

**Mid-Atlantic Regional Chapter of the American  
College of Sports Medicine  
(MARC-ACSM)**

**36<sup>th</sup> Annual Scientific Meeting - 2013**

**Friday, November 1, 2013 and Saturday, November 2,  
2013**

**Clinical Case and Research Abstracts**

---

## Clinical Case Study Abstracts

---

### **Elbow Injury – Crossit (Olympic Lifting)**

Christian Basque and David Ross, Geisinger Wyoming Valley – Sports Medicine Fellowship

**HISTORY:** A 31 year old male presents to the clinic with right elbow pain. Patient sustained the injury while in the gym two months prior. He was Olympic weight lifting performing a power snatch when he felt a pop and pain in his elbow. He had pain and swelling in the elbow and rested for one month. After the swelling decreased he returned to activity. He presents today with continued pain most notable when performing push ups and decreased strength.

**PHYSICAL EXAMINATION:** Upon inspection he had soft tissue swelling over the olecranon. There was tenderness over the medial epicondyle and triceps. His ROM was equal bilaterally for both elbows as was his carrying angle. Valgus and varus stress test were both negative as was resisted wrist extension. Resisted wrist flexion and pronation did produce pain. Right arm elbow extension was weak 3/5. Neurovascular assessment was intact.

#### **DIFFERENTIAL DIAGNOSIS:**

- 1.) Medial epicondylitis
- 2.) Ulnar collateral ligament strain
- 3.) Avulsion fracture
- 4.) Triceps rupture

#### **TESTS AND RESULTS:**

X RAY of the right elbow was ordered. The findings showed normal alignment with a fractured enthesophyte at the triceps insertion on the right

#### **FINAL WORKING DIAGNOSIS:**

Avulsion fracture of the right olecranon

MRI has been ordered to rule out a triceps tendon rupture which would necessitate repair.

#### **TREATMENT AND OUTCOME:**

For minimally displaced avulsion fractures splinting is recommended and immobilization for 6 weeks. Once pain has resolved range of motion exercises can be started. For avulsion fractures displaced greater than 2 mm a referral to an orthopaedic surgeon should be given.

Further imaging of this patients injury will dictate treatment. If there is a triceps tendon rupture surgical intervention will be necessary. Patient has yet to be complaint with current recommendations.

---

### **Sport: Field Hockey**

#### **Progressive Numbness of Distal Lower & Upper Extremities**

Jason J. Brucker, Christiana Care Sports Medicine Center, Wilmington, DE

e-mail: [jbrucker@christianacare.org](mailto:jbrucker@christianacare.org) (Sponsor: Bradley Sandella)

**HISTORY:** 21 year old collegiate field hockey player who initially presented with 6 months of exercise-induced numbness & pain in her distal lower extremities. Testing consistent with exertional compartment syndrome. Diagnosis ultimately was nerve entrapment of multiple nerves bilaterally underwent subsequent surgical decompression & nerve release. Now presents with numbness & tingling of her distal aspects of her hands one year later. All 5 digits on both hands affected equally sparing the palms. No pain, radiation, or involvement beyond the digits. Symptoms not exercise-induced although 1 episode of self-limited hand weakness following practice was reported; otherwise no motor deficits noted. There is accompanying hyperemia with areas of blanching over both palms that are not affected by temperature. Denies any antecedent injury although completed a 6 week course of minocycline for acne treatment 3 weeks prior to the onset of symptoms.

**PHYSICAL EXAMINATION:** Cranial nerve & visual acuity testing normal. Deep tendon reflexes intact. Strength testing 4/5 weakness in bilateral triceps, wrist extension & finger abduction but intact for remainder of upper extremities. Slight decreased sensation to light touch over left thumb, 3rd digit & 5th digit compared to right hand. Hyperemia with areas of blanching on palms but capillary refill & distal pulses both intact & equal bilaterally. Tinel's testing was equivocal, negative at cubital tunnel. Romberg & coordination testing normal. Allen's test & Lhermitte's sign both negative.

**DIFFERENTIAL DIAGNOSIS:** 1. Subacute Carpal Tunnel; 2. Polyneuropathy; 3. Mononeuritis Multiplex; 4. Vasculitis; 5. Charcot-Marie-Tooth variant. 6. Multiple Sclerosis

**TEST & RESULTS:** MRI Brain – Negative; MRI Cervical Spine – Minimal degen changes at C5-C6 without cord signal abnormality; EMG/NCS upper extremities – consistent with very mild & early left carpal tunnel syndrome. No evidence of radiculopathy, peripheral polyneuropathy or myopathy; Labs – slight lymphocytosis on CBC; normal Vitamin B12, Folate, TSH, BMP & iron studies.

**FINAL/WORKING DIAGNOSIS:** Mild Carpal Tunnel syndrome vs. occult systemic autoimmune illness.

**TREATMENT & OUTCOMES:** 1. Field hockey as tolerated. 2. Regular follow up visits. 3. Follow up with neurologist & obtain MRI Neurography of lower extremities.

---

### **Elbow Injury – High School Football**

C. Chamberlain, K. Vanic, G. Rozea \ East Stroudsburg University, PA  
email: kvanic@esu.edu (Sponsor: K. N. Waninger, FACSM)

**HISTORY:** A 15-year-old high school linebacker was involved in a pile-up after diving for fumbled ball during a junior varsity football game. Athlete remained on the field clutching his left elbow. He described feeling a clunk and the sensation of his arm "popping out".

**PHYSICAL EXAMINATION:** Initial on-field observation showed an obvious deformity at the elbow with a noticeably sulcus at distal humerus and prominent olecranon. Palpable point tenderness and observable swelling was evident. Athlete appeared neurologically and vascularly intact. The athlete was splinted and taken off the field by a stretcher. EMS pre-hospital care included pain medication prior to emergency room transport. The athlete was then transported to the hospital for further examination and diagnosis.

**DIFFERENTIAL DIAGNOSIS:** Compartment syndrome UE, Coronoid fracture, Terrible triad (elbow dislocation with radial head and coronoid fracture), Olecranon fracture, Posterolateral rotatory instability, Radial head fracture, Valgus Instability, Distal humerus fracture, Monteggia fracture, Medial Epicondyle fracture

**TEST AND RESULTS:** Initial elbow radiographs included AP, lateral and oblique views. Radiographs were revealed no apparent fracture. Stress films not considered and MRI not warranted at the time of evaluation. Prominent shift of olecranon posteriorly.

**FINAL/WORKING DIAGNOSIS:** Posterior elbow dislocation

**TREATMENT AND OUTCOMES:** After the initial hospital visit, the athlete was splinted in 90 degrees of flexion for 10 days and instructed to use a sling for comfort. Once the splint was removed, he remained in the sling for an additional three days and performed passive elbow motion as tolerated. Physical therapy commenced three times a week and included active/passive range of motion exercises. Cryotherapy and electrical stimulation modalities were administered for pain relief and muscle relaxation. At three weeks post injury, the athlete was permitted to increase exercise routine and was provided home exercise programs (which was performed with the high school's athletic trainer). Passive extension brace was used 10 minutes/day; four times a day for subsequent 3-6 weeks post injury. Athlete did not return to full contact football activities. Five months post-injury the athlete was cleared for return to full

activity. Stretching and strengthening, joint mobilization and functional activities continued through rehabilitation process. Pre-injury strength returned prior to spring sports season.

---

**Division 1 Freshman Basketball Player with Palpitations.**

R. Davis and M. McElroy, Geisinger Medical Center, Danville, PA

**CASE HISTORY:** 19 yom freshman point guard presents to Training room after feeling racing heart/palpitations. Had 2 episodes both at rest, 1 happened during finals 6 weeks ago lasted 10 seconds and passed. Did not have any associated chest pain with the events. Denies any exertional chest discomfort, denies syncope or lightheadedness. Sister had “hole in her heart” and had surgery after she had a small stroke. He was anxious and thought he may have a similar problem.

**PHYSICAL EXAM:**

Constitutional: WDWN, HEENT: NCAT EOMI, PERLL, Neck: Supple, CV: RRR, no mrg, Chest: CTA bilaterally. No wheezes rales or rhonchi, Abdomen: Soft, non-tender non-distended. NABS x 4, Extremities: No swelling or edema noted in bilateral LE, Skin: Warm, dry, Neuro: alert and oriented x 3, CN II-XII grossly intact

**DIFFERENTIAL DIAGNOSIS:** PAC's, SVT, PVC's, ARVD, PFO, HCM, Thyroid abnormalities, Electrolyte abnormality, Anemia, Infection, Drug Abuse

**TESTS AND RESULTS:**

CBC, BMP, TSH: WNL

EKG: Rate 52, PR interval 162ms, QRS duration 96ms, QT 414. Rightward Axis

CXR: Unremarkable for any acute cardiopulmonary process

TTE: EF 60-64% Atrial Septal Aneurysm, Large Patent Foramen Ovale. Right to Left shunt noted through PFO. LV and RV dimensions normal no evidence of hypertrophy.

TEE: PFO measuring 11mm, Atrial Septal Aneurysm not present. PFO hemodynamically insignificant, limbus of IAS tissues between PFO and central fibrous body 8 mm length. No R-L shunt seen, believed 2DE appearance due to high cardiac output and contrast may not have been appreciated on TEE Views.

**FINAL/WORKING DIAGNOSIS:** Patent Foramen Ovale

**TREATMENT AND OUTCOMES:** An Interventional Cardiologist evaluated him and decision was made with patient to continue playing basketball with no restrictions. In his case no evidence exists to close the PFO, no signs or symptoms of stroke. Even though his sister had neurologic sx's, PFO risk is still extremely low to suggest closing. Returned to basketball with-in 3 weeks.

---

**Knee Pain – High School Wrestler**

N. Ferrarini, G. Rozea, K. Vanic, J. Hauth, East Stroudsburg University, PA.

email: grozea@esu.edu (Sponsor: K. N. Waninger, FACSM)

**HISTORY:** A 14-year-old male wrestler presented with left posterior knee pain. The athlete could not describe a specific mechanism for the injury/condition. Pain has developed progressively/insidiously and shifted to the medial side of the knee with further joint line pain complaints. Past medical history unremarkable for any previous knee injury.

**PHYSICAL EXAMINATION:** No swelling or ecchymosis was noted in knee region. Slight pain described with palpation in the posterior left knee. Ligamentous stress tests were negative for pain or joint laxity (anterior drawer, posterior drawer, valgus and varus tests at 0° and 30°). No neurological or vascular changes noted. No range of motion or strengths deficits.

**DIFFERENTIAL DIAGNOSIS:** Posterior cruciate ligament pathology, medial meniscus tear, medial cruciate ligament pathology

**TEST AND RESULTS:** AP and lateral x-rays were negative for any fracture. Activity was restricted until orthopedic clearance. MRI revealed apparent bony exostosis near proximal growth plate along with pes anserine bursitis.

**FINAL/WORKING DIAGNOSIS:** Solitary tibial osteochondroma in the left knee.

**TREATMENT AND OUTCOMES:** The patient was referred to physical therapy three times a week for 4-6 weeks consisting of quad sets, towel crushes, short arc quads, straight leg raise, hip abduction, prone hip extension, quarter squats, theraband press backs, hamstring and gastroc/soleus stretching. Rehabilitation caused continued pain in the left knee. Cortisone injection was administered in the left medial knee joint. Athlete undergoes periodic routine evaluation and diagnostic examination to identify any changes or complications.

---

### **Knee Pain – Adolescent**

A. Kauffman, G. Rozea, K. Vanic, J. Hauth, East Stroudsburg University, PA.  
email: [grozea@esu.edu](mailto:grozea@esu.edu) (Sponsor: K. N. Waninger, FACSM)

**HISTORY:** A 9-year-old male elementary school student with no past medical history of lower extremity injury. During school recess, patient was playing soccer when his foot “fell into a hole” with a classmate tackling thereafter. Patient described a fixed hyperextension and rotational knee mechanism.

**PHYSICAL EXAMINATION:** Patient reports with chief complaint of knee pain. Initial management included emergency room referral where x-rays were obtained and ice was provided. The patient presents with pain and swelling. During the initial evaluation, patient reported with an antalgic gait and the feeling that his knee would “give way” when he walks. Visual inspection revealed gross swelling of the tibiofemoral joint with 2+ effusion. Palpation revealed left hamstring guarding. The patient was apprehensive towards fully straightening his left knee with a 30° extension lag was observed. Strength was 4/5 due to pain and guarding. Lachman’s test was positive for 1+ laxity, Anterior Drawer test was positive with a 2cm step off deformity. Valgus and varus stress tests were negative.

**DIFFERENTIAL DIAGNOSIS:** tibial plateau fracture, avulsion fracture, Salter-Harris fracture, posterior cruciate ligament rupture, lateral collateral ligament rupture, medial collateral ligament rupture, meniscal tear, and an anterior cruciate ligament rupture.

**TEST AND RESULTS:** Plain radiographs revealed open epiphyseal plates and was negative for fracture. The patient was referred from ER to orthopedic specialty. MRI revealed a partial tear of the anterior cruciate ligament of the left knee.

**FINAL/WORKING DIAGNOSIS:** Pediatric ACL rupture

**TREATMENT AND OUTCOMES:** The patient was referred to a pediatric orthopedic surgeon. Patient is undergoing knee rehabilitation and will undergo arthroscopic surgical intervention. Special considerations with surgical reconstruction, the possibility of injury to the physes should be given special consideration. The proximal tibial physis is the structure at risk during ACL reconstruction in pediatric patients. The literature offers a variety of operative techniques. Physeal-sparing techniques may result in non-anatomic graft placement and the long-term function of these grafts is unknown.

---

### **Acute Knee Pain- College Lacrosse Player**

Christine S. Persaud, Mark Mirabelli, University of Rochester Medical Center, Rochester, NY.  
Acknowledgments: Ilya Voloshin, John Goldblatt  
email: [ChristineSPersaud@gmail.com](mailto:ChristineSPersaud@gmail.com)

**HISTORY:** 22 year old male lacrosse player with right knee pain and swelling x 2 days. Pain was described as diffuse with no associated erythema, fevers, chills, swelling in other joints, or mechanical symptoms. There was no inciting event. He had no limitation in his activities. He attempted to rest and elevate with no relief. On initial visit X-rays and MRI were ordered that

were only remarkable for an effusion. On follow-up, an aspiration was done with 55mL of clear yellow joint fluid removed.

**PHYSICAL EXAMINATION:**

Vital Signs- normal

Gait- normal

Right knee - 1+ effusion, mild tenderness to palpation over the medial and lateral joint lines, pain with flexion, vague non focal pain with McMurrays ; neurovascularly intact.

**DIFFERENTIAL DIAGNOSIS:** Meniscal Injury, Septic Arthritis, Rheumatologic Disease, Osteochondral injury

**TESTS/RESULTS:** Right Knee X-ray-moderate size joint effusion.

MRI right knee without contrast-ACL, PCL, MCL, LCL, distal quadriceps tendon, patellar tendon, patellar retinaculum intact, medial and lateral menisci intact; Small effusion.

Knee Aspiration#1: Aerobic culture- Staphylococcus epidermidis -broth only

Knee Aspiration#2: Aerobic culture Staphylococcus epidermidis - broth only

Culture from OR: Aerobic culture Staphylococcus epidermidis - broth only

CRP-9 RF <10 ANA neg ESR- 10 WBC 5.3

**FINAL DIAGNOSIS:** Septic arthritis

**TREATMENT/OUTCOMES:**

The culture from the first aspirate showed Staphylococcus epidermidis from broth culture only and patient was advised to go to ER. In the ER a repeat aspiration was done showing Staphylococcus epidermidis from broth culture only. Although clinically the patient did not appear to have a septic knee, on follow-up he had persistent swelling with two positive cultures and was recommended for arthroscopic I&D. In the OR patient he had an arthrotomy with exploration, irrigation and drainage of copious green-tinged and straw-colored fluid. Cultures from the OR grew Staphylococcus epidermidis from broth only. Patient was seen by Infectious Disease, they felt the significance of the cultures were unclear because it only grew from the broth. Given that he had no other obvious cause for an effusion he was continued on Keflex for septic arthritis for 5 weeks. He was able to return to full activity and symptomatically improved.

---

**Unique Muscle Strain Masquerading as an Intraarticular Ligamentous Knee Injury in a Female, Collegiate Basketball Player**

Edward Rosero, Christiana Care Health System Department of Sports Medicine.

[edjrosero@gmail.com](mailto:edjrosero@gmail.com). (Sponsor: Kristopher Fayock)

**HISTORY:** 19-year-old female, collegiate basketball player was referred to the sports medicine clinic by the athletic training office. One-day prior, she reported posterior knee pain and inability to fully bear weight immediately after hyperextending her knee while running. She denies feeling a "pop" or a "click." Several hours after the injury she developed knee swelling and lost ability to fully extend her knee. She denies any paresthesias in the leg.

**PHYSICAL EXAMINATION:** Examination in the office was significant for a right knee effusion and pain along the medial aspect of the knee along medial collateral ligament and medial joint line. Pain was reproducible with valgus stress. Range of motion testing revealed a 15-degree extension lag. Ligamentous instability testing was equivocal secondary to pain.

**DIFFERENTIAL DIAGNOSIS:**

1. Medial collateral ligament sprain
2. Medial meniscal tear
3. Anterior cruciate ligament sprain
4. Patella or Quadriceps tendon strain
5. Intraarticular loose body
6. Hamstring strain

**TEST RESULTS:** MRI of the right knee revealed a moderate strain of the semimembranosus muscle and tendon along the distal aspect of the knee and mild strain of the patellar tendon at the attachment to the lower pole of the patella.

**FINAL WORKING DIAGNOSIS:** Moderate semimembranosus strain and mild patella tendon strain.

**TREATMENT AND OUTCOMES:**

1. Referred for Orthopaedic evaluation, who recommended knee immobilizer and rehabilitation with emphasis on increasing range of motion.
  2. Non-steroidal anti-inflammatory medication for pain.
  3. After 2 weeks of rehabilitation, she was able to pass all functional tests and was cleared to start non-contact drills and progress activity as tolerated.
- 

**Bilateral Triceps Atrophy in a Personal Trainer**

M. Nameer Sidiquee, Geisinger Orthopaedics and Sports Medicine, Wilkes-Barre, PA.

E-mail: MNSidiquee@geisinger.edu (Sponsor: David S. Ross)

**HISTORY:** A 41-year-old personal trainer with no significant PMH presents for evaluation of bilateral triceps muscle weakness and atrophy. He denies any specific injury but does report an instance when he had pain and swelling above his left elbow 5 years prior which developed subsequent to a weight lifting session. It was drained by his PMD and yielded dark red fluid. He reports progressive weakness and shrinking of his left posterior upper arm over the next 5 years. He also began having weakness and shrinking of his right posterior upper arm approximately 2 years ago. He has since regularly done triceps-specific exercises but reports a gradual weakening and significant atrophy of his bilateral triceps. He denies any neck or shoulder pain. He denies any paresthesias. He admits to anabolic steroid use 5 years ago.

**PHYSICAL EXAMINATION:**

**Inspection:** significant atrophy of triceps bilaterally

**Shoulder ROM:**

ABD - 150' bilaterally

ER - 90' bilaterally

IR - 70' bilaterally

FF - 150' bilaterally

**Tenderness:** none

**Strength:**

Shoulder Abduction: Right - 5/5 Left - 5/5

Shoulder External Rotation: Right - 5/5 Left - 5/5

Shoulder Internal Rotation: Right - 5/5 Left - 5/5

"Empty can": Right - 5/5 Left - 5/5

Biceps: Right - 5/5 Left - 5/5

Triceps: Right-3/5 Left- 3/5

Peripheral pulses: normal

Reflexes: normal (Triceps 2+ bilaterally)

Sensation: normal

**DIFFERENTIAL DIAGNOSIS:** 1. Triceps tear 2. Triceps Denervation

**TEST AND RESULTS:** MRI of left arm done 2 years prior showed mild-moderate triceps atrophy, greatest distally, and moderate triceps edema, greatest involving the mid to distal triceps about its insertion. No additional tests or studies done subsequently due to lack of patient follow up.

**FINAL/WORKING DIAGNOSIS:** Triceps atrophy due to chronic tear vs. denervation.

**TREATMENT AND OUTCOMES:** EMG ordered of bilateral upper extremities, to be done in 1 week and then follow up appointment planned.

---

### **Eye Pain – College Rugby Player**

M. Slaughter, K. Vanic, G. Rozea, East Stroudsburg University, PA.  
email: kvanic@esu.edu (Sponsor: Kevin N. Waninger, MD, FACSM)

**HISTORY:** A 22-year-old male rugby player. The patient was in a scrum during a rugby match and was hit below the right eye and cheek by an opposing players elbow. Patient denies any past medical history of trauma to eye or face.

**PHYSICAL EXAMINATION:** Patient presented with immediate pain (9/10), diplopia, and the inability to gaze/track upward; remaining extraocular movements appeared intact. There was no obvious deformity or discoloration at time of injury. ER physicians evaluated the patient and subsequently initiated discharge instructions with NSAIDs. While awaiting final instructions, the patient blew his nose which caused swelling and periorbital ecchymosis surrounding his right eye with an increasing sensation of pain and orbital pressure. ER physician determined that diagnostic imaging would be ordered. Patient described a severe amount of pressure on the right side of his face but minimal pain (2/3) with palpation to aforementioned areas.

**DIFFERENTIAL DIAGNOSIS:** LeFort Fracture, Zyomatic Fracture.

**TEST AND RESULTS:** X-rays revealed a 3mm nondisplaced fracture along the orbital floor. No foreign bodies or other fractures were detected.

**FINAL/WORKING DIAGNOSIS:** Orbital Blowout Fracture

**TREATMENT AND OUTCOMES:** Patient was referred to ophthalmologist. The patient agreed to have surgery. An endoscopic technique was used and a .85X38X50mm medpor plate was fixated to stabilize the fracture site. Patient spent 24 hours in the hospital. After he was discharged he complained of moderate levels of pain and pressure on the right side of his face as well as numbness blew his eye. Patient experienced photophobia 2-3 post-surgery. Activity restriction for 9 weeks. He was cleared to play for the last match of the season and with no ensuing complications.

