption (VO_{2max}) was obtained via a graded exercise test on a treadmill during which heart rate, blood pressure, and RPE were recorded. Heart rate was recorded after 1 minute of recovery and HRR was reported as maximal heart rate – 1-min recovery heart rate. Participants then returned to the seated position and HRV and BRS were reported at 10, 20, and 30 minutes of recovery as previously described. Participants were grouped based on VO_{2max} into a low-fit (LO) group (n=6; VO_{2max} = 39.2±4.4 ml/kg/min), moderate-fit (MOD) group (n=12; 45.0±4 ml/kg/min), and a high-fit (HI) group (n=8; 54.1±5 ml/kg/min). A 3 (group) X 4 (time) ANOVA was used to examine group and time differences in BRS and HRV, whereas a one-way ANOVA was used to examine group differences in HRR. A p- value of 0.05 was used for all tests. RESULTS: HRR was greater in HI (45.1±4) compared to LO (24.8±2), but not significantly different than MOD (36.0±4; p=0.08). HRR between LO and MOD approached significance (p=0.06). There was a main effect of time on LF/HF such that it was higher during all recovery time points compared to baseline. There was also a main effect of time on BRS such that it was lower at 10 minutes post-exercise and then returned to baseline at 20 minutes. CONCLUSION: Elevated aerobic fitness is associated with greater vagal reactivation following maximal exercise. Although BRS and HRV are altered in the immediate post-exercise period, BRS appears to have a quicker recovery time.

24. THE RELATIONSHIP BETWEEN SWAYMEDICAL'S CONCUSSION MANAGEMENT SYSTEM APPLICATION AND BIODEX BALANCE SYSTEM SD DURING THE BALANCE ERROR SCORING SYSTEM TEST

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Introduction: Balance testing has increasingly become one of the common assessments in a battery of tests for concussions for athletes. Concussion testing has become a prime factor in an athlete's return-to-play safety. Baseline results have provided trainers and coaches' quantifiable data to effectively assess the severity of an athlete's injury. **Purpose**: The purpose of the study is to determine the relationship between SwayMedical's Concussion Management System Application and Biodex Balance System SD during the Balance Error Scoring System (BESS) test. **Methods**: Ninety Division II athletes, both male and female completed a single session balance test. All participants read and signed informed consent. Prior to any testing, all participants were familiarized with the BESS protocol. Participants completed SwayMedical's baseline balance test with an iPod strapped via chest harness, while completing the BESS protocol on the Biodex Balance System concurrently. Both protocols consisted of five stance conditions: Double Stance (FT), Tandem Left (TL), Tandem Right (TR), Single Left (SL), and Single Right (SR). Each condition was performed for ten seconds with eyes closed. Pearsons r correlations were conducted to analyze the relationship between the two systems for all variables. **Results**: A significant (p < .000), strong, and negative correlation for SR (r = -.710) and SL (r = -.762) was found. Additionally, a significant (p<0.00), strong, and negative correlation between Overall Score (r = -.733) for the Biodex and Sway app was found. However, there was no significant (p>0.05) differences for DS, TL, and TR. **Conclusion**: There is an overall significant relationship between the Biodex Balance System and SwayMedical's Concussion Management System Application. The negative correlations were a result of these opposite scoring systems. Consequently, SwayMedical's app is a valid tool that can be used by trainers and coaches to assess concussions in the trainer's room or on the field.

25. QUADRICEPS AND HAMSTRING STRENGTH: A RELATIONSHIP TO NUMBER OF COMPETITIVE YEARS ON THE CROSS-COUNTRY TEAM

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Strength imbalances between the quadriceps and hamstring muscle groups, commonly measured with the hamstring to quadriceps ratio (HQR), are associated with performance decrements and injury risk. Many years of high intensity training completed by collegiate runners may contribute to such imbalances. Early identification of these imbalances may be useful for improving performance and reducing injury risk. PURPOSE: The purpose of this study was to determine if the number of years participating on an intercollegiate cross-country team influences hamstring strength, quadriceps strength, or HQR. METHODS: 10 female intercollegiate cross country runners with varying years of Division-1 experience *(3-years, n=4; 2-years, n=3; 1-year, n=3*) granted written consent and performed isokinetic testing of the dominant limb to determine maximal concentric strength of the quadriceps and hamstring muscle groups (3 reps; 120°/s; Biodex, Shirley, NY). The maximum torque value of all trials was selected and HQR was calculated for each participant. A linear regression was used to assess how influenced HQR, quadriceps strength and hamstring strength. RESULTS: A negative trend (R^2=0.998) was observed in HQR (3-years=0.493; 2-years=0.573; 1-year=0.643). A positive trend (R^2=0.747) was observed in quadriceps strength (3-years=1.914; 2-years=1.916; 1-year=1.40). No trend (R^2=0.074) was observed in hamstring strength (3-years=0.930; 2-years=1.103; 1-year=0.862). CONCLUSION: The findings suggest that athletes with more years of collegiate cross-country participation have a lower HQR. As there was no trend in hamstring strength, the difference in HQR maybe attributed to the trend of greater quadriceps strength in athletes with more years on the team. Greater quadriceps strength can improve performance measures, yet a low HQR has been correlated to injury risk. Therefore, our recommendation is to increase hamstrings strength training so that similar strength gains occur in both the quadriceps and the hamstrings muscles over time, thus maintaining a healthier HQR.

26. EFFECT OF CAFFEINE ON MUSCLE CELL DIFFERENTIATION

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Caffeine is commonly used as an ergogenic aid. Previous studies in cultured cells suggest that caffeine may affect muscle growth, but these effects were seen at non-physiological caffeine concentrations. The question that we sought to answer is whether or not caffeine affects muscle differentiation at physiological concentrations and we hypothesized that caffeine would inhibit differentiation. We differentiated C2C12 skeletal muscle cells with various concentrations of caffeine from 0.0375 – 5 mM. Immunofluorescent staining revealed an inverse relationship between caffeine concentration and the number of nuclei associated with myosin heavy chain-positive cells. Thus, our results suggest that caffeine, even at physiological concentrations, impairs skeletal muscle differentiation. Thus, heavy caffeine ingestion could lead to impaired muscle repair after injury.

27. THE IMPACT OF THREE PROGRESSIVELY HIGHER STEP RECOMMENDATIONS ON WEIGHT AND BODY COMPOSITION OVER THE FRESHMEN YEAR

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The transition from high school to college generally results in reduced physical activity and weight gain that is at a rate that is higher than the general population. **PURPOSE:** The purpose of this study was to examine the effects of three progressively higher step recommendations over 24 weeks on change in body weight and body composition. **METHODS:** Seventy-nine freshmen college women wore a multi-function pedometer for 24 weeks after being randomly assigned to a daily step level: 10,000; 12,500; or 15,000. Pedometer data were downloaded every two weeks and participants were counseled on meeting their step recommendation. Body weight and body composition was assessed at baseline and 24 weeks. Body composition was assessed by dual x-ray absorptiometry. **RESULTS:** On average women got 10,904 ± 927, 12,935 ± 1319 and 14077 ± 1276 steps per day for the 10,000, 12,500 and 15,000 step groups respectfully (F = 15.48, P < 0.0001). Participants gained 1.4 ± 2.6, 1.8 ± 2.1 and 1.4 ± 2.1 kg for the 10,000, 12,500 and 15,000 step groups. Weight gain was not significantly different between groups (F = 0.18, P = 0.8385). There was also no difference in fat weight gain (F = 0.41, P = 0.7954). **CONCLUSION:** A step recommendation beyond 10,000 does not seem to prevent weight or fat gain over the first year of college. Future research should focus on either intensity of physical activity or the addition of dietary interventions to prevent weight gain during the first year of college.

28. EFFECTS OF COMBINED CREATINE AND CARBOHYDRATE SUPPLEMENTATION ON ENDURANCE EXERCISE PERFORMANCE

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Background: Previous research has shown that creatine and carbohydrate supplementation independently increase exercise performance, however it remains unclear whether combining these two supplements has an additive effect on endurance exercise performance. **Purpose:** To determine whether combining creatine and carbohydrate supplementation increases endurance exercise performance more than each supplement alone. **Methods**: Twelve healthy, endurance trained adults (7 W, 5 M; 19.3 ± 1.2 years; BMI;22.0 ± 2.2 kg/m^2, VO_2 max;53.6 ± 10.6 ml/kg-min) exercised on a cycle ergometer at 60% of max wattage to exhaustion and were given the following supplements 40 minutes prior to the exercise and every 20 minutes thereafter in a blocked-randomized, double blind fashion; 1) Placebo (P), 2) Creatine alone (0.5g; Cr), 3) Carbohydrate alone (5g; CHO), 4) Creatine plus Carbohydrate (0.5g, 5g; Cr-CHO). The primary outcome measure was time to exhaustion assessed with a Repeated Measures ANOVA adjusting for baseline BMI, age and sex. **Results:** There was a significant treatment effect (P=0.02) for time to exhaustion. Specifically, relative to placebo, Cr-CHO significantly increased time to exhaustion by 23% (6518 ± 1875 vs. 7697 ± 1958 sec, respectively; P<0.01). However, Cr (7095 ± 1983 sec) and CHO (6993 ± 2621 sec) alone did not significantly differ from placebo (P>0.05) in time to exhaustion. **Conclusion:** Cr-CHO increased endurance exercise performance, however Cr and CHO alone had no significant effect on endurance performance. From a practical perspective, these data provide insight to coaches and endurance athletes to the beneficial effects of combining creatine and carbohydrate supplements on exercise performance.

29. A HEALTH BEHAVIOR INDEX FOR THE HAWAIIAN ISLANDS

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Although an American Fitness Index® (AFI) has recently been created to help generate sustainable and healthy communities, the AFI only evaluates the 50 most populous metropolitan areas in the U.S. leaving many areas unevaluated. **PURPOSE:** To generate a Health Behavior Index (HBI) for the Hawaiian Islands based on health behavior statistics. **METHODS:** Data were collected by modifying The My AFI Community Application Tool. This tool was created to help report communities outside of the 50 most populous metropolitan areas. Population characteristics and health behavior statistics of Hawaiian Islands were collected through rigorous searching of various websites (e.g., U.S. Census, U.S. County Health Rankings, Centers for Disease Control's WONDER system, etc…). Health Behavior Index was determined by summing Z-scores for the following variables: 1) Percentage engaged in leisure time physical activity, 2) Percentage who do not smoke, 3) Percentage not obese, 4) Percentage in excellent or very good health, 5) Percentage with health insurance, 6) Percentage with access to health foods, 7) Number of recreation facilities/100,000 people, and 8) Percentage of Medicare patients ages 65-75 years not receiving diabetic fee-for-service. Data were collected for the state of Hawaii and individual Hawaiian Islands of Kona, Oahu, Maui, and Kauai. **RESULTS:** Population statistics were composed for each location. Using state statistics, Hawaii State had a HBI of 2.13. Maui ranked first with HBI of 3.14, compared to Oahu (2.26), Kauai (0.45), and Kona (-4.30). **CONCLUSION:** Data from the available Hawaiian Islands indicates Maui has the healthiest behaviors, while Kona ranks last. Although these results assume compatible comparison between islands and equally weighted health variables, it shows clear discrepancies in health behaviors among the different Hawaiian Islands. Future research may identify other variables related to health (e.g., environmental factors) and focus on island specific strategies to improve health behaviors.

30. THE EFFECTS OF EXERCISE INDUCED MUSCLE SORENESS ON BALANCE AND PAIN

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Introduction: A number of studies have been conducted in the attempts to understand the effects of delayed onset muscle soreness (DOMS), but few have investigated its effect on balance. It is imperative to understand DOMS and its effect on balance and stability measures in order to enhance an athlete's recovery and performance. Purpose: The purpose of this investigation was to determine the effects of exercise induced muscle soreness on balance and pain. Methods: Eight males and females volunteered to participate in 5 testing sessions. Day one, participants performed a dynamic warm-up followed by familiarization of all testing protocols. Day 2, baseline measures were obtained. Double leg (DL) static and dynamic balance was tested on the Biodex Balance System SD. The balance tests consisted of Double Leg Static Balance (DLSB) and Double Leg Dynamic Balance (DLDB). Pain in the quadriceps was measured using a visual analogue scale. Participants then performed the muscle damage protocol consisting of 40% of body weight front-loaded; Bulgarian Split Squats. Day 3-5, participants returned to the lab, where identical balance and pain measures were repeated after performing the damage protocol. To monitor the effects of the damage protocol, participants returned to the lab for 24, 48, and 72 hours to re-test for balance and pain measures. A 1x5 repeated measures ANOVA was used to analyze the difference between baseline and all time points for each variable. **Results**: There was a significant ($p < 0.05$) difference between 24, 48, and 72hr time points in the pain scale. There was no significant ($p > 0.05$) difference between all time points in both double leg balance conditions. **Discussion**: These results indicate the pain scale results show the damage protocol did induce DOMS between each testing day. However, the DOMS was not severe enough to cause impairments in DL static and dynamic balance.

31. A SCALED BIOMECHANICAL MARKER TO DIFFERENTIATE FALLERS AND NON-FALLERS

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Fall risk in the aged is a serious problem that must be addressed. Unfortunately, most biomechanical gait markers associated with falls are difficult to compare between individuals. Thus, the purpose of this study was to scale select quantitative gait markers to individual characteristics in an effort to develop a discriminating model that might be applied on an individual basis. It was hypothesized that stride length scaled to leg length would be an effective discriminator of fallers and non-fallers. METHODS: A total of 742 subjects over the age of 60 years were recruited from 36 testing sites across the United States by the Electronic Caregiver® Mobil Falls Risk Assessment Laboratory team. Subjects completed a brief medical history form that included information regarding falls history and their left and right leg lengths were measured to the nearest 0.01cm before completing a pressure system based gait analysis. Following gait analysis, stride length was scaled to leg length for all subjects. RESULTS: Initial correlation analyses indicated significant positive relationships between scaled stride length variables and both cadence and linear gait velocity ($0.342 \leq r \leq 0.337$, $p < 0.001$.). Logistic regression analysis revealed that the scaled stride length variable for both the left and right sides was a significant predictor of falls at both 1 and 3 years ($-2.227 \leq \text{Exp(B)} \leq -1.857$, $p < 0.001$ for right at both 1 and 3 yrs and $-1.971 \leq \text{Exp(B)} \leq -1.844$ for left at both 1 and 3 yrs). DISCUSSION: The normalized left stride length showed a higher accuracy in both positive and negative cases in one year and positive cases in three years. The model predicts that for every .01 change toward a value of 1 in the normalized stride length results in a 15.8% decrease in falls risk in one year and a 13.9% decrease in falls risk in three years. CONCLUSION: The left stride length to left leg length ratio scales the stride length gait marker allowing individuals to be compared regardless of their build or dimensions and is a single metric able to predict the fall risk of an individual over a period of one or three years.

32. EFFECTS OF HIP STRENGTH AND RANGE OF MOTION ON LOW BACK PAIN IN COLLEGIATE WOMEN GOLFERS

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Context: Hip internal rotation (IR) range of motion (ROM) of the lead leg and strength has been associated with low back pain (LBP) in elite golfers. This LBP relationship may also affect the collegiate women's golfer population. **Purpose**: The purpose of this study was to examine the relationship between hip ROM of the lead leg and strength with LBP in Division I collegiate women golfers. **Methods**: Six in-season right-handed Division I collegiate women's golfers (age: 20 years ± 1.41, height: 164.08 cm ± 4.25 mass: 60.93 kg ± 6.76) participated in the study. During a single testing session, passive ROM (PROM) and strength were evaluated. PROM for hip IR and hip external rotation (ER) were measured using a standard goniometer in the prone position. Hip IR and ER strength were measured using a hand-held dynamometer in the same position; strength was normalized by body weight . LBP was assessed using a modified Micheli Functional Scale (MFS). Four athletes reported with having LBP, while two reported no LBP. **Results**: An independent *t*-test revealed significant difference for hip IR strength ($t(3) = -7.219$, $p < .05$) of the lead leg for those with and without LBP. Athletes with LBP had weaker hip IR strength (M = 19.26 ± 3.69 %BW) compared to those without LBP (M = 22.41± 5.45 %BW). There were no significance differences for hip IR and ER ROM nor hip ER strength between athletes with and without LBP. **Conclusion**: The results of this study suggest a relationship between decreased lead leg hip IR strength and subjective LBP. This deficiency may affect training participation and competition performance. Due to the small sample size of this study, further research is needed to investigate LBP and the relationship between hip ROM and strength.

33. AN EXAMINATION OF MUSCLE ACTIVATION AND POWER CHARACTERISTICS WHILE PERFORMING THE DEADLIFT EXERCISE WITH STRAIGHT AND HEXAGONAL BARBELLS

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The deadlift is commonly performed to develop strength and power, and to train the lower body and erector spinae muscle groups. However, little is known about the acute effects of using a hexagonal vs. a straight barbell. **Purpose:** To examine the hexagonal barbell in comparison to the straight barbell by analyzing electromyography (EMG) from the vastus lateralis, biceps femoris, and erector spinae, as well as peak force, peak power, and peak velocity. **Methods:** Twenty men completed a one-repetition maximum (1RM) test with each barbell on two separate occasions. Three repetitions at 65% and 85% 1RM were performed with each barbell on a third trial. **Results:** There was no significant difference for 1RM values between the barbells (mean ± SD in kg = 181.4 ± 27.3 vs. 181.1 ± 27.6, respectively) ($p > 0.05$). Significantly greater normalized EMG values were found from the vastus lateralis for both the concentric (1.199 ± 0.22) and eccentric (0.879 ± 0.31) phases of the hexagonal compared to the straight barbell deadlift (0.968 ± 0.22 and 0.559 ± 1.26), while the straight barbell led to significantly greater EMG values from the bicep femoris during the concentric phase (0.835 ± 0.19) and the erector spinae (0.753 ± 0.28) during the eccentric phase compared to the corresponding values for the hexagonal barbell deadlift (0.723 ± 0.20 and 0.614 ± 0.21) ($p \leq 0.05$). The hexagonal barbell deadlift demonstrated greater peak force (2,553.20 ± 371.52 N), peak power (1,871.15 ± 451.61 W), and peak velocity (0.805 ± 0.165) compared to the straight barbell deadlift values (2,509.90 ± 364.95 N, 1,639.70 ± 361.94 W, and 0.725 ± 0.138 m/s) ($p \leq 0.05$). **Conclusion:** The barbells led to different patterns of muscle activation, and the hexagonal barbell may be more effective at developing maximal force, power, and velocity.

34. EFFECTS OF TREADMILL WALKING WITH HAND-HELD WEIGHTS ON ENERGY EXPENDITURE AND EXCESS POST-EXERCISE OXYGEN CONSUMPTION

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INTRODUCTION: While any form of exercise might be beneficial, walking is a simple activity that should be encouraged. Progression may involve moving hand-held weights (HHW) to raise energy expenditure, thus increasing weight loss. **PURPOSE:** The purpose of this study was to compare the relative oxygen uptake (VO_{2rel}) responses and excess post-exercise oxygen consumption (EPOC) in sedentary women between treadmill walking with HHW versus without. **METHODS:** Eight untrained women (mean± SD; age= 21.9± 1.81, height= 163± 5.32 cm, body mass= 67.5± 15.6 kg, BF%=30.1± 8.55 %, BMI=26.0± 6.58) participated in two randomized sessions of either walking with 3 lbs HHW or a control condition. The entire testing session included 5 min of sitting, a warm-up, and 30 min exercise followed by subsequent quiet sitting for 30 min. Participants alternated their arms 12 inches forward and backward while maintaining elbow flexion at 90° for both sessions during the warm-up and exercise. Treadmill grade was set at 1% and speed was adjusted to the participant's target heart rate set between 40-59% of heart rate reserve, a moderate level of intensity. VO_{2rel} was collected every 5 min interval. Two two-way repeated measures ANOVAs were used to analyze exercise and EPOC VO_{2rel} data. **RESULTS:** There were no significant differences between conditions during exercise ($p > 0.05$) or between conditions for EPOC. However, there was a main effect for time for EPOC. Pairwise comparisons collapsed across conditions indicated VO_{2rel} was significantly higher immediately after exercise compared with baseline ($p < 0.05$). No other significant differences were found among other time points after exercise ($p > 0.05$). **CONCLUSION:** While there were no differences between walking with HHW versus without, HHW might provide an alternative to regular walking. In addition, walking at a moderate intensity was not sufficient to maintain energy expenditure elevated beyond immediately after exercise.

35. IMPROVING LATERAL KINESIS AFTER UNILATERAL TOTAL KNEE REPLACEMENT

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Background*:* Significant improvements in pain and function have been reported following total knee replacement (TKR); however, patients still demonstrate persistent proprioceptive deficiencies [1] and balance impairments [2], compared to healthy age-matched controls. Importantly, greater balance impairment [3] and likelihood of injury [4] occur in the frontal plane in comparison to the sagittal plane. The purpose of this project was to investigate whether a specific rehabilitation intervention focused on frontal plane movement could improve balance confidence and functional mobility in patients after TKR. ***Methods****:* 47 TKR patients were randomly assigned into two separate groups; standard course of therapy (CON) and intervention exercises (INT; cone slalom and lateral stability task) + standard course of therapy. Participants completed the Activities-specific Balance Confidence (ABC) Scale, Berg Balance Scale (BERG), Timed Up-and-Go (TUG) test and Western Ontario McMaster Osteoarthritis Index (WOMAC) at their *initial* physical therapy visit (2-weeks post-TKR) and the end of therapy (*final*; 10 weeks post-surgery). ***Results****:* ABC analysis revealed that the two groups did not differ at the *initial* time point ($p = 0.845$), but the INT group reported a significantly higher balance confidence score at the *final* time point compared to the CON group ($p = 0.002$). The INT group also had a significantly shorter TUG test time and higher BERG score at the *final* time point compared to the CON group ($p < 0.001$), the groups did not differ for either measure at the *initial* time point ($p = 0.448$ and $p = 0.331$, respectively). The WOMAC analysis revealed no difference between groups at *initial* or *final* time points ($p > 0.05$). ***Conclusions****:* Exercises that specifically include lateral movements after TKR surgery significantly improves balance confidence and functional mobility compared to standard therapy for TKR patients.

36. INDICES OF ADIPOSITY BY WEIGHT STATUS IN CHILDREN WITH AND WITHOUT CONGENITAL OBESITY

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Prader-Willi Syndrome (PWS), a form of congenital childhood obesity, presents with excessive adiposity and low lean body mass. Body mass index (BMI), an indicator of weight status, is monitored to address changes in total body mass (TBM). However, when classified by BMI, it is unknown whether abnormal body composition remains in all PWS children, and if these values are comparable to typically-developing children (TDC). **Purpose:** This study characterized indices of adiposity by BMI within PWS and compared to TDC. **Methods:** Thirty-six PWS (BMI:10 healthy, 7 overweight, 19 obese; 8-16 y) and 107 TDC (BMI:38 healthy, 11 overweight, 58 obese; 8-12 y) participated. Anthropometrics (stature, TBM, waist circumference [WC]) and body fat parameters obtained through DXA (body fat [BF%], trunk fat [TF%]) were measured. In PWS, WC and BF% classifications were identified. ANCOVA, controlling for age, determined group differences ($p<0.05$). **Results:** Within PWS, healthy and overweight<obese for WC and TBM, while healthy<overweight and obese for BF% and TF% ($p\leq0.01$ for all). PWS (n=33) were classified as having normal (healthy=5; overweight=3), moderate (healthy=3; overweight=2; obese=4) and high (overweight=1; obese=15) WC values. For BF%, healthy PWS were classified as healthy (n=2), overweight (n=2) and obese (n=6); overweight and obese PWS were all obese. When comparing child groups by BMI separately, PWS>TDC for BF% and TF% in all weight statuses ($p\leq0.01$ for all), and for WC in healthy BMI only ($p=0.03$). **Discussion:** In PWS children, healthy had lower body fat parameters than overweight and obese, but still fell into overweight/obesity WC and BF% classifications. PWS had greater adiposity than TDC regardless of BMI, though WC was similar between groups for overweight and obese BMI. Monitoring BMI changes may not be enough to combat the excess adiposity inherent to PWS. WC may be a valuable addition in guiding management of morbid obesity in PWS.
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37. ASSOCIATION BETWEEN MUSCLE FIBER TYPE AND BONE MINERAL DENSITY

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Recent research has shown that an increase in muscle mass is linked to an increase in bone mineral density. However, it remains unclear if muscle fiber type is a determinant of bone density. **Purpose**: The purpose of this study was to determine if bone density is fiber type dependent both cross sectionally and longitudinally. **Methods**: Twenty male master runners, aged 40-77 years, were recruited. Muscle biopsy samples were obtained by needle biopsy from the vastus lateralis and analyzed using standard histochemistry. Bone mineral density (BMD) of the lumbar spine, proximal femur, and total body were measured by dual energy x-ray absorptiometry on two occasions. Subjects were divided by fiber type, and comparisons between groups and across time made using independent samples *t* – test. Relationships between muscle and bone variables were examined using partial order correlation. **Results**: There were no significant differences between groups 1 and 2 (48.0±6.5% vs. 38±5.6% type II fiber respectively) for Spine or Hip BMD. Lean body mass and aerobic fitness were also similar between groups. Across time, there was no significant difference in change in spine (-.0149 ± .0321 vs. .0160 ± .0301, p = 0.07) or hip BMD (-.0015 ± .0360 vs. .0228 ± .0474, p = .250) between the two groups. However, significant positive relationships were found between type II fiber percentage and hip (r = .60, p = .019) and spine (r = .46, p = .043) BMD when controlling for lean body mass, age, weight, and VO_2 max. **Conclusion**: Our findings show an association between fiber type and bone density that could suggest a greater influence of type two fibers on bone strength.

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39. EXPIRATORY RESISTANCE, DYNAMIC HYPERINFLATION, AND FATIGUE IN YOUNG HEALTHY HUMANS

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Purpose: Expiratory airflow limitation (e.g. in COPD) results in dynamic hyperinflation leading to low inspiratory reserve volume, dyspnea, and premature exercise intolerance. Unknown is whether this cascade reduces locomotor power either through greater muscle fatigue or reduced motor activity. **Methods:** We investigated the effects of imposed expiratory airflow limitation (6 cm H_2O $L \cdot s^{-1}$ vs control) during constant power cycling to intolerance, terminated with a maximal 5 s isokinetic sprint (N=14, 23±3 yr). An additional trial was completed without expiratory resistance, but terminated at a time equal to that achieved with expiratory resistance (isotime-control). Simultaneous measurement of crank power and electromyographic activity (EMG) of the leg muscles allowed the total decline in maximal isokinetic power to be apportioned to 1) the power equivalent from a reduction in maximum voluntary muscle activation (activation fatigue) and 2) the reduction in expected power at a given muscle activity (muscle fatigue). Additionally, we measured the locomotor power reserve; the difference between the required constant power and the instantaneous maximal isokinetic power at intolerance. **Results:** Expiratory resistance reduced exercise tolerance (487±145 vs. 575±137 s, $p<0.001$). Expiratory airflow limitation resulted in a more rapid reduction in the inspiratory reserve volume (0.19±0.56 vs. 0.76±0.54 L, $p<0.01$, CI_{diff} -0.94, -0.20), and increased dyspnea at isotime-control (8.5±2.0 vs. 6.7±2.5, $p<0.01$). Activation fatigue was exacerbated (102±76 vs. 127±71 W, $p<0.05$) and related to low inspiratory reserve volume (r=-0.64, $p<0.05$). However, at isotime-control the progression of skeletal muscle fatigue was unaffected. Consequently, there was a more rapid decline in the locomotor power reserve at isotime-control with expiratory resistance (253±83 vs. 201±92 W, $p<0.05$). **Conclusion:** Hyperinflation and low inspiratory reserve volume exacerbated activation fatigue and reduced locomotor power reserve. Thus, imposed expiratory airflow limitation initiates a cascade of abnormal lung mechanics, symptoms, and locomotor fatigue, which conflate to reduce exercise tolerance.

38. PREDICTORS OF MAXIMUM FAT OXIDATION DURING PROGRESSIVE CYCLING TO EXHAUSTION IN ACTIVE MEN AND WOMEN

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Introduction: The workload coincident with maximum fat oxidation (MFO) has been shown to widely vary across individuals (Venables et al. 2005). Significant predictors of MFO include fitness level measured with VO_2max, fat-free mass, and dietary fat intake, although the majority of these data were obtained from progressive treadmill exercise to exhaustion and not cycle ergometry, which has been shown to elicit lower fat oxidation compared to treadmill exercise (King et al. 2015). **Aim**: To determine significant predictors of MFO during progressive cycling in recreationally-active men and women. **Methods**: 49 men and women (age, %BF, and VO_2max=23.7±4.9 years, 16.2±6.6 %, and 40.6±5.5 mL/kg/min) performed a graded VO_2max test after an overnight fast and abstention from exercise for 36 h. Subjects cycled for 7 minutes at 30 or 40 Watt followed by a 20 Watt increase in work rate every 3 minutes until RER = 1.0, after which power output was increased by 20 Watt/min until fatigue. Gas exchange data were obtained from the last 90 s of each stage to determine fat and CHO oxidation. Demographic characteristics including body composition were also measured. **Results**: Across participants, MFO was equal to 0.30 ± 0.08 g/min and occurred at intensities equivalent to 21.8±8.6% Wmax, 33.6±6.5% VO_2max, and 57.6 ± 6.6 %HRmax, respectively. Fat free mass, VO_2max, respiratory exchange ratio (RER) during stage 1 of exercise, and waist circumference accounted for 81.5% of MFO ($p<0.05$). Bivariate correlation analyses showed that VO_2max (r = 0.42, p=0.001), FFM (r=0.41, p=0.002) and RER in stage 1 (r=-0.76, p<0.001) were significant correlates of MFO. **Conclusion**: Data demonstrate that fitness level and body composition account for much of the variance in MFO. Clinicians should emphasize the need to improve cardiorespiratory fitness as it is related to capacity for fat oxidation and potentially metabolic health.

40. EFFECTS OF TASK DIFFICULTY ON THE AMOUNT OF FEEDBACK REQUESTS DURING SELF-CONTROLLED SKILL ACQUISITION

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Allowing learners to decide when to receive feedback has consistently led to enhanced acquisition of motor skills compared to externally determined feedback regimens. However, the amount of feedback requests observed in the self-controlled feedback literature is varied. Some studies report participants requested feedback after a relatively low percentage of trials while in other studies participants requested feedback after a relatively high percentage of trials. It has been argued that the tasks used in such experiments might explain these variations. However, that has not yet been directly investigated. Therefore, the purpose of this study was to investigate the effects of task difficulty on the amount of self-controlled feedback requests during skill acquisition. Twenty-six college-aged (21.65±1.67 years) participants were asked to perform either an EASY or DIFFICULT key pressing task. The task involved pressing 5 computer keys sequentially in a specified movement time (1200ms). The difficulty of the task was established in a pilot study. Each participant performed 50 trials (of the EASY or DIFFICULT task) and was allowed to request feedback (constant error) after each trial, with the exception of the last trial. After a 20 minute break participants completed a retention test and transfer test which consisted of performing the same sequence in 1500ms. Repeated measures ANOVAs indicated a block effect for AE (p=.00) and VE (p=.00) suggesting participants improved performance during the acquisition phase. Additionally, the analyses indicated a group effect (p=.017) during acquisition suggesting participants who practiced the easy task had more consistent performances. Additionally, independent T-test indicated a lower AE (p=.038) for the EASY group in the transfer test. The analyses however, did not indicate any differences between groups in terms of the amount of feedback requested. It is possible that the different between tasks were too small to impact feedback requests.

41. EFFECTS OF ACUTE POST-ACTIVATION POTENTIATION ON OLYMPIC SHOT PUT THROW AND STANDING LONG JUMP

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Muscular contractile force can be increased when it follows a potentiating activity incorporating brief maximum voluntary contractions known as post activation potentiation (PAP). There is a paucity of research regarding the effects of PAP on measures directly related to athletic competition. **Purpose**: This study examined the effects of a PAP warm-up strategy on shot put throw and standing long jump performance. **Methods**: Six male and seven female collegiate Division I shot-putters and multi-event athletes were pooled for this study (age: 21.0±2.0 years, height: 1.78±0.76 m, mass: 80.0±18.2 kg). A randomized repeated measures cross over design was employed. During week 1: half of the participants performed a dynamic warm-up followed by an 8 minute rest period then a shot put throw test, and 48 hours later repeated the same warm-up strategy followed by a standing long jump test. The other participants performed the same dynamic warm-up with the addition of a PAP event induced by 3 repetitions of hang clean and jerk at 80% 1RM followed by an 8 minute rest then a shot put throw test, and 48 hours later repeated the same warm-up strategy (including PAP event) followed by a standing long jump test. The participants switched warm-up strategies during the second week. Three trials were collected under each condition and the best score was used for subsequent analysis. The dependent variables were compared between warm-up strategies with a paired t-test. **Results:** The shot put throw scores were: PAP 10.93±1.81* and non-PAP 10.57±1.84 meters. The standing long jump scores were: PAP 2.46±0.38* and non-PAP 2.41±0.37 meters. (*p<0.01) **Conclusion**: Within the parameters of this study, when compared to a standard dynamic warm-up, a dynamic warm-up strategy that includes a PAP event significantly improves both shot put throw and standing long jump performance.

43. LOWER EXTREMITY KINETICS WHILE PICKING UP A GOLF BALL

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Golf is a recreational activity that includes periods of walking, high velocity golf swings, and bending over to pick up a golf ball. Golf swing and walking demands are characterized in the literature; however, there has been no characterization of the demands of picking up a golf ball. Therefore, the purpose of this study was to investigate the lower extremity sagittal plane joint moments associated with picking up a golf ball. Six healthy, young male golfers were recruited to participate. 3D kinematics and kinetics were measured while participants replaced a golf ball with a ball marker. Participants completed 3 trials for each of the following: lunge (LUNGE), squat (SQUAT), and bend at the waist (SUP) with a 7iron; single leg with the 7iron on the ipsilateral (SLIPS) and contralateral side (SLCON); bend at the waist without the 7iron (NOSUP). The peak ankle (ANKLE), knee (KNEE), and hip extensor (HIP) moments were calculated and a Repeated Measures ANOVA assessed differences among strategies ($p \leq 0.05$). There was a main effect of strategy for ANKLE, KNEE, and HIP. SLCON had a significantly higher ANKLE than SQUAT and NOSUP. SUP had a significantly lower KNEE than SQUAT. SQUAT had a significantly lower HIP than LUNGE, SLIPS, SLCON, and SUP. SUP and NOSUP had a significantly lower HIP than LUNGE and SLIPS. In general, single leg strategies were more demanding at the ankle and strategies with a narrow base of support were more demanding at the hip. Therefore these should be used in individuals with sufficient ankle strength, hip strength, and postural control or under supervision. The SQUAT was most demanding at the knee and should be avoided by individuals with knee OA or pain. This study with further investigation will allow golf professionals to provide evidence-based recommendations on how to pick up a golf ball.

42. DISSIMILAR RESPONSES OF HEART RATE AND SYSTOLIC BLOOD PRESSURE TO LOWER BODY RESISTANCE EXERCISE. A PILOT STUDY

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INTRODUCTION: Exercise has been used as a method to achieve, maintain, and improve health, fitness, and sports performance. An acute increase in heart rate (HR) is expected after exercise while a reduction in systolic blood pressure (SBP) is expected. However, it is unknown whether lower body resistance exercise (LBRE) in isolation results in similar reductions in SBP. **PURPOSE**: To investigate SBP and HR during a 60 minute rest period following LBRE. **METHODS**: Six recreationally trained males (age 25.3 ± 5.3 yrs.; ht 172.5 ± 5.7 cm; mass 83.1 ± 8.9 kg) completed twenty minutes of quiet seated rest followed by a lower body warm-up with a resistance band. They then performed LBRE followed by another 60 minutes of quiet seated rest. LBRE consisted of back squat, leg curl, and leg extension (4 sets of 6 repetitions with 2 minutes rest between sets, and one minute rest between exercises). SBP and HR were measured immediately prior to and immediately after LBRE and every 10 minutes for 60 minutes. **RESULTS**: A significant ($p < 0.001$) main effect for time for SBP was observed, with immediate post (137.17$\pm$ 6.11 mmHg) being greater than resting (113.17 $\pm$ 4.60 mmHg) but not different than any other time point. Also, a main effect for time for HR was observed, with immediate post (96.83 $\pm$ 6.01 bpm) being greater than resting (66.67 $\pm$ 4.42 bpm), 10 minutes (84.50 $\pm$ 5.26 bpm), 20 minutes (77.50 $\pm$ 4.23 bpm), and 30 minutes (75.50 $\pm$ 3.05 bpm) but not any other time point. **CONCLUSIONS**: SBP returned to resting values after 10 minutes. However, HR remained elevated for 30 minutes post exercise. A prolonged elevated HR can be attributed to increased sympathetic nervous system activation, or depressed parasympathetic activation post exercise.

44. EFFECT OF DIFFERENT MARGARIA-KALAMAN STAIR CLIMB TEST ANALYSIS TECHNIQUES ON CORRELATION WITH WINGATE POWER

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INTRODUCTION: Anaerobic power is an important attribute in sport performance, yet there are many methods of measurement, yielding various results. The Margaria-Kalaman (MK) test measures power via the vertical height of the stairs and speed. It is unknown if the use of horizontal distance or hypotenuse power (Pythagorean Theorem) have greater correlations with standard power tests. **PURPOSE**: To investigate the correlation between a modified Wingate test, and the MK test using the original vertical equation, a horizontal equation and the Pythagorean Theorem equation. **METHODS**: Fourteen recreationally trained males (23 ± 1.5 yrs.; 175.0 ± 12.5 cm; 78.7 ± 15.5 kg) completed the MK stair test and a modified Wingate. The MK stair test was conducted using a 6 meter approach then climbing nine stairs, three at a time. Time was recorded using timing gates and started on the third step and ended on the ninth step. Subjects were given three practice runs followed by three maximum trials. Subjects also performed a modified Wingate test using a flying start then cycling for 10s at 9% of their body mass. **RESULTS**: Correlations between all three equations and Wingate peak power (895.2 ± 265.8 Watts) were identical (r=0.833) although power between the three equations was significantly different: the original MK vertical equation (1470.6 ± 479.9 Watts), horizontal equation (2854.8 ± 931.6), and Pythagorean Theorem equation (3211.3 ± 1047.9 Watts). **CONCLUSIONS**: The lack of difference between equations may allow testers the choice of analysis techniques based on subject or client goals. Future investigations should examine stairs of various heights and distances to gain a better understanding of any differences in power.

45. DOES PHYSICAL ACTIVITY LEVEL HELP COGNITION?

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It has been shown that walking may be more beneficial on cognitive executive function than more intense exercise. However, regular daily physical activity (PA) contribution is unclear. **Purpose**: (i) to identify the contribution of PA on a range of cognitive function and (ii) to determine if the cardiovascular system function could predict cognition. **Methods**: PA was collected on 11 college-aged sedentary subjects using a watch accelerometer (GT9X Link, Actigraph). Activity energy expenditure, steps, exercise intensity and sleep time were continuously collected for seven days. Subjects performed a VO2max to evaluate their fitness level on a cycloergometer. Resting metabolic rate (RMR) was measured using a canopy system (Cosmed). During a moderate intensity exercise, partial pressure of end-tidal carbon dioxide (PETCO2) was continuously recorded for 10 minutes. Cognitive function was assess using the Cogstate brief battery tests. **Results**: Light activity during the day had a tendency to be correlated with reaction time for detection, one back task and errors during maze tests. Moderate activity may be linked to reaction time during one back task, but with no significance was found. Average MET during the day was correlated with maze numbers of errors (p=0.05). Vo2max level was correlated with maze speed during test (p=0.05) and recall (p=0.01), while PETCO2 was correlated with the maze number of errors during test (p=0.05) and recall (p=0.05). **Conclusion**: Although pilot, it appears that PA and fitness level could be correlated with reaction time and visual memory. We could also speculate that the cardiovascular system may be involved in the effect of PA on cognition since PETCO2 is a marker of cardiac output.

47. THE EFFECT OF GROUP SIZE ON ENERGY EXPENDITURE DURING HACKY SACK PLAY ENERGY EXPENDITURE AND EXERCISE INTENSITY

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Introduction: As obesity rates continue to rise in America, it is clear that a large portion of the population is not getting the recommended amount of exercise. A novel exercise in which participants find a great deal of entertainment is ideal for helping the more sedentary part of the population be active. Playing hacky sack is simple to play, fun, requires very little equipment, and can be played in various settings with a varying number of participants. **PURPOSE**: To understand the value of hacky sack play as a form of exercise, energy expenditure was measured in players in groups with varying numbers of participants. This data will shed light on the quality of exercise in groups of various sizes. **METHODS**: Groups ranging in size from one to six participants played hacky sack for 30 minutes. During play, energy expenditure was estimated with armband accelerometers. Play groups had the same ratio of experienced and inexperienced players. Means were analyzed by ANOVA in Microsoft Excel. **RESULTS**: There is a relationship between group size and energy expenditure. There is no difference in energy expenditure in groups with 4 or fewer players. In groups with 5 and 6 players, energy expenditure is less than in groups with fewer players.

Group Size (# of players)	1	2	3	4	5	6
EE (Joules)	850	752	735	881	677	599
n	10	9	13	10	13	10

CONCLUSION: Hacky sack players expend more energy when playing in a group of 4 or fewer participants. As hacky sack play is a very simple activity to perform and can be played almost anywhere, it has great potential as an entertaining way for people to be physically active. Regardless of group size, players will benefit from this fun activity.

46. ALTERATIONS IN SKELETAL MUSCLE AUTOPHAGY FOLLOWING RESISTANCE EXERCISE AND EXCESS POST EXERCISE LEUCINE INGESTION IN OLDER MEN

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The purpose of this study was to determine the role of excess post exercise leucine ingestion on the autophagosomal-lysosomal system in skeletal muscle following resistance exercise (RE) in older adults over a 24h time course. Older men performed a bout of RE and at 1h post exercise ingested 10g of essential amino acids (EAA) containing either a leucine content similar to high quality protein (CTRL, 1.8g leucine, n=7) or excess leucine (LEU, 3.5g leucine, n=8). Western blot (protein) and RT-qPCR (mRNA expression) were used to examine markers of autophagy in skeletal muscle (*vastus lateralis*) biopsies obtained at rest and at 2, 5, and 24h post exercise. Relative to basal values, mRNA expression of Beclin1 was increased only in CTRL at 5h post exercise ($P<0.05$). GABARAP, BNIP3, and LAMP2B mRNA expression were unchanged in both groups and at all time points ($P>0.05$). An increased RUNX1B mRNA expression at 2h, 5h, and 24h post exercise was observed only in LEU ($P<0.05$). LC3B mRNA expression was increased 2h and 5h post exercise in both groups, and remained elevated 24h post exercise in CTRL ($P<0.05$). LC3B-I protein was unchanged in both groups and at all time points ($P>0.05$), whereas LC3B-II protein was decreased 2h post exercise in both groups ($P<0.05$). The LC3B-II/LC3B-I ratio, however, was reduced 2h post exercise for both groups, and remained depressed 5h and 24h post exercise in CTRL ($P<0.05$). These data indicate that autophagy is likely increased in the skeletal muscle of older men following the combination of RE and EAA ingestion. Excess post exercise leucine ingestion may reduce the time course for increased autophagy in skeletal muscle following resistance exercise.
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48. DIFFERENCES BETWEEN DYNAMIC STRENGTH INDEX AND DELTA DYNAMIC STRENGTH INDEX OF A HEX BAR MID-THIGH PULL

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INTRODUCTION: The dynamic strength index (DSI) is the ratio of explosive force to strength force. It is used to determine whether an athlete needs more explosive or strength training. In comparison, delta dynamic strength index (ΔDSI) reduces force by the bodyweight of an athlete. **PURPOSE**: To compare DSI and ΔDSI of a hex bar isometric mid-thigh pull (IMTP). **METHODS**: Twenty resistance-trained men (age=24.05±2.09 yrs, ht=178.07±7.05 cm, mass=91.42±14.44 kg) volunteered to participate and performed a countermovement jump (CMJ) and IMTP. To perform the CMJ, subjects jumped with arm swing on a force plate. To perform the IMTP, a power rack was positioned over a force plate and a hex bar was fixed in the rack at mid-thigh position with a knee angle of 135 degrees ensured by a goniometer. Participants were provided with lifting straps, and instructed to pull on the bar as hard and fast as possible. Peak ground reaction force (PGRF) was recorded for both tests to calculate DSI. In order to calculate ΔDSI, bodyweight (N) was subtracted from PGRF. **RESULTS**: Repeated measures ANOVA indicated that DSI (0.76 ± 0.12) was significantly ($P<0.05$) greater than ΔDSI (0.67 ± .016). **CONCLUSIONS**: Calculating ΔDSI lowered the score to less than 0.7, indicating a necessity for explosive power training. If a score is greater than 0.7 it indicates a need for strength training. Bodyweight is an additional gravitational force that increases PGRF. Exclusion of bodyweight using ΔDSI lowers PGRF and shifts the focus from strength to explosive training. Further research is necessary to determine the validity of DSI and ΔDSI for resistance training prescription.

49. INCREASING SURFBOARD VOLUME REDUCES ENERGY EXPENDITURE AND ALTERS BIOMECHANICS DURING PADDLING

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BACKGROUND: Surfboard shapers manipulate board volume (BV) with the notion of altering the surfer's experience. However, there is no scientific evidence on the impact of BV on a surfer's ability to paddle, catch, and ride waves. **PURPOSE**: The purpose of this study was to investigate how BV affects energy expenditure and biomechanics during paddling. We hypothesized that energy expenditure decreases as surfboard volume increases. **METHODS**: Twenty amateur surfers (18 men, 2 women, ages 18-45) paddled against a constant current in a swim flume (Endless Pool Elite) on five surfboards in random order twice. All surfboards were 60 in (178 cm) long, 19.8 in (50.9 cm) wide and varied only in thickness and, therefore, ranged in BV from 28.4 to 37.4 L. Heart rate (HR) and oxygen consumption (VO_2) were measured at 5-s intervals with a heart rate monitor (Polar RCX5) and metabolic cart (Parvo Medics TrueOne 2400), respectively. A digital camera (GoPro Hero 4) was attached to the inside lining of the swim flume to collect 2-D underwater footage of the sagittal plane in order to measure pitch angle, roll angle and paddling cadence. **RESULTS**: VO_2 and HR decreased on thicker boards [VO2 = 32.2 - 0.263*BV ($p < 0.001$); HR = 167 - 0.822*BV ($p < 0.001$)]. Pitch and roll angles also decreased on thicker boards [Pitch = 13.1 - 0.125*BV ($p < 0.001$); Roll = 36.1 - 0.344*BV ($p = 0.044$)]. Cadence was independent of BV ($p = 0.227$). **CONCLUSIONS**: Results from this study suggest that thicker surfboards reduce the metabolic cost of paddling and lower pitch and roll angles, thus linking metabolic and biomechanical responses to paddling a surfboard with increased volume.

50. A COMPARITIVE EVALUATION OF GAIT BETWEEN CHILDREN WITH AUTISM AND TYPICALLY DEVELOPING MATCHED CONTROLS: INSIGHT GAINED VIA SINGLE SUBJECT DESIGN

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Background: Autism spectrum disorder (ASD) is a developmental disorder that generally characterized by limited social communication skills and repetitive behavior patterns. Anecdotal reports suggest that children with ASD walk and move differently than their typically developing (TD) peers, but researchers have not been successful in identifying and quantifying these observed differences. The purpose of this study was to examine gait characteristics in children with ASD using a TD matched sample as a comparative. Methods: Twenty children (10 ASD and 10 matched controls) performed 20 walking trials while spatio-temporal, kinematic and kinetic gait parameters were collected. These data were used to compare gait of children with ASD to their TD controls. All data were normalized to 100% of the gait cycle. Each paired set of children was evaluated on a single case level. The Model Statistics procedure (α=.05) was used for statistical analyses. Results: Model statistics revealed the following percent of significant differences in joint positions collapsed across all 10 matched pairs: pelvis (90.2, +/-18.4); right hip (78.4; +/-16.9), left hip (76.1, +/-25.0); right knee (69.1, +/-15.0), left knee (81.1, +/-12.4); right ankle (73.1, +/-16.4), left ankle (82.0, +/-14.9). Matched pair analyses revealed that each child with ASD displayed individualistic differences at unique phases across the gait cycle. Interpretation: This study suggests that children with ASD can complete motor tasks similar to their TD peers; but demonstrate unique differences in gait patterns. Children with ASD displayed parameter-specific differences throughout the gait cycle compared to their TD controls. This study suggests that a matched-pair design can reveal information that may assist health professionals in planning intervention strategies for children with ASD. To better understand the complexities associated with ASD, we suggest that researchers should examine children with ASD on an individual basis rather than as a group.

51. EFFECTS OF INSTRUCTION ON THE ACQUISITION OF A COINCIDENCE TIMING TASK

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Studies using an occlusion paradigm indicate that errors increase when the initial portion of the trajectory is occluded. This suggests that success in coincidence timing tasks is achieved by focusing on the beginning of the trajectory of the moving stimulus. However, it is still unclear if instructions directing participants' attention to different portions of the trajectory are capable of producing beneficial effects in coincidence timing performance. Therefore, the purpose of this study was to investigate whether instructing participants to focus on different portions of the stimulus' trajectory impacts performance and learning of a coincidence timing task. Seventy-seven college aged students were instructed to pay attention to the 1) BEGINNING; 2) END; 3) ALL of the track or 4) not given specific focus instructions (CONTROL). A Bassin Anticipation Timer was used in this study. Participants performed 40 batting swings similar to that of the swing used in baseball/softball. Participants were asked to interrupt a beam of light with a batting swing to intercept a traveling light stimulus simulated to be moving down a runway and decelerating towards the participant. Performance during acquisition phase was analyzed through repeated measures ANOVAs for absolute error (AE), constant error (CE) and variable error (VE). Performance in retention and transfer tests was compared using separate one-way ANOVAs. There were significant (p=.00) block effects for AE, CE, and VE indicating improved performance during acquisition. The results also indicated participants told to focus on the BEGINNING of the track had lower CE than those focusing on the END. Additionally, participants told to focus on the BEGINNING of the track had lower CE than those without any focus instruction. These results suggest that instructions directing participants' attention to the beginning of the trajectory of a stimulus lead to some performance and learning benefits.

52. THE EFFECTS OF PHOSPHATIDIC ACID VS MAXXTOR® ON STRENGTH AND POWER ON RECREATIONALLY TRAINED MALES.

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Background: This study compared the changes observed in strength and power in recreationally trained males who ingested either MaxxTor® (MT) or phosphatidic acid (PA) alone. Research has demonstrated a link between PA and muscle protein synthesis (1-8, 12-14). A protein kinase known as the mechanistic target of rapamycin (mTOR) has been recognized as a critical regulator of muscle protein synthesis (1-7). PA is a lipid messenger that has been shown to increase muscle protein synthesis via stimulation of mTOR signaling. MT is a supplement that contains 750 mg of PA as the main active ingredient but also contains other synergistic ingredients including L-Leucine, Beta-Hydroxy-Beta-Methylbuterate (HMB), and Vitamin D-3 to deliver mTOR signaling activation. **Methods:** The results of a study which investigated the effects of 750 mg of PA alone on the aforementioned variables were compared with the results of a study which investigated the effects of MT on the same variables. Aside from the different supplementation, both studies followed the same testing, nutrition, length of study, and training protocol on recreationally trained male subjects. **Results:** Independent T-Tests indicate that there is a significant difference between MT and PA supplementation. Mean leg press strength increased by 58.2 kg for the MT group and by 51.9 kg for the PA group ($p = 0.000$), mean bench press strength increased by 15.4 kg for the MT group and by 7 kg for the PA group ($p = 0.000$), mean power increased by 91.1 W for the MT group and by 62.3 W for the PA group ($p = 0.000$). **Conclusion:** MT appears to be more effective than PA alone at increasing leg press strength, bench press strength, and power.

53. NEURAL RESPONSES TO PICTURES OF FOOD AFTER EXERCISE IN CHILDREN

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Purpose: To examine neural responses to pictures of food after exercise in children (8-11 y) using fMRI. **Methods:** Using a randomized cross-over design, 26 children (9.42±1.16 y; 16.67±2.37 kg/m^2; 19.21±9.79% body fat; and 69% male) completed two separate laboratory conditions (exercise vs. no-exercise). Each subject completed a 30-minute bout of exercise on a motor-driven treadmill (~70% of HR_{max}). In the non-exercise condition (rest), each subject sat at a table for 30 minutes and played games or read books. Neural responses to high- and low-calorie pictures were determined following each 30-minute condition using fMRI. The software SAS was used to test for a condition (exercise vs. no-exercise)*picture (high- or low-calorie) interaction and for the main effects of condition and exercise. **Results:** There was a significant condition*picture interaction in the bilateral medial temporal lobe (MTL) ($p<0.05$). In the left MTL, fMRI activation was highest in response to the high-calorie foods after exercise and lowest for the low-calorie foods during no-exercise. In the right medial temporal lobe, fMRI activation was highest in response to the high-calorie foods after exercise and lowest for the low-calorie foods after no-exercise. Main effects for picture type (greater activation to high-calorie foods) were observed in the visual cortex, medial prefrontal cortex, the right middle frontal gyrus, the right and left superior temporal gyrus, the right inferior frontal gyrus and the right posterior central gyrus ($p<0.05$). Main effects for exercise condition were observed in the left posterior central gyrus (greater activation after exercise) and the right anterior insula (greater activation after rest) ($p<0.05$). **Discussion:** Acute exercise may influence neural activation to food cues in several areas of the brain. Neural responses to high-calorie foods tended to be greater in this sample of children. The extent that these findings predict eating behaviors needs additional research.

54. THE EFFECT OF FOOT DOMINANCE ON FOOT STRENGTH BEFORE AND AFTER PARTICIPATION IN A SPECIFIED 8 WEEK EXERCISE PROGRAM

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Purpose: Improved strength of the foot muscles may have important implications in injury risk, injury prevention, and performance enhancement in many athletic settings due to their controlling effect on foot motions. The purpose of this study was to identify if there were differences in the strength of the foot musculature between dominant and non-dominant feet before and after undergoing an 8-week exercise program. We believe that the non- dominant musculature will show greater strength gains over the dominant foot due to the idea that non-dominant feet may have greater need for development. Methods: 10 active college students participated in the 8-week exercise program while concurrently running 15-30 miles per week. The exercise protocol focused on strengthening the musculature of the foot and toes on both feet. At week 0 and 8 strength testing was done using customized dynomometers. Strength data was recorded for arch doming as well as flexion strength of toes 1 and toes 2,3,4 together. Each test involved contracting the specific muscles and holding the position for 3 seconds. The peak force was recorded from 3 trials, and then averaged for statistical analysis. Peak forces from dominant and non-dominant feet were compared using a repeated measures ANOVA for the movements of interest. Results: The results showed a significant increase in strength in both feet ($p<.001$). There was no difference in strength gains between dominant and non-dominant feet for the movements of interest ($p= 0.5$-0.9). Conclusion: While it is clear that the exercise program resulted in increased strength in the intrinsic foot muscles, there was no statistical evidence to support the hypothesis that foot dominance had any effect on amount of strength increase.

55. EFFECT OF GENDER AND LANDING DIRECTION ON KNEE JOINT TORQUE DURING DROP LANDINGS

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Previous research has identified factors that may contribute to ACL injury, including gender, improper landing mechanics, and landing direction. Landing direction influences both frontal and sagittal joint angles, particularly the knee (Berg and LeBlanc, 2014). The purpose of this study was to compare the effect of landing direction and gender on knee joint torque. Thirty physically active subjects (15 M, 15 F) age 18-25 years participated in this study. Drop landings were performed from a 60 cm box using a Vicon 6-camera motion capture system (120 Hz) and two Kistler force plates (1200 Hz) to collect data. Trials were performed from six equal distance directions (Right, Diagonal Right, Forward with Left lead foot, Forward with Right lead foot, Diagonal Left, Left) with direction order randomized. Peak knee joint torque values were calculated from touchdown (TD) to maximum knee flexion (LP) with five successful trials per direction averaged for analysis with a two-factor ANOVA ($p < 0.05$) with post hoc tests performed with Bonferoni. Peak internal knee extension torque values had a main effect for direction ($p < 0.001$) and a trend for gender ($p = 0.08$). Forward Right values (1.61±0.49 Nm/kg) were smaller than all other directions and Right values (2.90±0.47 Nm/kg) were larger than all other directions. Male values were larger than Females (2.56±0.41 vs 2.15±0.43 Nm/kg). While not statistically significant, directions using a right lead leg had smaller torque values than those with a left lead leg. Peak internal varus torques had a main effect for direction ($p < 0.001$), but no gender effect or interaction. The values for Right and Left (1.76±1.12 and 2.29±1.41 Nm/kg, respectively) were significantly larger than all other direction values. Landing direction, along with the lead leg, led to a meaningful difference in peak knee torque which could be linked to injury risk.

56. LOADING PATTERNS OF RUBBER-BASED RESISTANCE BANDS ACROSS DISTRIBUTORS

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The rehabilitation and resistance training communities often include the use of rubber-based resistance (RBR) bands for improvements in musculoskeletal performance. In order to minimize safety risk and improve program prescription, an understanding of the nature and consistency of RBR loading patterns is vital. The purpose of this study was to examine the consistency of RBR band force-production across four RBR band distributors (Elitefts, Power Systems, Rouge Fitness, and RubberBanditz). A minimum of five sample bands were acquired across a spectrum of reported distributor widths. In total, six sets of Elitefts (0.635, 1.27, 1.27, 2.86, 4.45, 6.35 cm widths), Power Systems (0.635, 1.27, 1.27, 2.86, 4.45, 6.35 cm widths), and RubberBanditz (0.635, 1.27, 2.22, 2.86, 4.45, 6.35 cm widths) and five sets of Rouge Fitness (0.635, 1.27, 1.27, 2.86, 4.45 cm widths) bands were tested. A total of 125 RBR bands were stretched in 5 cm increments from resting to twice their resting length (200 cm) while force-production was measured with bands in series using a load cell (DBBP-500; Kistler-Morse; Spartanburg, SC) affixed to a digital controller (SVS2000; Kistler-Morse; Spartanburg, SC). Each band was tested twice (n=250) on different days to assess intertrial reliability. Reliability for all bands demonstrated an ICC greater than 0.99 and SEM less than 5%. One-way ANOVAs for each band width group revealed statistical differences (p<0.05) in mean force production at twice resting length for bands of equal width across distributors. Band force-production inconsistency exists across RBR bands available from distributors in a range of -8.5-12.6% of the mean per width. This study may be useful to strength and conditioning professionals and clinicians who should be cognizant of loading variance between both band widths and distributors and work to quantify a set of loading parameters specific to their training environment.

57. BLOCKADE OF TGF-B SIGNALING THROUGH THE ACTIVIN TYPE IIB RECEPTOR WITH THE SMALL MOLECULE, SGI-1252

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Antagonism of the TGF-β signaling pathway represents a promising potential therapy for the muscular dystrophies and other muscle wasting disorders (i.e., cachexia or sarcopenia). Previous research has shown that antagonism of TGF-β signaling promotes muscle growth, attenuates muscle wasting, and restores function in both wild type and diseased animals. Our laboratory has recently developed a novel small molecule (SGI-1252) that inhibits TGF-β signaling. **Purpose:** In this study we determined how 8-weeks of oral and intraperitoneal (IP) administered SGI-1252 affected whole body and individual limb muscle mass. **Methods:** Wild-type (WT) mice were treated with SGI-1252 or a vehicle control (VC) either orally (400mg/kg 3 times per week) or via intraperitoneal (IP) injection (200mg/kg 5 times per week) for 8-weeks. Body mass was measured twice per week during the 8-week treatment period. At the end of the treatment period, gastrocnemius muscles were excised, weighed and prepared for histological and biochemical analyses **Results:** IP SGI treated mice gained less weight compared to both VC and orally treated mice over the 8 week period. Gastrocnemius wet muscle weight was significantly greater in the orally SGI treated group relative to the VC treated mice (137.7 mg vs 124.5 mg P=0.0159). Conversely, gastrocnemius wet muscle weight was significantly larger in both orally treated groups by 28.9 mg (P=0.0415) and 24.4mg (P=0.0314) relative to the IP SGI treated mice. **Conclusions:** Loss of weight and muscle mass in the IP treated mice suggest a cachectic condition likely due to SGI-1252 overdose. Nevertheless, results in the oral group suggest that this mode of delivery may be effective at promoting muscle mass gains. Further studies using a wider range of doses and delivery methods are needed to ascertain the efficacy of SGI-1252 as potential therapeutic.