---

### **Hip Pain – High School Track**

M. Taylor, G. Rozea, K. Vanic, East Stroudsburg University, PA & L. Zaparzynski, Mansfield University, PA

email: grozea@esu.edu (Sponsor: K. N. Waninger, FACSM)

**HISTORY:** A 19-year-old female field hockey athlete presented with pain over the left anterior inferior iliac spine (AIIS) and pain/stiffness in her hip joint (Asian descent). Past medical history revealed pain initially recognized two year prior to currents complaints and bilateral hip fracturing during childbirth.

**PHYSICAL EXAMINATION:** No deformity noted over greater trochanter and hip flexor region. Pain elicited during hip flexor manual muscle testing. Point tender over iliopsoas and rectus femoris tendons. The patient pronates and internally rotates hip during gait cycle. There is anterior medial clicking when the patient is retroverted and externally rotated. Inflammation apparent around AIIS. Athlete does excessively pronate and does present with internally rotated hips.

**DIFFERENTIAL DIAGNOSIS:** Hip Dysplasia (Adult Form), SI dysfunction, Lumbar Radiculopathy, Trochanteric Bursitis, Piriformis Syndrome, Psychosomatic Pain Disorder, Iliopsoas Tendinitis/Tendonitis/Tendinosis, Adductor Strain, Sports Hernia, Iliac Apophysitis, Quadriceps Strain, Endometriosis, Deep Gluteal Syndrome, Hamstring Tendinitis/Tendinosis, Chronic Pain Syndromes, Osteonecrosis, Labral tears

**TEST AND RESULTS:** Supine AP Pelvis view and a Hip Cross Table Lateral View was taken. MRI revealed signs of osteoarthritic changes. Alpha angle greater than 50°

**FINAL/WORKING DIAGNOSIS:** CAM hip and femoroacetabular impingement/dysfunction

**TREATMENT AND OUTCOMES:** After 4 weeks of rehabilitation, pain did not subside. The athlete not returned to full contact. She is not pain free and she is working on the proper

biomechanical field hockey stance. Rehab protocol included: leg raises, stretching hip flexors, quads and hamstrings and therapeutic electrical modalities. .

Manual muscle therapy included separation of the rectus femoris from the iliopsoas while holding laterally and internally rotating. Sustained pressure on pelvic girdle and pectineus and iliofemoral stretching. A normal end feel with posterior capsule stability has been potentially obtained. FAI rational may contribute to the low squat position during athletic play.

---

### **Foot Pain – College Football Player**

B. Tew, K. Vanic, G. Rozea, W. Wheeler-Dietrich, East Stroudsburg University, PA.

email: kvanic@esu.edu (Sponsor: K. N. Waninger, FACSM)

**HISTORY:** A 20-year-old male collegiate DII football player was examined in the locker room at half time after sustaining an injury to his left foot. During pre-game activities, his left foot was stepped on as his foot was planted and slightly rotated. Initially, he underreported his symptoms and was allowed to start the game. During halftime, he described the apparent nature of his injury. Past medical history of left navicular fracture. Idiopathic Toe-walker (ITW).

**PHYSICAL EXAMINATION:** Pain scale 8/10. Point tenderness was elicited over the navicular, 1<sup>st</sup> cuneiform, and 1<sup>st</sup> and 2<sup>nd</sup> tarsometatarsal joint. Dorsal edema was noted. He appeared neurovascular intact. Initial diagnosis by physician on sidelines was a midfoot sprain. Past medical history of navicular fracture warranted ER follow up post-game. Following Monday, he athlete was provided pain medication and crutches for ambulation with pneumatic walking boot. Full activity restriction warranted.

**DIFFERENTIAL DIAGNOSIS:** longitudinal stress injuries; fracture base of second metatarsal, cuboid fracture, navicular compression fracture, rupture of posterior tibialis tendon, compartment syndrome

**TEST AND RESULTS:** One week post-injury, stretching/strengthening activities ensued. Athlete could not pass functional tests for return to play. MRI determined that the athlete sustained a grade 3 Lis Franc sprain with a dislocation of the 2<sup>nd</sup> metatarsal. An avulsion fracture of the base of the 2<sup>nd</sup> metatarsal was ruled out. Surgery was required.

**FINAL/WORKING DIAGNOSIS:** Lis Franc Fracture-Dislocation

**TREATMENT AND OUTCOMES:** Open Reduction Internal Fixation (ORIF) was performed on the medial aspect of the foot by the 1<sup>st</sup> cuneiform; 1<sup>st</sup> cuneiform was fixated to the 2<sup>nd</sup> metatarsal and the middle cuneiform. Post-surgical treatment involved placing the patient in a walking boot and crutch ambulation for 2 weeks. After this time, the athlete was allowed to fully weight-bear. Over the next two months, athlete had a subsequent surgery to remove the hardware. After this surgery, he was required to use the walking boot for 2 weeks, and afterwards was allowed to return to full weightbearing status and cleared for activity. Orthopedic surgeon did not require rehabilitation post-operatively. The athlete has since returned to full-activity but is having complications due to excessive scar tissue and tendonitis of the extensor hallucis longus. Post-operative complication may have been avoided with compliant rehabilitation efforts.

---

### **Recreational Runner with Right Shoulder Pain and Cyanosis**

Mary Tierney, Parminder Nizran, George Pujalte

mtierney@hmc.psu.edu; pnizran@hmc.psu.edu; gpujalte@hmc.psu.edu

Penn State Milton S. Hershey Medical Center

**HISTORY:** A 25-year-old female presented to the emergency department with right shoulder pain for 3 days. Pain was 10/10 in intensity associated with swelling, numbness, coldness, and cyanosis, which worsened whenever she ran. No recent trauma. She was being followed by Rheumatology for the last 6 months for a positive ANA and anticardiolipin. Symptoms improved with warming, gabapentin, and narcotics.

**PHYSICAL EXAM:** Normal vital signs. Patient appeared anxious and in pain. Right arm was held at her side, fingers were noted to be purple, hand was swollen and cold to touch over the dorsal and ventral aspects, extending to the mid forearm. She had decreased sensation of the right hand over the median nerve distribution. She had 3/5 weakness of the right arm and tenderness over the right shoulder and right trapezius muscle. There was limited internal rotation and abduction of 70 degrees actively over the right shoulder. She had palpable radial pulses as well as palpable ulnar and superficial palmar arches. Her left shoulder exam was normal.

**BROAD DIAGNOSIS:** Thoracic outlet syndrome; reflex sympathetic dystrophy; thrombosis; conversion disorder.

**RESULTS AND STUDIES:** Repeat ANA negative, low immunoglobulin G (IgG) and immunoglobulin M (IgM), positive IgM fraction at 22. Normal white blood cell count, and normal C-reactive protein. Venous duplex initially ordered to rule out a thrombus was negative. MRI of the shoulder showed tendinopathy and partial tear of the supraspinatus tendon. MRI of the brachial plexus and CT angiography of the chest were negative. CT of the neck showed diffuse enlargement of the right trapezius muscle. A repeat ultrasound of the upper extremity with repetitive arm motions was positive for mild venous stasis and reduced phasity of venous flow.

**WORKING DIAGNOSIS:** Thoracic outlet syndrome with an unusual mixed presentation of neurologic, venous, and arterial manifestations.

**TREATMENT/OUTCOME:** Patient underwent a successful surgical resection of the right first rib, with resection of hypertrophied anterior scalene and subclavius muscle. As of this writing, she is currently undergoing rehabilitation and gradually regaining functional mobility of her right arm.

No grant funding was used for this case report.

---

### **Shoulder Injury – Certified Nursing Assistant**

Romulo Vasquez, United Health Service Hospitals Sports Medicine, Binghamton, NY.

romulo\_vasquez@uhs.org (Sponsors: Luis Rodriguez, Andrew Getzin)

**HISTORY:** 20-year-old right-handed female certified nursing assistant presented with right shoulder pain for six weeks after pulling a patient for bed transfer. Pain was sharp 7/10, constant on right neck, upper back, shoulder and arm. She complained of numbness, tingling, and weakness in right upper extremity. Pain was aggravated with movement, sleeping on right shoulder, lifting, pushing, and work related activity. Flexeril and Naproxen did not relieve symptoms. She denied similar symptoms in the past.

**PHYSICAL EXAMINATION:** Cervical lordosis is mildly decreased. There is mild tenderness in right lower paracervical muscles, but no tenderness in spinous processes. AROM, strength and Spurling test are normal. Right shoulder has no erythema, ecchymosis, swelling or joint deformity. There is tenderness in right upper trapezius. AROM and strength of right shoulder are limited in all planes by pain. Hawkins, Speeds, Supraspinatus, Yergason, O'Brien, and Cross Arm tests are negative. Upper back exam is significant for medial scapula winging, which is worse with arm flexion to 90 degrees. Trapezius and rhomboids strength are normal, but right serratus anterior strength is decreased. Neurovascular exam is normal.

**DIFFERENTIAL DIAGNOSIS:** 1. Cervical strain, 2. Rotator cuff injury, 3. Rhomboid palsy, 4. Trapezius palsy, 5. Accessory nerve palsy, 6. Long thoracic nerve palsy.

**TESTS AND RESULTS:** Cervical spine x-ray anteroposterior and lateral views: mild loss of lordosis. Cervical spine MRI is normal. Right shoulder x-ray anteroposterior, Y-scapular and axillary views all normal. Nerve conductive study of right upper extremity is consistent with long thoracic nerve injury.

**FINAL WORKING DIAGNOSIS:** Right long thoracic nerve injury

**TREATMENT AND OUTCOMES:** 1. Pt educated on etiology, signs and symptoms, and natural course of the injury. 2. Off work for a week, then return to light duty work with no lifting over ten pounds and no right arm pushing or pulling related activities. 3. Start physical therapy program focusing on right scapular stabilization and strengthening. 4. Gabapentin. Three and a half months post injury pain has resolved and scapula winging is unchanged, still on rehabilitation program working light duty.

---

### **Shoulder Injury — Rugby, Tennis**

Kenneth Vitale, Manhattan Wellness Medical Care (MWMC), New York, NY.

e-mail: kvitale@nihonclinic.com

**HISTORY:** A collegiate rugby player at age 19 shoulder tackled his opponent's hip with immediate pain / instability requiring sling, but didn't seek treatment. In his 20's continued rugby however had progressive weakness / instability. Age 35: during baseball tournament had acute pain after throwing and couldn't lift shoulder; only improved after complete rest. Age 47: during rugby match fell on arm injuring shoulder and wrist, requiring scapholunate ligament surgery and discontinuation of all sports. Age 50: he reattempted sports, tried overhead smash during tennis match and had sudden onset sharp pain / instability. No neck pain, radiating arm symptoms, or weakness.

**PHYSICAL EXAMINATION:** Prominent AC joint, tenderness over AC joint and deltoid, positive Neer/Hawkins, cross-arm adduction, active compression, crank, painful arc, and give-way weakness during range of motion (ROM) testing. Negative Speed's and biceps load test I&II. Normal neck and right arm neurovascular exam.

**DIFFERENTIAL DIAGNOSIS:** 1. Glenohumeral joint dislocation / Bankart lesion with chronic instability. 2. Labral tear. 3. AC sprain/dislocation with chronic instability. 4. Osteolysis of lateral clavicle. 5. Rotator cuff tendinosis/tear.

**TEST AND RESULTS:** MRI: moderate AC joint arthrosis, superior AC ligament thickening and fraying; mid/inferior anterior glenoid labrum fraying; mid/inferior glenoid rim cartilage thinning; superior labrum tear extending to biceps anchor; no rotator cuff signal abnormality.

**FINAL/WORKING DIAGNOSIS:** 1. Type II SLAP lesion. 2. Mid/inferior anterior glenoid labral tear, glenoid rim cartilage thinning. 3. AC joint arthrosis.

**TREATMENT AND OUTCOMES:** 1. Physical therapy: periscapular muscle strengthening, dynamic stabilization, scapular retraction / depression, scapular stability during ROM, posterior capsule stretching. 2. Currently in month 3, pain is decreasing but symptoms continue. 3. Difficult surgical decision: improving pain and he doesn't want surgery, however tear is considerable and has multiple other pathologies. 4. Candidate for Platelet-rich Plasma? Prolotherapy? 5. Case highlights challenges treating a labral tear and achieving scapular stability while not aggravating AC pathology, and difficulties treating athletes who continue to play multiple sports despite injuries.

---

### **Shortness of Breath in a Runner**

Adrian Western, Cayuga Medical Center, Ithaca NY; Andrew Getzin, Cayuga Medical Center, Ithaca, NY

Email: awestern@cayugamed.org

**HISTORY:** A 17 year old female high school runner presented for evaluation of dyspnea with exercise. She had been diagnosed with EIA (exercise-induced asthma). She was treated with albuterol which did not seem to help. Symptoms occurred within a couple minutes around half a mile into her runs, and typically would last for about five minutes if she stopped and walked. During symptoms she felt as though she is not able to get enough air into her lungs. The location of her restriction was in her throat and she described the feeling of her throat "closing". She did not have a cough but did report breathing loudly. She did have seasonal allergies that

affected her more in the fall. She perceived her level of fitness as high compared to others (8/10). She is a 4.0 student and described her level of stress as being "high by choice."

**PHYSICAL EXAMINATION:** Patient presents in the office with complaining of shortness of breath at high levels of exertion. She is a normal appearing 17 year old female with no symptoms at rest. BMI 19.7, weight 136 lbs, Heart Rate 65, Respiration 10 bpm. She has a history of asthma, seasonal allergies, and anemia. On 12/21/12 patient was tested with a methacholine challenge which was negative. She has no history of any other chronic disorder. Patient has a healthy diet that focuses on fruits and vegetables and limits processed food. Current medications include Vitamin D, and Iron supplementation.

**DIFFERENTIAL DIAGNOSIS:** 1) Asthma 2) Vocal Cord Dysfunction 3) Lack of Fitness/unreasonable expectations

**TESTS AND RESULTS:**

Pre and Post Beta Agonist testing revealed no change in FEV1, a 1% decrease in FVC, and a 1% increase in FEV1/FVC. This testing revealed a slight flattening of her inspiration loop with difficulty exhaling after 1 second. ECG revealed a sinus arrhythmia, but was otherwise normal. Blood work included Hemoglobin of 13.5 g/dL and Hematocrit of 41%. Chest X-rays were within normal limits. Shortness of breath testing revealed a maximum drop of 9% for FVC, 7% for FEV1, and 1% for FEV1/FVC ratio. Maximum heart rate during testing was recorded at 200 bpm (98% of age predicted max). VO2 response to work load was 57.4 ml/kg/min, 3.57 L/min (99% for women 20-29 age, ACSM's Guideline for Exercise Testing and Prescription, Ninth Edition). Pulse ox revealed a drop from 98%-88% during exercise. Heart rate response to exercise was normal. Post-exercise lung exam was clear throughout. Post exercise flexible fiberoptic laryngoscopy showed significant adduction throughout membranous vocal cords on inspiratory effort with posterior glottis opening; however, full abduction with expiration. The patient exhibited and audible stridor during the last stage of testing.

**FINAL/WORKING DIAGNOSIS:** Vocal Cord Dysfunction

**TREATMENT AND OUTCOMES:** Patient had enrolled in speech therapy prior to testing because of pretest suspicion for VCD. Patient was instructed to continue speech therapy to help treat her vocal cord dysfunction by working to maintain vocal cord abduction and airway patency near VO2max. She continues to compete in her cross country season with intermittent symptoms.

---

## Research Study Abstracts

---

### The Effect of Passive Heat Stress on Arterial Wave Reflection, Arterial Stiffness, and Cerebral Blood Flow

Ashton, K., Edwards, D., Rose, W., University of Delaware, Newark, DE

**Purpose:** It is well known that the prevalence of cardiovascular events is increased in extreme weather conditions. The purpose of this study was to determine the effect of passive heat stress on cerebral blood flow (CBF), arterial stiffness, and wave reflection. **Methods:** Sixteen apparently healthy adults were studied (age  $21.2 \pm 3.4$  years, 10 males, 6 females) at baseline and during passive heating in a water-perfused suit to a  $0.9 \pm 0.25^\circ\text{C}$  increase in core temperature. CBF was assessed by transcranial Doppler, arterial stiffness by carotid-femoral pulse wave velocity (PWV) and wave reflection by aortic augmentation index (Alx). Wave reflection transit time (Tr) was also measured. Changes in these variables from baseline to passive heat stress were evaluated with a paired t-test. We also investigated whether there was an association between baseline measurements of Alx, PWV, Tr, and changes in CBF. In addition, we examined the relationship between changes in Alx, PWV, Tr and changes in CBF. **Results:** Alx was found to significantly decrease from a baseline of -1% to -12% during passive heat stress ( $p < 0.05$ ). PWV and Tr did not significantly change from baseline. Mean CBF decreased from baseline to passive heat stress (15.5 cm/s to 14.1 cm/s,  $p = 0.06$ ). Correlation analyses revealed no significant associations between these variables. **Conclusion:** To our knowledge, the present study is the first to demonstrate a decrease in Alx during passive heat stress. These data suggest that while CBF and Alx both decline under passive heat stress, these changes appear unrelated to each other.

This work was supported by a grant from the University of Delaware Research Foundation.

---

### Vascular Function in Exercise-Trained Women

Augustine, J., Lefferts, W., Martin, E., Spartano, N., Heffernan, K. Syracuse University, Syracuse, NY

Cardiovascular disease (CVD) is a leading cause of death in women. Chronic exercise in combination with low energy availability may lead to lack of menses in women. This amenorrheic state has been associated with endothelial dysfunction, considered the first step in the atherosclerosis process. Currently it is unknown whether functional changes in the vessel wall lead to further structural changes, such as arterial stiffening and vascular remodeling (i.e. altered lumen diameter and increased wall thickness) in exercise-trained amenorrheic (ExAm) women. **Purpose:** To examine endothelial function, arterial stiffness and vascular remodeling in ExAm women to gain insight into the extent and severity of subclinical atherosclerosis risk. **Methods:** 43 women participated in this cross sectional study: 10 ExAm women (Age  $21 \pm 3$  years, BMI  $21.5 \pm 2.0 \text{ kg/m}^2$ ), 18 exercise-trained eumenorrheic (ExEu) women (Age  $22 \pm 3$  years, BMI  $22.9 \pm 2.4 \text{ kg/m}^2$ ), 15 sedentary eumenorrheic (SedEu) women (Age  $23 \pm 4$  years, BMI  $23.9 \pm 3.2 \text{ kg/m}^2$ ). Flow mediated dilation (FMD) of the brachial artery was used to measure endothelial function using ultrasonography. Carotid-femoral Pulse Wave Velocity (PWV) was taken as a measure of aortic arterial stiffness using applanation tonometry. Diameters and intima media thickness (IMT) of the superficial femoral artery (SFA) were taken as measures of vascular remodeling, using ultrasonography. **Results:** A one-way ANOVA indicated FMD in ExAm was significantly lower versus both ExEu and SedEu groups ( $6.91 \text{ mm} \pm 1.33$  vs.  $10.97 \text{ mm} \pm 0.98$  vs.  $10.57 \text{ mm} \pm 1.11$ ,  $P = 0.05$ ), after adjusting for the shear stress stimulus. Aortic PWV in ExAm was not significantly different from ExEu and SedEu groups ( $5.0 \pm 1.0 \text{ m/s}$ ,  $4.6 \pm 0.5 \text{ m/s}$ , vs.  $5.4 \pm 0.8 \text{ m/s}$ ,  $P = 0.03$ ). SFA diameter in ExAm and ExEu was significantly higher

versus SedEu ( $5.70 \pm 0.72$  mm vs.  $5.68 \pm 0.70$  mm vs.  $5.10 \pm 0.63$  mm,  $P = 0.03$ ), while SFA IMT in ExAm was significantly lower versus SedEu ( $0.31 \pm 0.03$  mm vs.  $0.38 \pm 0.07$  mm,  $P = 0.01$ ). SFA IMT was similar between ExAm and ExEu ( $0.31 \pm 0.03$  mm vs.  $.35 \pm 0.06$  mm).

**Conclusions:** Despite presence of endothelial dysfunction, aortic stiffness in ExAm is not different from ExEu, and SedEu. ExAm women demonstrate similar favorable remodeling of the SFA compared to ExEu women. Vascular dysfunction in young ExAm women may not extend beyond the endothelium.

---

### **IGF1R Pathway is Related to Enhanced Insulin Sensitivity Following Exercise Training**

<sup>1</sup>Barberio, M., <sup>2</sup>Huffman, K., <sup>1</sup>Hoffman, E., <sup>2</sup>Kraus, W. FACSM, <sup>1</sup>Hubal, M. FACSM. <sup>1</sup>Children's National Medical Center, Washington, D.C., <sup>2</sup>Duke University Medical Center, Durham, NC

**Purpose:** Skeletal muscle insulin resistance is a hallmark of Type 2 diabetes development and a precursor to cardiovascular disease. Insulin resistance is a complex trait, driven by both intrinsic (i.e. inherited) and extrinsic (i.e. environmental) factors. Exercise training is known to ameliorate insulin resistance, but this response is highly variable among individuals. The purpose of this study was to identify molecular adaptations in skeletal muscle associated with variable changes in insulin sensitivity ( $S_i$ ) following structured endurance training. **Methods:** Global gene expression (N=32; M= 15, F= 17) from vastus lateralis biopsies and blood  $S_i$  (via intravenous glucose tolerance test (IVGTT)) were determined prior to and following 6 months of endurance exercise training. Subjects were stratified based on change in  $S_i$  post-training as responders (top 2/3; n=21) and non-responders (bottom 1/3; n=11). mRNA profiles were analyzed using ANCOVA (gender, age, and group covariates; Partek Genomic Suite) for each responder group. Resultant mRNA lists were filtered at  $P < 0.01$  and fold change  $> |1.2|$ , then uploaded into biological pathway analysis software (Ingenuity Pathway Analysis). **Results:** ANCOVA detected 2878 and 8602 transcripts affected by training in non-responders and responders respectively. Biological pathway analysis of 317 annotated genes that were uniquely dysregulated in high responders (i.e. transcripts specifically related to  $S_i$  improvement) highlighted the insulin like growth factor 1 receptor (IGF1R) pathway as a potential mediating mechanism. Transcripts related to IGF1R included estrogen receptor 1 (ESR1; FC = +1.4 from pre to post training), mitogen activated protein kinase 8 (MAPK8; FC = -1.3), and cyclic ADP ribose hydrolase (CD38; FC = -1.2). **Conclusion:** Global gene expression coupled with pathway analysis suggests a role for the IGF1R pathway in modifying the varied response of  $S_i$  to structured endurance training. Increased expression of ESR1, along with down regulation IGF1R and multiple related genes, were associated with the greatest improvements in  $S_i$ . These data present a new pathway target to manipulate in order to maximize insulin sensitivity improvements with exercise.

Study supported by NIH (HL057354, DK081559, AR052596).

---

### **Effects of a High Speed-Low-Resistance Bicycling Intervention in Parkinson's disease**

Bellumori, M., Uygur, M., Knight, C.A. University of Delaware, Newark, DE

Bradykinesia is a symptom of Parkinson's disease (PD) that substantially decreases mobility while contributing to increased rates of disability and health care costs. Bicycling exercise is a promising strategy that could improve mobility in PD. **Purpose:** To determine the effects of a six week exercise intervention that uses high speed- low-resistance (HS-LR) stationary recumbent cycling in people with PD. **Methods:** Pre-exercise tests assessed level of PD severity, physical function, and perceived health. These were again performed following a supervised, 6-week (12 sessions), HS-LR program. **Results:** Eleven participants (age 62.7 (8.8) years; disease duration 41.5 (32.6) months) completed this study and had positive results (see Table below). HS-LR

training positively affected the disease severity and the tasks that relate to walking, balance, cognition, and dexterity.

	Pre-mean (SD)	Post-mean (SD)	t-value	p-value	% Change
Unified Parkinson's Disease Rating Scale	18 (6.80)	14.18 (6.08)	-4.35	<b>0.001</b>	-21.21
Hoehn-Yahr stage	2.55 (0.61)	2.59 (0.63)	1	0.341	1.54
Short Form (36) Health Survey	53	57.27	1.47	0.247	7.02
Activities Specific Balance Scale	77.33 (16.28)	88.26 (12.29)	2.26	<b>0.048</b>	15.51
Timed Up and Go (s)	7.35 (1.82)	6.15 (1.71)	-6.03	<b>&lt;0.001</b>	-16.27
6 Meter Walk (s)	3.53 (0.97)	2.99 (0.71)	-4.42	<b>0.001</b>	-15.14
Steps taken during 6 Meter Walk (#)	8.3 (1.32)	7.23 (1.03)	-5.88	<b>&lt;0.001</b>	-9.91
4 Square step test (s)	8.05 (1.53)	6.74 (1.68)	-4.75	<b>&lt;0.001</b>	-16.27
9 Hole peg test (s)	24.30 (4.71)	22.35 (4.22)	-3.04	<b>0.012</b>	-8.05
Simple Reaction Time (s)	0.29 (0.09)	0.26 (0.06)	-2.08	0.064	-12.99
Choice Reaction Time (s)	0.43 (0.08)	0.36 (0.08)	-2.74	<b>0.021</b>	-16.31
Shirt Buttoning Task (s)	66.54 (42.87)	42.25 (32.66)	-2.13	0.059	-30.05
Functional Reach Test (cm)	25.1 (3.062)	32.70 (6.51)	4.1	<b>0.003</b>	27.13
Grip Strength (kg)	31.91 (10.06)	32.18 (10.43)	0.17	0.872	0.85
Signature Size (mm <sup>2</sup> )	548.55 (224)	742.7 (376)	-1.70	0.119	35.40

**Conclusion:** High-speed recumbent bicycling is a successful strategy to improve mobility, function, and independence in people with PD that can be completed within a clinical setting or the comfort of one's home.

Supported by a grant from NIGMS (8 P20 GM103446-13) at NIH.

### Effects of Manganese (Mn) Supplementation on Muscle Force Generation during Hypoxia.

<sup>1</sup>Benson, M., <sup>1</sup>Receno, C., <sup>2</sup>Mohamed, Z., <sup>2</sup>DeRuisseau, L., <sup>1</sup>DeRuisseau, K. <sup>1</sup>Syracuse University, Syracuse, NY, <sup>2</sup> Le Moyne College, Syracuse, NY

**Purpose:** Impaired skeletal muscle contractile function and increased oxidative stress were previously shown to occur during exposure to hypoxic conditions. Notably, antioxidants were shown to attenuate the hypoxia-mediated declines in skeletal muscle function. In the mitochondria, manganese (Mn) plays a role in the normal functioning of manganese superoxide dismutase (MnSOD); a key antioxidant enzyme. Manganese administration could lead to increased MnSOD activity and thus attenuate the skeletal muscle dysfunction that is observed during hypoxia. **Methods:** Eleven week old male CD-1 mice were assigned to receive either saline (S; n=8) or manganese chloride (Mn; n=8) i.p. injections (12mg/kg body mass) once per

day for 7 days. Animals were anesthetized with isoflurane and the diaphragm was quickly harvested. Diaphragm strips were dissected and vertically suspended in a Krebs's- Henseleit buffer maintained at 37°C. Skeletal muscle twitch and tetanic force generation (N/cm<sup>2</sup>) measurements were obtained under normoxia conditions (95%O<sub>2</sub>; 5%CO<sub>2</sub>). Force frequency (20Hz, 30Hz, 60Hz, 150Hz, 200Hz) and baseline force measurements were obtained following a 30 minute incubation in hypoxia (95%N<sub>2</sub>; 5%CO<sub>2</sub>) conditions. Animal body mass and muscle contractile characteristics were analyzed using an independent samples t-test. Force frequency data were analyzed using a 2-way repeated measures ANOVA using SPSS Statistics 20 and significance was set at p<0.05. Data are expressed as mean±SEM. **Results:** No differences in animal mass (p>0.05), normoxia peak twitch tension (S: 2.4±0.21 vs. Mn: 2.2±0.38; p>0.05), or normoxia peak tetanic tension (S: 15.6±0.81 vs. Mn: 15.8±1.32; p>0.05) were observed. The rise in baseline force following 30 minutes of hypoxia was not significant when expressed in absolute values (C: 0.34±0.08 vs. Mn: 0.47±0.09; p>0.05) or as a percentage of maximal force generation (C: 2.35±0.64 vs. Mn: 2.80±0.39; p>0.05). No differences were observed in muscle force generation at any of the frequencies examined when normalized (N/cm<sup>2</sup>) or expressed as a percentage of maximal force generation (p>0.05). **Conclusion:** Short term manganese supplementation did not alter skeletal muscle contractile function during exposure to hypoxia.

Research funded by Le Moyne College Biological Sciences Department

---

### **Music Playlist Tempo and Self-Paced Running, Mood, and Attentional Focus**

Bly, K., Sforzo, G., King, D. Ithaca College, Ithaca, NY

**Purpose:** To examine the effects of music playlist tempo on exercise performance, mood, and attentional focus tendencies. **Methods:** A repeated measures design with three tempo conditions administered in a partially randomized, balanced fashion was used in which 36 participants ( $M = 32.3$ ,  $SD = 11.4$ ) participated in three 4800 m running conditions (Varying, Constant, No music) on three separate days, with at least 48 hours between them. On testing days the participants were asked to fill out the Subjective Exercise Experience Scale (SEES) and were given the selected tempo playlist. They were instructed to "enjoy their run" and allowed to run at a self-selected pace for 4800 m. During the run, split times, HR, and RPE were gathered for each 400 m increment with total run time, average HR, and average RPE also being calculated. The participants were also asked to fill out the SEES and the Attentional Focus Questionnaire (AFQ) at the end of the run. **Results:** A one-way repeated measures ANOVA showed ending RPE for the constant tempo had a non-significant trend of being lower and no music conditions ( $p = .06$ ). A paired t-test showed a significant increase in HR ( $t(35) = 9.64$ ,  $p < .01$ ) in the fast tempo as compared to slow tempo selections of the varying tempo condition. **Conclusions:** The current study demonstrated that music playlist tempo does not affect exercise performance, mood, nor attentional focus tendencies. Therefore, it appears playlist tempo is not a critical factor in selecting music for exercise, but instead one may listen to enjoyable music of diverse tempos with no apparent negative impact on exercise performance.

---

### **Effects of Applying Floss Bands on Regional Blood Flow**

Bohlen, J., Arsenault, M., Deane, B., Miller, P., Guadagno, M., Dobrosielski, D.A. Towson University, Towson, MD

Compression tack and band flossing results in re-perfusion of muscle tissue that may ultimately increase range of motion (ROM) and improve joint mechanics. Whether band flossing influences regional vascular adaptations or strength has not been evaluated. **Purpose:** Examine the effects of 14 days of band flossing combined with joint mobilization and resistive exercise on calf blood flow and plantar/dorsi flexion strength. **Methods:** Five participants (age:  $20 \pm 1$

years; men = 1, women = 4) completed 14 days of once per day bilateral therapy that included: unloaded squats (2 sets X 10 reps), heel raises (1 set X 10 reps), active dorsi flexion (1 set X 10 reps) and passive ankle mobilization. During each session, floss bands were applied proximal and distal to the patella of the experimental leg (EXP) while the contralateral leg acted as the control (CON). Resting arterial inflow and reactive hyperemic blood flow (RHBF) were assessed with venous occlusion plethysmography. An isokinetic dynamometer was used to measure plantar/dorsi flexion strength. Baseline assessments were repeated after the 14-day intervention. **Results:** At baseline, there were no differences between legs in average resting arterial inflow (EXP:  $2.17 \pm 1.39 \text{ ml} \cdot 100\text{ml}^{-1} \cdot \text{min}^{-1}$  vs. CON:  $2.22 \pm 0.70 \text{ ml} \cdot 100\text{ml}^{-1} \cdot \text{min}^{-1}$ ,  $p=0.89$ ) or RHBF (EXP:  $17.91 \pm 3.79 \text{ ml} \cdot 100\text{ml}^{-1} \cdot \text{min}^{-1}$  vs. CON:  $19.14 \pm 2.89 \text{ ml} \cdot 100\text{ml}^{-1} \cdot \text{min}^{-1}$ ,  $p=0.60$ ). Dorsi flexion peak torque at  $60 \text{ degrees} \cdot \text{sec}^{-1}$  was similar between legs at baseline (EXP:  $9.4 \pm 2.7 \text{ Nm}$  vs. CON:  $10.7 \pm 3.1 \text{ Nm}$ ,  $p=0.11$ ). No changes from baseline were observed in RHBF for either leg. Dorsi flexion peak torque increased 22% in the EXP ( $p=0.06$ ), while no change in the CON was observed. **Conclusion:** While strength was modified in the EXP leg, we found no change in RHBF, suggesting no adverse or beneficial effects of band flossing on vascular function. However, the implications of more rigorous protocols of longer duration on vascular health should be comprehensively examined.

---

### **Dietary Sodium-induced Changes in Plasma Osmolality are Greater in Those with Salt Sensitive Blood Pressure**

Brian M.S., Matthews, E.L., Ramick, M.G., Lennon-Edwards S.L., Edwards, D.G., Wenner, M.M., Farquhar, W.B., University of Delaware, Newark, Delaware

**Background:** Changes in dietary sodium intake lead to modest alterations in plasma osmolality. Recent evidence from animal models suggests a link between plasma osmolality and sympathetic outflow, which may be part of the etiology of salt sensitive blood pressure (BP) in animal models. **Purpose:** To begin to examine the relationship between osmolality and salt sensitivity of BP in humans, we tested the hypothesis that dietary sodium manipulation would lead to a greater change in plasma osmolality in those with salt sensitive (SS) BP compared to those with salt resistant (SR) BP. **Methods:** Twenty participants, 10 SS ( $45 \pm 3$  years) and 10 SR ( $46 \pm 4$  years) completed a controlled feeding study consisting of a 3-7 day run-in period (100mmol Na/day) immediately followed by a two phase randomized crossover 7-day diet perturbation: low sodium (LS; 20 mmol/day) and high sodium (HS; 300-350 mmol/day). All measurements were completed on the final day of each diet. Salt sensitivity was defined as a change in ( $\Delta$ ) 24 hour (24-hr) mean BP of  $> 5$  mmHg between the low and high sodium diets. **Results:** The diet-induced  $\Delta$  in 24-hr mean BP was greater in the SS compared to the SR group ( $\Delta 8.2 \pm 0.5$  vs.  $-0.9 \pm 1.0$  mmHg,  $p < 0.001$ , by design). Twenty-four hour urine sodium excretion, and 24-hr urine volume increased during the high sodium diet ( $p < 0.05$ ) but were not different between the SS and SR groups ( $p > 0.05$  for all). The  $\Delta$  in plasma osmolality was greater in the SS group compared to the SR group ( $\Delta 5.7 \pm 1.9$  vs.  $1.3 \pm 0.7$  mOsm/kg,  $p < 0.05$ ). There was a modest but significant correlation between the  $\Delta$  in plasma osmolality and the  $\Delta$  24-hr mean BP across all subjects ( $r^2 = 0.30$ ;  $p = 0.01$ ). **Conclusions:** These preliminary data suggest that SS subjects have a greater  $\Delta$  in plasma osmolality for a given dietary sodium manipulation than SR subjects, providing evidence that the change in plasma osmolality may be one factor in contributing to SS BP.

Research funded by NIH grants 2 P20 RR016472-11 & R01 HL104106.

---

### Glycemic Control Following Nordic Ski Training

Braun, W.A. (FACSM), Shippensburg University, Shippensburg PA

**Purpose:** To study the effects of Nordic ski training on post-exercise blood glucose (BG) clearance. **Methods:** Twenty-one (male = 10; female =11), competitive college Nordic skiers (age=19.14±1.3 yrs.; body fat %=14.9±6.2) completed two ski training conditions (high intensity: HI; and easy volume: VOL) and one resting control (CON) condition on separate days. At rest on the control day and upon completion of ski training, a 75 g oral glucose tolerance test (OGTT) was administered. BG was measured prior to the OGTT and at 20 min intervals for 80 min of passive rest. Hunger was assessed prior to the OGTT and at 40 and 80 min of rest via visual analog scale. Data were analyzed using a two-way ANOVA with repeated measures and one-way ANOVA (SPSS v. 19). **Results:** Significant time effects were present for BG. BG area under the curve (AUC) was significantly smaller following HI vs. CON, but not different from VOL (table). VOL AUC tended to be smaller than CON ( $p = 0.064$ ). CON hunger was lower than VOL and tended to be lower than HI ( $p=0.064$ ).

Condition	Pre	20 min	40 min	60 min	80 min	AUC
CON	86.09 ± 2.2	133.05±3.7	130.09±4.9	116.29±2.9	104.43±3.0	9493
VOL	85.29±2.3	122.76±5.2	130.76±5.3	111.14±5.1	94.10±3.0	9087
HI	81.33±3.1	127.71±3.8	125.43±3.6	101.14±3.8	92.62±3.1	8825*

BG measures ( $\text{mg dl}^{-1}$ ) mean ± S.E. \*Different from CON. All time points differ except the 20 and 40 min measures.

**Conclusion:** Intensity of Nordic ski training appears to positively affect glucose clearance rates during recovery from exercise.

### Landing Differences in Ground Reaction Force and Kinematics between Collegiate Female Basketball Players and Dancers

Bravo-Pontrelli, E., Rubin, K., Stearne, D. West Chester University, West Chester, PA

**Purpose:** Altered landing mechanics may decrease force attenuation capacity at ground contact and expose the athlete to non-contact knee injuries. Jump landing strategies exhibited by dancers during training and performance may reduce injury risk by improving alignment through the knee. The purpose of this study was to examine differences between collegiate female basketball players and dancers on hip and knee strength, sagittal and coronal plane lower extremity kinematics and ground reaction forces on single-leg drop landings and drop jumps from 30 cm and to evaluate Reactive Strength Index (RSI) as a functional measure of effective landing strategy and energy transfer on a countermovement. **Methods:** Four healthy female dancers from a university dance group (age = 20.5 ± 1.3 years, height = 164 ± 5 cm, weight = 60 ± 8.2 kg) and four healthy NCAA Division II female basketball players (age = 20.5 ± 1.9 years, height = 169.7 ± 7.4 cm, weight = 66 ± 8 kg), each with at least 7 years of competitive experience in their respective disciplines, participated. A cross-sectional design was used. Independent variable was training modality (dance or basketball). Dependent variables were isometric strength, for hip extensors, flexors, abductors, adductors, lateral and medial rotators, and knee extensors and flexors, RSI, ground reaction forces and sagittal and coronal plane kinematics. **Results:** Independent t-tests revealed that dancers exhibited greater knee flexion ( $p = .014$ ,  $t = 3.43$ ) on the single-leg drop landing and lower knee valgus angle ( $p = .014$ ,  $t = 3.45$ ) on the drop jump task, compared to basketball players. No other differences were statistically significant. **Conclusion:** Although normalized strength differences between groups did not exist, dancers appeared to demonstrate a softer landing strategy through greater knee flexion and more effectively maintained neutral alignment in the coronal plane at ground contact. Further, since RSI scores did not differ between groups, the safer landing strategy exhibited by

dancers did not significantly reduce countermovement performance and thus indicates that dance training principles may show potential for application to more conventional sport training programs aimed at knee injury risk reduction.

Research funded by a West Chester University Student-Faculty Research Grant.

### The Effect of Music Tempo on Squat Performance

Burket, J., Eubank, T., Reed, C., Sanders, J. Shippensburg University, Shippensburg, PA

**Purpose:** The purpose of this study was to determine whether music tempo affects squat performance. **Methods:** A total of eleven healthy college aged subjects (Age range: 18 ~ 22 yrs, Weight: 81.4±12.0 kg, Height: 1.7±0.1 m) volunteered in the study and eight subjects (one female and seven males) completed the study. After obtaining baseline measures, subjects performed heavy barbell squat exercise under three conditions. The three conditions were to perform the squat exercise with load equal to 60% of their body weight until failure while listening to fast tempo (200 bpm), slow tempo (60 bpm) and no music. The order of the trial was randomized and each trial was separated by a minimum of 7 days. Using descriptive statistics and one-way analysis of variance, data were analyzed to compare the difference in performance under three conditions. **Results:** Compared to fast music and no music condition, subjects performed more repetition of squat under slow music condition (34.8±29.6 vs. 33.5±22.7 vs. 35.1±37.0 reps). However, the difference was not significant (p>0.05). Although not significant, subjects reported higher rate of perceived exertion (RPE) under slow music condition while exercise heart rate and systolic blood pressure were reported to be lower with slow music condition.

	Repetition	RPE	HR (bpm)		SBP (mmHg)	
			Before	After	Before	After
No Music	33.5±22.7	14.0±2.5	79.1±17.9	162.0±14.8	130.8±22.0	155.8±19.3
Fast Tempo	34.8±29.6	13.5±2.4	80.3±13.8	161.9±17.5	122.5±17.5	156.3±10.6
Slow Tempo	35.1±37.0	14.5±1.8	81.6±10.9	159.6±12.4	123.0±13.2	146.0±16.4

**Conclusion:** The results of the study indicate that music tempo has no significant influence on heavy squat exercise performance or cardiovascular measures during exercise. Future studies are needed to further examine possible effect of music tempo when using a larger variation.

### Metabolic Demand and Nutrient Resource in Rowing Ergometer and Treadmill Exercise

Burns, E., Burns, D. DeSales University, Center Valley, PA

**Purpose:** Rowing ergometer exercise differs from treadmill exercise in two ways. Treadmill exercise utilizes primarily the lower extremities and is a load-bearing activity. Rowing is a seated activity and utilizes a much greater muscle mass. This study compared metabolic responses to these two exercise modes at differing submaximal intensities. **Methods:** Twelve healthy college-age males completed one exercise exposure on a treadmill and one on a rowing ergometer. Metabolic steady state was achieved during each stage of exercise at intensities approximating 4, 6, and 8 MET. Oxygen consumption, respiratory exchange ratio (RER), and heart rate were monitored throughout the exercise. Fat-free mass (FFM) was estimated by hydrostatic weighing using a helium dilution technique so that metabolic cost could be expressed relative to both total body mass (TBM) and lean body mass. **Results:** Although not significantly different, the power generated in rowing exercise is uniformly higher than on the treadmill at the same intensity. Metabolic resource and energy cost relative to working mass appear similar in the two exercise modes, although the RER at 4 MET is somewhat lower in treadmill exercise as compared to rowing.

	Power (W)	RER	VO2 / Kg LBM
Treadmill 4 MET	18.1	.83 (p<.01)	16.8
Treadmill 6 MET	54.6	.94	24.4
Treadmill 8 MET	100.4	.95	32.4
Rowing 4 MET	32.9	.91	16.8
Rowing 6 MET	67.1	.94	24.1
Rowing 8MET	109.3	.95	31.3

**Conclusion:** The data from this small study appear not to justify claims that the larger muscle mass utilized during rowing generate higher metabolic demands as compared to treadmill exercise; in fact the opposite may be true since rowing generated higher power output than treadmill exercise at similar metabolic demand. There appears to be little difference in metabolic resource or metabolic demand relative to actively working muscle between the two exercise modes.