58. IS VARIABILITY OF STRIDE FREQUENCY A FACTOR THAT DETERMINES PREFERRED STRIDE FREQUENCY DURING RUNNING?

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Purpose: The purposes of this study were 1) to quantify and describe variability of stride frequency during running, and 2) to determine if the variability of stride frequency is minimized at the preferred stride frequency. **Methods:** The participants (n=8; 24.88±4.16 years; 173.19±9.33 cm; 72.81±14.27 kg) performed seven 5-minute run conditions on an instrumented treadmill (Bertec FIT, USA). The seven runs were a function of their preferred stride frequency (PSF, PSF±5%, PSF±10%, PSF±15%). Participants matched each foot fall with a metronome set to the stride frequency for each condition. Data were collected during four 30-second trials per condition. Variability of stride frequency was determined using coefficient of variation (CV_{SF} = standard deviation/mean*100). CV_{SF} were each compared between conditions using a repeated measures ANOVA. **Results:** CV_{SF} was different across SF conditions ($F=14.672$, $p<0.001$). Using pairwise comparisons, it was determined that CV_{SF} at PSF (0.991) was significantly less than during PSF+10% (1.262; $p=0.016$), PSF+15% (1.454; $p<0.001$), PSF-10% (1.362; $p=0.028$), and PSF-15% (1.652; $p<0.001$). The CV_{SF} during PSF+5% (1.025) was different from all other SF perturbations ($p<0.05$). CV_{SF} during PSF+10% (1.262) was less than during PSF-15% (1.652; $p=0.025$). CV_{SF} during PSF+15% (1.454) was greater than PSF-5% (1.209; $p=0.016$). CV_{SF} during PSF-5% (1.209) and PSF-10% (1.362) were less than PSF-15% (1.652; $p=0.001$, $p=0.028$, respectively). **Conclusion:** CV_{SF} was influenced by large changes in SF. Stride frequency variability increased as stride frequency increased further from the preferred stride frequency. It may be that decreased variability of SF is a factor determining the preferred stride frequency during running.

59. LOW DOSES OF CAFFEINE CAN BE ADVANTAGEOUS OVER LARGER DOSAGES IN A SHORT ALL-OUT EXERCISE BOUT

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PURPOSE: Identify the efficacy of different caffeine dosages in short all out exercise. The effect of various caffeinated beverages on high-intensity performance, using a cycling 3-minute all-out exercise test (3MT) was assessed. **METHODS:** Twenty-four subjects of varied fitness levels, with low risk stratification, completed four 3MTs over a period of 3 weeks. The subjects included males and females with the following demographics: age 22 ± 2 yr; height 175 ± 6.1 cm; weight 78.8 ± 16 kg. One hour before the start of each 3MT, subjects consumed either 250 ml of water, Coca Cola (Cola), Red Bull (RB), or Coca Cola with added dry caffeine (Cola+). The RB and Cola+ beverages had the same caffeine content. **RESULTS:** After each 3MT, measures of critical power (CP), anaerobic work capacity (W'), oxygen uptake ($\dot{V}O_2$peak) and rating of perceived exertion (RPE) were determined. 41% of subjects had the highest W' after the consumption of Cola compared to 25% each for water and RB, and 8% Cola+. W' was significantly higher after Cola consumption compared to Cola+. Cola consumption produced the highest CP in 11 subjects. The mean and standard deviation of CP for water, Cola, RB, Cola+ consumption were 192±45 W, 201±45 W, 201±50.5 W, 198±42 W, respectively ($p<0.05$). $\dot{V}O_2$peak increased significantly with the amount of caffeine ingested. No differences in RPE were found between beverages. **CONCLUSION:** The recommendation is to consume a standard Coca Cola, as available in the grocery store, as it provoked an increase in CP and W' for most subjects in short high-intensity exercise.

60. ANALYSIS OF THREE METHODS OF MEASURING MEDIAL LONGITUDINAL ARCH HEIGHT

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Purpose: The medial longitudinal arch (MLA) helps dissipate ground reaction forces experienced during running. Understanding arch structure is important in injury prevention. The Variform AccuPin (VAP) scanner uses a pin casting matrix to measure arch height. Though previous research has shown the VAP to be a reliable method of arch height measurement, it has not been demonstrated as a valid method of measuring the MLA compared to other proven methods: the Arch Height Index Measurement System (AHIMS) and digital photography (DP). The purpose of this study is to compare arch height measurements of the VAP, AHIMS, and DP methods. Method: Both feet of 21 healthy college-aged subjects were measured using the VAP scanner, AHIMS, and DP. The feet were measured in a neutral/non-weight bearing position, with the subject seated at 90 degrees of knee flexion, and a standing/weight bearing trial (50% BW). Pearson product-moment correlation coefficients were calculated to compare the VAP and DP to the AHIMS. Results: Neutral trials of AHIMS and DP had a strong correlation (r=.75) and neutral trials of AHIMS and VAP were weakly correlated at r=.12. Standing trials of AHIMS and DP were correlated moderately at r=.56 and standing trials of AHIMS and VAP were weakly correlated at r=.22. Conclusion: Measurements from the AHIMS method and the VAP are weakly correlated. The VAP is used to form orthotics by mapping the plantar-surface foot structure, its measurement of arch height is thus substantially different than other more accepted methods, which may explain the poor comparison to commonly accepted methods. The weaker correlation between AHIMS and DP during standing compared to the correlation during sitting may be due to the angle of the subject's ankle varying from 90 degrees while standing during DP

61.
SPINAL CONNECTIONS MEDIATING ARM AND LEG ACTIVITY

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Typical strategies for neurorehabilitation after traumatic injury involve specific motor output induced by sensory stimulation. This is of critical importance for spinal cord injury (SCI) as these connections are impaired. For walking, cues such as load, cutaneous sensation, joint position, and stretch on stepping have been shown to be important but the impact of upper body activity feedbacks is less appreciated, especially in humans. **Purpose**: To assess the impact of arm/hand activity on leg muscle excitability in neurologically intact humans. **Methods:** Monosynaptic reflexes (H-reflexes) were measured in 6 college-aged adults in three conditions (i) with arms hanging freely to their sides (FREE), (ii) holding fixed parallel bars (HOLD), and (iii) with arms in a similar holding position, but without support (SHAM). Electromyographic signals elicited by stimulation to the anterior tibial nerve at the popliteal fossa were recorded in the soleus muscle. Amplitudes of H-reflex responses were normalized to those of direct efferent stimulation (M-wave) and compared across the three conditions via repeated measures ANOVA. Pairwise differences between conditions were assessed upon finding significance in the omnibus test. **Results**: Monosynaptic response amplitude differences were not observed in the HOLD condition, but were significantly different between the SHAM and FREE conditions (p < 0.05). **Conclusion**: This pilot study suggests that activity in the arms may significantly modify neuromuscular excitability in the legs even when body position and balance were controlled

63. THE EFFECTS OF GAIT RETRAINING IN RUNNERS WITH PATELLOFEMORAL PAIN

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Running popularity has increased, resulting in a concomitant increase in running-related injuries. Of these injuries, patellofemoral pain (PFP) is the most commonly reported. **PURPOSE:** The purpose of this study is to determine whether gait retraining by modifying footstrike patterns from rearfoot strike (RFS) to forefoot strike (FFS) reduces PFP and improves associated biomechanical measures, and whether the modification influences the risk of ankle injuries. **METHODS:** Sixteen subjects (n=16) received clearance to participate by a licensed physical therapist, and were randomly placed in the control (n=8) or experimental (n=8) group. Over a period of two weeks, the experimental group (EXP) performed eight gait retraining running sessions where footstrike pattern was switched from RFS to FFS, while the control group (CTL) performed eight running sessions with no intervention. Knee flexion (Kflex), knee valgus (Kvalg), and ankle flexion (Aflex) at initial contact, knee (KL) and ankle loading (AL), patellofemoral contact force (PFCF), patellofemoral stress (PFS), Achilles' tendon force (ATF), and knee pain as reported on a visual analog scale (VAS) were recorded pre-, post-, and one-month post-running trials. **RESULTS:** In EXP, knee pain was significantly reduced post-retraining (mean Δ, -4.225; p<0.05) and at one-month follow-up (mean Δ, -4.276; p<0.05). Kflex was significantly increased post-retraining (mean Δ, 6.044°; p<0.05). Kvalg was significantly improved post-retraining (mean Δ, 2.782°; p<0.05) at one-month follow-up (mean Δ, 4.066°; p<0.05). Aflex was significantly different post-retraining (mean Δ, -23.958°; p<0.05), as well as AL post-retraining (mean Δ, 14.738°; p<0.05) and one-month follow-up (mean Δ, 17.192°; p<0.05). PFCF, PFS, ATF, and KL were not significantly different. **CONCLUSION:** Retraining from RFS to FFS results in significant reductions in knee pain in runners with PFP without increasing risk of ankle injuries.

62. THE EFFECT OF TORQUE DEVELOPMENT RATE ON PEAK STRAIN IN THE PATELLAR TENDON

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Previous studies have used ultrasound to assess mechanical properties of tendon during ramped isometric contractions. Contraction duration has been reported to affect patellar tendon strain; however, the extremely slow contractions (10 seconds) studied by Person et al. (2007) are not representative of common functional contraction speeds. Additionally, the previous studies have determined tendon strain using Tendon Elongation methods (Joseph et al., 2012). The purpose of this study is to use acoustoelasticity methods to determine if the rate of torque development affects patellar tendon strain. Nine recreationally active males, 18-25 years old, were recruited. Subjects were strapped in a Biodex System 3 isokinetic dynamometer to isolate preferred leg knee extension. After they completed conditioning contractions, they performed a set at regular (2-3 s), fast (1-2 s), and slow (4+ s) ramp up speeds. A Terason 3200 ultrasound collected images of the tendon during the isometric contractions. Echosoft software (Echometrix, Madison, WI) used downloaded DICOM files to compute strain within a tendon region of interest. One-way ANOVA was used to determine the effect of contraction speed ($p < 0.05$). Time to peak torque for regular, slow and fast contractions were significantly different (3.36 ±0.33 s, 4.90±1.02 s, 2.63±0.85 s, respectively; $p < 0.001$) and peak torque values were not different (270±66 Nm, 265±78 Nm, 281±76 Nm, respectively). Peak strain values did not differ due to contraction speed (10.3±2.2%, 10.4±3.5%, 9.5±2.6%, respectively), however the time to the peak strain did differ with the slow trials taking longer to reach peak strain than the fast trials (4.49±0.65 s vs 3.37±1.17 s; $p < 0.05$). It appears that the rate of torque development affects peak strain values only when the rates differ more significantly than the current study speeds. Project Funded by the Swenson Summer Research Fellowship program. REE conditions (p < 0.05). **Conclusion**: This pilot study suggests that activity in the arms may significantly modify neuromuscular excitability in the legs even when body position and balance were controlled.

64. PERFORMANCE BETWEEN ISOMETRIC MID-THIGH PULLS AND THE DEADLIFT WITH DIFFERENT BARS

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Isometric pulls are a frequently used assessment for measuring force. The most common position used is the mid-thigh position, however, many dynamic movements are initiated below the knee. **PURPOSE:** The purpose of this study was to compare force between isometric mid-thigh pulls and the deadlift. **METHODS:** Twenty resistance trained men (age=24.05±2.09 years, ht=178.07±7.05 cm, mass=91.42±14.44 kg) participated. Participants performed isometric pulls from both the mid-thigh (MT) and deadlift (DL) positions via a power rack positioned over a force plate. A barbell was fixed in the rack at mid-thigh or plate height from the floor. A traditional Olympic barbell (OLY) and a hexagonal (HEX) barbell were used for each pull, while a goniometer was used to ensure a 135 degree knee angle for the mid-thigh pulls. Each bar was positioned at plate height for the deadlift pulls. Participants were provided with lifting straps, and instructed to pull against the bar as hard and fast as possible. Peak ground reaction force (PGRF) was collected and analyzed. **RESULTS:** Statistical analyses revealed no significant difference in PGRF between bars (OLYMT: 3196.28±590.29 N; HEXMT: 3177.48±531.34 N; OLYDL: 2461.08±397.11 N; HEXDL: 2541.21±414.84 N). However, there was significantly greater PGRF at the mid-thigh position (3158.74±111.43 N) than the deadlift position (2514.29±90.45 N) when collapsed across bars. **CONCLUSIONS:** Based on these results, greater PGRF can be produced at the mid-thigh position when compared to the deadlift position, as the deadlift position may be a less biomechanically advantageous position.

65. THE EFFECT OF TIME-OF-DAY ON THE RATE OF BLOOD LACTATE REMOVAL IN RESPONSE TO ACTIVE RECOVERY POST 30-S WINGATE

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Blood lactate accumulation and removal during high intensity intervals can be an indicator of performance over a widespread of sports. Active recovery compared to passive recovery has been shown to increase the rate of blood lactate removal. There has been some debate regarding whether time-of-day influences the rate of blood lactate removal. Some have found that the evening allows for a faster rate of blood lactate removal, while others have found no difference. PURPOSE: to determine if time-of-day has an effect on the rate of blood lactate removal after performing a 30-s Wingate. METHODS: A group of 9 subjects (male, n=6; female, n=3; 24.67 (±2.40)yrs old), healthy and untrained reported for testing on 3 separate sessions (07:00-09:00, 12:00-14:00, 17:00-19:00) to perform a Wingate anaerobic test (WAnT), before 20 minutes of low intensity active recovery (30-50% HRR). Blood lactate was recorded at baseline and at the 20th minute of active recovery. RESULTS: Blood lactate (BLa) concentrations taken before the WAnT were 2.24 (±1.62) mmol/l at 07:00 hours, 1.92 (±0.99) mmol/l at 12:00 hours and 3.66 (±2.90) mmol/l at 17:00 hours. At the 20th minute of recovery, BLa were 7.59 (±3.33) mmol/l at 07:00 hours, 6.29 (±2.78) mmol/l at 12:00 hours and 8.18 (±3.36) mmol/l at 17:00 hours (p = 0.072). CONCLUSION: Time-of-day on the rate of blood lactate removal did not vary significantly among the three time periods examined. Blood lactate has been recognized as being a contributor to impaired muscle function and exercise performance. Therefore, it becomes relevant to continue designing strategies which will assist in a faster removal of blood lactate to aid in exercise performance. Further research is needed to determine the correlation between the intensity of active recovery and effect of time of day.

67. THE ACUTE EFFECTS OF CAFFEINE AND POLYPHENOL SUPPLEMENTATION ON METABOLIC AND FAT OXIDATION RATE AT REST AND FOLLOWING A BOUT OF SPRINT INTERVAL EXERCISE

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Thermogenic supplements, which typically include key bioactive compounds like caffeine and green tea polyphenols, have shown efficacy in producing a significant rise in energy expenditure and physical performance in human subjects. The purpose of this study was to investigate the acute effects of green tea extract polyphenol and caffeine supplementation on subsequent muscular power output during a bout of sprint interval exercise (SIE) while also examining responses in metabolic rate at rest and after exercise. In a double-blind, randomized, placebo-controlled, crossover study and following an initial familiarization visit, 12 subjects (male: n=11; female: n=1) (bodyweight= 76.1±2.2 kg; height= 169.8±1.6 cm; BMI= 22.7±3.0 kg/m2; body fat %=21.6±2.0%) underwent two testing sessions during which time they consumed either a caffeine-polyphenol supplement or placebo. After supplementation, resting energy expenditure, heart rate (HR), and blood pressure (BP) were assessed. Subsequently, subjects performed 30 minutes of SIE while researchers collected performance data. Subjects were then tested for post-SIE energy expenditure, HR, and BP. The caffeine-polyphenol treatment resulted in significantly ($p<0.05$) greater energy expenditure (+7.99% rest; +10.16% post-SIE), VO2 (+9.64% rest; +12.10% post-SIE), and fat oxidation rate (+10.60% rest; +9.76% post-SIE) vs. placebo at rest and post-SIE. No significant differences were detected for peak and average power at all sprint intervals between treatments. Post-SIE HR was significantly ($p<0.05$) greater with caffeine-polyphenol supplementation vs. placebo (90.8±3.5 vs. 85.1±3.6 bpm). There were no significant between-treatment differences for BP. It may be concluded that the observed thermogenic response post-SIE was directly attributable to caffeine-polyphenol supplementation as opposed to an indirect manifestation of enhanced performance and work output. Collectively, these results corroborate the use of dietary caffeine and polyphenols to support efforts to reduce adiposity and improve overall body composition especially in conjunction with sprint interval exercise.

66. LIPID OXIDATION IN FEMALES DURING THE POSTEXERCISE RECOVERY PERIOD: ONE VS TWO BOUTS OF EXERCISE

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Purpose: Research has shown a difference in substrate oxidation rates between rest and the postexercise recovery period after performing a single bout of exercise. Most notably, differences in the duration of increased lipid oxidation are seen between sexes. It is unclear what happens to substrate oxidation rates during postexercise recovery during same-day split exercise sessions in females. The purpose of this study was to determine if total postexercise lipid oxidation in females is affected by frequency of exercise (1 vs. 2 bouts) without altering total work (60 min vs. 2 x 30 min at 65% VO2max). Methods: Recreationally athletic females (n=7, age 27.7 ± 4.7 years, VO2max 44.6 ± 3.6 ml/kg min, body fat 24.6 ± 6.8 %) participated as their own control in a crossover design. Resting VO2, substrate oxidation (lipid and carbohydrate) rates, RER and VO2max were determined using indirect calorimetry. Subjects were randomly assigned to each treatment, either 60 minutes of exercise at 65% VO2max on a cycle ergometer, or two 30- minute bouts at 65% VO2max on a cycle ergometer separated by five hours. Metabolic parameters were collected every 15 minutes postexercise for three hours. Results: Significant increases in lipid oxidation (81.5 g to 149.8 g) ($p<0.001$) and carbohydrate oxidation (85.6 g to 203.7 g) ($p<0.005$) were found between the 60-min trial postexercise recovery period and the sum of the split 30-min sessions, respectively. Significant differences in carbohydrate oxidation were found between exercise and control, and between exercise and all postexercise timepoints ($p<0.008$). Conclusions: These results may indicate that performing split exercise sessions of identical workload may lead to an overall greater postexercise lipid oxidation in females when compared to a single exercise session.

68. DOES SPRINT INTERVAL TRAINING ELICIT SIMILAR HEMODYNAMIC RESPONSES AS RAMP EXERCISE TO EXHAUSTION?

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Sprint interval training (SIT) has been shown to elicit comparable long-term metabolic and cardiovascular adaptations versus continuous endurance training. However, there is limited research on the acute hemodynamic responses to SIT and how these compare to ramp-based VO_2max values (RAMP). **Aim:** The aim of this study was to compare hemodynamic responses between SIT and ramp exercise to VO_2max. **Methods:** Sixteen habitually active men and women (mean age and VO_2max = 25.8 ± 5.6 yr and 38.5 ± 4.1 mL/kg/min) performed a RAMP VO_2max test on the cycle ergometer to determine workload (Watts) for the SIT session. Subjects returned within 1 week at the same time of day and completed a SIT session consisting of six 30-second bouts of "all-out" cycling at power output equal to 130% Wmax interspersed with 120 seconds of active recovery at 20%Wmax. Gas exchange and hemodynamic data (thoracic impedance to estimate heart rate (HR), stroke volume (SV), and cardiac output (CO)) were continuously obtained during RAMP as well as during exercise and recovery in SIT. **Results:** As expected, hemodynamic variables increased linearly during SIT and surpassed 80 – 90 % of maximal values from RAMP. Repeated measures ANOVA revealed significant differences ($p < 0.001$) in CO between RAMP and SIT, although it only differed during recovery between bouts. SV was similar ($p = 0.49$) across bouts. HR differed across bouts ($p < 0.001$), and HRmax via RAMP was similar to that shown at the end of SIT. VO_2 (L/min) was lower ($p < 0.001$) in response to SIT compared to RAMP, with active recovery eliciting approximately 60 % VO_2max. **Conclusion:** SIT elicits near-maximal to maximal values of HR, SV, CO, and VO_2 which are similar versus other modalities of interval training including repeated Wingate tests.

69. PSYCHOLOGICAL WELL-BEING AND DIETARY QUALITY OF COLLEGE WOMEN: EXAMINING THE CONFOUNDING INFLUENCEOF SEASON, PHYSICAL ACTIVITY, AND SLEEP

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Objective. To determine the relationship between overall psychological well-being and stress on diet quality among young adult women and to examine the potential confounding influence of physical activity and sleep on these relationships. *Design/Participants.* The study used a cross-sectional design. Participants included 351 women university students (20.2 ± 1.6 y). Overall psychological well-being was assessed using the General Well-being Schedule (GWB) and the Perceived Stress Scale (PSS). Diet intake was measured using three 24-hour recalls over a seven day period. The Healthy Eating Index (HEI) was calculated to assess diet quality. Physical activity (PA) and sleep were both measured objectively using accelerometers over seven consecutive days. *Results.* The average HEI score was 59.3 ± 12.5 out of 100. Significant relationships were seen with specific aspects of psychological well-being, however global psychological well-being as measured by the General Well-being schedule was not related to any measure of diet quality. Chronic stress was related to low adherence to dietary guidelines ($F = 11.46$ and $p = 0.0008$). Chronic stress was also related to low consumption of fruits and vegetables ($F = 5.03$, $p = 0.0256$). Feeling in control of emotions and behaviors was related to low consumption of non-nutrient dense foods (NNDF)($F = 3.33$, $p = 0.0198$). Controlling for PA and sleep time reduced the magnitude of all of these relationships between 11% and 42%. Results from the PSS were positively related to the consumption of NNDF ($F = 3.97$, $p = 0.0472$). Controlling for PA and sleep time increased the magnitude of this relationship by 34%. *Conclusion.* Subscales of psychological well-being such as chronic stress, acute stress, and emotional behavioral control were related to diet quality. While these observed relationships were independent of the influence of physical activity and sleep, controlling for these variables had moderating effect.

71. CHANGES IN DAILY PHYSICAL ACTIVITY AND FITNESS LEVELS OF BANK PERSONNEL AFTER A 4-MONTH FITNESS PROGRAM

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Purpose: To quantify the daily physical activity of office workers during a four month exercise intervention and to monitor changes of fitness levels associated with the intervention. **Methods:** IRB approval was granted for this project. Participants were bank employees who had been in the position for at least 6 months previous to the start of the project. All participants had no physical or health limitations that prevent them from participating in a fitness program. The International Physical Activity Questionnaire, Queens College step test, Maximal handgrip strength (dynamometer), Push-up test (ACSM), Broad jump, Curl-up test and Traditional sit-and-reach tests were used to assess individual physical activity levels and fitness levels, respectively. **Results:** All participants were women with a mean age of 40.8 years of age. The averages for height and weight were 1.65 m and 83.76 kg respectively. The mean BMI was 30.68. Participants' fitness levels and individual physical activity levels were assessed at baseline and at the end of each month throughout the intervention. At baseline the averages for Physical Activity (PA) Transportation to work was 85.50 min, 1395 min for housework, 816.2 min for recreation, time spent sitting during the week was 1770 min and time spent sitting during the weekend 2310 min. There were changes in fitness components of participants at the conclusion of the intervention. **Conclusions:** Although the sample is limited and results are not statistically significant, they provide some insight of the benefits of physical activity in this subset of the population, and also support the relevance for companies to create physical activity programs for their employees to improve their health, overall wellbeing, reduce health-care and insurance costs and enhance the workplace environment.

70. RELATIONSHIP BETWEEN TURNOUT GENERATION AND JOINT LOADING IN DANCERS

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Turnout is a fundamental component of ballet. While a theoretically perfect turnout requires 90° of external rotation at the hip, literature suggests this rarely happens. Rather, the hip contributes approximately 60% of the external rotation while the knee and ankle contribute roughly 40% of the external rotation. Too little hip contribution with excessive knee and ankle contribution has been hypothesized to increase torsional stress on the knee and may be related to the development of common overuse injuries. **PURPOSE:** To characterize strategies used by collegiate dancers for achieving turnout and examine the relationship between percentage of turnout originating at the hip and peak joint moments. **METHODS:** Whole body kinematics were recorded on thirteen female university dancers while participants performed vertical jumps for maximal height while maintaining turned out first position. Total turnout (TTO) was calculated by summing the external rotation components of the hip, knee and ankle. Each joint's contribution, as a percentage of TTO, was then calculated. Linear regression was used to examine the relationship between hip contribution to TTO and peak joint moments. **RESULTS:** Average TTO was 41.3° (±10.1°), of which 52.2% (±16.7%) came from the hip. Of the 26 legs analyzed, only 5 achieved 60° of external rotation at the hip. Although many participants achieved the same amount of TTO, the relative joint contributions used to achieve it varied. There was a significant positive relationship between percent TTO generated at the hip and peak hip external rotator moments (R^2=0.152, p=0.048) and negative relationship between percent TTO generated at the hip and knee extensor moments (R^2=0.199, p=0.022). **CONCLUSION:** These findings reveal the importance of considering how turnout is achieved in ballet. Although a high degree of turnout is sought, different strategies to obtain it may result in higher or lower joint loading which overtime could influence injury susceptibility.

72. THE CLINICAL APPLICATION OF PERIODIZED RESISTANCE TRAINING DURING A 12-WEEK HYPOCALORIC TREATMENT FOR OBESITY

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PURPOSE: To evaluate the efficacy by which periodized resistance training enhances morphometric, metabolic, and functional outcomes for obese patients undergoing a 12 wk medically supervised hypocaloric treatment. METHODS: Eight male and female participants were placed in either: Standard Treatment Control (CON) (n=4) or Periodized Resistance Training (RT) (n=4) for 12 wks. All participants consumed 1120 kcals/day by way of Optifast® VLCD products and whey protein supplementation. Both groups underwent a pedometer-based walking program; only RT performed periodized resistance training 3 days/wk for 12 wks. Body composition via DXA, resting metabolic rate (RMR), and neuromuscular function were measured at wks 1, 6, and 12. Serum free fatty acid (FFA), free glycerol, beta-hydroxybutyrate (βHB), insulin-like growth factor 1 (IGF-1), IGF binding protein 3 (IGFBP3), and cortisol were analyzed via ELISA for samples obtained at wks 1, 6, and 12. RESULTS: Total body mass (TBM) and fat mass (FM) decreased ($p<0.05$) pre-post in CON (-20.4 kg TBM; -15.3 kg FM) and RT (-14.6 kg TBM; -13.4 kg FM) with no group differences. There was a group x time interaction for lean body mass (LBM) as CON lost 5.0 kg from pre-post ($p<0.05$) while RT showed no significant changes. Relative weight-loss composition differed between groups (CON: 75% FM, 25% LBM vs. RT: 90% FM, 10% LBM) ($p<0.05$). There was a group x time interaction for RMR as CON exhibited a 350.7 kcal/day decrease from pre-post ($p<0.05$) while RT showed no changes. RT showed greater increases in all measures of neuromuscular function when compared to CON ($p<0.05$). RT had greater overall increases in serum FFA, glycerol, and βHB than CON ($p<0.05$). IGF1 decreased ($p<0.05$) from pre-post for CON and RT with no group differences. IGFBP3 increased significantly from pre-post in RT but not in CON. IGF1 to IGFBP3 ratio decreased ($p<0.05$) from pre-post with no group differences. No changes were found for cortisol. CONCLUSION: RT improved weight-loss composition by preserving LBM without compromising overall weight- or FM-loss. These changes corresponded to positive adaptations for energy metabolism and muscular function. Our preliminary results provide support for the clinical integration of periodized RT in VLCD-based obesity therapeutics and warrants investigation in a larger patient pool.

73. MUSCLE ACTIVITY OF AN ATHLETE DURING WHEELCHAIR PROPULSION AND HAND CYCLING: A CASE STUDY

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Purpose: The purpose of this study was to describe upper extremity muscle activity during wheelchair propulsion and handcycling at an athlete's self-selected chosen race speed and sprint speed. **Methods**: Muscle activity of biceps brachii, triceps brachii, pectoralis major, and anterior deltoid were measured using electromyography (EMG, Delsys Trigno Personal Monitor, 2000Hz). The athlete is a competitive paratriathlete. For data collection, the participant performed five trials in his handcycle and wheelchair at his self-selected race speed and sprint speed while on a regulation 400-m track. He was given adequate space on the straight away of the track to build up the desired speed for each condition. Using anterior-posterior acceleration data from the EMG bicep unit, four individual propulsion cycles were identified per trial. EMG data were processed by removing any zero offset, full wave rectified, and averaged for one propulsion cycle. EMG data were normalized to the peak value observed during wheelchair race speed. Means and standard deviations were determined for wheelchair and handcycling at race and sprint speeds. **Results**: At race speed, muscle activity for biceps, triceps and deltoid was greater during handcycling than wheelchair, while pectoralis was greater during wheelchair than handcycling: 217±32% vs 73±16%; 167±42% vs 74±11%; 132±12% vs 71±18%; 145±36% vs 32±3%, respectively. At sprint speed, muscle activity for biceps, triceps and deltoid was greater during handcycling than wheelchair, while pectoralis was greater during wheelchair than handcycling: 206±58% vs 90±11%; 190±43% vs 81±19%; 148±26% vs 94±4%; 73±19% vs 33±7%, respectively. **Conclusion**: Measuring muscle activity gives insight to propulsion mechanisms during wheelchair and handcycling. An athlete may benefit by knowing which muscles are largely responsible for these modes of locomotion. From this case study, it was determined the athlete used his pectoralis major more during wheelchair propulsion, while the biceps, triceps and deltoid more during handcycling.