---

### Perceived Credibility of Weight Management Apps/Websites among Female College Students

<sup>1</sup>Clark, A., <sup>1</sup>Kretsch, J., <sup>1</sup>Haros, P., <sup>1</sup>Gelfen, G., <sup>2</sup>Albright, C., <sup>1</sup>Jerome, G.J. <sup>1</sup>Towson University, Towson, MD, <sup>2</sup>Immaculata University, Immaculata, PA

**Purpose:** Apps and websites aimed at helping individuals make lifestyle changes to manage their weight are readily available. Students are often early adopters of technology; however they also have the burden of determining the accuracy, credibility and evidence-base of these technologies. **Methods:** There were 110 female college students with an average age 21.5 (SD=4.9) and BMI of 25.5 kg/m<sup>2</sup>(SD=5.7) who completed a survey via email and an in-person visit which included standardized height and weight. Participants used a 7-point likert scale to indicate the extent a characteristic detracted from the credibility (-3), was neutral (0) or added to the credibility (+3) for both the app/website they used and for an ideal app/website. They also indicated if 12 different evidence based strategies were used in their app/website or would be used in an ideal app/website. **Results:** Participants provided lower than ideal credibility ranks for the apps/websites they were using and reported that believability, trustworthiness, and expert content increased the credibility while spelling errors, questionable advertising and mismatched domain names decreased credibility. Additionally, 87% of participants used apps/websites that included some but not all of the identified evidence based strategies, and only 33% expected the apps/websites to include the full complement of evidence based strategies. **Conclusion:** Participants selected apps/websites that they considered less than ideal. The extent that apps/websites are not utilizing a full range of evidenced based approaches may limit an individual's weight management success and lead to frustration. Ensuring that college students use safe and effective methods to manage their weight could lead to better health across their lifetime.

Research funded by the School of Emerging Technology, Towson University

---

### Ilex Increases Cutaneous Blood Flow by Augmenting Endothelium-derived Hyperpolarizing Factors

Craighead, D., Conlon, C., Alexander, L, FACSM. Penn State University, University Park, PA

**Purpose:** Menthol containing topical analgesics are used for pain relief and cryotherapy. However, the effect of these topical agents on skin blood flow (SkBF) has not been fully elucidated. We sought to determine the effects of a commercially available analgesic gel, and

isolated ingredients menthol, and ilex paraguarensis on nitric oxide (NO) and endothelium-derived hyperpolarizing factor (EDHF)-mediated cutaneous vasodilation. **Methods:** Standardized reactive hyperemia (RH) and local heating (LH) protocols to investigate EDHF and NO-mediated vasodilation respectively were performed on 10 healthy human subjects. Four gels were applied to separate sites on the ventral forearm: 1) placebo 2) topical analgesic 3) menthol 4) ilex. Temperature at each site was controlled with a local heater. Temperature was clamped at 34°C for baseline and RH, increased to 42°C for LH, and subsequently increased to 43°C to elicit maximal vasodilation. Red blood cell flux was measured using laser speckle contrast imaging and normalized to cutaneous vascular conductance (CVC: flux/mean arterial pressure) and expressed as a percent of maximum CVC (%CVC<sub>max</sub>). **Results:** The topical analgesic and ilex, but not menthol, caused a baseline increase in %CVC<sub>max</sub> compared to placebo. The topical analgesic and ilex also caused an increase in the total hyperemic response (THR). There was no difference in %CVC<sub>max</sub> across sites in response to LH. Menthol was not significantly different from placebo.

Gel	Baseline (%CVC <sub>max</sub> )	THR (%CVC <sub>max</sub> *sec)	LH (%CVC <sub>max</sub> )
Placebo	20 ± 2	5913 ± 792	74 ± 3
Topical Analgesic	58 ± 5*	18941 ± 3345*	78 ± 1
Menthol	20 ± 2	5242 ± 606	78 ± 3
Ilex	63 ± 7*	18760 ± 3021*	80 ± 2

\* indicates significantly different from placebo

**Conclusion:** Menthol had no effect on skin blood flow, however commercially available analgesic gels containing Ilex augments SkBF at baseline and during RH, likely through EDHF-mediated mechanisms.

### Phosphate Decrement in Repeated Sprint Ability

DiMartino, V., Schmidt, G. (FACSM), Carpenter, T., Campo, G., William Paterson University, Wayne, NJ

**Introduction:** The purpose of this study was to analyze phosphate fatiguing and decrement (PD) patterns in university students completing a repeated sprint ability (RSA) test. **Methods:** Subjects were comprised of 7 women and 7 men (N=14) whose ages ranged from 23 to 41 years with a mean age of 25.7 ± 4.7 years. The average height of men was 1.79 ± 0.01 m and women was 1.59 ± 0.1 m. The average weight of men was 92.5 ± 14.7 kg, and women was 59.0 ± 8.9 kg. Subjects ran 8 trials of 20 meters with 30 second rest periods. **Results:** Men had faster times (3.62 ± 0.16 sec) than women (4.71 ± 0.82 sec) with an overall average of 4.17 ± 0.18 sec. An Independent *t*-test revealed no significant difference between genders (*P* = ns). Average phosphate decrement (PD) between men and women was 7.49 ± 4.35 % for men and 3.57 ± 4.64% for women.

	Fastest Time (sec)	Slowest Time (sec)	Average Time (sec)	Phosphate Decrement(%)
Male (n=7)	3.25	4.69	3.62 ± 0.16	7.49 ± 4.35
Female( n=7)	3.73	6.57	4.71 ± 0.82	3.57 ± 4.64
Average (n=14)	3.49	5.63	4.17 ± 0.80	5.53 ± 4.77

**Discussion:** RSA times for all participants suggest a high demand on physiological adaptations. Being that the RSA replicated high intensity interval training (HIIT), the

physiological responses were different for all the participants based on their current conditioning levels. PD was correlated with the exertion of each subject and the consistency of the times of each trial. **Conclusion:** This study concluded that the RSA showed a PD among all participants. A larger PD would indicate more reliability on the lactic anaerobic system for energy.

---

### High-Fat Diet Regulation of Cell Cycle

Dungan, C. M. and Williamson, D. L. University at Buffalo, Buffalo, NY

**Purpose:** Like aged individuals, skeletal muscle proliferative capacity, mass, and function of the obese are decreased. This has a negative metabolic impact, because skeletal muscle is a major site for insulin action and glucose disposal and comprises a large portion of fat free mass, which is positively associated with metabolic homeostasis. There is mounting evidence of increased expression of senescence proteins in obese tissues, similar to that of aged, suggesting premature senescing of obese tissue. The aim of this study was to determine if cell cycle regulatory proteins (p53, p21, p27, Rb, and E2F1) are altered in young and old rodents following consumption of a high-fat diet. **Methods:** 3-month (Y) and 23-month (O) male mice were fed either a 10% (LF) or 60% (HF) lard-containing diet for 8 and 6 weeks, respectively, that resulted in 25% and 30% increase in body weight (vs. respective LF group). Following the treatment period, the plantar flexor complex (gastrocnemius, plantaris, soleus) was removed and processed to obtain total, nuclear, and cytosolic fractions. **Results:** Nuclear and cytosolic p21 expression was significantly reduced ( $p < 0.05$ ) in the Y-HF vs. Y-LF, while nuclear p27 and Rb were increased ( $p < 0.05$ ). Nuclear p53 expression remained unchanged, while cytosolic p21 was reduced ( $p < 0.05$ ) in the Y-HF vs. Y-LF. Additionally, there was a significant increase ( $p < 0.05$ ) in E2F1 expression in the Y-HF vs. Y-LF. In the old mice, HF diet had no effect on nuclear p53, p21, or p27 expression. Cytosolic p21 expression was elevated in the O-HF vs. O-LF ( $p < 0.05$ ), while p53 trended upwards ( $p = 0.19$ ). Despite reciprocal reductions and increases phospho-Rb and total Rb (O-HF vs. O-LF;  $p < 0.05$ ), respectively, E2F1 expression was not effected by the HF diet. **Conclusion:** Consumption of a high-fat diet that results in obesity, significantly alters cell cycle regulatory proteins in both young and old muscle, which may indicate potential mechanisms for reduced muscle adaptation in the aged and/or obese.

Research was supported by UB Start-Up Funds

---

### KINECTing Generations to Physical Activity

Duszak, E., Sullivan, J., Orsega-Smith, E. University of Delaware, Newark, DE

**Purpose:** The purpose our project was to determine if older adults demonstrate increased balance, coordination and social opportunity after participating in an exercise program using the Xbox Kinect with their grandchildren. **Methods:** Participants consisted of 7 older adults (6 females and 1 male) and 7 kids (3 females and 4 males). Average age of the older adults was 72 (69 to 81 years) and the average age of the grandchildren was 13 (9-16 years). Pre and post test questionnaires for the older adults consisted of: Satisfaction with Life Scale, Godin Physical Activity Scale, Rating Activities of Daily Living, Activities-Specific Balance Confidence Scale, and Falls Self-Efficacy Scale. Functional tests (timed-up-and-go, chair stands and the Berg Balance Test) were conducted in order to track their progress throughout the program. All participants wore an accelerometer for a period of seven days to track their physical activity during and outside of the program. **Results:** There were significant improvements in Berg balance ( $t = 3.02$ ,  $p < 0.05$ ) and timed-up-and-go ( $t = 2.86$ ,  $p < 0.05$ ) from pre-test to post-test. There were no significant differences in the measures of satisfaction with life, perceived balance, physical activity or Social Support. Additionally accelerometer data showed that the older adults were significantly more active on the days in which they played the Kinect ( $t = 2.99$ ,

$p < 0.05$ ) than the days when they did not. The average number of kilocalories expended on days on which the game was played was 3408 kilocalories, as opposed to the 2352 average kilocalories when the Kinect was not played. **Conclusion:** The results of this study suggest that Xbox Kinect exercise programs in senior centers may increase daily caloric expenditure and balance in older adults and interaction with their grandchildren can enhance this experience.

---

### **The Heart Rate Response and Force Production Related to Deer Hunting-Associated Activities**

Eberhart, K., Verba, S., Jensen, B., Lynn, J. Slippery Rock University, Slippery Rock, PA.

According to the U.S. Fish and Wildlife Service, Pennsylvania accounts for the second most number of hunters with approximately 970,000 license holders. Little research on the physiologic demands of this activity has been conducted, especially in female hunters.

**Purpose:** To examine the physiologic demands of deer hunting-associated activities in apparently healthy individuals. **Methods:** Eleven men and women (BMI:  $26.9 \pm 5.5 \text{ kg/m}^2$ ; Age:  $27.1 \pm 10.0 \text{ yrs}$ ;  $\text{VO}_{2\text{max}}$ :  $53.93 \pm 8.25 \text{ mL/kg/min}$ ; Hunting Experience:  $5.5 \pm 3.7 \text{ years}$ ) participated in this study. Subjects completed a 0.8km hike over terrain simulating Pennsylvania hunting grounds. Following a short rest, subjects completed a 0.4km drag using a fake deer weighing 56kg (123 pounds, the weight of the average deer in PA) over similar terrain. Heart rate was measured during the activities using a Polar Heart Rate Monitor. Mean tension ( $T_N$ ) while dragging the deer was measured using a cable tensiometer. **Results:** Maximal ( $\text{HR}_{\text{max}}$ ) and mean ( $\text{HR}_{\text{mean}}$ ) heart rate during the hike was  $118.3 \pm 27.6 \text{ bpm}$  and  $104.6 \pm 23.8 \text{ bpm}$ , respectively.  $\text{HR}_{\text{max}}$  and  $\text{HR}_{\text{mean}}$  during the drag was  $179.4 \pm 20.2 \text{ bpm}$  and  $156.5 \pm 21.5 \text{ bpm}$ , respectively. Percent of time spent with a HR above 85%  $\text{HR}_{\text{max}}$  was  $49.9 \pm 35.9\%$ . Mean force production ( $T_{N\text{mean}}$ ) during the drag was  $69.2 \pm 5.6 \text{ lbs}$ . **Conclusion:** This study demonstrated that normal hunting activity is a high intensity physical activity, eliciting heart rate responses above 85% of maximum in a high-fit population. These findings may be valuable when considering the physiologic demand of hunting-associated activities, especially in untrained individuals.

Funded by the College of Health, Environment, and Science, Slippery Rock University

---

### **Challenging Balance in Older Adults Using the Wii Fit Balance Program**

Farrell, A., Orsega-Smith, E., Ferguson, J., Plante, K. University of Delaware, Newark, DE

**Purpose:** The purpose of this study was to investigate the impact of a Wii Fit Balance program on older adults' functional balance and measures of balance perceptions. **Methods:** Sixteen community dwelling older adults from local senior centers (81% females and 19% males) with an average age of 75 years played Wii Balance games for 30 minutes once a week. Additionally they were given specific balance exercises to complete at home. In the first and last week of the program, the older adults completed pre and post tests. The questionnaires included the following: Satisfaction with Life Scale, Godin Physical Activity Scale, Activities-Specific Balance Confidence Scale, Falls Self-Efficacy Scale, and the Rating Activities of Daily Living. Functional balance was assessed through the timed up-and-go, chair stands, and the Berg Balance Test. A sub-study was conducted where nine participants were given an accelerometer to wear on their right hip for one week. **Results:** There was a significant difference pre-post testing in the Activities-Specific Balance Confidence Scale ( $t = 2.81$ ,  $p < 0.05$ ) and non-significant improvements in the functional balance measure (timed up-and-go, chair stands, and the Berg Balance test). Additionally, measures of perceived balance were significantly correlated to functional balance ABC and TUG ( $R = .87$ ,  $p < 0.001$ ) ABC and Berg ( $R = .83$ ,  $p < 0.001$ ) ADL and Berg ( $R = .98$ ,  $p < 0.0001$ ). **Conclusions:** The results of this study indicate that the Wii Fit

Balance Program improved the older adults' confidence level when participating in specific balance activities. The study also suggests that there was a positive relationship between the older adults' perceived balance and their actual balance. However, further research should be conducted to determine if this program can make significant improvements in regards to functional balance.

Research funded by University of Delaware Summer Service Learning 2013.

---

### **Impact of Hybrid Delivery on Learning Outcomes in Exercise Physiology**

Fisher, M., Pfeifer, N. Montclair State University, Montclair, NJ

**Purpose:** The purpose of this study was compare the effectiveness of a traditional face to face class format and hybrid class format (partially online instruction) on learning outcomes in exercise physiology. **Methods:** Fifty five undergraduate students who were enrolled in one of two sections of Exercise Physiology at a University in the northeastern United States participated in the study. Participants were upper level students majoring in athletic training, exercise science, or physical education. The traditional section (n = 27) met twice a week for a total of 150 min of lecture and 50 min of laboratory activities. The hybrid section (n = 28) met once per week for a 75-min lecture and 50-min laboratory. For the hybrid section, the remaining 75-min lecture was replaced with a link to an online lesson that incorporated class notes, illustrations, physiology animations, and interactive activities. Students accumulated points throughout the lesson to serve as a record that they completed the assigned content. Measures of student learning included scores on three written exams and the overall semester average. Additionally, a questionnaire with a series of Likert-scale items was administered at the end of the semester to evaluate student perceptions of delivery mode. Procedures for obtaining informed consent at the beginning of the semester and collecting data were approved by the University Institutional Review Board. The comparison of exam and semester grades was accomplished through an independent t test. Perceptions of course delivery were evaluated with a 2x2 Chi Square analysis. A level of  $p < 0.05$  was used as the criteria for statistical significance. **Results:** There were no significant differences between groups with respect to Exam 1 (traditional  $81.33 \pm 9.32\%$ , hybrid  $81.14 \pm 10.89\%$ ), Exam 2 (traditional  $77.96 \pm 10.70\%$ , hybrid  $78.77 \pm 10.61\%$ ), Exam 3 (traditional  $82.54 \pm 8.18\%$ , hybrid  $80.82 \pm 8.53\%$ ), and Semester Average (traditional  $83.92 \pm 6.64\%$ , hybrid  $82.55 \pm 8.63\%$ ). Perceptions of content delivery with respect to the learning experience, feedback, clarification of concepts, and level of engagement were also similar between sections ( $\chi^2 > 0.05$ ). **Conclusion:** Both traditional and hybrid modes of delivery were equally effective in promoting mastery of exercise physiology content.

---

### **Association between Inflammation, Cardiorespiratory Fitness, Body Size, and Dietary Behaviors in Young Adults**

<sup>1</sup>Fleming J.J., <sup>1</sup>Fradkin A.F., <sup>1</sup>Andreacci J.L., <sup>2</sup>Miles M.P., <sup>1</sup>Rawson E.S., Bloomsburg University of Pennsylvania, Bloomsburg, PA, Montana State University, Bozeman, MT

Chronic inflammation predicts cardiovascular disease risk. However, the lifestyle factors that increase systemic inflammation have not been well characterized in young healthy individuals. **Purpose:** To determine if systemic inflammation is associated with differences in fitness, body size, or dietary behaviors in apparently healthy young adults. **Methods:** A cross section of thirty participants were randomly selected from a database of individuals who were assessed for  $VO_{2max}$ , body mass index (BMI), dietary behaviors, and serum high-sensitivity c-reactive protein (hs-CRP). Volunteers were separated into low (Group 1:  $< 1.0$  mg/dL), medium (Group 2:  $1.0$  to  $3.0$  mg/dL), and high (Group 3:  $> 3.0$  mg/dL) inflammation groups based on hs-CRP values.

One way ANOVAs and Tukey's post-hoc tests were performed to locate differences between the three groups. **Results:** Mean hs-CRP was different between groups (Group1:  $0.4 \pm 0.3$  mg/dL < Group 2:  $1.5 \pm 3.1$  mg/dL < Group 3:  $7.5 \pm 4.2$  mg/dL) ( $P < 0.001$ ) (mean  $\pm$ SD). Relative  $VO_{2max}$  was greater in Group 1 vs. Group 3 ( $51.4 \pm 4.7$  vs.  $42.4 \pm 5.71$  ml/kg/min) ( $p = 0.02$ ). There was no difference in BMI between groups ( $p = 0.82$ ). Dietary fat intake was lower in Group 1 vs. Group 3 ( $56.1 \pm 25.7$  vs.  $124.1 \pm 76.7$  g/d) ( $p = 0.02$ ) and Group 2 vs. Group 3 ( $67.5 \pm 36.8$  vs.  $124.1 \pm 76.7$  g/d) ( $p = 0.05$ ). Dietary protein intake was lower in Group 1 vs. Group 3 ( $63.0 \pm 30.1$  vs.  $136.5 \pm 31.5$  g/d) ( $p = 0.04$ ). Total kilocalorie intake tended to be lower in Group 1 vs. Group 3 ( $1774.2 \pm 741.2$  vs.  $3103.5 \pm 1865.8$  Kcal/d) ( $p = 0.07$ ). There was no difference in carbohydrate intake between groups ( $p = 0.10$ ). Glycemic index was lower in Group 1 and Group 2 vs. Group 3 ( $44.1 \pm 3.3$  vs.  $46.8 \pm 2.2$  vs.  $50.8 \pm 3.0$ ) ( $p < 0.001$ ) and glycemic load tended to be lower in Group 1 vs. Group 3 ( $93.2 \pm 44.3$  vs.  $168.7 \pm 95.6$ ). **Conclusion:** Increased CRP was associated with lower cardiorespiratory fitness and dietary factors typical of a westernized diet. These results suggest that, regardless of BMI, lifestyle habits can influence inflammation level in young adults.

Funding: Bloomsburg University Foundation

### Perceptions of Body Weight and Contributing Weight Gain Factors in British Adults

Fox, K., Stovall, B., Mariacher, K., Pautler, P., Hedgepeth, A., Fengl, C., & Smith, K. Slippery Rock University, Slippery Rock, PA

**Purpose:** To examine the self-perception of body weight and the contributing factors of weight gain in British adults. **Methods:** A survey was constructed based upon previously validated questionnaires and was randomly administered to subjects in various British cities. Seventy nine subjects with a mean age of  $31.92 \pm 12.03$  and mean body mass index (BMI) of  $23.95 \pm 4.47$  participated in this study. **Results:** Of the 79 subjects, 52 subjects self-reported their height and weight and were classified into one of three BMI categories: underweight (BMI < 18.5), normal weight (BMI = 18.5-24.9), or overweight (BMI  $\geq$  25). The table below illustrates the subjects' BMI classifications and their corresponding self-perceptions of body weight.

BMI CLASSIFICATION	SELF PERCEPTION OF WEIGHT		
	Perceived underweight	Perceived normal weight	Perceived overweight
Underweight (n=2)	n=1 (50%)*	n=1 (50%)	n=0 (0%)
Normal Weight (n=38)	n=7 (18%)	n=25 (66%)*	n=6 (16%)
Overweight (n=12)	n=1 (8%)	n=2 (16%)	n=9 (75%)*

\*Indicates self-perception that correctly reflects BMI classification

Below are the factors that were self-perceived to contribute to the national obesity epidemic based upon a rating scale of 1-4, 1=no contribution, 4=great contribution.

FACTORS	M $\pm$ SD
Lack of physical activity	3.73 $\pm$ 0.63
Excess food consumed	3.34 $\pm$ 1.01
Slow metabolism	2.85 $\pm$ 1.05
Stress/depression	2.82 $\pm$ 1.01
Genetics	2.54 $\pm$ 0.94

**Conclusion:** Although a majority of British adults correctly perceived body weight, 50% of underweight, 34% of normal weight, and 25% of overweight subjects misperceived their body weight. British adults contributed their obesity epidemic to lack of physical activity, excess food consumption, slow metabolism, stress/depression and genetics.