74. VALIDATION AND ACCURACY OF FITBIT CHARGE: A PILOT STUDY

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Introduction: Wearable activity monitors (e.g., Fitbit®) have become increasingly popular for both researchers and lay people alike. Recent studies have reported several Fitbit® models correlate with research grade monitors; however none to date have examined the Fitbit® Charge model. Furthermore, none have reported on the accuracy of Fitbit® devices. **Purpose:** The primary purpose of this study was to compare step counts assessed by Fitbit® Charge and a research grade accelerometer (i.e., Actigraph®). The secondary purpose of this study was to compare the Fitbit® Charge algorithms for physical activity intensity with an algorithm validated for research purposes. **Methods:** Participants (*n=8*) wore Fitbit® Charge and Actigraph® monitors for 7 days. First, correlations were run to examine the concordance of step counts and physical activity intensity levels derived from Fitbit® Charge and Actigraph® algorithms. Next, accuracy was investigated by paired sample t-tests comparing each device's assessment of step counts and minutes spent in light, moderate and vigorous intensity activity. **Results:** Significant correlations were found for all study outcomes (p's < .05). Significant differences were observed for step counts on all days and weekly total step count (p's < .05). Analyses of each intensity level revealed significant differences on most days for light and moderate intensity (p's <.05). For vigorous intensity, only day 6 (p = .007) and accumulated weekly total of minutes were different (p = .014). **Conclusions:** Our correlation results were similar to previous research examining validity of other Fitbit® models. However, Fitbit® Charge devices may overestimate step counts. Moreover, the algorithm used by Fitbit® may overestimate light and vigorous physical activity, while underestimating minutes in moderate physical activity. Further research is needed to determine reliability of Fitbit® Charge to assess activity and intensity that reflects current health recommendations. Therefore, researchers should use discretion if considering use of Fitbit® Charge for research purposes.

75. FOUR WEEKS OF MINIMALIST SHOE WALKING AND SPECIFIC FOOT STRENGTHENING EXERCISES IMPROVE INTRINSIC FOOT MUSCLE STRENGTH

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Purpose: Intrinsic foot musculature is necessary in order to maintain proper function of the medial longitudinal arch. Improper function of these muscles may lead to injuries that might be avoided through intrinsic foot muscle (IFM) strengthening. The purpose of this study was to assess the change in IFM strength in individuals walking in minimalist shoes compared to those performing an IFM strength training protocol. **Methods:** Twenty-eight subjects, average age of 22.6 years, were randomly assigned to either a minimalist shoe walking group (MSW) or to an exercise group. The MSW, 10 subjects, walked for four weeks in their minimalist shoes starting at 2,500 steps daily progressing to 5,000 steps daily as measured via pedometer. The exercise group, 18 subjects, followed a progressive IFM strength training protocol for four weeks. Strength testing was completed at baseline and post intervention by completing three trials of great toe flexion, lateral toes flexion, and arch doming on a customized dynamometer. Statistical analysis of the strength data was performed using a repeated measures ANOVA ($p<.05$). **Results:** There was a significant increase in IFM strength for great toe flexion, lateral toe flexion and doming in both groups ($p=0.010$). No strength differences were noted between MSW and IFM strength training groups at any time point ($p>0.375$). **Conclusion:** Over a 4 week period, walking in minimalist shoes strengthens intrinsic muscles used for great toe flexion, lateral toe flexion and doming. Likewise, our IFMS protocol increased muscle strength in all actions tested. Future research should investigate the correlation between improved IFMS and decreased injury risk of the lower extremity.

76. THE EFFECTS OF MUSIC ON INTENSE RESISTANCE TRAINING PERFORMANCE

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Background: Compared to endurance training, Resistance training (RT) elicits distinct physiological adaptations including muscle hypertrophy and enhanced bone mass in both healthy and diseased populations. The potential of music to accompany repetitive endurance tasks such as cycle ergometry, walking and running (Karageorghis et al., 2009; Simpson & Karageorghis, 2006) has been examined, yet no study has identified its effects during RT. Aim: The purpose of this study was to determine the effects of music on RT performance. Methods: Ten men (age = 23.3 ± 2.8 yr) familiar with resistance training completed acute sessions of RT under two different conditions: music and no music. In the first week, each subject's one-repetition maximum (1-RM) was assessed for the following multi-joint exercises: leg press, bench press, seated cable row, and seated barbell shoulder press. There was 90 s of rest between sets and 3 min between exercises. Subsequently, RT was completed for 3 sets of each exercise at 80% 1-RM, with music condition randomized across days. Rating of perceived exertion (RPE) was measured continuously during RT using a categorical scale. Results: There was a significant effect of music in bench press ($p = 0.001$), seated cable row ($p = 0.038$), and shoulder press($p = 0.047$). Post hoc analyses determined that repetitions performed for bench press set 1, seated cable row sets 1-3, and shoulder press set 2 were all significantly higher for music versus no music. There was no significant difference ($p > 0.05$) in leg press performance with music and no change in RPE ($p > 0.05$). Conclusion: Data indicate that listening to music during high intensity strength resistance training can increase performance during the latter stages of intense RT. However, there was no effect of music on RPE.

77. THE REPEATABILITY OF MAXIMUM VOLUNTARY CONTRACTION AND POTENTIATED TWITCH FOLLOWING A TIME TRIAL TO FATIGUE

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PURPOSE: The magnitude of central and peripheral fatigue is often measured using a maximum voluntary contraction (MVC) and potentiated twitch ($Q_{tw.pot}$). However, the repeatability of these tests has not been measured. The purpose of this study was to assess the repeatability of the MVC and $Q_{tw.pot}$ following a time trial to fatigue at two different intensities. METHODS: Fourteen non-cyclist college students (20.5±0.65yr, 48.3±7.45mL/kg/min) performed three time trials at 77 and three at 83% of VO_{2peak} to volitional exhaustion. Baseline MVC and $Q_{tw.pot}$ were taken immediately pre- and post-exercise. MVC and $Q_{tw.pot}$ were obtained beginning one minute after exercise and were recorded every 30 seconds for six measurements. RM ANOVA, ICC, and Bland-Altman plots were used to examine the repeatability of MVC and $Q_{tw.pot}$. RESULTS: MVC at 77% resulted in significant differences ($F=4.931$, $p<0.05$) though it was highly correlated ($R^2=.695$, $p<0.001$) and reliable (ICC=.575, $p<0.05$). MVC at 83% was not significantly different, nor was it well correlated ($R^2=.115$), though it was reliable (ICC=.622, $p<0.05$). $Q_{tw.pot}$ was significantly different at 77% ($F=51.2$, $p<0.001$) and was neither correlated ($R^2=0.125$) nor reliable (ICC=.499, $p=0.07$). $Q_{tw.pot}$ was not different at 83% nor was it correlated ($R^2=0.172$), though it was reliable (ICC=.659, $p<0.05$). The bland-altman plots showed differences in the mean between the trials for the $Q_{tw.pot}$ for both intensities though the agreement was high. DISCUSSION: From this study, exercise at higher intensities had lower variability in the MVC than exercise at lower intensities. There was also better agreement in the $Q_{tw.pot}$ measurement at higher intensities. This suggests that the repeatability of MVC and $Q_{tw.pot}$ may be influenced by exercise intensity and perhaps the variability in the exercise endpoint. However, the overall ICC of both the Qtw.pot and MVC is high, suggesting this is a reliable and useful measurement of peripheral fatigue.

78. CEREBRAL BLOOD HEMODYNAMICS SYMMETRY DURING EXERCISE

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A very tight cerebral blood flow hemodynamics is essential for brain function. At rest, there is a symmetry between the right and left middle cerebral artery (MCA) flow. Assymetry left/right is typically evaluated for clinical diagnosis of stroke or during surgery, thus a better understanding of the cerebral hemodynamics during stress is important. **Purpose**: To assess the CBF assymmetry during a metabolic stress. **Methods**: 8 college-aged sedentary subjects performed a light (LE) and moderate (ME) constant-load cycling exercises for 10 minutes. Middle cerebral artery (MCA) blood flow velocity (MCA V*mean*), peak and pulsatility index (PI) was continuously monitored for the left and right side. The proximal segment of the MCA was insonated with two 2-MHz Doppler probes placed on the temporal lobe and hold by a headset. Tracings of the envelope for all MCA hemodynamics parameters were obtained automatically using the Doppler software (Sonara, Carefusion). **Results**: MCA V*mean* was 48.8 vs. 51.8 at rest, 48.8 vs.43.9 for LE and 44.3 vs. 45.8 for ME (cm s^{-1}) for right and left side respectively. Peak was 78.7 vs. 77.6 at rest, 85.5 vs. 79.5 for LE and 84 vs.45.8 for ME (cm s^{-1}) for right and left side respectively. Finally, PI was 1.02 vs. 0.94 at rest, 1.43 vs. 1.17 for LE and 1.37 vs.1.74 for ME for right and left side respectively. A two-way anova analysis revealed no intensity effect but a side effect ($p=0.025$). **Conclusion**: For this pilot study, a change in cerebral blood flow symmetry seems to occur during exercise. This could help us better understand cerebral hemodynamics during stress, and have clinical implications.

79. EFFECTS OF POSTMEAL WALKING ON POSTPRANDIAL GLUCOSE CONTROL AND OXIDATIVE STRESS

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Postprandial hyperglycemia can increase levels of oxidative stress and is an independent risk factor for complications associated with type 2 diabetes. **Purpose**: To evaluate the acute effects of a 15-minute postmeal walk on glucose control and markers of oxidative stress following a high-carbohydrate meal. **Methods**: Ten obese subjects (55.0 ± 10.0 yrs) with impaired fasting glucose (107.1 ± 9.0 mg/dL) participated in this repeated measures trial. All subjects underwent three conditions: 1) Test meal with no walking or fiber (CONTROL), 2) Test meal with 10g fiber and no walking (FIBER), 3) Test meal with no fiber followed by a 15-min treadmill walk at preferred walking speed (WALK). Blood samples were taken over four hours. A repeated measures ANOVA was used to compare all outcome variables. **Results**: The 2hr and 4hr iAUC for glucose was lower in both FIBER (2hr: -93.59 mmol·120 min·L^{-1}, p= 0.006; 4hr: -92.59 mmol·240 min·L^{-1}; p= 0.041) and WALK (2hr: -77.21 mmol·120 min·L^{-1}, p= 0.002; 4hr: -102.94 mmol·240 min·L^{-1}; p= 0.005) conditions respectively, compared with CONTROL. There were no differences in 2hr or 4hr iAUC for glucose between FIBER and WALK (2hr: p= 0.493; 4hr: p= 0.783). The 2hr iAUC for insulin was significantly lower in both FIBER (-37.15 μU ·h/mL; p= 0.021) and WALK (-66.35 μU ·h/mL; p< 0.001) conditions, compared with CONTROL, and was significantly lower in the WALK (-29.2 μU ·h/mL; p= 0.049) condition, compared with FIBER. The 4hr iAUC for insulin in the WALK condition was significantly lower than both CONTROL (-104.51 μU ·h/mL; p= 0.001) and FIBER (-77.12 μU ·h/mL; p= 0.006) conditions. Markers of oxidative stress were not significantly different between conditions. **Conclusion**: A moderate 15-minute postmeal walk is an effective strategy to reduce postprandial hyperglycemia. However, it is unclear if this attenuation leads to improvements in postprandial oxidative stress.

80. MODERATE ALTITUDE ACCLIMATION HAS NO EFFECT ON RESPIRATORY EXCHANGE RATIO, OR PERCENT OF CHO AND FAT UTILIZED DURING A 1-MILE TRAIL RUN

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It is known that ascent to altitude increases reliance on carbohydrates and may affect respiratory exchange rate (R). It is unknown if these adaptations occur during exercise at moderate altitudes. The purpose of this study was to determine differences in R, carbohydrate (CHO) and fat utilization in acclimated and non-acclimated participants during a trail run at moderate altitude. Seventeen participants volunteered and were grouped based on location of residency: acclimated (AC, living at 5800ft, N=8) and non-acclimated (NA, living at 2181ft, N=9). The trail altitude was 5385 feet at onset with 56 feet rise in elevation, and environmental condition ranges included temperature: 79.2°-90.2° F, humidity: 4.5%-8.3%, and wind speed: 1.1-3.5 mph. All measures were obtained using a CosMed K4b2 portable metabolic system. Measurements were taken mid-run and 45 seconds prior to the end of the run. Data were analyzed using independent t-tests, with significance at the $p<0.05$ level. There were no differences between groups per variable: AC R mid run = 0.89±0.05, t_{15} = -.111, p = .913; NA R mid = 0.89±0.06; NA R end = 0.83±0.05, t_{15} = -.641, p = .531; AC R end = 0.81±0.03; AC Fat% mid = 36.9±16.3, t_{15} = -.083, p = .935, NA Fat% mid = 36.2±18.9; AC Fat% end =58.7±16.0, t_{15} = .512, p = .616, NA Fat% end = 62.3±12.5; AC CHO% mid =63.6±16.3, t_{15} = .242, p = .812, NA CHO% mid = 65.6±17.8; AC CHO% end = 41.8±15.7, t_{15} = -.512, p = .616, NA CHO% end = 38.2±12.5. Our results indicate that acclimation to moderate altitude has no influence on respiratory exchange rate, nor Fat or CHO utilization during a one-mile trail run. Exercise of longer duration may produce different results. Overall fitness level of the participant may also influence nutrient utilization.

81. THE EFFECTS OF EXERCISE OF PSYCHOSOCIAL WELL-BEING AMONG CANCER SURVIVORS IN THE LOS ANGELES COUNTY

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The cancer treatment experience can result in cancer survivors experiencing depression, poor motivation to be physically active, cancer-related fatigue, anxiety and fear. Engaging in physical activity may improve physical as well as psychosocial wellbeing. The purpose of this study is to assess the potential psychosocial and physical benefits of participating in a 9-month supervised combined aerobic and resistance training intervention (CART). The IMPAACT Study (Improving Physical Activity After Cancer Treatment) intervention comprised of CART offered in 1-hour sessions, 3 days per week. Prior to beginning the study, 33 cancer survivors completed the National Institute of Health's PROMIS survey which assesses five domains of psychosocial well-being: perceived level of fatigue, anxiety/fear, physical function, pain interference, and satisfaction with social roles. The survey as well as volunteered blood samples, were collected at baseline, midpoint, and post intervention. After nine months of CART, 19 participants completed the study. Findings included improvements in perceived levels of fatigue (72.7%), pain interference (40.9%), anxiety and fear (63.6%), physical function (54.6%), and social role satisfaction (72.7%). Results also show a decrease in cortisol levels (72.2%) suggesting a decrease in stress. These observations suggest that psychosocial and physical well-being improves as cancer survivors increasingly engage in exercise.

83. RAPID HUMAN MUSCLE FIBER DISSECTION METHODS: MECHANICAL ISOLATION VS ENZYME DIGESTION

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Introduction: Human single muscle fiber structure and function analysis provides researchers with vast information regarding muscle plasticity. Unfortunately, the traditional method of mechanically isolation with tweezers is labor and time intensive. Other isolation methods using enzyme digestion (such as collagenase) are effective in animal muscle tissue preparation. However, the application of collagenase for the purposes of isolating individual human muscle fibers lacks investigation. **Purpose:** Evaluate the capacity of collagenase digestion to serve as a viable, non-mechanical option for the separation of individuals skeletal muscle fibers. **Methods:** Tissue samples (~10-20 mg) from previous investigations were retrieved from the freezer where they were stored in "skinning solution" (with propionic acid). Separate samples were placed in ~5 ml of either 0.2% or 0.35% collagenase plus "relaxing solutions" and oscillated for a range of 30 min – 30 hr at either room temperature or 37°C. Sample quality was visually and/or microscopically inspected at various time points. **Results:** Incubation in 0.2% collagenase for 24 hours at room temperature successfully broke down tissue samples such that individual fibers could be retrieved in a fashion similar to the traditional, mechanical approach. Shorter time periods failed to sufficiently free single fibers from the larger bundle. The integrity and quality of the fibers was considerably compromised in as little as 1 hr when incubation at the physiological temperature of 37°C. **Conclusion:** Mechanical isolation of individual fibers requires high precision with tweezers and a microscope, requiring ~1 minute of microscope time per fiber. The method described here allows collection of several hundred individual fibers in <10 minutes of microscope time. Thus, enzyme digestion via collagenase incubation appears viable as a time and resource saving technique when isolating human muscle fibers from a biopsy sample. Further analysis is needed to verify the compatibility of collagenase digestion isolation with subsequent analysis techniques.

82. CHARACTERIZATION OF SURFING HEART RATE AND ACTIVITY ACROSS AGE GROUPS

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Background: The popularity of surfing has increased over the past several decades to encompass all age groups. The activity profile and heart rate (HR) responses to surfing have previously been characterized in younger but not older surfers. **Purpose:** The purpose of this study was to investigate the impact of aging on the activity profiles and HR responses during surfing. **Methods:** A total of 160 male recreational surfers (18-75 years) were observed during a single surf session. Surf session duration and average HR were measured using HR monitors (Polar FT1 and RCX5). Additionally, a more detailed analysis of HR was performed in a subset of subjects (n=79) in conjunction with evaluation of activity in the water, which was recorded using a video camera (Canon HD). HR responses from the RCX5 HR monitor and activity data from the video camera were synchronized and assessed in 5-second intervals during data analysis. One-way Analysis of Variance (ANOVA) was used to determine differences between age groups for surf duration time. Pearson's correlation coefficient (r) determined relationships between two variables. Significance was set at an α=0.01 due to the large number of correlations tested. **Results:** There were no significant differences between age groups for total time spent in a single surf session (18-29: 66.7±27.0, 30-39: 67.2±29.7, 40-49: 61.9±27.3, 50-59: 66.0±28.0, 60-69: 71.0±33.2min). Similarly, percent time spent in the different surfing activities was not correlated with age (paddling: r=-0.205 p=0.07, stationary: r=0.21 p=0.064, wave riding: r=-0.263 p=0.019, miscellaneous r=0.015 p=0.898). Average HR was increased in older subjects (r=0.389 p<0.001), with significant increases occurring during paddling (r=0.392 p<0.001) and stationary stages (r=0.392 p<0.001). **Conclusion:** The results from the current investigation suggest that aging has little impact on the time spent in the various surfing activities, but does significantly increase HR responses during paddling and stationary stages of surfing.

84. COMPARISON OF HEX BAR DEADLIFT VS. BACK SQUAT POSTACTIVATION POTENTIATION ON VERTICAL JUMP

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INTRODUCTION: A unique form of power training is to try and invoke a postactivation potentiation (PAP) response which has been extensively researched in regards to a heavy resistance stimulus. PAP is based on the premise of performing a heavy resistance exercise followed by a power exercise, resulting in increased power performance. Back squats (BS) are normally used, but a less researched tool is the hex bar deadlift. **PURPOSE:** To compare the potentiating effects of a back squat vs. hex bar deadlift on vertical jump performance. **METHODS:** Ten resistance-trained men (age=23.36±3.80 years, ht=175.50±4.22 cm, mass=79.53±5.28 kg) volunteered to participate and performed 3 pre countermovement jumps (CMJ) then 3 repetitions of back squat or hex bar deadlift (HBDL) at 85% 1RM. To perform the CMJ, subjects jumped with arm swing on a force plate. The back squat was performed with a standard barbell in a power rack. Participants wore the safety squat device which insured they achieved the parallel position. For HBDL, participants used the low handles but were not allowed to use straps. Following the BS or HBDL and 8 minutes rest, subjects performed 3 post CMJ. A control condition consisted of 3 pre CMJ, 8 minutes standing rest, then 3 post CMJ. **RESULTS:** Repeated measures ANOVA revealed no interaction or main effects of condition or time; (Control pre 62.17±8.42cm vs. post 62.30±7.64cm; BS pre 62.36±9.12cm vs. post 62.49±8.23cm); HBDL pre 61.91±6.96cm vs. post 61.47±7.24cm). **CONCLUSIONS:** Manipulation of critical variables determines PAP outcomes. PAP response is also highly individualized and training experience of the subjects may have been too low to demonstrate increased performance. In addition, rest, volume, or intensity may have also affected power performance.

85. ACUTE EFFECTS OF STATIC VS. BALLISTIC STRETCHING ON LEG FATIGUE BETWEEN BALLET DANCERS AND RESISTANCE TRAINED WOMEN

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Stretching is used flexibility in ballet dancers, usually before their performances and rehearsals. However, resistance trained women are usually more focused on increasing their strength. **PURPOSE**: To compare the acute effects of static vs. ballistic stretching on leg fatigue between ballet dancers and resistance trained women. **METHODS**: Subjects performed 3 days of testing. The first day was control (no stretching) and the other two days were static or ballistic stretching in a counterbalanced order. There were fifteen resistance trained women (age 23.8 ± 1.80 yrs, mass 67.47 ± 7.77 kg, ht 168.30 ± 5.53 cm) and eight ballet dancer women (age 22.5 ± 2.77, mass 58.53 ± 4.11, ht 168.87 ± 8.08 cm). First they performed a dynamic warm up, then did 6 different stretching exercises, 3 for quadriceps and 3 for hamstrings in a counterbalanced order. Each stretching exercise consisted of 3 sets of 30 second holds and 15 seconds of rest. After stretching they performed 50 maximal knee extension repetitions at 180° on a Biodex isokinetic dynamometer. To assess leg fatigue percentage the mean of the first 3 repetitions were compared with the mean of the last 3 repetitions. **RESULTS**: Ballet dancers were significantly more fatigable in control (72.47 ± 5.10%) compared to the ballistic condition (65.70 ± 8.76%) but no differences between static (64.02 ± 11.65%). Resistance trained demonstrated no differences between control (63.06 ± 7.49%), static (65.03 ± 5.33%) and ballistic (63.84 ± 6.56%). **CONCLUSIONS**: These findings suggest that stretching may not affect leg fatigue in resistance trained women, but ballistic stretching can increase fatigue resistance in ballet dancers. This may be because ballet dancers stretch as a chronic part of their routine.

86. EFFECT OF MUSCLE COOLING ON AMPK AND INFLAMMATORY PROTEINS IN SKELETAL MUSCLE

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AMP-activated protein kinase (AMPK) regulates many intracellular signaling responses including the inflammation-related NF-κB and STAT3 pathways. Recent research suggests that cold water immersion of the leg activates AMPK in skeletal muscle. It isn't known whether cold directly activates AMPK in skeletal muscle or if the aforementioned results are due to systemic or hormonal responses. Furthermore, the direct effect of cooling on inflammation-related signaling in skeletal muscle has not been established. Therefore, the purpose of this study was to determine the effect of in vitro cooling on skeletal muscle AMPK, STAT3 and NF-κB phosphorylation. To test this skeletal muscle (n=10/group) was 1) incubated for 30 minutes at 37C and then 15 additional minuets at 37C (CONTROL), or 2) incubated for 30 min at 37C and then 15 more at 27C (COLD). 27°C was chosen as the COLD temperature because this is the approximate minimum temperature of human skeletal muscle during cryotherapy. Muscle samples were western blotted for phosphorylated AMPK, STAT3 and NF-κB. COLD had no effect on AMPK or STAT3 phosphorylation, but significantly increased NF-κB phosphorylation. Thus, our results suggest that COLD does not directly affect AMPK phosphorylation, but may promote inflammatory signaling via NF-κB activation.

87. DIFFERENCES IN COLLEGIATE FEMALE ATHLETES ON BALANCE AND STABILITY MEASURES

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Balance and Stability are essential components that are required for the execution of movement in sports. Athletes in basketball, soccer, volleyball, and softball use balance and stability to promote optimal performance in their respective sport. **Purpose**: The purpose of this study was to determine the differences in collegiate trained female basketball, soccer, volleyball, and softball players on balance measures. **Methods**: Eighty-nine Division II collegiate trained female basketball, soccer, volleyball, and softball players volunteered to participate in one familiarization session, followed immediately by a testing session. During the session, participants performed the Balance Error Scoring System (BESS) test once as a familiarization. The five conditions for the BESS test were the double leg stance, tandem right leg stance, tandem left leg stance, single right leg stance, and single left leg stance, with the participant's eyes closed for the duration of each condition. Each condition consisted of one, 10s trial with a 10s rest between each condition until completion of task. Following a familiarization, participants performed the BESS test on the Biodex Balance System SD to obtain sway index measures for each of the 5 conditions. A one-way analysis of variance was used to analyze differences between basketball, soccer, volleyball, and softball players in each condition. **Results**: There was a significant ($p<0.05$) difference between groups for the single right leg (SRL) condition, demonstrating that collegiate trained female basketball players had a decreased level of balance in comparison to the other groups. There were no significant ($p>0.05$) differences between groups for all other conditions. **Conclusions:** These results indicate that female collegiate basketball players had a significantly lower level of balance during the SRL condition compared to other female collegiate players. These results may be attributed to the demands that each sport requires of its athletes and the specific training that accompanies each sport.

88. DIFFERENCES IN RATE OF FORCE DEVELOPMENT WHEN GRIPPING A HEXAGONAL BARBELL WITH LOW VS. HIGH HANDLES

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The hexagonal (hex) barbell is a commonly used implement for strength and power development. However, little is known of performance differences between the two sets of handles on the bar. **PURPOSE:** The purpose of this study was to compare isometric performance differences between low-handles (LH) and high-handles (HH) on a hex bar. **METHODS:** Twenty resistance trained men (age=24.05±2.09 years, ht=178.07±7.05 cm, mass=91.42±14.44 kg) volunteered to participate. Participants performed isometric mid-thigh pulls with a hex bar, using both LH and HH. To perform the pulls, a power rack was positioned over a force plate and a hex bar was fixed in the rack at mid-thigh position. For LH condition, a knee angle of 135 degrees was ensured by use of a goniometer. Knee angle was not controlled for HH, and the bar was fixed in the rack at the same height as for LH. Participants were provided with lifting straps, and were instructed to pull on the bar as hard and fast as possible. Rate of force development (RFD) was recorded every 50ms to 250ms. **RESULTS:** Analysis of variance revealed that RFD at 50ms was greater in HH (9126.26±5774.18Ns) than LH (6698.62±2997.87Ns). There were no significant differences between LH and HH at 100 ms (LH=7034.26±2687.92Ns; HH=7978.16±3371.69Ns), 150ms (LH=6859.47±2509.44Ns; HH=7119.18±2673.70Ns), 200ms (LH=7123.73±2256.14Ns; HH=7095.08±2137.48Ns), or 250ms (LH=6654.27±1686.91Ns; HH=6503.91±1513.99Ns). **CONCLUSIONS:** Based on these results, a greater instantaneous RFD can be achieved via hex bar high-handles. This may be due to a more advantageous biomechanical position, as the high-handles allow for a more upright posture.

89. BRADYKINESIA IN PARKINSON'S DISEASE AS DEMONSTRATED WITH REDUCTIONS IN THE RATE OF FORCE DEVELOPMENT-SCALING FACTOR AND FUNCTION

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Speed of movement is a functional quality that declines with age and is further impaired in people with Parkinson's disease (PD). We compared neuromuscular and physical function between older adults and people with PD. The rate of force development-scaling factor (RFD-SF) is an index of an individual's relative quickness across a range of small to large isometric muscular contractions performed as quickly as possible. RFD-SF is the slope of the linear regression of the peak RFD from each contraction against the corresponding peak force. The resulting R^2 provides an index of task proficiency. Measures of physical function include the timed up and go (TUG) which assesses leg strength, walking speed, and balance; the nine hole peg test (9HPT) which measures hand dexterity; and grip strength. Participants were 12 people with PD (age: mean(sd) = 72(7)) and 12 age-matched controls (age = 71(6)). An independent samples t-test revealed significant differences between the groups such that RFD-SF ($t_{(16.1)}$=-5.51), p<.001), TUG ($t_{(13.5)}$=2.4, p=.032), and 9HPT ($t_{(12.3)}$=2.9, p=.013) were less in people with PD. There were no differences in age or grip strength between the groups (p>.05). R^2 was on the cusp of being significantly higher in the healthy controls ($t_{(22)}$=-2.1, p=.05). These results indicate the need for interventions that include exercises aimed at improving neuromuscular quickness and physical function in people with PD.

90. COLLEGE PHYSICAL EDUACTION COURSES NOT HELPING STUDENTS

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INTRODUCTION: Most college/university students graduate engaging in less than the recommended physical activity levels, and stay below physical activity guidelines throughout adulthood. Physical education/activity classes (PE) are one of the last institutionalized opportunities to improve this behavior. The purpose of this study was to investigate if different activity courses engendered different fitness or exercise motivation outcomes. **METHODS**: 155 male and 122 female students, enrolled in PE classes at Wake Technical Community College, consented to participate. On day one of PE, students were assessed on body fat percentage (BF%), beep test performance, push ups, plank, sit and reach, and the Behavioral Regulations of Exercise Questionnaire-2. On the last day of the semester, students were reassessed. Student improvement and differences between activities were analyzed with repeated measures ANOVAs. **RESULTS**: On average, all classes improved on BF% (p=0.004), beep test (p<0.001), push ups (p<0.001), plank (p<0.001), and sit and reach (p<0.001). While there was a significant difference between activities on plank (p=0.006), there was not a significant difference for change over time (p=0.866). Overall exercise motivation did not change, and on the subscales, only identified regulation changed, slightly improving (p=0.005). There was also a significant main effect for activity on intrinsic regulation (p=0.015), with post-hoc tests revealing that students in walk-jog-run were less intrinsically motivated than aerobics students (p=0.015). **DISCUSSION**: While students significantly improved all fitness outcomes, only the muscular endurance changes were meaningful. There was a significant improvement in students' motivation to exercise in order to meet personal or health related goals, however this change may not be clinically meaningful either. Overall, there were no significant or meaningful changes in exercise motivation. **CONCLUSION**: While in the short term, these PE classes increased physical fitness, they are not preparing the students to leave college with a lifelong commitment to physical activity.

91. A COMPARISON OF STROKE LENGTH DURING SURFBOARD PADDLING ON A MODIFIED SWIM ERGOMETER VS. SWIM FLUME IN RECREATIONAL SURFERS

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Surfers spend a majority of their time in the water paddling while lying prone on a board, yet little is known regarding the biomechanical properties of this motion. Researchers have used a modified swim ergometer to study this motion in the laboratory, but recent evidence suggests that this device may not be a good surrogate for the study of paddling in water. PURPOSE: The purpose of this study was to compare self-selected stroke lengths obtained while paddling on an ergometer with those obtained while paddling in a swim flume at a comparable workload. METHODS: Nineteen recreational surfers, with mean age (27.26 ± 10.42 years), height (1.76 ± 0.06 m) and weight (68.42 ± 12.52 kg) volunteered to participate. Subjects performed two, one-minute paddling sessions at predetermined speeds of 2:20 and 1:50 (min:sec/100 meters) on both the modified swim ergometer and in the swim flume. The subjects were recorded using GoPro Hero4 cameras, and stroke lengths were determined offline through manual digitization of two-dimensional video. RESULTS: Stroke lengths in the flume were significantly longer than stroke lengths on the ergometer during both the slow speed (1.270 ± 0.081 m vs 0.957 ± 0.112 m , p<0.001) and fast speed (1.272 ± 0.106 m vs 1.029 ± 0.099 m, p<0.001) conditions. Overall, stroke lengths were consistently longer in the swim flume for all subjects regardless of age, gender, surf experience, or preferred board type. DISCUSSION: These data provide additional support for the idea that a modified swim ergometer is biomechanically different from paddling in water. Future biomechanical investigation of the paddling motion should occur in a water medium.

92. ACUTE EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON PEAK TORQUE AND MUSCLE IMBALANCE

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INTRODUCTION: The concept of strength imbalance between the agonist and antagonist muscles, more specifically the hamstring-to-quadriceps peak torque (PT) ratio, has been associated with injury risk. Stretching has been demonstrated to decrease PT; however, little is known regarding the effects of proprioceptive neuromuscular facilitation (PNF) stretching on PT and the hamstring-to-quadriceps (H:Q) ratios. **PURPOSE:** To examine the effects of PNF stretching on leg extension and flexion peak torque and the conventional and functional H:Q ratios. **METHODS:** Seventeen participants (mean ± SD; age = 22.1 ± 1.4 yrs; body mass = 70.3 ± 12.9 kg; height = 169.4 ± 10.9 cm) performed three maximal voluntary unilateral concentric leg extension and flexion, as well as maximal eccentric leg flexion muscle actions at randomly ordered velocities (60, 180, and 300°·s^{-1} concentric; 60°and 180°·s^{-1} eccentric) before and after a bout of PNF stretching or a control condition. The PNF stretching protocol consisted of four assisted 6-second isometric hamstring contractions (~60% maximal effort) followed by a static stretch of the hamstrings muscles for 30-second hold durations and 30-second rest intervals between repetitions. For the control protocol, participants sat quietly for six minutes. Five separate four-way mixed-factorial ANOVAs were performed to analyze the PT and H:Q ratio data. **RESULTS:** After collapsing across condition and gender, paired samples t-tests revealed significant 2.6-10.1% decreases post-testing for leg extension at 60°·s^{-1} ($p < 0.05$). No significant stretching-related changes were found for PT or H:Q ratios ($p > 0.05$). **CONCLUSION:** The results indicated that neither the current stretching protocol or a control condition affected hamstring and quadriceps peak torque or the H:Q ratios, with the exception of leg extension at the 60°·s^{-1}. These findings suggest PNF stretching of the hamstrings may not adversely affect the H:Q ratios, and consequently not negatively affect injury risks associated with muscular strength imbalances.

93. USING WEARABLE TECHNOLOGY TO EXAMINE RELATIONSHIPS BETWEEN STRIDE LENGTH, FREQUENCY, AND VELOCITY WHILE RUNNING ON A TREADMILL AND OVERGROUND.

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Mathematically, running velocity is calculated as the product of stride length (SL) and stride frequency (SF), with their relationship well documented. With the increase in availability and accuracy of wearable technology, it is possible to measure parameters such as SL, SF, and velocity while running outdoors as well as on a treadmill. However, there are no data directly comparing the relationship between these parameters during treadmill running (indoors) and overground running (outdoors). **Purpose** To compare the relationship between SL, SF, and velocity using wearable Global Positioning System (GPS) technology while running at different velocities on the treadmill and overground. **Methods** Subjects (n=10 ; 22.3±2.6yrs; 1.71±.08m; 71.4±15.5kg) completed a total of 14 runs (7 treadmill, 7 overground) with each run at different velocities. SL, SF, and velocity data were recorded using a GPS watch and footpod (Garmin, Fenix2). Running velocity ranges were established during outdoor runs (approximately 1 minute), with treadmill run velocities attempting to match the range of outdoor velocities. Raw data were exported to excel via a combination of proprietary software (Garmin Connect) and custom software to convert raw data format to excel format. SL vs. velocity and SF vs. velocity plots were generated for treadmill and overground data sets and fit with a 2nd order polynomial. **Results** The SL vs. velocity relationship during treadmill running was described as SL=-0.046v^2 +0.86v+0.01 (where 'v' represents velocity) (R^2=0.94) and during overground running SL=-0.11v^2+1.04v-0.18 (R^2=0.95). The SF vs. velocity relationship during treadmill running was SF=0.38v^2+3.18v+69.8 (R^2=0.38) and during overground running SF=3.03v^2–5.7v+81.4 (R^2=0.68). **Conclusion** The larger coefficient for the v^2 component for both SF vs. velocity and SL vs. velocity for overground running is an indication that the relationships between these parameters are influenced by whether subjects were running overground or on a treadmill.

94. THE EFFECT OF EXTREME CUSHIONING SHOES ON RUNNING ECONOMY AT DIFFERENT SPEEDS AND INCLINES

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Running economy is defined as the oxygen cost for running at a given submaximal speed. Several factors related to shoe design can affect running economy such as shoe mass and cushioning. While shoe mass has been shown to increase the metabolic cost of running, the effect of shoe cushioning on running economy is less clear. **Purpose:** To determine the effect of wearing extreme cushioning shoes on running economy at different speeds and inclines. **Methods:** Subjects (n=10, age 28.7±6.4 yr, weight: 67.8±10.4 kg, height: 1.72±0.09 m) were fitted with a pair of neutral running shoes (Addidas Prene) and a pair of extreme cushioning shoes (Hoka Bondi 4). Each subject completed two days of testing. Day 1: Subjects ran on a treadmill at three speeds (preferred speed (PS), PS+1 mph, PS-1 mph) in each shoe condition (6 total conditions). Day 2: Subjects ran on a treadmill at two different inclines (0%, 6%) in each shoe condition (4 total conditions). For all conditions, subjects ran for 8-10 minutes while rate of oxygen consumption (VO_2) was recorded (Moxus). Average VO_2 during each condition was calculated and compared Day 1 using a 2 (shoe) x 3 (speed) and Day 2 using a 2 (shoe) x 2 (incline) repeated measures ANOVA (α=0.05). **Results:** VO_2 was not influenced by the interaction of speed and shoe (p=0.496). VO_2 was different between speeds (p<0.001) but not between shoes (p=0.191). VO_2 was not influenced by the interaction of incline and shoe (p=0.054). VO_2 was greater for incline (p=0.017) but not different between shoes (p=0.059). **Conclusion:** It seems that the cushioning of the shoe (extreme vs. regular) play no role in the influence of running economy.

95. THE EFFECT OF COOPERATIVE AND COMPETITIVE SOCIAL EXERGAMING ON ENERGY EXPENDITURE AND EXERCISE INTENSITY

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Introduction: Exergaming is a way for people to mix video gaming with physical activity. Exergaming may help at-risk populations such as children, obese, and sedentary to convert inactive time to active time. In cooperative social exergaming, multiple players work together to achieve a common goal, while in competitive social exergaming players compete against one another. The aim of this project was to determine whether players in solo, competitive, or cooperative exergaming will play with greater intensity and expend more energy. **Materials/Methods**: Eleven male and female (6 females and 5 males) adult (ages 18-25) volunteers completed four trials of two types of exergaming: cooperative or competitive. Playing Kinect Adventures (KA), subjects completed one trial of solo play and another trial in cooperative. Playing Motion Sports Adrenaline Rush (MSA), subjects completed one trial of solo play and another trial in competitive mode. Energy expenditure (Joules - J) and exercise intensity (MET) were measured during play using SenseWear accelerometers (BodyMedia). **Results**: The KA solo trial energy expenditure was 604 J, and exercise intensity was 4.12 MET. The KA cooperative trial energy expenditure was 558 J, and exercise intensity was 3.80 MET. The MSA solo trial energy expenditure was 620 J, and exercise intensity was 4.24 MET. The MSA competitive trial energy expenditure was 633 J (p=.102 compared to MSA solo), and exercise intensity was 4.48 MET (p=.0629 compared to MSA solo). **Conclusion**: Exergaming cooperatively did not result in higher exercise intensity or energy expenditure than playing alone. A trend supported both by energy expenditure and exercise intensity indicates that playing exergames competitively may result in greater work done by players than during solo play. This potential for competitive exergaming to stimulate more physical activity and healthy adaptations to exercise may make competitive social play a better way to improve health through exergaming.

96. EFFECT OF TWO DIFFERENT ISOKINETIC TRAINING PROTOCOLS ON CONCENTRIC HAMSTRING-TO-QUADRICEPS RATIOS

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Hamstrings-to-quadriceps (H:Q) strength ratios are often assessed by isokinetic dynamometers in order to determine knee muscle balance. However, little is known about the effect of different strength training protocols on H:Q ratios. PURPOSE: To compare 2 different training protocols on concentric H:Q ratio. METHODS: Eleven untrained subjects (age 23.18 ± 2.18 yrs, mass 68.54 ± 10.44 kg, ht 172.93 ± 5.66 cm) performed 6 weeks of strength training of their dominant knee flexors and extensors on a Biodex isokinetic dynamometer. They were randomly divided into 3 training groups; concentric quadriceps and hamstrings (CON/CON), concentric quadriceps and eccentric hamstrings (CON/ECC), and no training (CNTRL). Training began with 10 maximal repetitions at 210˚/s concentrically and 60˚/s eccentrically. Intensity of training was increased every week by increasing the angular velocity for concentric and decreasing it for eccentric in 30˚/s increments. Volume of training was increased by adding 1 set each week. All training sessions were separated by at least 48 hours. Concentric hamstrings and quadriceps strength were tested 72h before and after training on the same machine, and concentric H:Q ratios were calculated. RESULTS: A 2x3 (time x group) ANOVA showed no interaction, but there was a main effect for time; CON/CON pre = 76.61 ± 9.46%, post = 65.69 ± 9.0%; CON/ECC pre = 74.38 ± 10.10%, post = 55.79 ± 9.89%; CNTRL pre = 62.23 ± 16.35%, post = 66.08 ± 12.62%; Total group average pre = 70.57 ± 13.16%, post 62.23 ± 10.93%. CONCLUSIONS: The decrease in H:Q ratio may be related to training resulting in a significant increase in quadriceps strength with maintenance of hamstring strength.

97. THE EFFECTS OF MaxxTOR® UTILIZED IN CONJUNCTION WITH RESISTANCE TRAINING ON FITNESS LEVELS AND CARDIOVASCULAR RISK FACTORS IN WOMEN

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Aim: This study was a double-blind placebo controlled study investigating the effects of a compound containing phosphatidic acid (PA) in enhancing resistance-training induced changes in body composition, strength, and other sports performance markers. PA is a lipid messenger that has been shown to increase muscle protein synthesis via stimulation of mTOR signaling. MaxxTOR® is a supplement that contains 750 mg of Phosphatidic Acid (PA) from Chemi Nutra as the main active ingredient but also contains other synergistic ingredients including L-Leucine, Beta-Hydroxy-Beta-Methylbuterate (HMB), and Vitamin D-3 to deliver mTOR signaling activation; it is a supplement manufactured by Max Muscle Sports Nutrition. Methods: Sixteen healthy females initially volunteered to participate in the study, but only fourteen completed it. All subjects reviewed, completed, and signed an informed consent form approved by the Institutional Review Committee. All subjects that completed the study underwent pre and post exercise testing for 1-RM leg press, 1-RM bench press, body composition/thigh muscle mass via Dual Energy X-ray Absorpiometry (DXA), push-ups to failure, Wingate test, max vertical jump, agility, blood pressure, total cholesterol, and triglycerides. Ten subjects were randomly placed in the MaxxTOR group and 4 subjects were randomly placed in the placebo group (the two female subjects that dropped out of the study were part of the placebo group). All subjects were provided with a customized iso-caloric diet (based on the Harris-Benedict equation) prescribed by a registered dietician consisting of 50% carbohydrates, 25% protein, and 25% fat and underwent the same supervised periodized workout regimen. Participants were instructed not to perform any additional resistance training outside of the study nor take any other nutritional supplements throughout the study with the exception of 24 grams of a collagen based protein powder provided for all participants to consume immediately after training. The MaxxTOR group received the active ingredient for 8 weeks and the placebo group received an identical looking supplement with no active ingredients for the same 8 week period Results: The results of this study indicated that MaxxTOR significantly increases 1-RM leg press strength, 1-RM bench press strength, total strength (leg press 1RM plus bench press 1-RM), and lean body mass. No significant changes were noted in vertical jump, Wingate power test, maximum push-ups, estimated thigh muscle mass, fat mass, systolic blood pressure, diastolic blood pressure, total cholesterol, and triglycerides. Conclusion: These results suggest MaxxTOR can help improve upper body and lower body strength as well as an increase lean body mass compared to a placebo over an 8-week intervention without significantly affecting blood pressure, total cholesterol, triglycerides, or any sports performance markers.

99. DIFFERENCES IN DYNAMIC STRENGTH INDEX BETWEEN AN ISOMETRIC MID-THIGH PULL AND ISOMETRIC DEADLIFT

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INTRODUCTION: The dynamic strength index (DSI) is the ratio of the force produced by an explosive movement and force produced by a strength movement. It is a tool that can be used to determine if explosiveness or strength needs improvement. **PURPOSE:** To compare the DSI of an isometric mid-thigh pull (IMTP) to an isometric deadlift (IDL). **METHODS:** Twenty resistance-trained men (age=24.05±2.09 years, ht=178.07±7.05 cm, mass=91.42±14.44 kg) volunteered to participate. Participants performed a countermovement jump (CMJ), IMTP and IDL. To perform the CMJ, subjects jumped with arm swing on a force plate. To perform the pulls, a power rack was positioned over a force plate and an Olympic bar was fixed in the rack at the mid-thigh position for the IMTP and at plate height from the floor for the IDL. For IMTP, a knee angle of 135 degrees was ensured by use of a goniometer. Knee angle was not controlled for IDL. Participants were provided with lifting straps, and were instructed to pull on the bar as hard and fast as possible. Peak ground reaction force (PGRF) was recorded for all three tests to calculate DSI. **RESULTS:** Repeated measures ANOVA revealed that DSI for IDL (0.98±0.10) was significantly ($P<0.05$) greater than IMTP (0.76±0.12). **CONCLUSIONS:** Based on these results, PGRF for the CMJ and the IDL displayed similar values, resulting in a DSI score close to 1 while a greater PGRF was achieved via IMTP, resulting in a lower DSI score. This may be due to a more advantageous biomechanical position in the IMTP, allowing for more force generation. DSI is affected by isometric pull position and should be noted when making evaluations of athletes' needs relative to explosive vs. strength training.

98. IMPACT OF AGING ON RECREATIONAL SURFERS VO_{2PEAK} DURING SIMULATED PADDLING

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Background: There is a growing body of literature characterizing peak oxygen consumption (VO_{2peak}) of young surfers during simulated paddling. Conversely, no data on VO_{2peak} during simulated paddling has been collected in surfers over the age of 30. This paucity of data is surprising given the increasing participation rates of older adults in the sport of surfing. **Purpose:** The purpose of this study was to characterize VO_{2peak} during simulated paddling in recreational surfers between the ages of 18 to 69. **Methods:** Sixty-eight male recreational surfers participated in this study. Subjects performed a maximal graded exercise test on a surfboard attached to a swim bench ergometer (Vasa). Power output began at 20 watts and increased by 10 watts every minute. Oxygen consumption and heart rate were measured continuously using an integrated metabolic measuring system (ParvoMedics TrueOne 2400) and heart rate monitor (Polar RCX5), respectively. **Results:** Average VO_{2peak} during simulated paddling for subjects from the second, third, fourth, fifth, and sixth decades of age were 31.9±7.1, 26.1±5.3, 28.5±5.7, 24.9±5.1, and 20.9±2.9 ml/kg/min, respectively. Aging resulted in a significant reduction in VO_{2peak} ($r=-0.455$, $p<0.001$) that may, in part, be attributed to a significant reduction in maximal heart rate with age ($r=-0.407$, $p<0.001$). **Conclusion:** VO_{2peak} during simulated paddling on a swim bench ergometer was significantly lower in older adults. Paddling, an upper body exercise, shows similar age-related decline in VO_{2peak} as that of lower and whole body exercise.

100. BODY MASS INDEX HAS NO EFFECT ON THE POST EXERCISE HYPOTENSION RESPONSE FOLLOWING A TRAIL RUN

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It is well known that body mass index (BMI) has an influence on resting blood pressure. Additionally, post exercise hypotension (PEH) occurs following an exercise bout such that systolic blood pressure (SBP) is depressed in the period after a bout. It is unknown whether PEH is affected by BMI. The purpose of this study was to determine the influence of BMI on the PEH response following a trail run. Twenty-seven participants volunteered and were grouped based on BMI: Low (N=8, ht=170±11 cm, wt=57±9 kg, BMI=20±1), Average (N=10, ht=174±13 cm, wt=70±12 kgm BMI=23±1), and High (N=9, ht=172±12 cm, wt=82±12 kg, BMI=28±3). Participants provided resting SBP measurement, ran one mile on a trail at a self-selected pace, and measures were obtained immediately after, 20-min post, 40-min post, and 60-min post exercise. All SBP measurements were obtained using automated cuffs. The trail altitude was 5385 feet at onset with 56 feet rise in elevation, and environmental condition ranges included temperature: 79.2°-90.2° F, humidity: 4.5%-8.3%, and wind speed: 1.1-3.5 mph. Data were analyzed using a 3(group) x 5(time) ANOVA with repeated measures on time, and significance at the $p<0.05$ level. The time x group interaction was not significant ($p=0.85$). There were no differences for group ($p=0.52$): Low BMI pre=119±9, post=146±18, 20-min post=118±12, 40-min post=113±5, 60-min post=112±11 mm/Hg; Average BMI pre=125±19, post=155±17, 20-min post=120±15, 40-min post=118±15, 60-min post=118±18 mm/Hg; High BMI pre=125±15, post=149±17, 20-min post=116±7, 40-min post=119±17, 60-min post=118±13 mm/Hg. There was a main effect for time ($p=0.001$), with immediate post exercise measures significantly greater than all other times. Our results indicate that BMI has no influence on the PEH response following a one-mile trail run. With regard to the post-exercise response to systolic blood pressure, it is likely that other factors such as intensity and fitness have a greater influence compared to body weight.

101. MINIMALIST SHOE WALKING AND FOOT STRENGTHENING EXERCISES RESULT IN INCREASED INTRINSIC FOOT MUSCLE STRENGTH OVER 8 WEEKS

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The medial longitudinal arch has been classified as the central core of the foot structure and integrity during running gait largely depend on the strength and function of intrinsic and extrinsic foot muscles. **Purpose**: To observe changes in intrinsic foot muscle strength during doming, great toe flexion and lateral toe flexion between a group of individuals performing progressive foot strengthening exercises (FSE) and a group walking in minimalist shoes (MSW). **Methods**: Twenty-eight healthy college-aged subjects were recruited and randomly assigned to either the FSE or MSW groups and monitored over 8 weeks. The FSE group followed a series of exercises designed to target intrinsic foot muscles, while the MSW group began walking 2,500 steps daily and reaching 7,500 steps daily by the end of the study. Strength testing was completed using a customized dynamometer for each action and acquired during three time points throughout the study; pre (week 0), mid (week 4) and post (week 8). A repeated measures ANCOVA (week 0 strength) was used to obtain statistical analysis of the strength data. **Results**: Significant increases in intrinsic muscle strength were observed in both the FSE and MSW groups for doming ($p<0.000$), great toe flexion ($p<0.000$) and lateral toe flexion ($p<0.047$) over 8 weeks. No strength differences were noted between the FSE and MSW groups at any point of the study (doming, $p<0.876$; great toe flexion, $p<0.158$; lateral toe flexion $p<0.937$). In addition, there was no significant strength gain in doming ($p<0.524$) and lateral toe flexion ($p<0.361$) from weeks 4 to 8. **Discussion**: Increasing intrinsic foot muscle strength can be done by either following an exercise protocol or walking in minimalist shoes. These data suggest that individuals wishing to develop increased intrinsic foot strength can expect significant increases within the first 4 weeks of intervention.

102. THE EFFECTS OF VIBRATORY STIMULI ON QUADRICEPS PEAK TORQUE, RATE OF TORQUE DEVELOPMENT, AND ELECTROMYGRAPHY

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Introduction: Vibratory stimuli may improve neuromuscular function in individuals with knee pathologies who experience quadriceps dysfunction. Whole body (WBV) and local muscle vibration (LMV) both improve quadriceps function, but WBV is cost-prohibitive, and LMV may provide a cost-effective alternative. However, few investigations have compared the effects of WBV and LMV. **Purpose**: To compare the effects of WBV and LMV on quadriceps peak torque (PT), rate of torque development (RTD), and EMG amplitude. **Methods**: Fifty-six young, healthy adults were randomized to WBV (n=19,), LMV (n=19), Control (n=18) groups. Testing was completed in a single session, and all data were obtained from a maximal voluntary isometric knee extension (MVIC). Subjects completed an MVIC and received WBV, LMV, or a control (no vibration) intervention. The MVIC was repeated immediately, 10 minutes, and 20 minutes following application. The effects of the interventions on quadriceps function were evaluated via 3x4 (group x time) analyses of variance. **Results**: The group by time interaction was significant for PT ($p=0.002$), CAR ($p=0.011$), and EMG amplitude ($p<0.001$), but not for RTD ($p=0.563$). There was an increase from pre-test to post-test in PT in the WBV group (+0.30 Nm/kg, $p<0.001$), and in EMG amplitude in the WBV (+18.4%, $p<0.001$) and LMV (+12.6%, $p=0.002$) groups. EMG amplitude was greater in the WBV group (+19.7%, $p<0.001$) and LMV group (+13.7%, $p=0.001$) compared to control immediately post-test. No differences were observed between WBV and LMV groups, and no differences were observed at 10 or 20 minutes post-test. **Conclusions:** WBV and LMV improve quadriceps function as evidenced by increases in EMG amplitude and PT. While only WBV improved PT, there were no difference between WBV and LMV for any index of quadriceps function. These findings suggest that vibratory stimuli may be useful modalities for improving quadriceps dysfunction in individuals with knee pathologies.

103. THE EFFECT OF IP-10 ON PROLIFERATION IN HUMAN SKELETAL MYOBLASTS

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Muscle degenerative diseases such as muscular dystrophy, sarcopenia and cancer cachexia display diminished muscular regenerative capacity, resulting in decreased survival rates and quality of life. Improving muscle regenerative outcomes requires a comprehensive understanding of the cellular and molecular mechanisms involved in muscle growth. Previous research from our lab has shown that Interferon gamma-induced protein 10 (IP-10), a chemoattractant cytokine, is increased within human skeletal muscle in the days following damage-inducing exercise. Thus, we hypothesized that IP-10 plays a role in the regenerative process in human skeletal muscle. **Purpose:** As muscle regeneration is dependent on the proliferation of muscle progenitor cells (myoblasts), we determined the extent to which IP-10 directly influenced myoblast proliferation *in vitro*. **Methods:** We seeded passage 5 (P5) human primary myoblasts at a density of ~4,000 cells per cm^2. Cells were treated with IP-10 concentrations of 100ng/ml, 10ng/ml, 100 pg/ml, or 10pg/ml for 6hrs. Proliferation was measured via 5-ethynyl-2´-deoxyuridine (EdU) incorporation into proliferating cells.**Results:** Analysis of variance revealed an overall significant increase in myoblast proliferation following IP-10 treatment ($p=0.013$). Post-hoc testing indicates that the highest IP-10 treatment group (100 ng/ml) induced a significant proliferative response (32.6 ± 3.7%) compared to the control (26.0 ± 5.5%). There were no significant differences in proliferation between the lower treatments (10ng/ml, 100pg/ml, 10pg/ml) and the control condition. **Conclusion:** IP-10 mediates proliferation of human muscle cells *in vitro*. This finding supports a novel role for IP-10 in the muscle regenerative process. Future research should extend these findings to *in vivo* models.

104. DETERMINING THE OPTIMAL WORK RATE FOR CYCLE ERGOMETER VERIFICATION PHASE TESTING IN MALES

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Use of the verification phase (VP) following a graded exercise test has been shown to be superior to using secondary criteria to determine if a "true max" has been reached. The optimal work rate for VP testing on a cycle ergometer has not been established. Twelve healthy males (Age: 22.5 ± 1.17 years, BMI: 24.6 ± 1.87) first completed a Ramp VO_{2max} test then on 4 subsequent days in random order completed VP tests at 80, 90, 100, and 105% of the wattage achieved on the initial Ramp test. The test durations for the Ramp, 80, 90, 100, and 105% were 10.07 ± 1.66, 6.20 ± 1.43, 4.09 ± 0.54, 2.62 ± 0.55, 2.31 ± 0.33 min, respectively. The VO_{2max} values for each test were 3.70 ± 0.74 L/min (Ramp), 3.69 ± 0.80 L/min (80 %), 3.66 ± 0.75 L/min (90%), 3.55 ± 0.57 L/min (100%), 3.49 ± 0.54 L/min (105%). The VO_{2max} achieved on the VP at 105% was significantly lower than the VO_{2max} achieved during the Ramp test ($P=0.01$). There was a trend for a lower VO_{2max} on the VP at 100% compared to the Ramp test ($P=0.05$). Nine of the 12 subjects achieved their highest VO_{2max} during either the 80% VP (5) or the 90% VP (4) while only 1 subject on the 105% VP and 2 on the 100% VP achieved their highest VO_{2max} values. There were no significant differences in RPE, blood lactate, RER, or maximal heart rate between the VP tests. Our results suggest that submaximal VP work rates may be superior to supra-maximal work rates for achieving the highest VO_{2max} in young healthy males using cycle ergometry. The shorter test durations in the supra-maximal VP tests may be insufficient in some individuals to elicit VO_{2max}.

105. COMPARISON OF MEDIAL/LATERAL BALANCE BETWEEN SKATEBOARDERS AND NON-SKATEBOARDERS

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INTRODUCTION: Participating in the dynamic sport of skateboarding may promote adaptations in balance compared to those who do not skateboard. **PURPOSE**: To examine balance between skateboarders and non-skateboarders. **METHODS**: 14 skateboarders (13 male, 1 female) and 14 non-skateboarders (4 male, 10 female) (age= 22.68±1.70 yrs; ht= 168.10±8.09cm; mass= 68.72±13.77cm) participated in a balance test using the Biodex stability system that measured movement of the lower extremities on an unstable surface. Each participant performed 2 sets of 3 trials for 20 seconds. The first set was performed with feedback (tracking movements on screen), while the second set was performed without feedback. **RESULTS**: ANOVA showed greater medial/lateral mean deflection in skateboarders (2.49±1.33) compared to non-skateboarders (1.53±1.21). **CONCLUSIONS**: Based on these results, it is possible that the dynamic nature of skateboarding leads to participants being more comfortable in an unstable position. Further investigation is needed to determine training applications to enhance skateboarding performance.

106. PREDICTED VERSUS MEASURED CALORIC COST DURING PROLONGED EXERCISE USING VARIOUS WORK TO REST CYCLES

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The purpose of this study was to compare the measured versus predicted caloric cost of prolonged exercise using various work to rest cycles. Ten subjects performed 2 hours of exercise on a treadmill using six different work to rest cycles. Subjects performed in a random order the following six isocaloric protocols: A: 3.0 mph,1.7% grade; 30 minutes rest, 30 minutes work, B:3.5 mph, 3.8% grade; 20 minutes work, 40 minutes rest, C: 3.0 mph,1.7% grade; 30 minutes work, 30 minutes rest, D: 2.5 mph, 1% grade; 40 minutes work, 20 minutes rest, E: 2.0 mph, 1% grade; 50 minutes work, 10 minutes rest, F: 1.5 mph, 1.7% grade; 60 minutes work, 0 minutes rest. Oxygen consumption was measured every minute using a calibrated metabolic cart (2400 TrueMax, ParvoMedics, Sandy, UT). Predicted versus measured caloric cost for protocols A and F were not significantly different ($p > .05$). However, in protocols B, C, D, and E the measured caloric cost was significantly greater than the predicted values. Specifically, the measured caloric cost in kcals for the 2 hour exercise bouts were 7-15% higher than the predicted values as determined from ACSM metabolic equations. When the total caloric cost for each two hour period was separated into working and resting components, the measured versus predicted working components were not significantly different. However, the measured resting components were significantly higher than the predicted values by 24-46% for protocols B, C, D, and E ($p<.05$). The increased caloric cost during the resting component is believed to be due to excess post-exercise oxygen consumption. These results suggest that predictive formulas significantly underestimate the total caloric cost during interval exercise.