---

### **Validity of a Hand-held Tablet Compared to 3-Dimensional Motion Analysis to Assess Landing Mechanics.**

Gabor, Z., Lewis, E., Jackson, J., Alderman, E., King, D., Belyea, B. Ithaca College, Ithaca, NY

Lower extremity landing mechanics have been implicated as a contributing factor in knee pain and injury. Cost effective and clinically accessible methods for evaluating movement mechanics are limited. The identification of valid, reliable, and readily accessible technology to assess lower extremity alignment could be an important tool for clinicians, coaches, and strength and conditioning specialists. **Purpose:** To examine the validity and reliability of a hand-held tablet and movement analysis application (app) for assessing lower extremity alignment during a drop vertical jump task. **Methods:** Fourteen healthy college aged students gave their written consent to participate in the study. The subjects performed six drop vertical jumps which were recorded simultaneously using a 3D motion capture system and a hand-held tablet. Angles on the tablet were calculated using a motion analysis app. Frontal and sagittal plane hip and knee angles were measured and compared between both systems. 3D moments were calculated and regression analyses were performed with the hand-held tablet measures. The study was approved by the Ithaca College Human Subjects Review Board. **Results:** Significant correlations between the tablet and 3D measures ranging from  $r = .585$  ( $P = .028$ ) to  $r = .821$  ( $P < .001$ ) were found for frontal and sagittal plane range of motion (ROM) measures and angles at maximum knee flexion (MKF). However, hip MKF with the tablet was 25 degrees larger as compared to 3D ( $p < .001$ ). Hip ROM from the tablet was 9 degrees larger ( $p = .026$ ) than 3D. Frontal plane knee angles and hip flexion angles were predictive of knee abduction ( $r^2 = .568$ ,  $P = .049$ ) and hip external rotation ( $r^2 = .545$ ,  $P = 0.42$ ) moments. **Conclusion:** Results of this study suggest that a hand-held tablet and app is a valuable and cost-effective tool for physical rehabilitation specialists to analyze movement patterns; however these measures do not represent true 3D joint positions.

---

### **The Effect of L-citrulline and Watermelon Juice on Anaerobic and Aerobic Exercise Performance**

<sup>1</sup>Gadomski, S., <sup>1</sup>Cutrufello, P., <sup>2</sup>Zavorsky G., & <sup>1</sup>Demkosky, C., <sup>1</sup>University of Scranton, Scranton, PA, <sup>2</sup>University of Louisville, Louisville, KY

Citrulline has been proposed as an ergogenic aid because of its role in both ammonia detoxification and nitric oxide production. Watermelon juice has garnered recent media attention due to its citrulline concentration, yet no study has examined watermelon juice and exercise performance. **Purpose:** Determine the effects of a practical, single, pre-exercise dose of L-citrulline or watermelon juice on maximal oxygen consumption ( $VO_{2max}$ ), time to exhaustion (TE), the total maximum number of repetitions completed over 5 sets (REPS), and flow-mediated vasodilation (FMD). **Methods:** A randomized within-subjects study design was used to examine the effects of L-citrulline and watermelon juice supplementation among twenty-two college-aged subjects (11 females; 11 males). Each subject participated in three trials where supplementation included either an 8% sucrose drink containing a 6g dose of L-citrulline, 24 oz. of watermelon juice (1.3 g citrulline), or an 8% sucrose placebo drink. Supplementation was administered 1 or 2 h prior to exercise testing in order to investigate a timing effect.  $VO_{2max}$  was

assessed using an incremental treadmill protocol while the total number of repetitions completed over 5 sets (30 sec rest) was determined at 80% repetition maximum on a machine bench press. FMD was examined prior to supplementation and immediately before exercise testing using ultrasound. **Results:** Supplementation failed to have an effect on  $VO_{2max}$ , TTE, REPS, or FMD. There was also no interaction observed relative to gender or supplement timing ( $p > 0.05$ ).

	$VO_{2max}$ ( $mL \cdot kg^{-1} \cdot min^{-1}$ )	TE (min)	REPS	FMD (% change)
<b>L-citrulline</b>	56 ± 8	9.5 ± 1.6	33 ± 11	1.12 ± 3.10
<b>Watermelon</b>	56 ± 9	9.4 ± 1.7	33 ± 10	0.50 ± 4.13
<b>Control</b>	55 ± 8	9.3 ± 1.7	32 ± 10	0.77 ± 4.21
	p = 0.58	p = 0.41	p = 0.51	p = 0.86

**Conclusion:** A single dose of L-citrulline or watermelon juice as a pre-exercise supplement appears to be ineffective in improving aerobic or anaerobic exercise performance.

Research funded by an internal research grant from The University of Scranton (840690)

### The Influence of Arch Type on Injury in Minimally-Shod Runners

Galbreath K.M., Harrison K.D., McCrory J.L., FACSM, West Virginia University, Morgantown, WV

Greater than 30% of runners are injured annually. In shod runners, individuals with high arches (pes cavus) are more likely to sustain a bony injury and those with low arches (pes planus) are more likely to sustain a soft tissue injury. However, this relationship has not been established in minimally-shod runners. **Purpose:** To determine if arch type (pes cavus, pes planus) is related to location and type (bony, soft tissue) in minimally shod runners. **Methods:** Sixteen experienced minimalist runners participated (age: 27.4±10.1 yrs, hgt: 170.3±25.0 cm, mass: 78.1±18.0 kg, gender: 8M, 8F). Informed consent was obtained. Arch index (AI) was obtained via an inked footprint. Subjects were surveyed about the type and location of pain felt while running. Pain in areas of common running injuries (hip, knee, ankle, lower leg, and foot) was quantified using a validated visual analog scale (VAS). Based on survey data, injuries were classified as soft-tissue or bony. Subjects were considered to be injured if pain on the VAS >3. Left and right side data were pooled together. Feet were classified as being pes cavus (AI < 0.21, n=7 feet), or pes planus (AI>0.26, n = 11 feet). Feet with normal arches (n = 14) were excluded from further analysis. Chi-squared analyses were performed to determine if arch type was related the incidence of soft-tissue or bony pain. Separate chi-squared analyses assessed if arch type was a factor in the location of pain. ( $\alpha = 0.05$ ). **Results.** Runners with a pes cavus foot were more likely to report soft-tissue pain than those with a pes planus foot (PC: 85.7%, PP: 40.0%;  $p=0.040$ ). No differences were found in the likelihood of runners with different arch types to report pain in the hip, knee, ankle, foot, or calf ( $p > 0.05$ ). **Conclusions:** The results of this pilot study seem to contradict the results of a study on shod runners. We found minimalist runners with a pes cavus foot more likely to report soft-tissue pain whereas others reported shod runners with a pes cavus foot more likely to sustain a bony injury. Soft tissue pain was reported by our subjects in the Achilles tendon, calf muscle, patellar tendon, peroneal tendon, plantar fascia, and a Morton's neuroma. The loading mechanics of minimally-shod running need to be further investigated to determine why these runners with pes cavus feet are more likely to experience a soft-tissue injury.

### **Estimating Caloric Expenditure using Physical Activity Index (PAI) in Children Performing a Maximal Exercise Test**

<sup>1</sup>Gairola, A., <sup>1</sup>Robertson, R., <sup>1</sup>Bayles, C., <sup>1</sup>Goss, F., <sup>1</sup>Kane, I., <sup>1</sup>Nagle, E., <sup>2</sup>Arslanian, S.  
<sup>1</sup>University of Pittsburgh, Pittsburgh, PA, <sup>2</sup>Children's Hospital, University of Pittsburgh, Pittsburgh, PA.

**Purpose:** The primary purposes of this investigation were (a) to examine the validity of the PAI, (b) to develop a statistical model to predict cumulative Kcal expenditure using PAI as the predictor variable and (c) to develop a statistical model to predict total Kcal expenditure using PAI<sub>total</sub> and selected physiological and behavioral measures as the predictor variables for children and adolescents performing load incremented maximal treadmill exercise. The secondary purpose of the study was to develop a prediction model to estimate total Kcal expenditure using the PAI (session) alone and in combination with selected physiological measures as the predictor variables. **Methods:** Eighty-four children and adolescents (12.5±2.4yrs) performed a maximal Bruce treadmill (TM) protocol. During TM, heart rate (HR), oxygen consumption (VO<sub>2</sub>), rating of perceived exertion (RPE-overall), pedometer step count, and Kcal expenditure were measured. Post-TM, RPE-session was obtained and a physical activity questionnaire administered. The PAI, PAI<sub>total</sub>, and PAI (session) were calculated as:  
PAI = Cumulative step count x RPE-overall

PAI<sub>total</sub> = Total step count x RPE-overall at test termination

PAI (session) = Total step count x RPE-session

**Results:** Multiple regression analyses revealed a strong, positive relation between the PAI score and VO<sub>2</sub> in L.min<sup>-1</sup> (r=0.607, p<0.05), VO<sub>2</sub> in mL.kg<sup>-1</sup>.min<sup>-1</sup> (r=0.725, p<0.05) and HR in beats.min<sup>-1</sup> (r=0.755, p<0.05). These findings established a high level of concurrent validity for the PAI. The following models to predict Kcal expenditure were developed:

**Model I : Cumulative Kcal = 21.632 + 0.006(PAI) p<0.05, SEE=17.59, r=0.74, r<sup>2</sup>=0.54.**

**Model II : Total Kcal = -11.59+0.002(PAI<sub>total</sub>)+27.245(VO<sub>2</sub>max) p<0.05, SEE=15.37, r=0.86, r<sup>2</sup>=0.739.**

**Model V : Total Kcal = 38.6 + 0.004(PAIsession), p<0.05, SEE=24.23, r=0.36, r<sup>2</sup>=0.13.**

**Model VI : Total Kcal = -64.759+26.998(VO<sub>2</sub>max)+0.305(HRmax)+0.001 (PAIsession) p<0.05, SEE=10.46, r = 0.918 , r<sup>2</sup> = 0.842.**

PAI was a stronger predictor of Kcal expenditure than PAI (session) **Conclusions:** The PAI has public health implications, provides an easy tool to estimate total physical activity load (i.e. volume x intensity) and predicts Kcal expenditure in children and adolescents performing standard treadmill exercise protocols.

Research funded by NIH RO1 HD027503

---

### **A Comparison of CrossFit Training to Traditional Anaerobic Resistance Training in terms of Selected Fitness Domains Representative of Overall Athletic Performance**

Gerhart, D. H., Pasternostro Bayles, M., Indiana University of Pennsylvania, PA

**Purpose:** The purpose of this study was to evaluate the effects of two different types of exercise programs on selected fitness domains. The two groups were CrossFit exercisers (CF) and traditional anaerobic resistance exercisers (TAR). **Methods:** The study was cross-sectional in nature, with various observations being required for data collection. The seven domains of fitness tested in the study include body composition, flexibility, aerobic capacity, maximum strength, agility, maximum power, and muscular endurance. The all-male sample size includes 19 participants in each group. Self-reported exercise was evaluated and participants were required to be within the range of 5-6 days/week of 45-60min, an equivalent of 240-300 minutes per week of exercise performed at a moderate-vigorous level. Data was analyzed using multiple

regression analysis, and among each group through the use of independent T-tests and Chi-Square Analysis. **Results:** No statistical significance was found between groups in terms of subject demographics of age, height, and weight ( $p = .35$ ,  $.51$ , and  $.88$  respectively). No statistical significance was found between groups in terms of session frequency, duration and volume ( $p = .48$ ,  $.76$ , and  $.8$  respectively). Statistical significance exists between training experience and maximum strength ( $p = .01$ ) in CrossFit exercisers compared to Traditional Anaerobic Resistance trained exercisers. Statistical significance between groups among all tested domains of fitness was as follows: body composition ( $p = .31$ ), flexibility ( $p = .99$ ), aerobic capacity ( $p = .54$ ), maximum strength ( $p = .03$ ), agility ( $p = .45$ ), maximum power ( $p = .97$ ), and muscular endurance ( $p = .94$ ). **Conclusion:** The CrossFit exercisers in this study showed significantly greater performance in terms of one tested domain of fitness; maximum strength. This indicates the two types of training reported in this study, CF and TAR, produce similar results in overall athletic performance, with the exception of maximum strength.

---

### **Exercise Promotes Enhanced Gut Microbial Diversity Compared to Sedentary Counterparts**

<sup>1</sup>Gotthardt, J.D., <sup>2</sup>Noji, M., <sup>3</sup>Kerkhof, L.J., <sup>3</sup>McGuinness, L., <sup>4</sup>Hägglom, M.M., <sup>2</sup>Campbell, SC,  
<sup>1</sup>Department of Nutritional Sciences, <sup>2</sup>Department of Exercise Science and Sports Studies;  
<sup>3</sup>Institute of Marine and Coastal Sciences; Department of Biochemistry and Microbiology  
Rutgers, The State University of New Jersey, New Brunswick, NJ 08901

**Background:** Diet-induced obesity (DIO) has been shown to shift the balance of species present in the gut microbiome from predominantly *Bacteroides* to *Firmicutes*. Subsequent studies have shown the other factors can alter gut microbial ecology, e.g. calorie restriction and environmental toxin exposure.

**Purpose:** Our focus is exercise and since exercise contributes to both caloric expenditure and nutrient partitioning, we hypothesized that exercise may also alter gut microbial ecology. Our previous work showed individual clusters for exercised mice, regardless of diet, with 40% variation from sedentary lean and obese clusters as indicated by Sorenson's Index.

**Methods:** To follow-up these results and assess changes in species we used thirty-six ( $n=9$ /group) male C57 mice who were weighed and randomly assigned to one of 4 groups: 1-) lean-sedentary (10% fat diet, Research Diets); 2-) DIO- sedentary (45% fat, Research Diets); 3-) lean-exercise; and 4-) DIO-exercise for 12 weeks. Mice had ad libitum access to food and water. Exercise mice had free access to a running wheel in their cages. Food intake was monitored every other day, body weights once per week and body composition was taken prior to sacrifice. Upon sacrifice feces was obtained from the distal colon and were prepared for cloning and sequencing of genetic material.

**Results:** Results indicated that DIO-exercise mice presented with a lean phenotype compared to their sedentary counterparts, as indicated by lower body weight and fat mass. Sequencing of the genetic material results in identification of greater number and variation of species in samples from exercised mice supporting our hypothesis. Sequencing, however, lead to only the identification of species in the phylum *Firmicutes*, potentially due to cloning bias.

**Conclusions:** Ongoing work, aims at cultivation of predominant species to understand their impact on systemic metabolism and our recent grant will allow for sample deep sequencing which, will provide a greater distinction between treatment cohorts.

---

### **The Relationship between Aerobic Fitness, BMI, and Measures of Perception while at Very High Altitudes**

Gray, S., Drozdowsky, D., Schoenenberger, M., Wisniewski, K., Fitzgerald, P. Saint Francis University, Loretto, PA

Persons who live at low altitudes are referred to as 'low-landers' in the exercise literature. One does not have to be a mountaineer nor be physically fit to travel to extreme altitudes. Altitude is an environmental factor that directly challenges work performance due to exposure to hypoxic conditions. Low-lander environmental engineering students and faculty traveled to Bolivia to study acid mine drainage and were accompanied by exercise physiology students and faculty. The team landed in La Paz, Bolivia which has the highest international airport in the world at 13,325 feet above sea level. The research team spent 15 days at very high altitudes (3,658 m – 5,487 m). **Purpose:** To provide exercise physiology students and faculty studying at altitude an opportunity to complete a pilot study that would describe how participants would rate affective responses using the Feeling Scale (FS) at rest ( $FS_{rest}$ ) and after a one minute sit-to-stand functional exercise test ( $FS_{fex}$ ), and to determine if any relationship existed between BMI, and aerobic fitness measured prior to travel and  $FS_{rest}$  and  $FS_{fex}$  measured at altitude.

**Methods:** University IRB approval was obtained prior to data collection. 13 volunteer participants included 9 students (3 female, 6 male) aged  $19.77 \pm 1.39$  yrs., BMI  $25.05 \pm 4.67$   $kg \cdot m^{-2}$  and 4 professors (2 female, and 2 male), aged  $46.50 \pm 11.47$  yrs., BMI  $28.25 \pm 5.91$   $kg \cdot m^{-2}$ . Each completed a  $VO_2max$  test (Bruce treadmill protocol) with electrocardiogram (ECG) the week prior to altitude exposure. Resting and exercise affective valence was assessed using the FS. In Bolivia,  $FS_{rest}$  and  $FS_{fex}$  were collected at regular intervals.  $VO_2max$  testing was not repeated in Bolivia. **Results:** A statistically significant moderate correlation was found between  $FS_{fex}$  and age, ( $r = -0.673$ ,  $p = 0.012$ ). A moderate correlation approaching significance was found between  $FS_{fex}$  and BMI, ( $r = -0.538$ ,  $p = 0.058$ ). A high, significant correlation existed between  $VO_2max$  and sit to stand scores ( $r = 0.825$ ,  $p = 0.001$ ). **Conclusion:** These pilot data show that there was a decline in affective valence during muscular exercise at altitude which may be related to age.

Research partially funded by a SFU Faculty Development Grant

---

### **Intermittent Parathyroid Hormone Administration Attenuates Age-Related Endothelial Dysfunction**

Guers J.J., Prisby R. D., Edwards D.G. and Lennon-Edwards, S.L. University of Delaware, Newark, DE

**Purpose:** Aging is an independent risk factor for cardiovascular disease and is characterized by a decline in conduit artery function. Parathyroid hormone (PTH) treatment has been shown to increase endothelial cell nitric oxide synthase (eNOS) expression. Therefore, the purpose of this study was to test the hypothesis that 15 days of intermittent PTH administration would improve endothelial function in old rodents. **Methods:** Young (4 months;  $n=9$ ) and old (24 months;  $n=8$ ) Fischer-344 rats were given injections of PTH (43  $\mu g/kg/day$ ) or phosphate buffered saline (PBS; 100  $\mu l$ ) over the course of 15 days. Animals were sacrificed at minimum 18 hours following the last injection. The thoracic aorta was dissected, cleaned and sectioned. Endothelium-dependent relaxation (EDR) and -independent relaxation (EIR) were assessed *in vitro* to cumulative additions of acetylcholine (ACh) and sodium nitroprusside (SNP), respectively. **Results:** EDR was significantly reduced in response to ACh in the old compared to young rats ( $p < 0.05$ ), as was maximal relaxation (Old = 72.5% vs. Young = 93.9%;  $p < 0.05$ ). These decreases in age-related EDR were improved significantly in the old PTH-treated group to cumulative additions of ACh ( $p < 0.05$ ), as well as at maximal dilation (Old = 72.5% vs. Old PTH = 86.9%;  $p < 0.05$ ). EIR was significantly lower in the old versus young rats at several

doses of SNP ( $p < 0.05$ ); however, maximal relaxation did not differ between groups and PTH treatment did not alter these responses. **Conclusion:** In conclusion, these data indicate that age-related EDR was partially restored following 15 days of PTH treatment in old rats and suggests a potential role for PTH treatment for age-related declines in endothelial function.

Research supported in part by NIH Grant: 1R15AR062882-01(RDP)

---

### **Measuring the Effects of Pre-Workout Supplementation on Resting Metabolism over Time**

Harper, R., Anton, J., Torre, A., Lafferty, M. Delaware Technical Community College, Wilmington, DE

**Purpose:** Use of dietary supplements before strength and aerobic activities is claimed to increase energy, strength, and focus. This study is an expansion of a previous study, "Measuring the Effects of Pre-Workout Supplementation on Resting Metabolic Rate" (Harper, et al), and was conducted to measure changes in resting metabolic rate [RMR], respiratory quotient [R], and macro nutrients utilized over time after ingestion of a pre-workout stimulant.

**Methods:** All results were gathered with a Cosmed Quark PFT Ergo. Testing protocol required that subjects refrain from vigorous physical activity 24 hours prior to testing as well as fast for 8 hours prior to testing. A baseline RMR test was conducted at the start of each testing day. Immediately following the baseline test, subjects were given 2 scoops (11.4g) of pre-workout supplement mixed with 10oz of water. After 20 minutes of digestion up to four RMR post-tests were conducted, each separated by a 20 minute break. These tests were repeated for each subject on as many as four separate days. **Results:** Test data shows a 12.20% average increase in RMR, an average increase of 0.135 in R value, and an average 25.19% increase in carbohydrate utilization immediately following supplementation. **Conclusions:** As hypothesized in the previous pilot study: ingestion of a pre-workout stimulant may increase available energy by way of stimulating glycogenolysis to produce ATP. All subjects displayed an increase in RMR, R value, and carbohydrate utilization after supplementation. This was followed by a gradual return to baseline measurements in each area over the course of testing with the exception of RMR.

Funding for this project was provided by NIH NCRR INBRE, grant to Delaware 2P20RR016472

---

### **Primigravida Foot Anthropometric Effects on Foot, Posterior-Pelvic and Low Back Pain**

<sup>1</sup>Harrison, K.D., <sup>2</sup>Thomas K., <sup>1</sup>McCrary, J.L., FASCM. <sup>1</sup>Division of Exercise Physiology, <sup>2</sup>Division of Physical Therapy, West Virginia University, Morgantown, WV

Incidence of foot, posterior pelvic and back pain is increased during pregnancy. Furthermore, many women report changes in foot size during pregnancy; however these changes have not been thoroughly investigated. **Purpose:** To examine the effects of a first pregnancy on foot anthropometry and self-reported foot, posterior pelvic and low back pain. **Methods:** Eleven pregnant women (age:  $28.7 \pm 4.2$  yrs height:  $167.1 \pm 6.6$  cm) and 10 nulliparous controls matched to pre-pregnancy weight (age:  $22.9 \pm 2.4$  yrs height:  $164.8 \pm 4.6$  cm) participated. Following informed consent, foot length and width were assessed with an anthropometer. Arch index (AI) was assessed with an inked footprint obtained via an Aetrex Harris Mat. Arch Height Index (AHI) was measured with an Arch Height Index Measurement System. Rearfoot angle (RA) and pelvic obliquity (PO) were also assessed using digital photogrammetry and ImageJ software. Self-reported pain at the low back, hip and buttocks region, upper leg, knee, lower leg, and foot and ankle were obtained with validated VAS surveys. An ANOVA was used to compare results between groups (pregnant vs. control) and trimester (nested within pregnant group). For this prospective study,  $\alpha = 0.1$ . **Results:** Although mass was significantly different between groups

and trimesters (Con:  $61.5 \pm 8.1$  kg, 1<sup>st</sup> tri:  $64.7 \pm 8.7$  kg, 2<sup>nd</sup> tri:  $71.2 \pm 12.0$  kg, 3<sup>rd</sup> tri:  $77.5 \pm 15.2$  kg;  $p=0.068$ ), no significant differences were found in any measure of lower extremity alignment or anthropometry. Despite this, there were significant differences between groups in pain at the lower back (Con:  $9.2 \pm 0.8$ , 1<sup>st</sup> tri:  $9.0 \pm 0.8$ , 2<sup>nd</sup> tri:  $7.7 \pm 1.9$ , 3<sup>rd</sup> tri:  $7.5 \pm 2.1$ ;  $p=0.081$ ) and hip (Con:  $8.9 \pm 1.4$ , 1<sup>st</sup> tri:  $9.1 \pm 1.1$ , 2<sup>nd</sup> tri:  $7.7 \pm 1.9$ , 3<sup>rd</sup> tri:  $7.8 \pm 2.0$ ;  $p=0.099$ ), where 0 indicates worst possible pain and disability, and 10 indicates no pain or disability. **Conclusions:** Although no overall differences were found in lower extremity alignment, it is possible that individual biomechanical response to pregnancy is variable. Future research should investigate whether back, hip, and foot pain during pregnancy are more common in women who do experience changes in lower extremity alignment vs. those who demonstrate no changes.