107. AN ANALYSIS OF MOTIVATIONS FOR SUPPLEMENT USE AMONG COLLEGIATE ATHLETES

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Introduction: Few studies indicate why athletes use dietary supplements, which may contain banned substances or ingredients that negatively affect health. **Purpose:** Evaluate motivations for dietary supplement use among collegiate athletes and identify differences based on gender, sport-type, and weight status. **Methods:** Surveys were administered to 596 athletes participating in ten NCAA Division I sports. The survey inquired about the supplements athletes were taking and their reasons for taking supplements. Athletes were grouped into categories based on the energy system(s) utilized in their primary sport. **Results:** Athletes reported using dietary supplements to 1) improve health/nutrition (32.5%), 2) increase strength/power (26.5%), 3) increase muscle mass (22.7%), 4) improve recovery (21.8%), 5) and gain weight (21.6%). A higher percentage of athletes in sports using the phosphocreatine energy system (PCr) compared to the phosphocreatine system and anaerobic glycolysis (PCr/AG) or all three energy systems (PCr/AG/OP) reported taking supplements to gain weight (39.6%, 16.6%, 7.7%, $p<0.001$), increase strength/power (38.4%, 23.1%, 16.5%, $p<0.001$), and increase muscle (35.4%, 19.4%, 11.0%, $p<0.001$). A higher proportion of athletes in the PCr/AG/OP compared to the PCr/AG and PCr groups reported using supplements to reduce the risk of injury/disease/illness (27.5%, 16.0%, 11.6%, 16.0%,$p=0.004$). More females consumed supplements for weight loss than males (9.0% vs. 4.8%, $p=0.04$). Male compared to female athletes were more likely to consume supplements to gain weight (37.8% vs. 2.6%,$p<0.001$), increase strength/power (37.5% vs. 13.5%, $p<0.001$), improve recovery (25.1% vs. 18.0%, $p=0.04$), and increase muscle mass (31.1% vs. 12.8%, $p<0.001$). More athletes with a BMI >30 kg/m2 compared to 18.5-29.9 kg/m2 or <18.5 kg/m2 reported taking supplements to lose weight (26.9%, 6.0%, 0.0%, $p<0.001$) & body fat (30.8%, 6.9%, 0.0%, $p<0.001$). **Conclusion:** This study outlines motivations for supplement use among collegiate athletes, which may help inform outreach and educational efforts. *Supported by the NIGMS grant # 8TL4GM118980-02*

108. ROM ASYMMETRIES IN ROWERS

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Introduction: Sports that require laterality has been associated with asymmetrical adaption of strength and flexibility for certain muscles. Sweep rowing is a lateral dominant sport pulling one oar in port-side direction (left), starboard-side (right) or both (bisweptual). **Purpose:** The purpose of this study was to examine oar side and non-oar side range of motion asymmetries among collegiate rowers. **Methods:** Thirty-five collegiate rowers (22 female and 15 male; age 20$\pm$ 2.64 years; height 174.41$\pm$ 9.5cm; mass 73.12$\pm$ 11.60kg; average years of rowing: 1.53$\pm$ 1.03 years) participated in this study. Rowers were divided into port-side rowers (n= 12) or starboard-side rowers (n=23). Bisweptual rowers were not included in this study. Passive range of motion (PROM) was measured using a standard goniometer for trunk rotation, hip flexors flexibility, and hamstring flexibility. Trunk rotation was measured in a seated position, hip flexor with a Thomas test and hamstring flexibility using the 90-90 degree test. **Results:** Oar side and non- oar side ROM were compared using paired t-tests. There was a significant difference between the oar side (M= 66.93°$\pm$ 15.19°) and non-oar side (M= 72.47° $\pm$ 14.82°) trunk rotation for male rowers; $t(14) = -2.4$, $p = 0.03$. No significant difference was found for the female rowers. In addition, no significant differences were found in hip flexibility or hamstring flexibility between oar side and non-oar side for both genders. **Discussion:** The results showed increased trunk rotation on the non-oar side in male rowers that was not found in female rowers. Mobility asymmetries found in male rowers may be due to various mechanisms of biomechanical stress that differ from females. This may predispose them to lower back injuries. Strength and stretching programs should be considered for the male rowers.

109. ASSESSING THE PREVALENCE OF DIETARY SUPPLEMENT USE AMONG COLLEGIATE ATHLETES

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Background: While dietary supplement use among the general population has increased, literature outlining supplement use among collegiate athletes is limited. **Purpose:** Quantify the prevalence and type of dietary supplements used among NCAA Division I student-athletes. **Methods:** A survey was distributed to collegiate athletes, between ages 18-26, competing in ten NCAA Division I sports. The survey inquired about athletes' supplement use and consisted of 8 multiple choice and 5 open-ended questions. Data was recorded on Microsoft Excel using a coding system and analyzed using SPSS software. **Results:** Among the sample of 596 athletes (53% males, 47% females, BMI 23.7 ± 0.14 kg/m^2), 55% reported taking supplements on ≥2 days/week in the past year (46.6% reported taking 1-3 supplements, 8.6% reported intake of >3 supplements). Dietary supplements consumed by athletes included amino acid/protein (33.3%), vitamin/mineral (23.3%), fatty acid/fish oil (10.6%), other (5.2%), carbohydrate/hydration (4.5%), and herb/botanical (2.0%) supplements. Females were more likely to consume vitamin/mineral supplements than males, (X^2= 5.5, 27.8% vs. 19.4%, p = 0.019), more males reported use of amino acid/protein supplements (X^2= 36.0, 44.5% vs. 20.5%, p = 0.001). More athletes in sports using the phosphocreatine energy system (PCr) compared to the phosphocreatine system and anaerobic glycolysis (PCr/AG) or all three energy systems (PCr/AG/OP) reported using amino acid/protein (X^2= 12.1, 40.5%, 33.9%, 18.6%, p = 0.002) and fatty acid/fish oil, (X^2= 6.9, 15.2%, 9.9%, 4.7% p = 0.03) supplements. Athletes in the PCr/AG/OP compared to the PCr/AG and PCr groups were more likely to report use of carbohydrate/hydration supplements, (X^2 = 15.7, 11.6%, 4.5%, 0.6%, p < 0.001). **Conclusion:** This study provides evidence of regular supplement use in over half of collegiate athletes. Knowledge regarding supplement use by gender and sport may assist in optimizing health and targeting education efforts. *Supported by the NIGMS grant # 8TL4GM118980-02*

111. EFFECT OF BEETROOT JUICE SUPPLEMENTATION ON MARKERS OF OXIDATIVE STRESS AND INFLAMMATION

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High levels of nitrates in beetroot juice (BRJ) have been presume to contribute to cardioprotective effects in hypertensive patients and increased exercise efficiency in athletes. Most of the benefits of BRJ have been contributed to nitrates reduction to ·NO and the vasodilatory consequence of ·NO. Little is known about how beetroot consumption effects markers of oxidative stress or antioxidant activity in the blood. Additionally, differences in oxidative and inflammatory status based on either a single dose or regular consumption of BRJ are unknown. Participants consisted of 30 healthy, sedentary or recreationally active adults between the ages of 18 and 42 years. Participants were randomized to one of three groups: (BR7) consumed a beetroot supplementation every morning for a 7 days; (BR1) consumed the beetroot supplementation one time in morning 2 hours before final testing; and a Control that consumed a placebo every morning for seven days. Only BR7 had significant increase in resting nitrate, increasing from 2.5 µM to 8.2 µM. BR7 and BR1 had similar increases in resting SOD activity (approximately 0.07 units/mL). At rest, gene expression of IL-6 in leukocytes was reduced in BR7 (43% down regulated) and BR1 (25% downregulated). TNF-α was not changed in any group. Comparison of maximal oxygen uptake before and after the intervention revealed no differences. Only BR1 showed a significant reduction in the expected exercise-induced increase in nitrate as seen in Visit 1. Exercise induced the opposite changes in SOD activity for participants consuming the beetroot supplement. SOD activity showed a 0.91 fold decrease in BR7 and a 0.83 fold decrease in BR1 on Visit 2. Beetroot may not be a beneficial ergogenic aide to enhance exercise performance in healthy young adults. However, the health benefits of antioxidants and nitrates in beetroot appear to present advantages to individuals with cardiovascular disease.

110. HEART RATE VARIABILITY IN POST-TREATMENT CANCER PATIENTS FOLLOWING A 26-WEEK EXERCISE INTERVENTION

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Introduction: Heart rate variability (HRV), a standard autonomic regulation assessment method, quantifies variances in the sinus rhythm and is defined as the variation in time intervals between successive RR-intervals of the EKG. Studies have shown that cancer patients have decreased cardiorespiratory capacity as a result of cardiotoxicity exposure during treatment. Cardiotoxicity can negatively alter autonomic regulation by decreasing parasympathetic vagal tone and increasing sympathetic activation. **Purpose:** Purpose of the Improving Physical Activity after Cancer Treatment Study (IMPAACT) was to investigate the effects of a 26-week exercise intervention on cardiac autonomic functioning in post-treatment cancer survivors. **Methods:** Participants completed a tri-weekly, one-hour combined aerobic and resistance circuit training program for 26 weeks (female, n=29; male, n=4). Attendance was regularly recorded. HRV was assessed at baseline (pre), at 13 weeks (mid), and following 26 weeks (post). HRV was recorded using PolarRS800CX heart rate monitors while participants laid supine in a diminished sensory environment. Power spectrum density functions were derived from the R-R interval time series data using the autoregressive (AR) modeling based method for each participant. **Results:** Linear regression established statistically significant correlations between participant attendance and HRV AR Spectrum Low Frequency (LF) and High Frequency (HF) Power (r=0.764, n=10; r=0.821, n=11, respectively). Repeated measures ANOVA yielded a significant change in LF/HF following 26 weeks of intervention (F(2,18)=3.90, p=0.039). There was no significant change in participant's LF and HF Power following 26 weeks of intervention (F(2,16)=1.37, p=0.282; F(2,16)=0.19, p=0.831, respectively). **Discussion:** The moderately high correlations between attendance and LF and HF Power indicate that cancer survivors who exercise more often have a higher likelihood of increasing parasympathetic control and decreasing their sympathetic control, resulting in HRV and cardiac autonomic control improvements. Our results support that exercise can have a positive effect of increasing HRV in as little as 13 weeks of intervention.

112. EFFECT OF TWO DIFFERENT ISOKINETIC TRAINING PROTOCOLS ON QUADRICEPS MUSCLE STRENGTH

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Isokinetic dynamometers have been extensively used to assess and train muscle strength. However, there is a lack of research on which strength training protocol should be used for greatest strength gains. PURPOSE: To examine the effect of 2 different training protocols on strength. METHODS: Eleven untrained subjects (age 23.18 ± 2.18 yrs, mass 68.54 ± 10.44 kg, ht 172.93 ± 5.66 cm) performed 6 weeks of isokinetic strength training of their dominant knee flexors and extensors on a Biodex isokinetic dynamometer. They were randomly divided into 3 groups; quadriceps and hamstrings concentric strength (CON/CON), quadriceps concentric and hamstrings eccentric strength (CON/ECC), and no training (CNTRL). Concentric and eccentric strength training began with 10 maximal repetitions at 210˚/s and 60˚/s, respectively. The intensity of training was increased every week by increasing the angular velocity for concentric and decreasing it for eccentric in 30˚/s increments. Volume of training was increased by adding 1 set each week. All training sessions were separated by at least 48 hours. Quadriceps concentric strength was tested 72h before and after training on the same machine. RESULTS: The CON/ECC group had a greater quadriceps strength increase (26.69 ± 4.43%), compared to CON/CON (16.05 ± 31.64%). CNTRL did not change strength (-0.17 ± 45.2%). CONCLUSIONS: These findings suggest that CON/ECC training is more effective at increasing quadriceps strength. Hamstrings eccentric training may result in co-contraction reduction, allowing greater concentric quadriceps strength gains compared to CON/CON.

113. THE EFFECTS OF CHANGING FOOTSTRIKE PATTERN ON RUNNING ECONOMY

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Gait retraining is an emerging method of managing running-related injuries, including patellofemoral pain (PFP). However, as a result of an unnatural running pattern, it is possible that gait retraining can affect running economy. **PURPOSE:** The purpose of this study was to determine whether gait retraining by modifying footstrike patterns from rearfoot strike (RFS) to forefoot strike (FFS) increased running economy and heart rate immediately post-retraining and one month post-retraining. **METHODS:** Sixteen subjects (n=16) received clearance to participate by a licensed physical therapist, and were randomly placed in the control (n=8) or experimental (n=8) group. Subsequently, the experimental group (EXP) performed eight gait retraining running sessions where footstrike pattern was switched from RFS to FFS, while the control group (CTL) performed eight running sessions with no intervention. Running economy (VO2), respiratory exchange ratio (RER), and heart rate (HR) were recorded during pre-, post-, and one-month post-running trials. **RESULTS:** There were no significant differences for VO2 (p= 0.26), RER (p= 0.258), or HR (p= 0.248) between the groups as a result of retraining. Specifically, the average changes from pre-training to one-month post-retraining for CTL and EXP, respectively, were 0.03 ml/kg/min and 2.29 ml/kg/min for VO2, 0.01 and 0.03 for RER, and -2.75 bpm and 11.61 bpm for HR. **CONCLUSION:** Retraining from RFS to FFS did not increase running economy one-month post-retraining.

114. TRAINING TRAINERS - EQUIPPING STUDENTS WITH COGNITIVE BEHAVIORAL STRATEGIES TO IMPROVE PHYSICAL ACTIVITY LEVEL AND SELF-EFFICACY IN CLIENTS

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INTRODUCTION: Cognitive behavioral strategies (CBS) have shown to be an effective way to increase physical activity (PA); however, many kinesiology students are not trained to deliver such strategies (Brawley, 2013). **PURPOSE:** The purpose of this project was to explore if training students to use cognitive behavioral skills training (CBST) when working with clients was an effective way for increasing PA level of clients. This study also aimed at investigating changes in clients' self-efficacy (SE) to be physically active as well as students' self-efficacy to deliver these cognitive behavioral strategies. **METHODS:** 28 students (age: 23.5±2.4) received CBST as part of an upper division kinesiology class. All students were matched with a client (*N*=27, 25.0±11.1) who was seeking to increase their PA. Students met with their clients for a minimum of 5 visits over the course of 6 weeks. At the first and last meeting with students and clients, clients' levels of SE were measured using a multidimensional SE scale consisting of three subscales (task, coping, and planning SE; Roger et al., 2008). Clients' physical activity was assessed using Godin Leisure Time Exercise Questionnaire (Godin & Shephard, 1985). Students' SE was measured using a 10-item measure developed for this study. Paired t-tests were performed to compare differences between pre and post scores. **RESULTS:** There was a significant increase in PA levels of clients (*p*=.01). Clients' scheduling SE also significantly increased from pre intervention levels (*p*=.012) whereas client's coping SE showed a positive trend that did not reach significance (*p*=.077). Students SE to deliver cognitive behavioral strategies also increased significantly during the course of the class (*p*=.003). **CONCLUSION:** These findings provide preliminary evidence that CBST may be an effective way to increase clients' PA and scheduling SE along with students' SE to deliver CBS.

115. EFFECTS OF PEPPERMINT OIL ON THE VENTILATORY THRESHOLD IN ENDURANCE-TRAINED AND MODERATELY ACTIVE MEN

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INTRODUCTION: Peppermint oil (*mentha piperita*) has been shown to have cooling effects in animals and humans, as well as beneficial influences on pulmonary function tests possibly due to bronchodilatory mechanisms. We hypothesized that a single supplementation of one milliliter of peppermint oil would raise the ventilatory threshold in endurance-trained and moderately active men. **METHODS**: Six male participants (3 endurance-trained, 3 moderately active) performed two maximal oxygen consumption (VO_{2max}) tests on a cycle ergometer under randomized, single-blind trials of peppermint oil and placebo. For each exercise test, ventilatory threshold was determined through the ventilatory equivalent method (VE/VO_2 and VE/VCO_2 vs. time), ventilation method (VE vs. time), and the VCO_2 vs. VO_2 method to validate the point at which the ventilatory threshold occurred. **RESULTS**: Supplementation of peppermint oil resulted in the ventilatory threshold occurring at a significantly higher percentage of VO_{2max} compared to placebo (70 ± 2 % of VO_{2max} vs. 65 ± 2 % of VO_{2max}, $p < .05$). Additionally, VO_{2max} values were not different between the two conditions. **CONCLUSION**: Our findings suggest that peppermint oil supplementation may have a positive impact on the ventilatory threshold of both endurance-trained and moderately active men by raising the percentage of VO_{2max} at which the ventilatory threshold occurs. Though further research is needed to determine the mechanism, it appears that the cooling and the smooth muscle relaxing properties of peppermint oil may acutely contribute to improved aerobic performance.

116. EXAMINATION OF EXERCISE SELF EFFICACY IN STAFF, FACULTY, AND PARTNERS ENROLLED IN A UNIVERSITY WORKPLACE HEALTH PROMOTION PROGRAM

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Introduction: Self-efficacy is a strong predictor of who will engage in exercise on a regular basis. Workplace health promotion programs have shown success in improving self-efficacy and fitness levels; which in turn may increase productivity in the workplace and overall health.
Purpose: The primary purpose of this study was to examine the effects of a university workplace walking program on exercise self-efficacy and step counts between staff, faculty, and their partners. The secondary purpose was to examine changes in self-efficacy and step counts over the course of the workplace health promotion program. **Methods:** Participants (*n=15)* wore Fitbit® Charge devices to track steps over an eight week workplace health promotion program. Additionally, participants completed a validated measure of exercise self-efficacy during the first and eighth week of the program. A series of ANOVAs were used to compare self-efficacy scores and weekly step counts between staff, faculty, and partners that participated in the program. **Results:** Significant differences were found for baseline self-efficacy scores [F(2,13)=5.21, *p*=.02]. Bonferroni post hoc analyses revealed faculty reported greater self-efficacy than partners (*p*=.04). Follow-up self-efficacy scores were significantly different [F(2,13)=4.75, *p*=.03], with faculty reporting greater self-efficacy than partners (p=.05). For step counts, significant differences were found during week 8 [F(2,13)=5.10, *p*=.02], with faculty reporting more steps than partners (*p*=.05). Repeated measures ANOVA revealed no significant groups differences for change in self-efficacy scores from pre to post [F(2,16)=0.036, *p*=.97]. **Conclusions:** Faculty enrolled in a workplace health promotion program reported greater self-efficacy to exercise and more steps by the end of the program than partners. Results suggest worksite health promotion programs should use different strategies to target health behavior changes in faculty, staff, and partners.

117. THE EFFECTS OF ELECTROACUPUNCTURE AND HERBAL SUPPLEMENTATION ON ATTENUATING HINDLIMB SUSPENSION-INDUCED MUSCLE ATROPHY IN RATS

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Purpose: Muscle atrophy is a major concern for the elderly, those that succumb to injury or have experienced microgravity. Many different methods have been used to prevent and/or attenuate the muscle atrophy process. Previous studies suggest that electroacupuncture can help maintain and possibly stimulate the muscle to grow. In addition, there are numerous dietary interventions claiming that it can increase muscle mass and strength. Thus, this study will investigate the effects of electroacupuncture and/or herbal supplementation on skeletal muscle mass and function during 21 days of hindlimb suspension-induced muscle atrophy in rats. **Methods:** Thirty female Sprague-Dawley rats were randomly divided into 5 groups: 1) Control (CON), 2) Hindlimb Suspension (H), 3) H + Herbal supplementation (HH), 4) H + elctroacupuncture (HA), and 5) H + Combination of two treatments (HC) (*n*=6 each). Huang Qi was orally gavage once a day for 21 days (1 ml mixed with water based on concentration of 368 mg/kg). Electroacupuncture treatment (2-15 Hz, 2-4 Voltage for 15 mins) was applied 3 times/wk for 21 days. Western blot was used to measure Akt and mTOR. Data was analyzed using one-way ANOVA with LSD *post hoc* test. **Results:** Following 21-day hindlimb suspension the gastrocnemius showed significant atrophy in H compared to CON (614.3 ± 27.7 vs. 799.83 ± 19.9 mg; p< 0.05). Muscle mass of HA and HC were significantly higher than H (743.00±46.18 and 726.0 ± 23.6 mg; p< 0.05). In addition, the protein concentration of Akt and mTOR were similar across treatment groups. **Conclusion:** This study suggests that electroacupuncture treatment, but not Huang Qi supplementation, may attenuate hindlimb suspension-induced muscle atrophy in rats. However, the protein signaling mechanism responsible for this remains unclear. Thus, electroacupuncture may be a viable clinical treatment to prevent and/or slow muscle atrophy in certain populations.

118. THE PHYSICAL PROFILE OF ELITE BOARDERCROSS SNOWBOARDERS

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Boardercross Snowboarding is an increasingly popular sport where snowboarders race through a downhill course for the fastest time. Boardercross has recently become an Olympic Sport; however, limited data exists regarding these athletes' physical characteristics. **Purpose:** This study gathered data to further define the physical profile of an elite boardercross snowboarder so that coaches and athletes will be more able to set training benchmarks and identify athlete potential. **Methods:** NorAm level boardercross snowboarders (n = 10 males; n = 9 females) completed a series of tests designed to measure anthropometrics and parameters important to physical performance. Each participant's height and weight were measured. Body fat percentage was measured using skin fold calipers. The MBASS test was used to measure dynamic balance. A vertical jump test was used to assess leg power. A T-Test was used to measure speed and agility. A one-minute 12-inch soft hurdle jump test was used to measure lower body muscular endurance. A one-minute sit-up test was used to measure core endurance. **Results:** Body height and mass were: males 176.4±7.0 cm and 75.4±11.3 kg, females 164.1±6.1 cm and 60.8±10.2 kg. Body fat percentage for males and females was 11.6%±4.5% and 18.9%±6.4%. MBASS error scores were dominant/non-dominant leg: males 23.1±22.4/33.9±22.5, females 15.9±16.67/31.1±25.21. Male leg power (mean and peak) was 1,538.2±334.8 and 4,402.9±722.7 watts. Female leg power (mean and peak) was 778.2±216.1 and 2,634.6±350.1 watts. Male and female T-test times were 11.43±0.60 and 12.57±0.89 seconds. Leg endurance test scores were 85.3±14.0 (male) and 59.6±8.4 (female) jumps. Male and female core endurance test scores were 37.8±8.4 and 36.9±6.5 sit-ups. **Discussion/Conclusions:** In the future, additional data sets from other boardercross athletes should be added to this existing set and attempt to quantify the relationship between physical performance measures (as collected in this study) and actual NorAm competition rankings.

119. A COMPARISON OF PICKLEBALL AND WALKING: A PILOT STUDY

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Pickleball is one of the rising trends in recreation sports for all ages yet only one study in cardiac patients has reported its cardiorespiratory demands. **Purpose**: The objective of this study was to compare cardiac activity, movement, energy expenditure, perceived exertion, and level of enjoyment during pickleball and walking in healthy adults. **Methods:** Twelve novice to intermediate level pickleball players (4 male: 8 female, age: 48.5 ± 13.1 years, height: 170.8 ± 9.8 cm, mass: 72.9 ± 12.0 kg) participated in this comparative study. Average heart rate, peak heart rate, total steps, and total calories expended during 30-minutes of pickleball doubles and 30-minutes of walking at a self-selected pace were measured using the Hexoskin™ wearable vest. Overall level of perceived exertion (RPE: 6 – 20 category scale) and overall enjoyment (1 high to 5 low Likert scale) were determined for each activity. Subjects participated in both activities in a counter-balanced order with five minutes sitting between activities. Differences between the activities were examined with the use of paired sample t-tests (α = 0.05). **Results:** Average heart rate (HR) and peak heart rate (PHR) were significantly higher playing pickleball (*pk*) than walking (*w*) (*pk*HR 117.3 ±15.5, *w*HR 102.6 ±16.5, *pk*PHR 140.5 ±18.5, *w*PHR 119.8 ±23.3; $p < 0.001$). While significantly more steps were taken while walking than playing pickleball (*w*Steps 3,175±582, *pk*Steps 1,658±148; $p<.001$), significantly more calories (Cal) were expended in pickleball than in walking (*pk*Cal 229.2±61.6, *w*Cal 161.4±50.2; $p<.001$). Participants rated their level of exertion higher in pickleball than walking (*pk*RPE 11.0, *w*RPE 8.9) and their level of enjoyment higher in pickleball than walking (*pk*Enjoy 1.3, *w*Enjoy 3.3). **Conclusions:** This study provides critical information on the physiological demands associated with playing pickleball, heretofore, unreported. Pickleball is higher in intensity, expends more calories, and is more enjoyable than walking at a self-selected speed.

120. CHANGES IN BODY COMPOSITION IN RESPONSE TO SHORT-TERM HIGH INTENSITY INTERVAL TRAINING (HIIT)

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Data from Boutcher et al. (2012) showed that overweight men participating in 12 weeks of high intensity intermittent exercise exhibited significant reductions in waist circumference and increases in fat free mass. However, in sedentary women, no changes in body composition were observed (Astorino et al. 2013). Interval training is widely believed to induce fat loss, yet previous data supporting this outcome are equivocal.
AIM: To assess changes in body composition in response to short-term HIIT. **METHODS:** Active men and women (N = 23, age and %BF = 22.9 ± 5.8 yr and 16.1 ± 6.2 %) underwent varying intensities of HIIT over a 6-week period. Training was performed 3 days/week on a cycle ergometer. The initial ten sessions consisted of 8 – 10 60 s bouts interspersed with 75 s recovery, after which participants were randomized to HIIT + HIIT, HIIT + sprint interval training (SIT), or HIIT + periodized training (PER). After an overnight fast pre- and post-training, body composition was measured utilizing skinfold calipers, bioelectrial impedance analysis (BIA), and skeletal circumferences. A 3 day food log was also obtained pre- and post-training. **RESULTS:** Results demonstrated no significant change in skinfold-derived body fat (p = 0.27), BIA-derived body fat (p = 0.92), body mass (p = 0.60), thigh circumference (p = 0.71), or waist circumference (p = 0.82) in response to training. **DISCUSSION:** Although the HIIT structure varied across regimes, participants demonstrated no change in any measure of body composition which refutes some existing data. Whether HIIT has the potential to induce fat loss in lean individuals as used in this study is unknown. As HIIT increased energy expenditure by ~ 500 kcal/wk, it is possible that participants compensate for this by increasing energy intake or decreasing non-exercise activity thermogenesis.

121. THE EFFECT OF GRADUATED COMPRESSION GARMENTS ON FOOT VOLUME DURING RUNNING

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Compression stockings are commonly recommended to help reduce edema in the lower extremities at rest; however, the effect of wearing compression stockings on lower extremity edema during exercise remains a mystery. Understanding the effects of compression stockings on foot volume during exercise could potentially increase the type of aerobic activities available to adults with conditions contributing to lower extremity edema. **Purpose**: To determine if compression stockings will reduce running associated increases in foot volume compared to running without compression stockings. **Methodology**: Ten recreational runners (8 male, 2 female; 27.3±5.8 yrs; 73.2±8.4 kg, VO_{2max} 49.1±5.9 ml/kg/min) completed two 20 min submaximal treadmill runs (1% grade, 11.2±1.1 km/hr, 72.3±2.9% of VO_{2max}) with a compression sock or sleeve on the dominant leg and a regular sock on the control leg. Compression and control foot volume was measured using a foot volumeter before and after each trial and compared using a repeated-measures ANOVA. Pre and post run volume comparisons within groups were performed using a paired t-test (α=0.05). **Results**: In response to 20 min of treadmill running, foot volume significantly increased ($p<0.05$) in the control leg of the sock and sleeve trials (4.2±2.4 and 6.0±4.9%), as well as in the sleeve leg (3.1±3.5%). There was a non-significant trend for an increase in the sock leg (1.8±3.1%; p=0.08). The overall increase in foot volume was greater ($p<0.05$) in the control leg compared to the sock (24±14.1 to 11±17.8ml) and sleeve (33.0±27.5 to 17.5±20.8ml) legs, respectively. There was no difference in foot volume when comparing the effects of the compression sock to the sleeve. **Conclusion**: Use of a compression sock or sleeve appears to reduce the observed increase in foot volume experienced among runners, and this effect may be greater with a compression sock than sleeve.

122. EFFECTS OF RAPID WEIGHT LOSS ON MUSCULAR POWER, MUSCULAR ENDURANCE, METABOLIC MARKERS, AND MIXED MARTIAL ART PERFORMANCE AMONG MARTIAL ARTIST

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Purpose: This study investigated the effects of exercise-induced mild-hypohydration on mixed martial art (MMA) sport specific performance. **Methods:** Seven participants completed an exercise-induced dehydration protocol involving intermittent sprinting at speeds that corresponded to 100% VO_2max for one min and 30% VO_2max for 3 min for 90 minutes. A crossover design was implemented in a random order; they either rehydrated by replacing the amount of liquid weight they lost with water or were instructed to withhold consuming water for 5 hours as part of the experimental trials. After a 5-hour passive rest in laboratory, participants performed vertical jumping (VJ), bench throw (BT), punching velocity (PV), and repeated arm cycling (RAC) with euhyrated (CON) and hypohydrated (RWL) trials. Urine specific gravity (USG) and body mass (BM) were recorded before testing (PRE), after the exercise-induced dehydration protocol (POST) and at the end of the day following performance testing (END). Rating of perceived exertion (RPE), heart rate responses (HR), and blood lactate (La^-) were recorded immediately after RAC performance. **Results:** BM and USG were significantly different among groups at END ($P<0.05$). There were no significant differences between CON and RWL for VJ, BT, PV, and RAC. Blood lactate, RPE, and HR were not different between groups. **Conclusion:** Although this study protocol successfully induced mild-hypohydration with intermittent exercise and fluid restriction, the performance variables were not affected between the groups.

123. ACCURACY AND RELIABILITY OF HEART RATE MONITOR SYSTEM ENERGY EXPENDITURE ESTIMATES FOR UPPER- AND LOWER-BODY CONTINUOUS EXERCISE

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The purpose of this study was to determine the reliability and accuracy of energy expenditure (EE) measurements for both upper- and lower-body steady-state exercise using the MYZONE® and Activio® heart rate monitoring systems. Thirty-seven participants completed one graded exercise test and three submaximal steady-state tests on a cycle ergometer (LBE) or upper body arm ergometer (UBE). MYZONE® and Activio® EE estimates were compared to values derived through indirect calorimetry and evaluated using a one-way, repeated measures ANOVA ($p \leq 0.05$). Results of this research suggest that the MYZONE® and Activio® systems are less reliable than the criterion measure. Both systems significantly overestimated EE for UBE, and only the MYZONE® system significantly overestimated EE for LBE. Greater error is present on an individual basis. Based on these results, it is recommended that caution is exercised when using EE estimates from the MYZONE® and Activio® systems for the purpose of fitness programming.

124. MUSCLE ACTIVITY OF THE LOWER LIMB DURING SINGLE-LEGGED HOPPING

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Running can be described as a series of bilateral single-legged jumps and landings; however, single-legged locomotion (SLL) is anecdotally more difficult than bi-lateral locomotion (BLL). Muscle activity may play a role in this increased difficulty; it is not known how active different muscles are during SLL vs. BLL, or whether providing body weight support during SLL would elicit more similar activity levels compared with BLL. **Purpose:** To compare muscle activity during single-legged locomotion at different levels of effective body weight (BW). **Methods:** Subjects (n=12; 25.00±7.74 years, 1.67±0.09 m, 63.28±11.42 kg) performed running at 100% BW in addition to single-legged hopping at 80%, 70%, 60%, 50%, and 40% BW. Muscle activity of the Rectus Femoris, Semitendinosus, Tibialis Anterior, and Medial Gastrocnemius was measured. Activity from each muscle was analyzed using a one-way repeated measures analysis of variance (α=0.05). **Results:** Muscle activity of the Semitendinosus and Tibialis Anterior was not affected by varying levels of effective BW ($p>0.05$). Muscle activity of the Rectus Femoris and Medial Gastrocnemius was influenced by varying levels of effective BW ($p<0.05$). For the Rectus Femoris, hopping at 80% BW and 70% BW elicited higher average muscle activity than running (92.4%; 70.8% increase, respectively), hopping at 60% BW (24.2%; 10.2%), hopping at 50% BW (39.9%; 24.2%), and hopping at 40% BW (62.5%; 44.3%). For the Gastrocnemius, hopping at 80% BW and 70% BW elicited higher average muscle activity than running (70.3%; 50.8% increase, respectively) and hopping at 40% BW (57.2%; 39.2%). **Conclusion:** It appears that increased knee flexor muscle activity could be a possible explanation behind the bilateral deficit in a running movement. However, it is still unclear whether increases in knee flexor activity are the result of the bilateral deficit, or a result of a change in the movement pattern.

125. THE IMMEDIATE EFFECTS OF STABILIZATION EXERCISES ON DYNAMIC BALANCE IN MEN AND WOMEN

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Balance is a necessity for successful athletic performance and physical activity of everyday life. With the demonstrated potential of stabilization exercises (SE) for improving dynamic balance as measured on the Star Excursion Balance Test (SEBT) it is yet to be fully understood how quickly these balance improvements occur. PURPOSE: To determine if SE compared to a dynamic warm up (DWU) effect both sexes equally in balance ability immediately following an exercise intervention and 15 minutes post. METHODS: 4 males and 4 females (25 ± 2.6 years, 24 ± 4.6 BMI, 168 ± 6.2 cm) were recruited to participate. Each participant completed three different testing sessions on separate days in a randomized cross over study design. The SE intervention exercises were: plank and quadruped with alternating arm and leg raise and bridge with alternating leg raise. For the DWU session subjects jogged on a treadmill for ten minutes. The control trial was a no exercise. RESULTS Females achieving overall higher balance scores than males (scores (p= 0.013). There was also a significant interaction shown between balance test trial and time (p=. 022). There was no significant finding shown in a Tukey post hoc test for this interaction. The findings of this study demonstrated that all interventions showed an immediate decrease in dynamic balance ability. CONCLUSION: These data shows there is a potential of fatigue from SE and DWU in non-elite trained populations that decreases balance performance. Further research is needed to determine the correct quantity of SE needed for varying populations and skill levels to immediately improve dynamic balance.

126. EFFECT OF LIMB DOMINANCE ON LOWER EXTREMITY BIOMECHANICS WHEN LANDING FROM A JUMP

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Introduction: Sports that involve landing activities can produce large forces on the lower extremity joints. Many injuries occur during landing, and may be due to imbalances between the limbs. Uneven loading of the limbs could lead to an increased injury risk. Limb dominance studies have found many differences between limbs; however, little research has examined the differences in landing mechanics between the dominant and non-dominant limbs during a drop jump. **Purpose:** To determine if imbalances exist in the joint mechanics between the dominant and non-dominant limb when landing from a drop. **Methods:** Subjects were 30 healthy young males (n=19) and females (n=11), who performed 5 drop jump tasks stepping off with their right leg. A Qualisys motion capture system and AMTI force plates were used to quantify the peak knee valgus moment (KVM) and vertical ground reaction force (VGRF) in each leg. **Results:** Twenty-nine subjects were right leg dominant and one was left leg dominant. Also, there were greater ($p<0.05$) peak KVM and VGRF in the dominant limb (KVM = -0.59±0.15 Nm/kg, VGRF=1.96±0.51BW) when compared to the non-dominant limb (KVM=-0.45±0.15, VGRF=1.67±0.40BW). The greater KVM and VGRF in the dominant limb may indicate that these subjects had an imbalance between limbs. This may be problematic as previous research has shown that imbalances between limbs are a strong predictor of injury. The larger KVM may lead to small misalignments of the joint structures which, along with greater VGRF absorption, may be placing excessive loads on the joint soft tissues. This overload of the knee joint could ultimately lead to various knee pathologies, such as ACL injury. This study provided insight into the asymmetries that may exist between the dominant and non-dominant limb even in those without previous injury. Identification and correction of these imbalances may help in the prevention of knee pathologies.

127. JOINT MOMENT DIFFERENCES IN DANCERS LANDING IN TURNEDOUT VERSE PARALLEL POSITIONS

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Up to eighty percent of dance injuries occur in the lower limb, with the majority occurring at the hips and knees. Knee injuries in particular have been attributed to the repetitive jumping motions which make up many of the most popular ballet movements. **Purpose:** This study compared joint moments at the hip, knee, and ankle while jumping in a turned out ballet position compared to jumping with the legs in parallel position. **Methods:** Fourteen healthy female college age dancers (age 20.2 ± 1.1 years; 16.1 ± 18 years of dance experience) participated. Participants performed three sets of three maximal vertical jumps under two randomized conditions: feet in a turned out first position (TO) and feet in parallel position (P). Whole body kinematics were recorded using a 12-camera motion capture system and ground reaction forces were recorded using two force plates. Joint moments at the hip, knee, and ankle were calculated. Paired *t*-tests were used to compare peak joint moments between conditions. **Results:** In the P condition peak hip extensor moments (-77.3 ± 18.7) and hip external rotator moments (-25.0 ± 10.2) were higher than the TO condition. However, in TO knee external rotator (11.6 ± 5.9) and ankle external rotator moments (15.5 ± 5.5) were higher than in P. **Conclusion:** The observed differences were primarily in the transverse plane, suggesting joints experience higher torsional loading in the TO condition. These findings provide support to the theory that dancers create tibial torsion in their attempt to enhance the aesthetic of their turned out position. Previous qualitative works have labeled this strategy "screwing at the knee." In further studies it would be beneficial to investigate the distinction in force generation between extension and external rotation components required to maintain the specific aesthetic involved in turnout.

128. ASYMMETRY OF DROP JUMP MECHANICS AND KNEE EXTENSOR STRENGTH

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Asymmetry has been linked to injury risk, especially in activities with large GRFs (Malder, 2013; Pappas, 2012). Functional asymmetries have been linked to non-contact ACL injuries as well (Pappas and Carpes, 2012). The purpose of this study was to determine if symmetrical sports athletes exhibit functional asymmetries and, if so, if they are linked to leg strength differences. Ten (5 males, 5 females) athletes were recruited and stepped off of a 46 cm box and performed six maximum height drop jumps with lead leg order randomized. Kinematic data for 21 reflective markers was collected with Vicon MX40 motion capture cameras (120 Hz) while GRF data was collected using two Kistler force plates (1200 Hz). Subjects then performed maximum effort knee extension at 60°/s on a Biodex isokinetic dynamometer to determine each leg's strength. Each leg's maximum vertical GRF and lower extremity joint angle extreme values were determined during the box and jump landing phases. Data was analyzed using SPSS v22 ($p < 0.05$). There were significant differences in leg strength (191.0±32.2 Nm vs. 176.9±33.5 Nm; $p < 0.01$). The maximum vertical GRF values were significantly different between the two legs, regardless of lead leg in both landing phases ($p < 0.01$) and the dominant leg was the stronger leg in all phases for only two subjects. During the drop landing phase, significant asymmetries with the left lead leg were found at the ankle, knee, and hip (-25.8±7.9 vs -22.1±8.4°; $p < 0.001$, 80.8±9.8 vs 75.5±7.4°; $p<0.001$, 89.9±28.0 vs 85.8±29.3°; $p<0.01$, respectively). Similar results were found for the jump landing phase and the right lead leg jumps and landing phases. Functional asymmetries, not associated with strength differences, were found which might predispose the subjects to injury. Future work should include more comprehensive strength testing and the potential of symmetry training.

129. THE TIME TO ELICIT VO2MAX DURING REPEATED BOUTS OF HIGH INTENSITY EXERCISE DECREASES OVER TIME

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Exercise at an intensity corresponding to the minimal power that elicits maximal oxygen consumption (pVO_{2max}) will elicit VO_{2max} at 60% of time to fatigue at pVO_{2max}(T_{max}). However, previous data on priming exercise suggest that VO_{2max} may occur at an earlier time frame. This study was design to examine the stability of the time to reach VO_{2max} in repeated high intensity bouts of exercise similar to interval training. Eight trained male cyclists (VO_{2max}: 67.8 ± 4.1 $mL \cdot kg^{-1} \cdot min^{-1}$) completed a $35W \cdot min^{-1}$ graded exercise test (GXT) on a cycle ergometer to determine pVO_{2max}. The GXT was followed by a 30 min rest period and a time to fatigue test at pVO_{2max} (T_{max}). After seven days, subjects returned to complete 5 intervals at pVO_{2max} for 60% of T_{max} using a 1:1recovery at 20W. Expired air and HR were measured throughout. The percentage of T_{max}, $VO2_{max}$ VE_{peak} and HR_{max} were analyzed with one-way repeated measures ANOVA and Tukey's *post hoc* procedure. The percentage of T_{max} to elicit the VO_{2max} decreased over the first two intervals.(63.8 ± 13.6*, 47.1 ± 8.9*, 38.8 ± 8.0, 37.1 ± 6.3, and 33 ± 10.5% respectively) with no further change after the second interval. Similarly, VO_{2max} increased with the first two intervals (63.2 ± 4.3*, 67.5 ± 3.7*, 69.3 ± 3.5, 70.2 ± 3.5, and 71.2 ± 3.7 $mL \cdot kg^{-1} \cdot min^{-1}$ respectively) with no increase after the second interval. VE_{peak} increased significantly over the first three intervals (144.6 ± 16.6*, 154.9 ± 24*, 164.6 ± 25.8*, 172.3 ± 26.2, and 181 ± 23 $L \cdot min^{-1}$ respectively), as did HR_{max} (171.4 ±10.9*, 177.3 ± 8.9*, 180.6 ± 8.9*, 182.5 ± 8.1, 183.7 ± 9.3 bpm respectively) with a plateauing after the third interval. These findings indicate that VO_{2max} is achieved at an earlier percentage of T_{max} in repeated high intensity bouts of exercise.

131. VALIDATION OF HEXOSKIN BIOMETRIC SHIRT TO COSMED K4B^2 METABOLIC UNIT IN ADULTS DURING TRAIL RUNNING

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The development of new wearable biometric technologies have increased in recent years. The Hexoskin biometric shirt is a wearable technology designed to monitor biometric measures including heart rate (HR), ventilatory rate (VR), minute ventilation (V_E), steps, and energy expenditure (kcal). It is unknown whether the Hexoskin produces valid results for these measures in real-world applications. The purpose of this study is to validate biometric measures using the Hexoskin against the Cosmed k4b^2 portable metabolic unit during trail running. Participants (N=27) completed a self-paced one-mile trail run wearing the Hexoskin and the Cosmed unit. Biometric measures (HR, VR, V_E, steps, and energy expenditure) were recorded each minute by the Hexoskin and breath-by-breath by the Cosmed. Due to time for participants to reach the data collection location from the trail termination point, data from the last 30 seconds of each test was excluded from analysis. Data for HR, VR, and V_E were analyzed in 6 one-minute intervals, the first three minutes and the last three minutes as determined by exclusion. Data for steps and energy expenditure were analyzed for the entire one-mile trail run. All Hexoskin and Cosmed data were analyzed using intraclass correlation with significance at $p < 0.05$ level. Only one HR measure, the second to last minute, showed significant correlation (r= 0.342; p= 0.041). All other HR measures were not significantly correlated. All VR measures at all time points were significantly correlated ($p < 0.001$). The remaining variables (V_E, steps, and energy expenditure) were not significantly correlated at any time point. Our results indicate the Hexoskin provides valid real time measures of VR and HR in the second to last minute of activity. For all other measures and time points the Hexoskin does not provide valid results, with improved Hexoskin HR detection validation results may improve.

130. POST EXERCISE HYPOTENSION RESPONSE IN NON-HYPERTENSIVE ADULTS FOLLOWING A SELF-PACED TRAIL RUN

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During dynamic exercise, a rise in blood pressure (BP) can be seen in response to the increase in cardiac output demands. Once exercise has concluded, BP has been shown to decrease beyond pre-exercise measurements in most hypertensive and some normotensive adults. This prolonged decline in resting blood pressure is known as post exercise hypotension (PEH). Studies have shown that reductions in BP are inversely related to exercise intensity in controlled research environments. However, few studies have looked at the extent of PEH in an applied-setting, such as a trail run. The purpose of this study was to determine the magnitude of PEH in non-hypertensive adults after a 1-mile trail run at a self-selected pace. Twenty-seven male and female volunteers participated in this study (age=22±6 yrs; height=172.1±11.8 cm; mass=69.8±14.7 kg). Participants provided resting SBP and DBP measurements, ran one mile on a trail at a self-selected pace, and measures were obtained immediately after, 20-min post, 40-min post, and 60-min post exercise. All BP measurements were obtained using automated cuffs. The trail altitude was 5385 feet at onset with 56 feet rise in elevation, and environmental condition ranges included temperature: 79.2°-90.2° F, humidity: 4.5%-8.3%, and wind speed: 1.1-3.5 mph. Data were analyzed using a one-way ANOVA and significance at the $p<0.05$ level. Both SBP and DBP immediately after exercise were significantly higher than all other BP values ($p<0.001$ and $p<0.01$, respectively). Only 60-min post SBP values were significantly lower than resting (p=0.004), and 40-min post SBP was lower, but not significant (p=0.057). No significant changes were found in DBP after 20-, 40-, or 60-min post exercise. Our results confirm that SBP can be positively affected an hour post exercise, even in non-hypertensive adults. Since SBP was significantly lower at the last time interval, additional field-based research of PEH should focus on changes in BP for time periods greater than 60 minutes post exercise.

132. COMPARISON OF EXERCISE QUALITY BETWEEN SINGLE PLAYER AND COMPETITIVE EXERGAMING ENERGY EXPENDITURE AND EXERCISE INTENSITY

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Introduction: Most Americans do not exercise regularly and spend more than an acceptable time in a sedentary state. Video game play, on the other hand, is extremely popular. Exergaming combines video game play and physical activity, but much remains to be learned about the value of the activity experienced while exergaming: especially if that gaming happens alone or competitively with a partner. **Purpose:** The purpose of this study was to compare the energy expenditure, exercise intensity (MET), rating of perceived exertion (RPE), and number of steps taken during competitive exergaming and single-player exergaming. **Methods:** Healthy adult participants (n=61; men n=34, women n=27; ages 16-40) were randomly selected to play against each other in groups of two on the videogame Just Dance 3 on Xbox Kinect for 30 minutes. Other participants played the same game on Xbox Kinect in single-player mode for the same amount of time. During gameplay, caloric expenditure, MET, RPE, and steps were measured using SenseWear (BodyMedia) accelerometers. **Results:** No significant difference was found in energy expenditure or RPE between single-player and competitive sessions. During competitive play, the time spent at the <6 MET range was less and the amount of time spent in the 6-9 MET range was greater (12.9±.0007 vs. 17.9±.0002 min., P<.05) compared to single-player play. During competitive play, participants took more steps (2070.58±58 vs. 2230.1±48 steps, P<.05) than non-competitive players. **Conclusion:** Competitive players spent more time working at high intensity and took more steps than non-competitive players. As this data suggests, competitive play may have few advantages over single-player play. However, better understanding of the effect on exercise of competitive play may be gained in a study in which the same players play in competitive and non-competitive modes.

133. COMPARISON OF PHYSIOLOGICAL AND PERCEPTUAL RESPONSES BETWEEN CONTINUOUS EXERCISE TRAINING (CEX) AND TWO MODES OF HIGH INTENSITY INTERVAL TRAINING (HIT) IN PERSONS WITH SPINAL CORD INJURY: A PRELIMINARY STUDY

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Persons with chronic spinal cord injury (SCI) show significantly higher incidences of chronic diseases including obesity, diabetes, and heart disease. The efficacy and practicality of high-intensity interval training (HIIT) has been repeatedly demonstrated in able-bodied populations, showing higher enjoyment versus lower intensity modalities such as CEX. **AIM:** This study tested the efficacy and practicality of HIIT in persons with SCI by examining metabolic and perceptual responses to exercise. **METHODS:** Four men and 1 woman (age:35.8±12.7 yr; injury duration:5.3±6.9 yr; severity:1 tetraplegic, 4 paraplegic) with SCI completed 4 exercise sessions. Mean VO_2peak and Wpeak were equal to 16.4±5.5mL/kg/min and 88.2±37.5W. Baseline testing consisted of graded arm ergometry to assess VO_2 peak. Three subsequent exercise sessions consisted of CEX, HIIT, and SIT (sprint-interval training) in randomized order. During exercise, blood lactate concentration ($B[La^-]$), HR, RPE, affect, and Exercise Enjoyment were assessed at 25%, 50%, 75%, and 100% of completion, as well as 5-min post exercise. Post-ACtivity Enjoyment (PACES) was assessed 10-min post exercise. **RESULTS:** Higher oxygen uptake (VO_2), HR, and $[BLa^-]$ were revealed in response to HIIT and SIT versus CEX ($p<0.05$). During HIIT and SIT, VO_2 and HR surpassed 90% of peak values. RPE differed across mode ($p=0.025$) and there was a significant modeXtime interaction ($p=0.016$) in that RPE was lower in CEX versus HIIT and SIT. Affect declined during exercise ($p<0.05$) but was similar across modes, yet enjoyment did not differ across sessions ($p>0.05$). PACES was higher ($p=0.11$) in HIIT (104.3±19.5) and SIT (103.3±18.8) versus CEX (91.3±14.9).**CONCLUSION:** Low-volume HIIT can be performed by men and women with SCI without complications. Although HIIT induces higher HR, VO_2, and $[BLa^-]$ compared to CEX, this may elicit greater enjoyment. Potential exists for chronic HIIT to improve cardiorespiratory fitness and overall heath in individuals with SCI.

135. PREDICTION OF MAXIMUM ENDURANCE TIMES INVOLVING FIVE CORE STABILIZATION EXERCISE ASSESSMENTS

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Purpose: This study was designed to generate regression models to predict maximal muscular endurance time involving 5 core stabilization exercise assessments. **Methods:** Our sample included 80 healthy college-aged individuals. Participants were randomly assigned to perform the following core stabilization assessments: supine plank, side bridge (right side), side bridge (left side), static spinal flexion, and static spinal extension. Participants were instructed to hold each exercise stabilization position for a maximal endurance time, while maintaining perfect form, and then to rest for a minimum of 5 minutes between tests. Assessments were terminated when participants could no longer maintain perfect form. A test administrator recorded participants' ratings of perceived exertion (RPE; 10-point scale) every 5 seconds throughout each assessment. After each test, maximal exercise time (total seconds) was recorded, along with the elapsed time to reach an RPE of 4, 5, 6, 7, and 8. **Results:** Regression analysis generated relatively accurate models for estimating maximal exercise time. For example, the side bridge (right side) yielded the following regression model: maximum endurance time (R = 0.91; SEE = 11.9 sec; n = 80) = 39.2 + 4.0 (sex) - 0.78 (bmi) + 0.95 (rpe8). The independent variables we employed were sex, body mass index, and RPE8 (or the elapsed time for participants to reach an RPE of 8 out of 10). The RPE8 variable provided the most accurate regression predictions as compared with models employing the time to reach an RPE of 4, 5, 6, or 7. **Conclusion:** The regression models generated in this study yield relatively accurate predictions of maximum muscular endurance involving core stabilization exercise assessments. This provides an estimation of maximal endurance time based on submaximal data, specifically for those participants who are reluctant or unable to complete the maximal endurance protocols.

134. FEASIBLE CLINICAL MEASURES OF BODY COMPOSITION AND PHYSICAL ACTIVITY TO ASSESS CARDIOMETABOLIC RISK IN COLLEGE-AGED FEMALES

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Excess body fat and low physical activity (PA) are strong predictors of current and future cardiometabolic risk (CMR) in diverse populations. However, these risk factors are rarely assessed in clinical settings, especially in young adult populations. Identification of feasible but effective screening approaches may facilitate the wider assessment of these risk factors. PURPOSE: To examine the ability of low cost, low burden measures of body fatness and PA to identify women at higher risk for cardiometabolic disease in comparison to more accurate but less feasible clinical measures. METHODS: Participants were 308 women (mean age of 19±1.1 years, 72% white) enrolled at a large public university. Body composition was assessed by waist circumference (WC) and dual energy X-ray absorptiometry (DXA; GE iLunar). PA was assessed using the Godin Leisure-Time Exercise Questionnaire (GLTQ)) and NL-1000 accelerometers. Glucose, insulin, and lipid profile were measured in a fasting state. High CMR risk women were identified with presence of two or more elevated biomarkers based on ATP III criteria. Logistic regression models compared the ability of GLTQ and WC (Model B) versus the NL-1000 accelerometer and DXA (Model A) to identify women with elevated CMR scores, insulin resistance (HOMA-IR), and C-reactive protein (CRP). RESULTS: Both Model A and B showed strong and similar capability in predicting high CMR (*C*= .81 and .78, respectively), HOMA-IR (*C*= .92 and .88, respectively), and CRP (*C*= .83 and .85, respectively). CONCLUSION: The GLTQ and WC are feasible clinical measures of PA and body fatness which predict elevated CMR in college-aged females.

136. WEIGHT SUPPORTED QUADRUPEDAL TREADMILL EXERCISE IMPROVES INSULIN SENSITIVITY IN A RAT MODEL OF SPINAL CORD INJURY AND DIABETES

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Previous studies have shown exercise is a simple and economical therapeutic modality that effectively benefits patients with type 2 diabetes. Spinal cord injured (SCI) individuals have a high risk for developing type 2 diabetes. However, there have been no studies that have examined the effects of treadmill exercise in individuals with SCI and type 2 diabetes. We examined the effects of imposing quadrupedal body weight supported treadmill exercise in a rodent model of SCI and type 2 diabetes. Seventeen rats received a severe spinal cord contusion (T10). One day after the contusion, the rats were placed on a high energy diet (10% fat, 20% sucrose, and 70% rodent chow) and 40 days later, a low dose of streptozotocin (STZ; 30 mg/kg, i.p.) was administered. The rats were assigned to an exercise (n=8) or non-exercise group (n=9). Exercise consisted of weight supported, quadrupedal treadmill walking (23 cm/s) for 1 hr/day, 5 days/week for 6 weeks. Insulin tolerance tests were performed, hemodynamic measurements were recorded, and heart and hindlimb muscle tissue was harvested after the rats were killed. Based on fasting blood glucose, the high energy diet and STZ treatment was successful in inducing diabetes in the rats (i.e. >140 mg/dL; exercise: 202±50 mg/dL; non-exercise: 146±29 mg/dL). Fasting blood glucose levels were not significantly different between the groups. However, insulin sensitivity was improved by exercise based on insulin tolerance test. We found significant differences in glucose levels 45 and 60 min after insulin injection indicating a greater insulin sensitivity in the exercised group. Exercise also significantly increased tibialis anterior, gastrocnemius and soleus muscle weights by 7%, 20%, 31% respectively indicating the exercise was effective in activating hindlimb activity in the SCI rats. These findings suggest for the first time that weight supported treadmill exercise can reduce metabolic abnormalities that occur after SCI.

137. COMMON INJURIES AMONG ADULT FIGURE SKATERS

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Over the past 20 years, figure skating is more commonly being viewed as a lifetime sport. Similar to younger skaters, adult figure skaters are competitive and may experience similar injuries. **Purpose:** To observe the most common sites of injuries experienced by adult figure skaters, when in their training the injuries occurred, the onset of the injury, and the most common mechanisms of injury. **Methods:** An electronic injury survey was distributed to adult figure skaters affiliated with an assortment of skating clubs in 2012 and a paper survey was distributed at US Figure Skating Adult Nationals in 2015. Skaters were asked to complete the survey regarding their injury history since beginning private lessons. Data was analyzed using the SAS system and frequencies were reported. **Results:** Of the 207 injuries reported, the most common sites of injury were the knee (n=48), ankle (n=34), other (n=29), head (n=24), and hip (n=20). 89.04% of these injuries occurred during practice and 39.29% were the result of tripping (not involving another skater). 62.02% of these injuries were acute. **Discussion:** Anecdotally, we know that many adult figure skaters experience injuries as a result of their training. It is known from previous research that elite skaters suffer from more overuse injuries, which is in contrast to our findings that adult skaters experience more acute injuries. Adult skaters are injured most frequently as the result of tripping, which may explain the high frequency of head and other acute injuries. It should be noted that this data was collected from a convenience sample and is not representative of all adult skaters, as it appears to be skewed towards skaters who had experienced injuries.

138. AN ANALYSIS OF ASCENT AND DESCENT VELOCITY OF THE LIFTER AND BARBELL DURING A CLEAN

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Research has shown that barbell velocity plays a critical role in successful weightlifting, and is highest during the second pull phase of a clean. **PURPOSE**: The purpose of this study was to determine the ascent and descent velocity of both the barbell and lifter during a clean. **METHODS**: Twenty-four males volunteered to participate and were categorized according to relative strength. The stronger group (n = 12) was categorized as having a 1RM clean > 1.10 BW (mean ± *SD*: 1RM = 111.67 ± 13.81 kg), while the weaker group (n = 12) was categorized as having a 1RM clean < 1.10 BW (mean ± *SD*: 1RM = 92.54 ± 22.85 kg). Participants performed 3 cleans at 85% of their 1RM. Descriptive statistics and a 2x4 (group x velocity) mixed factor ANOVA was used to analyze both ascent and descent velocity of the barbell and lifter. **RESULTS**: Results (mean ± *SD*) revealed that weaker lifters demonstrated greater ascent velocity of the barbell (2.11 ± 0.11 m/s) than stronger lifters (1.98 ± 0.08 m/s). In contrast, stronger lifters demonstrated significantly greater descent velocity of the barbell (1.60 ± 0.34 m/s) than weaker lifters (1.23 ± 0.23 m/s). There was no difference in lifter velocities between the two groups. **CONCLUSIONS**: The results of this study indicate that bar velocity is affected by the relative strength of the lifter. Interestingly, relative strength had no affect on lifter velocity. This data may be useful to coaches and practitioners who are working with lifters or athletes of different ability levels on the clean exercise.

139. THE RELATIONSHIP OF DORSIFLEXION RANGE OF MOTION TO FRONTAL PLANE KNEE MOMENTS DURING THE PUSH-OFF PHASE OF A VERTICAL JUMP TASK

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Introduction: Individuals who participate in the sport of basketball are required to make multi-directional movements such as cutting, running, and jumping. During such movements individuals can experience a lack of control at the knee joint resulting in frontal plane knee moments which have previously been associated with non-contact anterior cruciate ligament (ACL) injuries. A limited dorsiflexion range of motion during the push-off phase has been hypothesized to increase frontal plane knee moments that result in an increased possibility of ACL injury. **Methods**: Twelve Division I and four Division III male collegiate basketball players with a mean height (1.93±.081m) and mean mass (90.65±15.12 kg) performed a vertical countermovement jump exercise. Participants were outfitted with a full body marker set and a nine camera motion capture system was used to track kinematics while two force plates collected kinetic data. **Results:** Mean frontal plane knee moments were found to have no significant difference between the right (0.42±.20 Nm/kg) and left (0.48±.20 Nm/kg) legs (t=--.799) (p=.437). Mean right ankle dorsiflexion range of motion (25.93±8.684 deg) and mean left ankle dorsiflexion range of motion (26.26±6.94 deg) had no significant difference (t = -.339) (p=.739). No relationship was also found between ankle range of motion and frontal plane knee moments in the right knee and ankle (r=.158) (p=.560) or left knee and ankle (r=-.007) (p=.978). **Conclusion:** Dorsiflexion range of motion during the takeoff phase of the vertical jump task showed no significant relationship to frontal plane knee moments. Future research on this topic should investigate the timing and relationship between the peak frontal plane knee moment and the peak dorsiflexion angle in the ankle. Additionally, future studies should look at other populations, especially those with known limitations in ankle range of motion.

140. COMPARING BASEBALL PITCHING: VELOCITY, ACCURACY, AND POWER

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Baseball is a game where the complete team is crucial to the performance, but the outcome can depend on one player's ability, often a pitcher. A pitchers success depends mostly on two things, velocity and accuracy of thrown baseballs, each parameter having equal effect on performance. On a baseball team no two pitchers are the same, which makes it difficult to train a team for competition. An idea of what physical abilities affect a pitchers velocity and accuracy would be helpful in designing exercise protocol. **PURPOSE:** To examine the performance of throwing a baseball with respect to velocity and accuracy compared to power. **METHODS:** Participants include the UVU baseball team, participants first completed a consent form and questionnaire approved by the UVU-IRB then they participated in the power tests. The power tests were a vertical Jump test using the Vertec for lower body and an incline medicine ball chest press using a 10 pound medicine ball to measure upper body power. Velocity and accuracy were recorded as the players pitched in actual baseball games. **RESULTS:** Using Excel, overall power outputs were correlated to velocity and accuracy, a linear regression was performed showing R^2=0.65 for velocity and R^2=0.05 for accuracy, showing that Players with greater power have higher velocities but power did not correlate to accuracy. **CONCLUSION:** Our research suggests that players can increase throwing velocity by increasing power but power does not affect accuracy. Therefore we suggest that players incorporate power exercises into their pre and in season training programs. In addition we see that due to the lack of correlation between power and accuracy further research into the training relationship between accuracy and power would help give a better idea of how to best create a complete exercise training program.