---

### **Effect of Front-Panel Support during Inclined Treadmill Walking**

Hoover, K., Peterson, M., Timmons, K., Mason, S., Venters, E., Crehan, L., McKenzie, J.A., and McCole, S.D. Department of Exercise Science & Physical Education, McDaniel College, Westminster, MD

**Purpose:** The study's purpose was to determine the effect of front-panel support during inclined treadmill walking. **Methods:** Healthy, physically active females ( $n=10$ ) and males ( $n=10$ ) each performed a  $VO_{2max}$  test on a treadmill and two 30-min bouts of inclined treadmill walking, one with the arms holding onto the front panel of the treadmill (FPS) and one using a normal arm swing (NAS) at least 48 hours apart. Walking tests consisted of 10 min on a level grade followed by a 4% increase in grade every 5 min. A walking speed that elicited 50% of a participant's  $VO_{2max}$  was used throughout each test.  $VO_2$ , cardiac output (CO), RER, BP, and RPE were measured throughout each test. Arteriovenous  $O_2$  difference (a-v  $O_2$  diff) was calculated from  $VO_2$  and CO data using standard calculations. Each test was preceded by 10 minutes of rest for measurement of baseline values.  $VO_2$ , RER, and energy expenditure (kcal) were measured using a calibrated ParvoMedics TrueOne metabolic system every 15 s throughout the test. CO was determined every 10 s via impedance cardiography (Physioflow Enduro). Values were analyzed for significant differences ( $p < 0.05$ ) between trials using paired t-tests. **Results:** All data reported as mean  $\pm$  SEM. Participants averaged  $24 \pm 1$  yr,  $76.5 \pm 4.3$  kg and  $1.73 \pm 0.02$  m with a  $VO_{2max}$  of  $49.4 \pm 2.1$  mL/kg/min. Baseline values were not significantly different ( $p > 0.05$ ) between the walking tests.  $VO_2$  was significantly lower in FPS ( $21.9 \pm 0.9$ ,  $25.5 \pm 1.0$ , and  $30.9 \pm 1.3$  mL/kg/min) compared to NAS ( $26.1 \pm 0.8$ ,  $33.6 \pm 1.0$ , and  $41.9 \pm 1.6$  mL/kg/min) for 4%, 8%, and 12% grade, respectively. Q was significantly lower in FPS ( $13.1 \pm 0.7$ ,  $14.6 \pm 0.8$ , and  $17.0 \pm 1.2$  L/min) compared to NAS ( $16.2 \pm 1.1$ ,  $19.7 \pm 1.3$ , and  $23.7 \pm 1.4$  L/min) for 4%, 8%, and 12% grade, respectively. a-v  $O_2$  diff was not significantly different between trials at any intensity. RER was significantly lower in FPS only during the last two stages of the test ( $0.84 \pm 0.01$  and  $0.82 \pm 0.02$ ) compared to NAS ( $0.86 \pm 0.02$  and  $0.88 \pm 0.02$ ). Energy expenditure (kcal) was significantly lower in FPS ( $40 \pm 2$ ,  $46 \pm 3$ , and  $55 \pm 4$ ) compared to NAS ( $48 \pm 3$ ,  $60 \pm 4$ , and  $74 \pm 5$  for 4%, 8%, and 12% grade, respectively). **Conclusion:** The use of FPS significantly reduced the metabolic and cardiovascular cost of inclined treadmill walking.

Research supported by the McDaniel College Student-Faculty Collaborative Summer Research Fund

---

**Sex differences in arterial stiffness and left ventricular pressure energetics.**

Hughes, W.E., Spartano, N.L., Lefferts, W.K., Augustine, J.A., Heffernan, K.S. Syracuse University, Syracuse, NY

**Purpose:** Arterial stiffness and pressure from wave reflections (WR) each negatively alter left ventricular (LV) energetics. There are sex differences in arterial stiffness and WR, which may lead to disproportionate increases in afterload and myocardial work in women. The purpose of this study was to examine sex differences in arterial stiffness, pressure from WR and measures of LV energetics. **Methods:** 79 apparently healthy adults from the surrounding University community participated in this study, from which 46 were selected (23 females, 23 males) and matched for potential confounders of central hemodynamic burden: age, BMI, brachial blood pressure, and heart rate. Aortic pressure waves, derived from the radial artery using a generalized transfer function, were used to obtain: pulse wave velocity as a measure of aortic stiffness, augmentation index (AIx) and reflection index (RIx) as measures of WR, the subendocardial viability ratio (SEVR) as a measure of myocardial work, and left ventricular pressure effort ( $\Delta E_w$ ) as a measure of the energy used by the LV to overcome WR. **Results:** Analysis of variance revealed women exhibited higher  $\Delta E_w$  ( $p < 0.001$ ), AIx ( $p < 0.001$ ) and RIx ( $p < 0.001$ ), and lower PWV ( $p < 0.05$ ) compared to men. There were no sex differences for SEVR ( $p = 0.59$ ). **Conclusion:** After controlling for important central hemodynamic confounders, women had higher values of LV effort than men. Results suggest that sex differences in LV energetics are more likely due to increased pressure from WR in women and not sex-differences in arterial stiffness. Although women had increased LV effort, myocardial work was not affected.

Table 1: Subject characteristics (n=46); mean±SE

Measure	Male	Female	Interaction
Age (years)	28±3	29±3	0.77
BMI (kg/m <sup>2</sup> )	24±0.5	23±0.9	0.32
Systolic Blood Pressure (mm Hg)	119±1	116±1	0.2
Diastolic Blood Pressure (mm Hg)	72±1	74±1	0.06
Heart Rate (bpm)	66±2	62±2	0.11
Augmentation Index (%)	-4±2	12±2	<0.001
Pulse-wave Velocity (m/s)	6.8±0.2	6.2±0.2	<0.05
Wave Reflection Index (%)	41±2	56±3	<0.001
Subendocardial Viability Ratio	179±8	186±10	0.59
$\Delta E_w$ (dynes s/cm <sup>2</sup> )	10±151	1033±172	<0.001

**Manual Asymmetry and Performance across the Lifespan**

Lorio, A., Flink, T. Gannon University, Erie, PA

Declines in manual asymmetry, or a more balanced performance between the right and left hands, occur with aging due to compensation for loss of function within the brain. Little research has been done on the reduction of manual asymmetry from a lifespan approach. **Purpose:** The purpose of this study is to determine the approximate age when the reduction of manual asymmetry occurs. **Methods:** Seventy right-handed participants (ages 20-90 years) were tested. Participants performed the Mini Mental State Exam and the Edinburgh Handedness Inventory to assess cognitive function and handedness, respectively. For the Purdue Pegboard Test, participants picked up individual pins and placed them in their respective holes as quickly

as possible in 30 seconds. Each participant performed three trials with the right hand, left hand, and then both hands together. The number of pins successfully placed in the holes was recorded. **Results:** There was a significant decrease in the number of pins successfully placed in the pegboard as age increased,  $F(6, 704) = 55.02, p = 0.000$ . The first significant decrease in performance occurred in individuals that were 50 years of age ( $p < 0.05$ ). There was no significant interaction between hand used and group; hence, no reductions in manual asymmetry were found with age.

Age Group	Number of Subjects	Mean Number of Pins	Standard Deviation
Twenties	21	14.8	2.2
Thirties	7	15.0	2.5
Forties	10	15.3	2.7
Fifties	11	13.7	2.1
Sixties	11	12.9	2.0
Seventies	3	11.2	1.8
Eighties	7	10.3	2.1
Total	70	13.8	2.7

**Conclusion:** Overall performance declines with age, and this decline is shown in the fifth decade. However, no significant declines in manual asymmetry with age were reported. The Purdue Pegboard test may not be sensitive enough to see performance changes between the hands with age. In addition, more participants may be needed in the older age groups to show statistical differences. More testing is needed to further clarify these issues.

#### Effects of Nasal Insufflation on Heart Rate Recovery from Exercise

Ivester, B., Miller, P., Bohlen, J., Phan, P. Dobrosielski, DA. Towson University, Towson, MD

During high intensity aerobic exercise the mechanical work of breathing increases significantly. Treatment with high flow nasal insufflation (NI) has been shown to reduce the nocturnal ventilatory loads in patients with chronic conditions such as obstructive sleep apnea. Yet, it is not known whether NI influences exercise recovery kinetics in athletic persons. **Purpose:** Determine the effects of NI on heart rate recovery following high-intensity exercise. **Methods:** Aerobic capacity ( $VO_{2max}$ ) was established on competitive runners using a Bruce treadmill protocol. On separate days, subjects completed two 30-minute bouts of exercise on a treadmill at anaerobic threshold. Following each bout, subjects were fitted with a nasal cannula and exposed in random order to: 1)  $35 \text{ L}\cdot\text{min}^{-1}$  NI, or 2)  $5 \text{ L}\cdot\text{min}^{-1}$  (Sham). Heart rate was monitored for 20 minutes post-exercise to quantify rate of recovery. The start of the post-exercise period was denoted as 0% recovery, and proceeded to 100% once resting heart rate was achieved. **Results:** Five men (age:  $27 \pm 6$  yrs;  $VO_{2max}$ :  $59.4 \pm 4.2 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) and six women (age:  $26 \pm 8$  yrs;  $VO_{2max}$ :  $50.4 \pm 6.4 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) completed the study. Heart rate values throughout exercise did not vary between bouts, indicating equal intensities were achieved. There were no differences in relative HR recovery during the NI condition compared to Sham condition at 2 min (NI:  $56 \pm 27\%$  vs. Sham:  $54 \pm 16\%$ ,  $p=0.77$ ), 5 min (NI:  $79 \pm 16\%$  vs. Sham:  $75 \pm 15\%$ ,  $p=0.77$ ), or 15 min (NI:  $100 \pm 24\%$  vs. Sham:  $97 \pm 18\%$ ,  $p=0.53$ ) post exercise. **Conclusion:** Treatment with high flow NI did not facilitate heart rate recovery following a high intensity bout of exercise. Future studies incorporating direct assessment of ventilation are required in order to determine whether use of NI during exercise translates to improved athletic performance.

### Correlations between Functional Balance and Postural Sway in a Geriatric Population: A Pilot Study

<sup>1</sup>Jordan, R., <sup>1</sup>Hertz, J., <sup>1</sup>Kieffer, H.S., <sup>2</sup>Sollenberger, B. <sup>1</sup>Messiah College, Grantham, PA and <sup>2</sup>CPRS Physical Therapy, Elizabethtown, PA.

**Purpose:** The purpose of this study was to compare various clinical measures of balance and postural sway in the elderly population. **Methods:** Thirteen independently living subjects (4 males and 9 females, age =83.5±10.66 and 81.3±7.68 years, respectively) participated in a quasi-experimental, comparative study. The subjects completed a series of functional balance protocols and questionnaires that included the Falls Efficacy Scale (FES), Stride Length (SL) and Dynamic Gait Index (DGI). In addition, a static standing eyes-open protocol was completed using an AMTI Forceplate and ACCUSWAY balance software to measure center of pressure (COP) deviations of each subject during a standard two-foot open stance. The variables of COP deviancy included total path length and maximum velocity in anterior-posterior ( $V_{y_{max}}$ ) and medial-lateral ( $V_{x_{max}}$ ) planes. Multiple Pearson's Product Correlation Coefficients were run to assess the relationship between functional measures. In addition, correlations were also run between the functional and static measures of balance. **Results:** High positive correlations were found among functional balance measures, ranging from 0.72 to 0.838. However, low correlations ranging from 0.35 to 0.47 were found between the functional and static measures. **Conclusion:** The high correlations between functional measures indicate that the FES, SL and DGI have similar predictive abilities for assessing dynamic balance. In contrast, the low correlations between the functional and static tests suggest that different aspects of balance are measured. The low predictability found between functional balance and static measures indicates that future research should investigate the utility of conducting static tests that minimize the base of support and challenge the control of COP.

---

### Sympathetic Reactivity in Young Women with a Family History of Hypertension

<sup>1</sup>Kaiser, C.R., <sup>1</sup>Fiorilli, D.M., <sup>1</sup>Matthews, E.L., <sup>2</sup>Greaney, J.L., <sup>1</sup>Farquhar, W.B., and <sup>1</sup>Wenner, M.M., <sup>1</sup>University of Delaware, Newark, DE, <sup>2</sup>Penn State University, State College, PA

Cardiovascular disease is the leading cause of death among women. Healthy young adults with a family history of hypertension have an increased risk of developing hypertension, a contributing factor of cardiovascular disease. The sympathetic nervous system plays an important role in regulating blood pressure, and has been implicated in the development of hypertension. **Purpose:** The purpose of this study is to test the hypothesis that young women with a family history of hypertension (+FH) have exaggerated sympathetic reactivity compared to young women without a family history of hypertension (-FH). **Methods:** We measured beat-by-beat blood pressure (BP), heart rate (HR) and muscle sympathetic nerve activity (MSNA) in 9 women -FH (24±2 years, 23±1 kg/m<sup>2</sup>, 82±2 mmHg) and 8 women +FH (23±1 years, 22±1 kg/m<sup>2</sup>, 80±3 mmHg). Each participant performed two sympatho-excitatory maneuvers: 2 minutes of isometric handgrip exercise at 30% of their maximal voluntary contraction, and a cold pressor test (CPT). **Results:** BP increased at the onset of exercise in both groups, but tended to be greater in +FH (ANOVA  $\Delta$ Systolic BP  $P=0.11$ ; ANOVA  $\Delta$ Mean BP  $P=0.13$ ). +FH women had greater increases in BP during the last minute of exercise ( $\Delta$ Systolic BP: -FH 14±2 vs. +FH 23±3 mmHg,  $P=0.01$ ;  $\Delta$ Mean BP: -FH 13±1 vs. +FH 19±3 mmHg,  $P=0.09$ ). Similarly, +FH tended to have a greater increase in BP during the cold pressor test ( $\Delta$ Systolic BP: -FH 9±4 vs. +FH 15±2 mmHg,  $P=0.15$ ;  $\Delta$ Mean BP: -FH 8±2 vs. +FH 13±2 mmHg,  $P=0.17$ ; -FH  $n=4$ , +FH  $n=6$ ). The increase in MSNA during exercise tended to be greater in +FH (-FH 9±3 vs. +FH 15±4 burst/min,  $P=0.24$ ; -FH  $n=7$ , +FH  $n=6$ ), but were similar during CPT (-FH  $n=3$ , +FH  $n=4$ ;

$P > 0.05$ ). **Conclusion:** These preliminary data suggest that +FH women may have greater sympathetic reactivity compared to -FH women.

---

### **The Acute Effects of Myofascial Release and Static Stretching on Flexibility**

Kaminski, Z., Kudrna, R. DeSales University, Center Valley, PA

Fascia is the connective sheathing that is found throughout the body. Both static stretching (SS) and self-myofascial release (SMR), or 'foam rolling', are stretching techniques that decrease fascial stiffness and increase flexibility. **Purpose:** The purpose of this study was to compare the acute effects of SS and SMR on flexibility. **Methods:** Twenty-three active college-aged volunteers (11 M, 12 F) completed 3 research trials in random order on non-consecutive days. Each trial began with a general warm-up, an initial sit and reach assessment, followed by one of the 3 treatment protocols. Sit and reach flexibility was re-assessed 3 and 10 minutes after the treatment. SS consisted of 7 unilateral stretches repeated on both sides of the body for a total of 14 minutes. SMR was identical to SS in duration and number of targeted muscles, but subjects used a foam roller. The control protocol (CON) consisted of sitting for 14 minutes. A 3x3 repeated measures ANOVA was used to determine differences in flexibility for the three time points (initial, as well as 3 and 10 minutes after protocol completion) and three conditions (CON, SS, and SMR). The Greenhouse-Geisser correction was used where sphericity was violated. Planned contrasts were used to clarify the ANOVA results. **Results:** There was a significant main effect for time points  $F(1.35,31.04)=5.05, p<0.05$ ; a significant main effect for stretching type  $F(1.72,39.77)=7.92, p<0.01$ ; and a significant interaction effect (time\*type)  $F(1.6,37.2)=5.84, p<0.01$ . **Conclusion:** SMR produced significantly greater flexibility than SS at the 3 and 10 minute time points. SMR could therefore be considered an effective alternative to traditional SS for acute increases in flexibility. Future research should examine if this is true for different joints and in diverse populations.

---

### **The Influence of Sport Goggles on Visual Target Detection in Elite Athletes**

<sup>1</sup>Kauffman, D., <sup>2</sup>Clark, J., <sup>1</sup>Smith, J.C. <sup>1</sup>University of Maryland, College Park, MD, <sup>2</sup>University of Cincinnati, Cincinnati, OH

**Purpose:** The aim of this study was to examine the effects of sport goggles on visual target detection in elite female athletes. **Methods:** Fifty-four Division 1 female athletes ages 18-22 were randomly divided into 3 groups which varied in goggle use over a total of 3 one-minute trials. The NG-NG-NG group did not wear goggles for any of the 3 trials. The NG-G-NG group only wore goggles for Trial 2 and the G-NG-G group wore them for Trials 1 and 3. Dynavision D2, a board with 64 lights arranged in 5 concentric circles, was used to test response time (RT) to visual targets. **Results:** Mean ( $\pm$ SD) RT (ms) during visual target detection for the three experimental groups as a function of the concentric distance from the central fixation point can be seen in the table below. The effects of goggles are most evident in Rings 4 and 5, the more peripheral rings. Those who went from no goggles on Trial 1 to goggles on Trial 2, did not improve as those who did not wear goggles on Trial 2 regardless of whether goggles were worn or not in Trial 1. The most significant result was the reversal of the practice and performance effects in the G-NG-G group on Trial 3. From Trials 1 to 2, this group showed clear improvement in performance; however, going from no goggles (Trial 2) to goggles (Trial 3), this group's RT in Rings 4 and 5 increased. Taken together, these findings suggest the sport goggles not only impaired the expected practice/learning effects from Trial 1 to 2 but also impaired RT to the more peripheral targets in the well-learned state. **Conclusion:** Detection of visual stimuli appearing in the peripheral visual field was impaired in elite athletes when sport goggles were worn.

---

### **Skeletal Muscle Immobilized in a Stretched Position does not Display Characteristics of Disuse Atrophy.**

Kelleher, A., Gordon, B., Kimball, S., Jefferson, L. The Pennsylvania State University College of Medicine, Hershey, PA.

**Purpose:** Immobilized skeletal muscle placed in a shortened position displays disuse atrophy, whereas when placed in a stretched position it does not. We hypothesized that characteristics of disuse atrophy such as attenuated rates of protein synthesis and induction of the repressors of mechanistic target of rapamycin complex 1 (mTORC1) signaling, regulated in development and DNA-damage response (REDD1 and REDD2), and atrogenes, Muscle Atrophy F-box (MAFbx) and Muscle Ring Finger 1 (MuRF1), would not manifest in skeletal muscle immobilized in a stretched position. **Methods:** Twenty male Sprague-Dawley rats were subjected to unilateral hindlimb immobilization for 3 days. Ten were immobilized in plantarflexion with the soleus muscle placed in a shortened position, while another ten were immobilized in dorsiflexion, with the soleus muscle placed in a stretched position. Soleus muscles from immobilized hindlimbs were compared to contralateral non-immobilized hindlimbs. **Results:** Soleus muscles immobilized in a shortened position exhibited disuse atrophy, an attenuated rate of protein synthesis (30% of the non-immobilized limb), repressed mTORC1 signaling as assessed by phosphorylation of p70 ribosomal protein S6 kinase 1 (p70S6K1) on Thr389 (15% of the non-immobilized limb), and induction of REDD1, REDD2, MAFbx and MuRF1 gene expression (350%, 600%, 250%, and 200% of the non-immobilized limb, respectively). Soleus muscles immobilized in a stretched position exhibited no differences between immobilized and non-immobilized muscles for muscle mass, rate of protein synthesis, p70S6K1 phosphorylation, or induction of REDD1, REDD2, MAFbx or MuRF1. In addition, soleus muscles immobilized in a stretched position exhibited elevated Akt Ser473 and Forkhead box O3a (FoxO3a) Ser253 phosphorylation, which suggests that FoxO3a-mediated induction of atrogenes is inhibited by Akt signaling. **Conclusion:** Skeletal muscle immobilized in a stretched position is protected from changes associated with disuse atrophy.

Research funded by NIH DK-15658.