141. STANCE AFFECTS DIRECTIONAL BALANCE IN SKATEBOARDERS AND NON-SKATEBOARDERS

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Introduction: Skateboarding is an unstable skill that skateboarders do on a daily basis. There are different stances used by each skateboarder called goofy or regular, based on their preference. However, it is unknown if balance is different than non-skateboarders and between stances. **Purpose:** To examine balance between stances, skateboarders and non-skateboarders. **METHODS:** A dynamic test using the Biodex stability system was conducted on 14 skateboarders (13 male, 1 female; age= 23.36±2.06 yrs; ht= 171.91±7.58 cm; mass=71.44±13.4 kg; RT leg dominant= 9) and 14 non-skateboarders (4 male, 10 female; age= 22.00±1.05 yrs; ht= 162.42±6.92 cm; mass= 60.19±8.35 kg; RT leg dominant= 11). The test measured movement of the lower extremities on an unstable surface. Each participant stood on the platform with two feet in their preferred stance and performed three trials for 20 seconds each while either tracking their movements on a monitor or without a monitor. **Results:** ANOVA demonstrated no influence of monitor feedback or skateboarding history. However, there was a main effect for stance in the amount of time spent in the posterior right position with regular stance (45.01%±4.45%) being significantly greater than goofy stance (23.50%±5.28%). **Conclusion:** These findings demonstrate that individuals lean more towards their dominant leg; which is posterior right for regular stance.

143. THE EFFECT OF ACUTE HYPERGLYCEMIA ON MUSCULAR STRENGTH, POWER AND ENDURANCE

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Introduction: Chronic hyperglycemia has been shown to cause skeletal muscle dysfunction; however, there is a paucity of understanding on the effect of acute hyperglycemia on skeletal muscle function. **Purpose:** The purpose of this study is to better understand the impact of acute hyperglycemia on skeletal muscle strength, power, and endurance. **Methods:** Ten male collegiate athletes (age 21.5 $\pm$ 1.5 years, height 186 $\pm$ 2.03 cm, body mass 108.8 $\pm$ 7.6 kg) participated in 2 testing sessions, separated by 7 days and randomized for either high glucose (HG) or control (C) treatment groups. The HG group consumed a high glucose drink (2 g glucose/kg body weight) while controls consumed an isocaloric nutrition bar with an energy provision of 40% protein, 30% fat, and 30% carbohydrate. Blood glucose (BC) levels for HG and C were tested at 0 (basal) and 30, 60, 90, and 120 minutes (mins) post-consumption. At 30 mins post-consumption, muscular strength in the HG and C groups was assessed by a 1RM bench press (BP) test followed by lower body power at 60 mins via vertical jump test. Muscular endurance was examined with a 3-set-to-failure BP test at 90 mins. **Results:** The HG group exhibited significantly greater BC values (p<0.05) at the 30, 60, 90, and 120 minute time points. Additionally, the glucose area under the curve was significantly greater (p<0.05) for the HG group. There were no between group differences in maximal strength, power or muscular endurance. **Conclusion:** Although performance measures were unaffected by acute hyperglycemia, we provide evidence that acute hyperglycemia can be induced and maintained in healthy, active and young subjects which may provide a valuable platform for future research on the etiological time course of metabolic diseases.

142. SHORT-TERM IMPACTS OF A WELLNESS PROGRAM OFFERED TO COLLEGE HOURLY EMPLOYEES BY UNDERGRADUATE STUDENTS

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Background: In the university setting, wellness programming is often inaccessible to hourly employees as a result of language barriers, inconvenient scheduling and participant fees. Objective: This study evaluated the impact of attendance at free bilingual wellness workshops hosted after work on physical activity (PA) and nutrition behavior. Methods: Campus dining and facilities staff (N=21) participated in a 6-week intervention. In addition to optional bi-weekly skill-based PA and nutrition workshops, all subjects received information via DVDs and handouts. Behavior (surveys), weight, mean arterial pressure (MAP), cardiorespiratory fitness (one-mile walk) and muscular fitness (pushup, crunch, squat tests) were assessed pre- and post-intervention. Subjects were divided into low (n=6), moderate, (n=8), and high (n=7) attendance groups post-intervention. Results: No changes were measured for weight (0.4±1.9%), MAP (1.5±7.1%), or pushup performance (0.9±5.7 repetitions), p>0.05. A significant improvement in crunch (12.4±12.4 repetitions, p<0.05) and a nonsignificant improvement in squat (9.5±17.4 repetitions, p=0.051) performance were measured pre to post. Post-intervention, a greater percentage of subjects practiced portion control (45 vs 15%, p<0.05). Additionally, average changes in weekday sedentary time decreased nonsignificantly (-52.0±27.3 minutes, p=0.052). Only high attendance subjects significantly decreased one-mile time (-3.7±1.3%, p<0.05) and significantly increased healthy cooking and PA self-efficacy (p<0.05). The intervention increased the number of subjects who meet the USDA recommendations for vegetables (25 vs 10%) and fruits (45 vs 40%) and the ACSM recommendations for aerobic (40 vs 20%) and resistance (25 vs 5%) PA despite no significant change in median fruit and vegetable servings consumed or time spent in low, moderate, or vigorous intensity PA, p>0.05. Discussion: Results indicate that although a 6- week staff wellness program may be effective in improving PA participation, dietary behaviors, and physical fitness levels, workshop attendance may be required to maximize program benefits. Post-intervention follow-up is recommended to determine long-term impacts.

144. THE RELATIONSHIP OF BMI AND FMS SCORES IN COLLEGE ATHLETES

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The ability to physically move well is associated with overall fitness, as is appropriate body size (i.e., weight relative to height). It is interesting to consider if body size is directly associated with the ability to move well. **PURPOSE**: This study investigated the relationship between body size, as determined by body mass index (BMI), and the ability to perform fundamental movements, as determined by the Functional Movement Screen™ (FMS) in collegiate athletes. **METHODS**: Participants included 85 NCAA Division II student-athletes (54 male and 31 female; $\bar{X}$ age = 21 yrs.) from four different sports (baseball, volleyball, soccer, track & field). Height and weight measures were conducted on each subject, followed by movement screening via the FMS. Testing for each subject took approximately 20 min. Measurements for BMI were performed using a Detecto® physician scale with stadiometer; BMI was calculated as kg/m^2. The FMS consists of seven fundamental movement tests. Each test was scored on a 0-3 scale. Both testing and scoring were performed according to published criteria by one of two Level-1 FMS Certified raters. The relationship between BMI and FMS scores was analyzed using the nonparametric test statistic (L). **RESULTS**: There was a significant inverse relationship between BMI and FMS scores (L = 13.02; p < .001). **CONCLUSION**: These results suggest that one's ability to perform fundamental movement patterns decreases with increasing body size. It should be noted again that the population studied was collegiate athletes. Although body composition was not determined, researcher observations would suggest that higher BMIs among some subjects were due, at least in part, to higher muscle mass. Follow-up studies to include body composition and certain anthropometrics (e.g., height and limb length) to further explore the relationship of body size to the ability to perform fundamental movements is warranted.

145. ALTERED RECIPROCAL INHIBITION AND HAMSTRING INJURY

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Background: Hamstring injuries make up between 12-35% of all sport related injury, and are the most common muscular injuries in athletes. Traditionally, hamstring injury (HI) has been related to short hamstring muscles, or an imbalance in strength between hamstring and quadriceps muscle groups. The more recent concept of synergistic dominance links HI to chronically tight hip flexor muscles which may inhibit the gluteus maximus through altered reciprocal inhibition, causing the hamstring to take on greater loads during hip extension. We hypothesized that if this concept holds true, then athletes with tight hip flexors should have an increased rate of HI. **Methods**: 147 CSULA collegiate athletes in multiple sports were screened for hip flexor range of motion preseason using a standard Thomas Test (TT), with positive TT results indicating tight hip flexors. Subjects were then monitored by the CSULA Athletic Training Center through their competition season for HI. A non-parametric chi-square analysis was performed to determine significant difference between expected and actual rate of HI in positive TT vs. negative TT athletes. **Results**: Of 147 subjects, 15 sustained a hamstring injury, with 2 subjects sustaining bilateral injuries for a total of 17 hamstring strains. At initial testing, 20% of the subjects showed a positive TT (33 of 147). 23% of positive TT subjects sustained HI during the season (4 of 33), while 11% of those with a negative TT sustained HI (13 of 114). An independent Chi-square analysis showed no significant relationship between hamstring injury and positive TT (p=0.75). **Conclusion**: There does not appear to be a relationship between tight hip flexors and increased risk of hamstring injury. Due to the low incidence of HI in this cohort, further testing is needed.

147. SELF-REPORTED KNOWLEDGE OF DIETARY SUPPLEMENTS AND THEIR USE AMONG COLLEGIATE ATHLETES

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Introduction: Supplement intake among collegiate athletes may increase exposure to substances that may impact health and eligibility. **Purpose**: Determine NCAA Division I collegiate athletes' knowledge of health risks associated with dietary supplements, related NCAA policies, and to evaluate relationships between self-reported knowledge and supplement use. **Methods**: A sample of 596 male and female athletes participating in ten NCAA Division 1 sports from two universities completed a 13-item survey inquiring about their intake of dietary supplements and self-reported knowledge of the safety and potential health risks and NCAA policies associated with dietary supplements. **Results**: A majority of athletes (BMI= 23.7 ± 0.1 kg/m^2) reported a moderate or strong awareness of health risks (50.8%, 24.0%) and NCAA polices (48.4%, 30.8%) regarding dietary supplements. A higher proportion of male athletes reported a strong awareness of the health risks associated with supplements compared to females ((X^2 = 11.0, 29.3% vs. 17.6%, p=0.01). A bivariate correlation analysis indicated a relationship between self-reported knowledge of health risks associated with supplement use and number of dietary supplements consumed (r= 0.21, p<0.001). Athletes reporting a strong awareness of health risks associated with supplements reported consuming a higher number of supplements compared to those with a minimal or no awareness (1.7 ± 0.1 vs. 0.9 ± 0.2, p= 0.02; 1.7 ± 0.1 vs. 0.4 ± 0.3, p<0.001, respectively). More athletes indicating a strong awareness compared to a moderate, minimal, or no awareness of health risks reported consuming more than three supplements (16.2%, 8.4%, 3.0%, 3.1%, respectively). No significant relationships were found between self-reported knowledge of NCAA policies and supplement use. **Conclusion**: A majority of participants identified themselves with strong or moderate knowledge of the safety and policies surrounding dietary supplements. As self-reported knowledge regarding supplement safety increased so did athletes' supplement use. *Supported by the NIGMS grant # 8TL4GM118980-02*

146. THE EFFECT OF ACUTE AEROBIC EXERCISE AND INTRACRANIAL PRESSURE MEASURED NONINVASIVELY

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Intracranial pressure (ICP) or the pressure inside the skull is altered during some forms of exercise. While some evidence indicates that chronic or repeated intermittent exposure to elevated ICP may harm cerebral vasculature and increase risk for neurological disorders, other studies suggest that high ICP during exercise confers protective benefits to the brain. Unlike the established science of resistance exercise (RE) and increased ICP, the effect of aerobic exercise (AE) on ICP is unknown, and this study aimed to determine whether AE caused a similar rise in ICP. The study included two groups, an exercise and a non-exercise, consisting of the same cohort of twelve subjects. Subjects' bodies were tilted to +30°, +15°, 0°, and -15° after no exercise or jumping jacks until 70% of maximum heart rate was reached. Subsequently, a device called the Cerebral and Cochlear Fluid Pressure (CCFP) Analyzer rested in subjects' ear canals and utilized the unique anatomy of the inner ear and its connection to the brain's cerebrospinal fluid to output an estimate of ICP based on the air displaced by the tympanic membrane following exposure to a 105 dB stimulus. There was no significant difference in ICP following AE (p=0.595) as compared to after no exercise. ICP at each tilt angle, however, was significantly different: +30° vs. +15° (p=0.045), +30° vs. 0° (p=0.001), +30° vs. -15° (p=0.001), +15° vs. 0° (p=0.001), +15° vs. -15° (p<0.001), and 0° vs. -15° (p=0.004). Our results show that AE itself does not cause a significant increase in ICP and suggest that AE does not appear to cause a prolonged elevation of blood pressure compared to RE. With the understanding that normal cardiovascular adjustments to jumping jack exercises do not seem to significantly affect ICP, future studies can examine ICP changes following head contact events in sports, for example.

148. CHANGES IN SPRINT KINETICS AND KINEMATICS FOLLOWING STATIC OR DYNAMIC STRETCHING

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BACKGROUND: Pre-activity stretching is common practice among athletes, yet a lack of consensus exists as to which type of stretch should be performed. Various types of stretching have been utilized over time, though due to equivocal results in the literature, the criterion for choosing a stretch is often based on familiarity or tradition. **PURPOSE:** This study aimed to compare the effects of dynamic or static stretching on hip kinetics and kinematics during intermittent sprinting. Variables of interest included hip flexion torque production at baseline, post-stretch and post-sprint, hip angular velocity during the initial swing phase of gait, and sprint times throughout the repeated sprint protocol. **METHODS:** Participants included 10 male (age 25 ± 2.3 years) and 2 female (age 20 ± 1 years) experienced soccer players recruited from the Las Vegas community. Following written informed consent, participants were asked to report to the University of Nevada, Las Vegas Sports Injury Research Center twice. Each visit consisted of the following: 1) 5-minute treadmill warm up at a preferred pace, 2) baseline hip flexion torque measurements, 3) either a static or dynamic stretch, 4) post-stretch torque measurements, 5) a repeated sprint protocol, and 6) post-sprint torque measurements. **ANALYSIS:** Peak hip flexion torque values were analyzed in SPSS using a 2x3 repeated measures factorial ANOVA. Paired t-tests for average sprint time, difference between first and last sprint time, peak instantaneous velocity, and percent phase occurrence of peak velocity were computed with (α=0.05). **RESULTS:** No statistically significant differences were found for any variable among any level. **DISCUSSION:** A lack of statistical significance may be attributed to a low *n* and high variability among participants. Additionally, coupled with previous results in the literature, it may suggest that there is not a "one-size-fits-all" approach to pre-activity stretching.

149. LEUKOCYTE RESPONSIVENESS TO EXERCISE IN INDIVIDUALS POSITIVE FOR HUMAN CYTOMEGALOVIRUS

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Human Cytomegalovirus (HCMV) infects 50% of adults in the United States. HCMV can become a cause for concern in individuals who have a compromised immune system, which may occur after high-intensity exercise. The purpose of this preliminary study was to characterize the lymphocyte, monocyte, and neutrophil responses to exercise in HCMV+ individuals. Participants were either positive (HCMV+) or negative (HCMV-) for HCMV. Participants visited the laboratory on three separate occasions: HCMV screening, 100% VO_{2max} test, and 80% VO_{2max} run. Mixed-model factorial ANOVA procedures with repeated measures on sampling condition were performed on absolute and relative circulating lymphocytes, monocytes, and neutrophils. Significant main effects for time for both absolute and relative values were seen for all leukocyte subsets regardless of virus status. Significant differences for absolute and relative values were seen between sampling conditions for all leukocyte subsets. We report for the first time that HCMV status does not affect circulating neutrophil responses to high-intensity exercise, though exercise-induced neutrocytosis is seen during the post-exercise and 60 minutes post-exercise sampling conditions, regardless of HCMV status. There is no HCMV effect on circulating monocyte responses to exercise, though exercise-induced monocytosis was seen during the post-exercise sampling condition regardless of HCMV status.

150. MAXIMAL OXYGEN UPTAKE IS GREATER DURING INTERVAL EXERCISE THAN DURING A GRADED EXERCISE TEST

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Eliciting maximal oxygen consumption (VO_{2max}) during repeated bouts of high intensity intermittent exercise has been shown to effectively raise VO_{2max} Given the vigorous nature of this training it is unclear if VO_{2max} is achieved during these intervals. This study was conducted to evaluate if VO_{2max} was achieved during intervals designed to elicit VO_{2max}. Eleven male trained cyclists (Height: 183.4±4.3 cm, Weight: 77.7±7.3 Kg, VO_{2max}: 66.7±4.4 $mL \cdot Kg^{-1} \cdot min^{-1}$) participated in the study. On the first visit to the laboratory volunteers performed a graded exercise test (GXT) on the cycle ergometer at 35 $W \cdot min^{-1}$ to volition fatigue. The highest power output at the beginning of the plateau in VO_{2max} was defined as the pVO_{2max}. Following a rest period of 30 minutes subjects performed a time to fatigue test at pVO_{2max} (T_{max}). Within the next seven days volunteers returned to the laboratory to perform an interval session (INT). The interval session required volunteers to cycle at 60% of T_{max} during the interval and then recovered between intervals at an equal duration and a fixed 20W. HR and expired air were measured continuously throughout the interval bout. VO_2, heart rate (HR), ventilation (VE), and O_2 pulse were assessed using a one-way ANOVA with repeated measures and Tukey's *post hoc* procedure. VO_{2max} was not significantly different between the GXT and Tmax, but was significantly higher during INT (66.7±4.4, 65.7±5.6, 70.7±5.0* $mL \cdot Kg^{-1} \cdot min^{-1}$). Similarly VE and O_2 pulse were significantly higher during INT (168.5±28.0, 169.6±28.7, 186.5±26.3* $L \cdot min^{-1}$) and (28.5±2.7, 28.2±3.1, 29.7±3.1* $mL \cdot beat^{-1}$), respectively. No difference was observed for HR between conditions (181.7±10.6, 180.5±9.8, 184.8±7.7 bpm). We conclude that VO_{2max} is attained during interval training and exceeds that measured during a GXT.

151. EFFECTS OF STANCE ON TWO LEG DYNAMIC BALANCE BETWEEN SKATEBOARDERS AND NON-SKATEBOARDERS

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INTRODUCTION: Stance can impact postural control in skateboarders and surfers. However, it is not well known if this is different in non-skateboarders. **PURPOSE:** To examine balance between skateboarders and non-skateboarders by specific stance. **METHODS:** A dynamic test using the Biodex stability system was conducted on 14 skateboarders (13 male, 1 female; age= 23.36±2.06 yrs; ht= 171.91±7.58 cm; mass=71.44±13.4 kg; RT leg dominant= 9) and 14 non-skateboarders (4 male, 10 female; age= 22.00±1.05 yrs; ht= 162.42±6.92 cm; mass= 60.19±8.35 kg; RT leg dominant= 11). The test measured movement of the lower extremities on an unstable surface. Each participant stood on the platform with two feet in their preferred stance (regular or goofy) and performed three trials for 20 seconds each while either tracking their movements on a monitor or without a monitor. **RESULTS:** ANOVA demonstrated an interaction between group and stance for amount of time spent in the anterior/right position. Follow-up tests showed no differences between skateboarders (20.70%±4.01) and non-skateboarders (17.92%±5.17). However, regular stance spent greater time (24.69%±3.19) than goofy stance (7.75%±4.51). **CONCLUSIONS:** These findings suggest that performance of balance may be influenced by right leg dominance. In regular stance, balance is emphasized on the back leg. In goofy stance, balance is focused on the front leg. Individuals tend to lean toward their dominant leg as they are constantly scanning the environment and adapting to instability.

152. A SINGLE-CENTER EVALUATION OF A PROPRIETARY HYPOCALORIC TREATMENT FOR MORBID OBESITY

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Despite the technical advancements in obesity therapeutics, medically supervised weight management programs incorporating proprietary very low calorie diet (VLCD) systems have remained the most prudent and prioritized clinical prescription for morbid obesity. Although effective in terms of inducing large scaled weight loss, reported long term outcomes reflect a high rate of weight recidivism exposing the futility of VLCD use. It has been speculated that the physiological adaptations of rapid weight loss imposes a condition conducive to eventual weight regain. The specific adaptations in question are those driving the loss lean tissue and resting metabolism. Through a single center retrospective study we aimed to systematically evaluate the tissue composition of weight loss induced by a 12 wk proprietary VLCD treatment in obese patients while assessing gender and age specific responses. Male (n=16) and female (n=16) obese patients underwent 12 wks of VLCD under standard medical care. Anthropometric measures and body composition (bioelectrical impedance) were analyzed pre to post by 2 way repeated measures ANOVA. Significance was set at $p < 0.05$. Data are presented as mean±SE. Patients lost 22.2±1.4 kg of bodyweight (BW), 16.6±1.4 kg of fat mass (FM) and 5.6±0.9 kg of lean mass (LM). FM- and LM-loss composed 73±3.1% and 27±3.1%, respectively, of total weight loss. Males lost more BW than females solely due to a greater reduction in FM. Weight loss was similar between age groups; however the younger patients (< 57yrs) lost more FM and less LM than the older patients (≥ 57yrs). Weight loss composition differed between age groups (Young: 81% FM loss, 19% LM loss; Old: 65% FM loss, 35% LM loss). Among all gender-age groups, BW-loss of older males was most attributable to LM loss while FM loss was the least contributory. There was a reduction in hemoglobin A1c, fasting glucose, total cholesterol, and triglycerides. The VLCD treatment induced a clinically meaningful weight loss characterized by a significant loss of both FM and LM. Older male patients exhibited the poorest composition of weight loss as they experienced the most severe loss of lean tissue. Our results demonstrate the need to modify VLCD treatment programs specific for various patient populations to better optimize outcomes for long term success.

153. ARE THERE DIFFERENCES IN VO_{2MAX} IN RESPONSE TO CHRONIC HIGH-INTENSITY TRAINING, VARYING IN EXERCISE VOLUME AND STRUCTURE?

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Participation in high intensity interval training (HIIT) elicits significant physiological adaptations including increases in maximal oxygen uptake (VO_2max) of up to 1.00 L · min^{-1} (Bacon et al., 2013). **AIM**: To compare changes in VO_2max response to different modes of interval training. **METHOD**: Twenty-three habitually active adults (11 men and 12 women, mean age and VO_2max = 22.9 ± 5.8 yr and 40.2 ± 5.6 mL/kg/min) were randomized to complete one of three interval-training regimens: HIIT + HIIT, HIIT + sprint interval training (SIT), or HIIT + periodized interval training (PER). Additionally, 10 men and 12 women (mean age and VO_2max = 24.6 ± 3.7 yr and 41.1 ± 5.6 mL/kg/min) served as non-exercising controls matched for age and fitness level. Training was performed on a cycle ergometer three days · week^{-1} for six weeks. Gas exchange data were acquired through progressive exercise pre-training and post-training, starting at 30 – 40 W for 7 min followed by continual increases in work rate until volitional fatigue. **RESULTS**: Repeated measures ANOVA revealed a significant increase across time in absolute VO_2max (8.4 ± 0.8, $p<0.01$) and Wmax (11.5 ± 1.0%, $p<0.01$) via all regimens. There were no significant differences ($p>0.05$) in adaptations between interval training modes. However, there were significant differences in change in VO_2max between HIIT + HIIT ($p<0.01$), HIIT + SIT ($p<0.01$), and HIIT + PER ($p<0.01$) versus controls, as well as in change in Wmax between HIIT + HIIT ($p<0.05$) and HIIT + SIT ($p<0.05$) versus controls. **DISCUSSION**: These results confirm that dissimilar approaches to cycle-based interval training, varying in exercise volume and structure, similarly improve VO_2max (Bacon et al., 2013; Sloth et al., 2013; Astorino et al. 2013). Further investigation is needed to elucidate the additional benefits of interval training and to identify an optimal mode of interval training.

154. COMPARISON OF MECHANICAL STRAIN IN THE PATELLAR TENDON USING TENDON ELONGATION AND ACOUSTOELASTICITY METHODS

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There are two relatively new methodologies for computing tendon strain in vivo using ultrasound images. Tendon Elongation (TE) measures distances between a fixed anatomical landmark and a marker on the images (Malliaras et al., 2013). Acoustoelasticity (AE) utilizes an algorithm to track the pixels within a region of interest (ROI) to generate a strain-time relationship (Kobayashi et al., 2010). The purpose of this study was to compare strain values using these two methods. Eight male participants, 18-25 years old, participated in this study. Subjects were strapped into a Biodex System 3 dynamometer to isolate knee extension of their preferred leg. A thin aluminum piece of tape was affixed ~30 mm distal to their inferior patellar apex to serve as a reference marker. Subjects completed 3-second ramp up maximum knee extension isometric contractions with ultrasound video collected simultaneously (Terason 3200). DICOM files were loaded into MicroDicom software to compute TE values and loaded into Echosoft software to obtain strain-time graphs via AE. Statistics were run using SPSS v22 ($p<0.05$). Mean strain values were significantly different between methodologies at 25%, 50%, 75% and 100% maximum strain from AE (8.9±5.5%, 15.2±8.7%, 16.8±9.0%, and 17.3±9.2%, respectively for TE and 4.1±2.7%, 6.2±2.8%, 7.9±2.7%, and 9.6±3.1%, respectively for AE; $p<0.05$ for all). There was a significant relationship in the mean strain values between TE and AE at 25% peak strain ($r=0.655$; $p=0.006$). The relationship trended towards significance at 50% peak strain ($r=0.479$; $p=0.060$), but there was not significance at 75% and 100% of the peak strain. The two methods did not show close agreement which might be due to AE computing values within a ROI while TE provides a single value that represents the strain for a longer length of the tendon. Project funded by the Swenson Summer Research Fellowship Program.

155. VITAMIN D STATUS AND BONE MINERAL DENSITY IN FEMALE COLLEGIATE DANCERS AND CHEERLEADERS

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INTRODUCTION: An athlete's bone mineral density reflects their cumulative history of energy availability, genetic predisposition for bone health, menstrual status, as well as nutritional, behavioral, and environmental factors. While weight-bearing activity is a factor in bone health, the effect of different types of weight-bearing activity on BMD is not always clear. **PURPOSE:** Therefore, the purpose of this study is to determine if bone mineral density (BMD) is different in two groups of female athletes who have comparable body size/weight requirements, but who engage in qualitatively different training regimens. **METHODS:** Participants were female's collegiate athletes who were members of the UNLV Dance team (n=10) or the UNLV Cheer team (n=9), ages 18-22. Participants' vitamin D status was assessed by obtaining a finger prick sample of blood (< 1 ml) and BMD for full body, spine and dual femur was assessed by dual energy X-ray absorptiometry (DEXA). Athletes also completed a calcium and vitamin D intake questionnaire, and sunlight exposure questionnaire. **RESULTS:** There was no significant difference between the groups for total body BMD (1.23 g/cm^2 vs. 1.22 g/cm^2 for dancers and cheerleaders respectively, $p=0.70$), spine BMD (1.39 g/cm^2 vs. 1.36 g/cm^2 for dance and cheer respectively, $p=0.72$) or dual femur BMD (1.20 g/cm^2 vs. 1.11 g/cm^2 for dance and cheer respectively, $p=0.23$). Between the two groups age matched z-scores for total body BMD were not significantly different (1.46±1.23 dance vs. 0.83±0.52 cheer, $p=0.19$). However there was a significant difference between age-matched z-scores of the dance team vs. non-athlete female controls (1.46±1.23 dance vs. 0.19±1.22 control, $p=0.033$). Vitamin D status was found to be insufficient in 74% of the athletes (7/10 dance and 7/9 cheer). **CONCLUSION:** The finding of no difference in BMD between the athlete groups indicates that the type of activity (low impact dance vs. high impact cheerleading) was not as big a factor in BMD as the fact that the athletes were participating in 20+ hours a week of physical activity. Although a majority of the athletes had insufficient vitamin D, their physical activity could have offset the negative effects this might have had on their bone health.

156. RELATIONSHIP BETWEEN GAIT KINETICS AND A SCALED PREDICTOR OF FALLS IN AGED INDIVIDUALS

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Fall risk in aged individuals is an area that needs continued study. Falls are the leading cause of accidental injury and death in this group. **PURPOSE:** The purpose of this study was to examine the relationship between select kinetic gait variables and a developing stride length to leg length ratio gait measure. **METHODS:** 742 subjects aged 60 and older were recruited from 36 testing sites across the United States by the Electronic Caregiver® Mobile Fall Risk Assessment Laboratory team. Subjects completed a medical history form regarding falls history. Leg lengths were measured to the nearest 0.01cm before completing a pressure system based gait analysis. Data collected included maximum resultant ground reaction force (%BW), impulse (%BW*s), maximum peak pressure (KPA) and stride length. Following data collection, stride length was scaled to leg length for all subjects. **RESULTS:** Table 1 displays the results of the Pearson product moment correlation coefficient. Impulse demonstrated an inverse relationship while both maximum pressure and maximum resultant ground reaction force demonstrated a positive relationship with stride length to leg length ratio. **CONCLUSION:** The developing stride length to leg length ratio has been shown to effectively differentiate fallers and non-fallers. The relationship between the kinetic variables analyzed in this study and stride length to leg length ratio indicates that the potential exists to modify specific gait kinetics in an effort to increase the stride length to leg length ratio. By increasing both maximum resultant ground reaction force and peak pressure, individuals may be able to illicit increases in stride length to leg length ratio. In contrast, by working to decrease impulse (changes in momentum) during walking, individuals may also be able to illicit increases in the stride length to leg length ratio. These changes may ultimately function to decrease aged individuals' likelihood of falling.

Table 1

Results of pearson product moment correlation coefficient analyses conducted to determine the strength of the relationship between gait kinetics and stride length to leg length ratio.

	Stride Length/Leg Length Ratio	maximum resultant ground reaction force (%BW)	impulse (%BW*s)	maximum peak pressure (KPA)
Stride Length/Leg Length Ratio				
correlation coefficient (r)	---	0.173	-0.079	0.301
significance (p)		<0.001	0.034	<0.001
maximum resultant ground reaction force (%BW)				
		---	0.830	0.265
correlation coefficient (r)			<0.001	<0.001
significance (p)				
impulse (%BW*s)				
correlation coefficient (r)			---	0.120
significance (p)				0.001
maximum peak pressure (KPA)				
correlation coefficient (r)				---
significance (p)				


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