---

### **Predicting Performance on a Firefighting Specific Ability Test in Volunteer Firefighters**

Kerns, Z., Bennett, D., Moir, G. East Stroudsburg University, East Stroudsburg, PA

The use of firefighter specific Ability Tests (AT) could allow firefighters to monitor their own fitness, and expose areas that need improvement. Those improvements could help decrease chances of fatality or injury and improve performance in firefighting operations leading to more lives saved. **Purpose:** The purpose of this investigation was to study the relationship between fitness parameters and performance on a firefighting specific ability test. **Subjects:** Nine certified firefighters (27.11±10.56 yr, 89.74±21.92 kg, mean±SD) from the East Stroudsburg Volunteer Fire Department performed the AT. **Methods:** The AT consisted of 6 events performed consecutively: stair climb, hose drag, equipment carry, ladder raise & extension, search, and rescue. Prior to the AT all subjects performed the following fitness parameter tests: aerobic capacity ( $VO_{2max}$ ), push-ups in a minute, sit-ups in a minute, handgrip strength (Dynamometer), and lower body power (Vertical Jump). Pearson's product moment correlations and linear regression statistics used to determine the strength of relationship between variables and to predict AT performance from the fitness variables. **Results:**  $VO_{2max}$  ( $r=-.812$ ) and sit-ups in a minute ( $r=-.787$ ) were found to be significantly inversely correlated with overall AT time.  $VO_{2max}$  could predict AT performance from the following regression equation ( $R^2=0.61$ ): AT time =  $0.148*(VO_{2max})+11.915$ . The equation for the fitted model with  $R^2=0.61$  is: AT Time =  $-0.148 *$

(VO<sub>2</sub> max) + 11.915. **Conclusion:** The results suggest VO<sub>2max</sub> to be an important physiological variable for firefighter's performance, explaining 61% of variance in AT performance. Future research should explore other relevant fitness parameters such as, Critical Power, Lactate Threshold and Maximal Strength, in combination for prediction of performance on AT; which may help to explain the remaining variance in performance, as well as to identify the specific training factors crucial to firefighter performance.

---

### **Energy Expenditure During Gait Using the ReWalk™ Exoskeletal Walking System for Persons with Paraplegia**

<sup>1,2</sup>Knezevic, S., <sup>1</sup>Emmons R., <sup>2</sup>Asselin, P., <sup>2</sup>Spungen, A., <sup>2</sup>Bauman, W. <sup>1</sup>William Paterson University, Wayne, NJ, <sup>2</sup>James J. Peters VA Medical Center, Bronx, NY

**Purpose:** The purpose of this study was to evaluate energy expenditure (EE) during powered exoskeleton-assisted walking in persons with paraplegia. **Methods:** A total of 5 male participants, (Ages: 37-61 years, Height: 1.70-1.85 m, Weight: 65.91-95.7 kgs, BMI: 22.71-28.61 kg/m<sup>2</sup>, Level of Injury: T1-T11, & Duration of Injury: 1.5-14 years) were recruited for this study. EE measurements were obtained from experienced exoskeleton users with paraplegia (PARA) during: seated rest, standing rest, walking, and seated recovery. EE was measured for 6 minutes while: seated, standing, walking, and seated again for two trials, (Pre, & Post) after approximately 60 sessions. A portable metabolic cart was used to obtain all metabolic measurements. Exhaled gases for O<sub>2</sub> and CO<sub>2</sub> were collected. Training was performed at different walking speeds over the course of the subjects' training period as execution of operating the exoskeleton increased. Six minute walk time distances were obtained during each trial, from which average walking velocity was calculated. **Results:** Preliminary data has shown that there is a significant difference between EE during testing (Pre: 1.57±0.36kcal/min Post: 2.00±3.0kcal/min, p,018<.05), RER during recovery (Pre: 0.92±0.06 Post: 0.98±0.20, p,042<.05), & oxygen consumption (VO<sub>2</sub>) during testing (Pre: 814.55±184.37ml/min Post: 1028.89±153.57ml/min, p,027<.05) before and after training. Data has shown that each subject increases their EE & VO<sub>2</sub> from their pre to post session. **Conclusion:** These preliminary results suggest that powered exoskeletal-assisted walking, for approximately 60 sessions, can improve an individual's oxygen consumption as well as increase the amount of energy expended. These improvements may potentially further enhance the quality of life of persons with paraplegia.

Support: This research was supported by the Veteran Affairs Rehabilitation Research and Development Service (#B4162C) and the James J. Peters VA Medical Center.

---

### **Effects of Simple Carbohydrate vs. Carbohydrate-Protein Intake on Glucose Homeostasis Following Intense Exercise**

Kluka, J., Baskerville, J., Clifton, K., Fisher, K., Marks, D., Weidner, C., Veerabhadrapa, P. and Braun, W.A. (FACSM), Shippensburg University, Shippensburg, PA.

**Purpose:** To test the effects of simple carbohydrate (CHO) and the combination of CHO and protein on blood glucose (BG) clearance following intense anaerobic exercise. **Methods:** Eight members (age = 18.8 ± 1.4 years) of the Shippensburg University Football team participated in the study. On separate test days, subjects were given either a placebo (PL) drink, a CHO drink (74 g CHO in 473 ml), or a carbohydrate-protein (C-PRO) drink (58 g CHO and 16 g PRO in 473 ml), upon completing the exercise bout. Before exercise, baseline measurements were taken for BG and heart rate. The subject then completed a 90-sec modified Wingate protocol (resistance set at 70% of the individual's Wingate protocol resistance). BG was tested post-exercise, and every ten minutes after ingestion of the solution for 60 min. **Results:** Neither total revolutions completed (PL = 123.0±5.0; CHO = 126.9±3.9; C-PRO = 125.4±2.8) nor post-exercise BG

(mg·dl<sup>-1</sup>) differed across treatments (PL = 88.6±6.5; CHO = 93.1±4.0; C-PRO = 101.1±4.7). However, CHO elicited the highest (p<0.05) mean BG during recovery and the lowest BG was found in the PL.

Treatment	Post-ex	10min	20min	30min <sup>^</sup>	40min <sup>^</sup>	50min <sup>^</sup>	60min <sup>^</sup>
PL	88.6±6.5	95.7±4.7	88.6±5.6	83.4±4.6	79.7±3.2	87.6±4.4	76.7±4.6
CHO*	93.1±4.0	98.6±4.8	100.3±5.8	114.9±6.6	110.4±5.8	117.9±6.8	116.3±5.3
C-PRO	101.1±4.7	91.9±5.8	89.8±3.5	91.3±5.2	99.2±10.4	96.6±11.3	99.4±6.4

Data are mean ± S.E.\*=Different from PL and C-PRO. <sup>^</sup>=Time x treatment effect(s) present.

**Conclusion:** While matching post-exercise energy intake, C-PRO elicited a smaller BG area than CHO but tended to be larger than that of PL (p=0.052). C-PRO may be a better choice for post-exercise intake if aiming to maintain glucose homeostasis during recovery.

### Poloxamer 188 Does Not Alter Performance Improvements Associated with Equivalent Exercise Regimens in Mice

<sup>1</sup>Krajek, A., <sup>2</sup>Weisleder, N., <sup>1</sup>Orange, M. <sup>1</sup>Gettysburg College, Gettysburg PA, <sup>2</sup>The Ohio State University, Columbus, Ohio

**Purpose:** Poloxamers are synthetic amphipathic co-block polymers that may insert themselves into the plasma membrane and have been shown to protect multiple cell types from various injuries. Our goal is to investigate the possible utility of poloxamer 188 (P188) to improve performance outcomes associated with regular exercise. The aim of this study was to determine the effect of P188 treatment among groups of equivalent exercise loads. **Methods:** Thirty-one adult C57Bl6/J mice were randomly distributed amongst four groups: P188 treated and exercised (P188-E), saline injected and exercised (Sal-E), P188 treated and no exercise (P188-N), saline injected and no exercise (Sal-N). Mice received intraperitoneal injection of P188 solution (10 µL/g of 100 mg P188/mL in 0.9% saline; 1000 mg P188/kg dose) or vehicle (0.9% saline solution) three times weekly. At 30 minutes post-injection mice were run on a treadmill for 45 minutes at speeds increasing to a maximum of 16 m/min. After eight weeks of this training and treatment program, average treadmill exhaustion time was determined for each group. **Results:** Exercise groups displayed significantly higher exhaustion times relative to non-trained control groups: P188-E 25.24 min, P188-N 21.43min, Sal-E 26.60 min, Sal-N 22.38 min (main effect, p = 0.002, 2X2 analysis of variance). The difference between P188 treated and vehicle injected groups was not statistically significant (main effect, p = 0.333). **Conclusion:** These observations suggest that the cellular mechanism of P188 membrane protection has no impact on performance improvement when treated and non-treated groups are exposed to equivalent exercise regimens. Future experimentation will investigate the impact of P188 on recovery from acute bouts of intense exercise.

Research funded in part by a grant to Gettysburg College from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program

### Voluntary Wheel Running Improves Cardiac Function in the 5/6 Ablation-Infarction Model of Chronic Kidney Disease

Kuczarski, J.M., Martens, C.R., Kim, J.H., Lennon-Edwards S.L., Edwards D.G., University of Delaware, Newark, DE

**Purpose:** The purpose of the present investigation was to determine if voluntary wheel running is a safe and effective therapeutic strategy to improve cardiac function in the 5/6 ablation-infarction (AI) rodent model of chronic kidney disease (CKD). **Methods:** Male Sprague Dawley rats underwent AI or sham surgeries at twelve weeks of age. After 4 weeks of disease development, AI animals were randomly assigned to either remain sedentary (AI-SED) or

undergo a 4-week voluntary wheel running intervention (AI-WR). Cardiac function was measured in all animals 8-weeks post-surgery using an isolated working heart preparation. In addition, serum creatinine was used to assess renal function, and left ventricular (LV) tissue was isolated upon sacrifice for biochemical tissue analysis. Data are presented as Mean  $\pm$  SEM. **Results:** Serum creatinine was significantly increased in both AI-SED ( $n = 6$ ;  $1.8 \pm 0.15$  mg/dl) & AI-WR animals ( $n = 6$ ;  $1.8 \pm 0.22$  mg/dl) vs. SHAM ( $n = 6$ ;  $0.76 \pm 0.05$  mg/dl; all  $p < 0.05$ ). Baseline cardiac output (CO) (assessed at  $13.5\text{cmH}_2\text{O}$  left atrial filling pressure &  $80\text{cmH}_2\text{O}$  aortic pressure) was impaired in AI-SED animals ( $n = 7$ ) relative to SHAM ( $n = 10$ ) ( $43 \pm 3$  vs.  $27 \pm 5$  ml/min;  $p < 0.05$ ). CO was also impaired at left atrial filling pressures of  $17.5\text{cmH}_2\text{O}$  ( $45 \pm 3$  vs.  $30 \pm 5$  ml/min) &  $21.5\text{cmH}_2\text{O}$  ( $46 \pm 4$  vs.  $32 \pm 5$  ml/min; all  $p < 0.05$ ) while aortic pressure was maintained at  $80\text{cmH}_2\text{O}$ . In contrast, CO in AI-WR animals ( $n = 7$ ) was not significantly different from SHAM at baseline ( $33 \pm 3$  ml/min) or while altering left atrial filling pressure ( $17.5\text{cmH}_2\text{O}$ :  $35 \pm 4$  &  $21.5\text{cmH}_2\text{O}$ :  $36 \pm 4$  ml/min; all  $p > 0.05$ ). LV total nitrite + nitrate, a marker of cardiac nitric oxide (NO), was significantly decreased in AI-SED animals ( $218 \pm 12$  vs.  $177 \pm 12$  nM  $\times$  mg<sup>-1</sup> of protein) as compared to SHAM, whereas LV hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) was increased ( $898 \pm 33$  vs.  $1157 \pm 86$  nM  $\times$  mg<sup>-1</sup> of protein; all  $p < 0.05$ ). In contrast, these markers of NO ( $212 \pm 7$  nM  $\times$  mg<sup>-1</sup> of protein) & reactive oxygen species (ROS) production (LV  $\text{H}_2\text{O}_2$ :  $1011 \pm 64$  nM  $\times$  mg<sup>-1</sup> of protein) were not significantly different from SHAM in AI-WR animals (all  $p > 0.05$ ). **Conclusion:** 4-weeks of voluntary wheel running improves cardiac function in the 5/6 AI model of CKD without altering serum creatinine. This may be partly mediated by increased NO and reduced ROS production.

Research funded by the NIH Grants P20 RR016472-12 and P20 GM103446-12

---

### Resistance Exercise, Carotid Artery Stiffness, and Cerebral Blood Flow Pulsatility

Lefferts, W., Augustine, J., Heffernan, K., Department of Exercise Science, Syracuse University, Syracuse, NY

Cross-sectional studies have identified arterial stiffness as an important correlate of cerebral blood flow (CBF) pulsatility, an important predictor of cerebrovascular damage. Central artery stiffness increases acutely following a bout of resistance exercise (RE). It has yet to be elucidated whether RE-induced increases in arterial stiffness affect CBF pulsatility. **Purpose:** To investigate the effects of acute RE on carotid artery stiffness and CBF pulsatility. **Methods:** 18 healthy men (age  $22 \pm 1$  yr; BMI  $23.7 \pm 0.5$  kg $\cdot$ m<sup>-2</sup>) underwent a) acute RE (5 sets, 5-RM bench press, 5 sets 10-RM bicep curls with 90 s rest intervals), and b) a time control condition (seated rest) in a randomized order. CBF pulsatility index (PI) was measured with transcranial Doppler at the middle cerebral artery (MCA). Common carotid artery (CCA) beta stiffness ( $\beta$ ) and blood flow velocity PI were assessed using Doppler ultrasound. CCA pulse pressure was measured using applanation tonometry. Wave intensity analysis (WIA) was used to derive measures of forward ( $W_1$ ) and backward (Negative Area (NA)) travelling pressure waves to gain insight into origins of CBF pulsatility. **Results:** CCA  $\beta$ , and pulse pressure significantly increased post-RE ( $p < 0.05$ ). There was a significant increase in post-RE forward wave pressure ( $W_1$ ,  $p < 0.05$ ) with no changes in measures of backward/reflected wave pressure (lnNA,  $p > 0.05$ ). There were no changes in CCA PI or MCA PI following acute RE ( $p > 0.05$ ). **Conclusions:** Acute RE increases CCA stiffness and pressure pulsatility without affecting CCA or MCA flow pulsatility. Increases in pressure pulsatility are due to increases in forward wave pressure and not pressure from wave reflections.

**Table 1.** Vascular and hemodynamic response to acute resistance exercise (mean  $\pm$  SE)

Measure	Condition	Baseline	10-min Post	20-min Post	30-min Post	Interaction
CCA PP, mmHg	Control	42 $\pm$ 2	40 $\pm$ 2	40 $\pm$ 2	40 $\pm$ 2	< 0.001
	RE	43 $\pm$ 2	58 $\pm$ 4 <sup>a,b</sup>	53 $\pm$ 3 <sup>a,b</sup>	54 $\pm$ 3 <sup>a,b</sup>	
CCA PI, [-]	Control	2.1 $\pm$ 0.1	2.1 $\pm$ 0.1	2.1 $\pm$ 0.1	2.1 $\pm$ 0.1	0.094
	RE	2.0 $\pm$ 0.1	2.2 $\pm$ 0.1	2.0 $\pm$ 0.1	2.0 $\pm$ 0.1	
MCA PI, [-]	Control	0.9 $\pm$ 0.1	0.9 $\pm$ 0.1	0.9 $\pm$ 0.1	0.8 $\pm$ 0.1	0.325
	RE	0.9 $\pm$ 0.1	0.9 $\pm$ 0.1	0.8 $\pm$ 0.1	0.8 $\pm$ 0.1	
CCA $\beta$ , [-]	Control	3.9 $\pm$ 0.4	3.6 $\pm$ 0.3	3.8 $\pm$ 0.2	3.5 $\pm$ 0.2	0.025
	RE	3.9 $\pm$ 0.4	5.3 $\pm$ 0.4 <sup>a,b</sup>	4.8 $\pm$ 0.4 <sup>a,b</sup>	5.0 $\pm$ 0.3 <sup>a,b</sup>	
CCA $W_1$ , mmHg·m·sec <sup>-3</sup>	Control	9.4 $\pm$ 0.8	10.6 $\pm$ 1.3	9.7 $\pm$ 1.2	9.1 $\pm$ 0.8	0.015
	RE	9.3 $\pm$ 1.0	16.6 $\pm$ 2.0 <sup>a,b</sup>	13.5 $\pm$ 1.5 <sup>a,b</sup>	11.7 $\pm$ 1.3 <sup>a</sup>	
CCA lnNA, mmHg·m·sec <sup>-2</sup>	Control	3.3 $\pm$ 0.5	3.6 $\pm$ 0.3	3.5 $\pm$ 0.2	3.3 $\pm$ 0.3	0.160
	RE	3.9 $\pm$ 0.4	4.9 $\pm$ 0.5	4.2 $\pm$ 0.4	3.2 $\pm$ 0.5	

<sup>a</sup> Significantly different from within condition/RE baseline ( $p < 0.05$ )

<sup>b</sup> Significantly different from Control at the same time point ( $p < 0.05$ )

RE, resistance exercise; CCA, common carotid artery; MCA, middle cerebral artery; PP, pulse pressure; PI, pulsatility index; NA, negative area

### The Effects of Ankle Taping and Bracing on Agility, Vertical Jump, and Power

Leonard, T. M., Rotay, J. S., Paulson, S., Sanders, J., Shippensburg University, Shippensburg, PA

Ankle sprains are the most common injury in athletics. Ankle bracing and taping are widely used in order to prevent ankle injuries. **Purpose:** The primary purpose was to examine the effects of ankle taping and bracing on agility, maximum vertical jump (MVJ) height, and vertical power. The secondary purpose was to determine if there were performance differences in training status (athletic vs. non-athletic) between the conditions. **Methods:** Nineteen participants (Age 20.6 $\pm$ 1.5 yr, Height 173.7 $\pm$ 11.9 cm, Mass 77.3 $\pm$ 18.0 kg) volunteered. Of the 19 participants, 10 (8 male, 2 female, Age 21.1 $\pm$ 1.4 yr, Height 178.6 $\pm$ 12.4 cm, Mass 81.52 $\pm$ 19.7 kg) were classified as athletic and 9 (3 male, 6 female, Age 20.1 $\pm$ 1.5 yr, Height 168.5 $\pm$ 10.0 cm, Mass 72.6 $\pm$ 15.8 kg) were non-athletic. Subjects completed three counter-balanced conditions (control, braced, and taped). The tests were a countermovement standing MVJ, vertical jump displacement test (VJD), and the Illinois Agility test (IA). The VJD was used to calculate power. **Results:** There were no significant differences between conditions for the MVJ test (M: Taped = 23.2 in; Braced = 23.3 in; Control = 23.3 in;  $p = .79$ ), power from the VJD test (M: Taped = 103.8 kg·m·s<sup>-1</sup>; Braced = 103.0 kg·m·s<sup>-1</sup>; Control = 106.1 kg·m·s<sup>-1</sup>;  $p = .10$ ) or the IA test (M: Taped = 18.1 s; Braced = 18.2 s; Control = 17.9 s;  $p = .43$ ). There were statistically significant differences in training status for all measurements ( $p < .05$ ); however, training status did not affect performance across conditions.

Variables	Athletic (n = 10)			Non-Athletic (n = 9)		
	Taped	Braced	Control	Taped	Braced	Control
MVJ (in)	27.5 $\pm$ 7.2	27.0 $\pm$ 7.5	21.1 $\pm$ 7.4	19.0 $\pm$ 4.8	19.1 $\pm$ 4.5	18.4 $\pm$ 5.0
VJD (kg·m·s <sup>-1</sup> )	118.1 $\pm$ 3	120.7 $\pm$ 30.	121.4 $\pm$ 34.	87.9 $\pm$ 21.	83.5 $\pm$ 22.	88.9 $\pm$ 23.
	5	5	3	7	4	3
IA (s)	16.2 $\pm$ 2.0	16.6 $\pm$ 1.8	16.3 $\pm$ 1.9	20.2 $\pm$ 2.8	19.9 $\pm$ 1.8	18.1 $\pm$ 35

**Conclusion:** According to these results, ankle bracing or taping did not significantly impair agility or MVJ and power performance. However, these measurements were affected by the training statuses of the individuals regardless of the condition.

### **Group-Based Aerobic Exercise in HIV+ Patients: A Pilot Study**

Lindsey, R., Shikuma, C., Chow D., Kocher, M., Kimura, I., University of Hawaii-Manoa, Honolulu, HI

**Purpose:** Highly Active Antiretroviral Therapy (HAART) minimizes Human Immunodeficiency Virus (HIV) replication and improves immune function, which has reduced mortality rates and extended life expectancy. Though HAART significantly enhances the clinical outcome of HIV with increased survival rates, these favorable effects are limited by the development of metabolic disorders. Exercise has been recommended for HIV+ patients to control their disease as well as HAART side effects. Despite this recommendation, only 25 to 28.2% of HIV+ individuals engage in moderate physical activity. Compliance in group-based exercise programs has been shown to exceed individual-based, therefore, the purpose of this study was to evaluate the feasibility and effectiveness of a group-based aerobic exercise program in HIV+ individuals. **Methods:** A pretest-posttest design was utilized to evaluate the effects of a 12 wk group-based aerobic exercise program on fitness level, lipid levels, insulin sensitivity, body composition, and quality of life in HIV+ individuals. The Physical Activity Group Environment Questionnaire (PAGEQ) was administered to obtain descriptive information. Participants were 18 sedentary HIV+ males between 32 and 59 years of age (mean  $45 \pm 6.34$ ) on HAART. **Results:** Eighteen participants were enrolled; nine completed the exercise program and six were compliant, attending >70% of exercise sessions. Treatment effects over time were compared by paired *t*-tests. Significant improvements ( $p=0.03$ ) in triglycerides and health transition scores (quality of life dimension) ( $p=0.02$ ) were seen post intervention. Additionally, significant improvements in maximal oxygen consumption ( $p = 0.03$ ) were revealed among the six compliant participants, an average increase of 15% (mean  $29.52 \pm 4.86$  (mL/kg<sup>-1</sup>/min<sup>-1</sup>) at entry to  $34.18 \pm 8.12$  (mL/kg<sup>-1</sup>/min<sup>-1</sup>) at 12 wks). Not surprisingly, compliant participants demonstrated higher levels of group cohesion for three of the four subscales in the PAGEQ than their non-compliant counterparts. **Conclusion:** A 12 wk group-based aerobic exercise program resulted in improvements in triglyceride levels and cardiorespiratory fitness among compliers and appears to be a viable option for HAART treated HIV+ individuals.

Research funded by the National Institute of Health (R01HL095135 and U54MD00)

---

### **Quality PE Classes versus After-School Physical Activity: Which Contributes to Adolescents' Aerobic Capacity More?**

Liu, W., Zillifro, T., Nichols, R., Slippery Rock University, Slippery Rock, PA

**Purpose:** Few studies investigate how moderate to vigorous physical activity (MVPA) in PE classes and after-school MVPA contribute to adolescents' fitness development differently. This study examined how MVPA in PE classes versus after-school MVPA was associated with adolescents' aerobic capacity development. **Methods:** One hundred and thirty-two students (64 girls) in a PE4life Academy middle school (S1) and 96 students (50 girls) in a same-area school (S2) with a traditional PE program completed PACER at the beginning of their 6<sup>th</sup> grade (baseline) and the end of 8<sup>th</sup> grade (follow-up). PACER scores between the two schools at the follow-up were compared using one-way MANCOVA controlling for the baseline scores. In addition, 45 lessons were observed at each school during the three years to measure MVPA in the PE class using the System for Observing Fitness Instruction Time, and the between-school differences in MVPA in PE classes were compared with one-way MANOVA. Further, weekly after-school MVPA was measured using Self-Administered Physical Activity Checklist at the end of 6<sup>th</sup> grade, end of 7<sup>th</sup> grade, and end of 8<sup>th</sup> grade, respectively, and the results between S1 and S2 were compared using independent *t* tests. Two schools were comparable in socioeconomic status (median household income \$30K), ethnicity (White > 90%), and weekly PE class time

(approximately 90 minutes). **Results:** Difference in percentage of the PE class time spent in MVPA between S1 and S2 was significant ( $p < .001$ ) in favor of S1,  $67.56 \pm 10.57$  vs.  $43.25 \pm 12.03$ , but there were no significant between-school differences in after-school MVPA minutes at any of the three assessment points for both boys (S1  $258.21 \pm 175.43$  vs. S2  $288.70 \pm 168.11$ ,  $311.75 \pm 203.64$  vs.  $313.54 \pm 115.89$ ,  $328.91 \pm 163.60$  vs.  $345.00 \pm 218.01$ ) and girls (S1  $262.50 \pm 164.43$  vs. S2  $303.33 \pm 217.49$ ,  $297.69 \pm 130.40$  vs.  $314.04 \pm 191.26$ , and  $280.38 \pm 153.99$  vs.  $312.00 \pm 157.17$ ). As for the PACER performance, S1 demonstrated significantly higher adjusted means ( $p < .05$ ) at the follow-up for both boys ( $51.58$  vs.  $33.84$ ,  $p < .001$ ) and girls ( $30.15$  vs.  $25.15$ ). **Conclusion:** Compared with after-school activities, PE classes reach every kid in the school, and quality PE classes provided by PE4life Academy School with large percentage of MVPA time are more associated with adolescents' aerobic capacity development.

---

### **Do Changes in Predicted Isotonic 1RM and Isometric Peak Torque Demonstrate Cross Education?**

<sup>1,2</sup>LoRusso, S, <sup>1</sup>Brownyard N, <sup>1</sup>Hay S, <sup>1</sup>Hiester R, <sup>1</sup>Pion J, <sup>1</sup>Schlanger S. <sup>1</sup>Department of Physical Therapy and <sup>2</sup>Exercise Physiology, Saint Francis University, Loretto PA

**Purpose:** To determine the cross education effects of bilateral and unilateral isotonic strength training on isometric ext. and flex. Peak Torque (Pktq) in the lower limbs at  $30^\circ$ ,  $60^\circ$  &  $90^\circ$  of knee flexion. **Introduction:** Unilateral strength training effects changes in strength in an untrained, contralateral limb. This phenomenon, crossed education (CE), can prevent strength loss in a contralateral untrained limb. This study examined this phenomenon using isometric peak torque and changes in 1RM as measures of CE. **Methods:** In a randomized pre/post-test design, 10 college aged male and female subjects, not formally strength trained for 3 months, were assigned to isotonic unilateral strength training (U), or control no training (C) groups. All subjects underwent 9 sessions of bilateral leg ext. strength training, followed by 9 sessions of no training (C) or right limb training only (U). Initial pre-training, post bilateral training, and final bilateral and unilateral 1 RM for knee extension, and isometric Pktq ext., flex. values at  $30^\circ$ ,  $60^\circ$  &  $90^\circ$  of knee flexion with "0" full extension were determined. Data analysis: One way ANOVA with Pos-Hoc Tukey for pair wise differences. **Results:** Bilateral training increased 1 RM, NS, ( $F=2.46, p=0.127$ ), while right limb unilateral training increased significantly ( $F=7.87, p=0.007$ ), with no change in left limb 1RM ( $F=2.16, p=0.158$ ). Post hoc analysis indicated significant increase in right limb ext Pktq at  $30^\circ$  &  $60^\circ$ , and NS at  $90^\circ$ . Left limb Pktq at  $30^\circ$  &  $60^\circ$  decreased significantly, and slightly increased at  $90^\circ$ . Right limb Flex. Pktq increased NS at  $30^\circ$  &  $60^\circ$  and decreased at  $90^\circ$ . There were no changes in left limb Pktq flexion. **Conclusion:** Unilateral training produced significant increases in 1RM of the right limb, and prevented strength loss in the left limb, demonstrating CE. Right Limb Ext. Pktq values increased, but demonstrated no CE effect to the left limb, as these values decreased significantly, with no significant change at  $90^\circ$ . However, the NS increases in right limb flexion Pktq at  $30^\circ$  &  $60^\circ$  suggests unilateral exercise influenced the right hamstrings. These results indicate that Pktq did not demonstrate CE, but there was support for the concept of specificity with effects mainly occurring in the trained limb.

---

### **No Association between Body Fat and Arterial Stiffness in Non-obese Women**

Martin, E., Augustine, J., Spartano, N., Lefferts, W., Heffernan, K. Syracuse University, Syracuse, NY

Obesity is known to increase risk for cardiovascular disease (CVD), which may be a result of the negative effects that high body fat has on arterial function. Obesity may increase pulsatile load

and over time contribute to vascular damage and increased arterial stiffness. However, it is currently unknown whether body fat is associated with pulsatile load and arterial stiffness in otherwise healthy non-obese women. **Purpose:** To investigate the association between body fat, pulsatile load and arterial stiffness in healthy non-obese women. **Methods:** Forty-eight non-obese women (ages  $22 \pm 8$  years, BMI  $22 \pm 2$  kg/m<sup>2</sup>). were studied in this cross sectional study design. Pulse wave velocity (PWV) was obtained from carotid-femoral pulse sites as a measure of aortic stiffness. Pulsatile load was calculated as the product of heart rate and pulse pressure (systolic blood pressure- diastolic blood pressure). Body fat percentage was measured by air displacement plethysmography. **Results:** Body fat percentage was significantly associated with pulsatile load ( $r = 0.35$ ,  $p < 0.05$ ). Aortic stiffness was also significantly associated with pulsatile load ( $r = 0.27$ ,  $p < 0.05$ ). However, arterial stiffness was not associated with body fat ( $r = 0.12$ ,  $p > 0.05$ ). **Conclusion:** Body fat percentage is not directly associated with aortic stiffness in young non-obese women. However, body fat is associated with higher pulsatile load. This is important because pulsatile load is known to damage the arteries and over time could lead to increases in arterial stiffness.

---

### **The Relationship between Aerobic Fitness and Bone Health in College-Aged Women**

<sup>1</sup>Masteller, B., <sup>2</sup>Dixon, C.B., FACSM, <sup>1</sup>Rawson, E.S., FACSM, <sup>1</sup>Andreacci, J.L., FACSM.

<sup>1</sup>Bloomsburg University, Bloomsburg, PA, <sup>2</sup>Lock Haven University, Lock Haven, PA

**Purpose:** To examine the relationship between body composition, cardiovascular fitness and bone mineral content (BMC) in college-aged women. **Methods:** Thirty-nine women (age =  $21.5 \pm 2.2$  years; body mass index =  $23.0 \pm 3.4$  kg/m<sup>2</sup>) reported for testing on two occasions separated by 48 hrs: (1) body composition assessment via dual-energy X-ray absorptiometry (DXA); and (2) a maximal oxygen consumption (VO<sub>2max</sub>) test performed on a motorized treadmill. **Results:** Of the 39 subjects tested, 34 achieved VO<sub>2max</sub> according to standardized criteria and included in data analysis. Statistical analyses revealed no relation between VO<sub>2max</sub> and BMC ( $r = 0.185$ ,  $p = 0.294$ ). As expected, a positive correlation was observed between body mass and BMC ( $r = 0.825$ ,  $p < 0.001$ ). Although both significant, absolute fat mass ( $r = 0.660$ ,  $p < 0.001$ ) was more strongly correlated to BMC than was percent body fat ( $r = 0.527$ ,  $p = 0.001$ ). Interestingly, no association between fat free mass and BMC was observed in this study ( $r = 0.291$ ,  $p = 0.095$ ). **Conclusion:** The results of this study indicate a positive relationship between body mass, and more specifically fat mass, and BMC. However, no relationship was observed between fat free mass and VO<sub>2max</sub> on BMC.

---

### **Applicability of Body Composition Assessments for Children**

Mastrangelo, M., Dean, R., Desmond, B., Pitcher, S., Rencher, A., Yau, A., The Richard Stockton College of New Jersey, Galloway, NJ

Childhood obesity has been on the rise for the past three decades. **Purpose:** To determine the most applicable tool to assess obesity in children. **Methods:** A systematic review was conducted on the following tools: Dual-Energy X-Ray Absorptiometry (DEXA), Underwater Weighing (UW), Skinfold Calipers (SF), Body Mass Index (BMI), Air Displacement Plethysmography (ADP), Waist Circumference (WC), Weight-Height Growth Velocity, Height and Weight Centiles, Photonic Imaging, Near-Infrared Interactance, Bioelectrical Impedance Analysis (BIA), and Waist and Neck Circumference. Databases: EBSCO, PubMed, Medline, CINNAHL, Science Direct. **Results:** A variety of assessment tools to determine overweight and obesity in children were researched. Testing environment and the number of participants involved directly impact the most effective assessment tool. In a non-clinical setting with the need for quick results, e.g., a school system or field test, certain tools are more appropriate.

Skin fold analysis predicts body composition whereas BMI is an indicator of obesity risk. Both tools are easy to use in a large group study. The tools found to be the most reliable and valid were DEXA and UW. The use of DEXA and UW for assessment of body composition are most effective in clinical studies. **Conclusion:** Assessment tools to predict overweight and obesity in children is dependent on the assessment environment. The tools with the highest reliability and validity are not feasible with large population study. BMI is an indicator of overweight and obesity and easy to use in a large population study. Researchers should determine the most practical tool to use to assess overweight and obesity based on equipment available and the size of the study population.

**\*\*Statement of Disclosure:** No researchers received compensation for this project.

---

### **Manual Asymmetries and Working Memory: Preliminary Results**

Matos, J. A., Flink, T. S., Gannon University, Erie, PA

The balance between handedness performances, or manual asymmetry, tends to decline with age. When people age, their brains lose functionality, which compensates for these losses with a reduced lateralized dominance between the two hands. Working memory declines with age and the areas of the brain, that control working memory, also show reduced lateralization in older adults. **Purpose:** The purpose of this study is to examine differences in manual asymmetry in young vs. older adults in tasks that require working memory and fine motor control. **Methods:** Nineteen right-handed participants (ages  $20.7 \pm 3$  years) were tested. Participants completed a Mini-Mental State Examination to test cognitive function and memory levels. The participants completed 3 tasks: working memory, spatial manipulation of shapes, and a combination of working memory plus spatial manipulation of shapes. Time until completion was recorded per trial. **Results:** Preliminary results showed right-hand performance was 3.7s and 7.4s faster compared to the left hand for the spatial manipulation ( $t(18) = -4.97, p = 0.000$ ) and combination ( $t(18) = -2.81, p = 0.011$ ) tasks, respectively. In addition, performance of the left hand significantly correlated with the laterality quotient computed for the spatial manipulation task ( $r(17) = -0.715, p = 0.001$ ) and combination task ( $r(17) = -0.705, p = 0.001$ ). **Conclusion:** Performance with the right hand was significantly better than the left hand for the young adults. However, manual asymmetry in young adults is dependent upon the performance of the non-dominant hand only. Research investigating differences in manual asymmetry in older adults is currently ongoing and will be compared with younger adults.

---

### **Thoracopelvic coordination of pregnant women during gait**

<sup>1</sup>McCrary J.L., FASCM, <sup>2</sup>Seay J.F., <sup>3</sup>Hamill J., FACSM, <sup>1</sup>West Virginia University, Morgantown, WV, <sup>2</sup>U.S. Army Research Institute of Environmental Medicine, Natick, MA, <sup>3</sup>University of Massachusetts, Amherst, MA, USA

Pregnant women experience dramatic alterations to the shape of their bodies, particularly in the torso. These changes contribute to a “waddling” gait later in pregnancy, which has been defined as greater thoracic extension, anterior pelvic tilt, and mediolateral translation of the torso compared to non-pregnant women. These changes could also increase chances of having pregnancy-related back pain, which has been reported by 50% of pregnant women. Other populations with low back pain exhibit changes in the coordination pattern between the thorax (i.e. upper torso) and pelvis during gait. The **purpose** of this study was to examine the effect of advancing pregnancy on thoracopelvic coordination during gait. **Methods:** Data were collected on 29 pregnant participants in their 2<sup>nd</sup> and 3<sup>rd</sup> trimesters and on 40 control women. An 8 camera motion capture system (120 Hz) was used to collect 3D angular data of the thorax and pelvis while subjects walked at their freely chosen speed along an 8m laboratory runway. The

thorax was modeled with markers placed on the manubrium, xyphoid process, and spinous processes of the C7 and T10 vertebrae. The pelvis was modeled with markers placed bilaterally on the ASIS and PSIS. Coordination between the thorax and pelvis during early stance, midstance, late stance, and swing was calculated via a vector coding technique. A MANOVA was performed to determine if differences existed in the coupling angle between the thorax and pelvis between pregnant women in each trimester and controls ( $\alpha=0.05$ ). Tukey post-hoc tests were performed when appropriate. **Results:** The frontal plane coupling angle was greater in late stance during the 3<sup>rd</sup> trimester ( $223.3\pm 63.4^\circ$ ) than in the 2<sup>nd</sup> trimester ( $198.7\pm 63.4^\circ$ ;  $p = 0.01$ ) or in controls ( $198.6\pm 63.2^\circ$ ;  $p=0.02$ ). No differences were noted in the coupling angles in the sagittal or transverse planes. **Conclusion:** Pregnant women are said to “waddle.” While previous studies have reported no alterations in the frontal plane angular movement of the thorax and pelvis individually during gait, we found that the frontal plane phase angle is increased in the third trimester, such that the pelvis and trunk had more in-phase coordination in the third trimester compared to controls. This change in coordination mechanics may be related to the high incidence of back pain in pregnant women.

---

### **Military Veterans' Attitude on the Value of Exercise as a Means of Coping with Stress**

McVaugh, C.S.<sup>1</sup>, Stevens, W.C.<sup>1</sup>, Roar, J.D.<sup>1</sup>, Bolt, M.C.<sup>1</sup> and Williams, J.G.<sup>1,2</sup> <sup>1</sup>West Chester University, West Chester, PA, <sup>2</sup>Kinestech Consulting.

Throughout history the United States military has been involved in numerous wars. Returning veterans are confronted with obstacles that are overwhelming and must ultimately be resolved through individual action. **Purpose:** To survey a population of veterans located on a university campus about their military-related exercise experience, attitude towards exercise and whether physical activity was employed as a therapeutic catalyst in coping with stress. **Method:** Participants were contacted through the campus Veteran's Center by email with a request to activate a link to an electronic questionnaire. Questions were grouped into four categories: military background, military-related physical training, mood/ “state-of-mind”, and extra-curricular physical activity. The study was approved by the institution's IRB. **Results:** Thirty seven veterans responded. Over three-quarters (78.4%,  $n=29$ ) indicated that a healthy lifestyle was a priority before entering the service. Thirty were deployed and twenty-two served in a combat role. Using a scale of 1 (extremely easy) to 10 (extremely rigorous) respondents judged the rigor of their military physical training (PT). The mean response was 7.5 with 28 indicating it was “adequately rigorous”. During their deployment 25 did PT on their own with 60.7% performing a combination of strength and cardiovascular training while 35.7% did strength training alone. When asked whether anger was an issue prior to, during or after deployment, respondents indicated “yes” 13.9% ( $n=5$ ), 47.2% ( $n=17$ ) and 50.0% ( $n=18$ ) respectively. When confronting negative situations or emotions 88.9% ( $n=32$ ) indicated that exercise helps. Over two-thirds (70.3%,  $n=26$ ) stated that physical activity helps them sleep better and 61.1% ( $n=22$ ) revealed more restful sleep on days when they exercised. Thirty one (86.1%) respondents stated participation in outdoor activities. **Conclusions:** Physical activity, including physical training was engaged in by the majority of veterans surveyed along with indications that it assists in coping with issues of anger as well as the transition back to civilian life. Trend in these results suggests that variants of exercise activity should be advised in the process, often problematic transfer, from military to civilian life.

---

### **The Effects of Fish Oil Supplementation on Cardiovascular Health**

Merk, L., Michael, C., Rackley, S., O'Brien K., Kramerenko, J., Sanders, J. Shippensburg University, Shippensburg, PA.

Recent research suggests that omega-3 polyunsaturated fatty acids present in fish oil can reduce the prevalence of CVD and can be beneficial to overall health. **Purpose:** This study examined if supplementing with fish oil can provide cardio-protective benefits. **Methods:** In this double blind study, eight female and male subjects (Age: 20.9±1.6 years, Weight: 168.3±48.7 lbs; Height: 167.4±48.7cm) were randomly assigned to either placebo (P) or fish oil (FO) group. FO group consumed 300 ml of fish oil per day for five weeks while P group consumed one vitamin B<sub>12</sub> tablet per day. Subjects' heart rate (HR), blood pressure (BP), low-density lipoproteins (LDL), high-density lipoproteins (HDL), triglycerides (TG), total cholesterol (TC), muscle soreness (RPE), glucose (GLU), blood lactate levels (BL), and muscle inflammation (MI) were measured at baseline, week two, and week five. During each visit, subjects also completed a submaximal cycle exercise test. A two way analysis of variance was used to examine the differences between groups and time. **Results:** There was no significant difference in total cholesterol before and after five weeks of FO supplementation (M±SD: 180.8±41.0 vs. 188.2±40.0 mg/dl, p>0.05). No significant change in systolic BP was found either (M±SD: 122.4±21.5 vs. 138.0±11.6 mmHg, p>0.05). There was no significant change in BL or RPE. However, a trend of reduced exercise HR, after supplementation, was shown in FO group (173.4±15.2 vs. 162±8.8 bpm; p=0.12) but not in P group. In **conclusion**, five weeks of FO supplementation in young individuals had no significant changes in their cardiovascular measures.

### Trial-to-trial Reliability of Biceps Brachii Mechanomyographic Responses during Isometric Contractions

Miles, P., McMahon, M., Mookerjee, S. Bloomsburg University of Pennsylvania, Bloomsburg, PA

**Purpose:** Investigate the between-trial reliability of the mechanomyographic (MMG) signal during isometric contractions of the biceps brachii. **Methods:** 15 males aged, 22.2 (± 2.2) years, performed 35 second, isometric, elbow flexions at 3 joint angles (60°, 90°, 120 °), at 50% and 75% of the maximal voluntary contraction (MVC), in randomized order. Surface MMG was recorded from the biceps brachii using an accelerometer-based sensor (bandwidth: 0-180 Hz; sensitivity: 100 mV·g<sup>-1</sup>). The Root Mean Square (RMS) was derived from 30, 1-second epochs. MMG data were also regressed against time to determine slope coefficients. **Results:** Between-trial Intraclass correlation coefficients (ICC) are presented below:

Joint Angle	RMS		Slope	
	50% MVC	75% MVC	50% MVC	75% MVC
60°	0.976*	0.947*	0.942*	0.463
90°	0.976*	0.904*	0.909*	0.313
120°	0.927*	0.895*	0.884*	0.730*

\*p<0.002

**Conclusion:** The high ICCs indicate the trial-to-trial reliability of the MMG RMS (@ both 50% and 75% MVC) as well as the MMG-time slopes (@ 50% MVC).

### Predictive validity of critical power and functional threshold power for mountain bike race performance.

Miller, M., Witmer, C., Moir, G., Davis, S., East Stroudsburg University, East Stroudsburg, PA

**Purpose:** This study tested the predictive validity of critical power (CP) and functional threshold power (FTP) for mountain bike cross-country (MTB) race performance. **Methods:** Five well-trained MTB athletes (mean ± s: age: 31.4 ± 9.3 years; mass: 70.8 ± 9.5kg; VO<sub>2max</sub>: 63.8 ± 7.0 ml/kg/min) volunteered for this study. Participants' FTP was measured during a ramped cycle

ergometer test to exhaustion and was indicated as the point at which blood lactate reached 4.0 mmol/L. This test also served to measure the gas exchange threshold and  $VO_{2peak}$  for CP testing. CP was tested during a 3-minute all-out test on a cycle ergometer against a fixed resistance. MTB performance measures were gathered from a USA Cycling sanctioned MTB race and reduced to mean lap time over four laps of 7.5 km each. Linear regression was used to assess the prediction of MTB performance using either FTP or CP. **Results:** This study shows that CP can predict MTB better than FTP ( $R^2=0.943$  versus  $R^2=0.784$ ). CP can also predict MTB with less error than FTP (39.413 s versus 76.526 s).

**Table 1.** Linear regression results from comparing relative measures of CP and  $LT_{4.0}$  to mean lap time.

Variable	R	$R^2$	Error (s)
Relative $LT_{4.0}$	0.886	0.784	76.526
Relative CP	0.971	0.943	39.413

**Conclusion:** Coaches and athletes can use this information to gauge ability and prescribe training for MTB athletes.

### The Correlation of Repeat Sprint Measures to Predicted $VO_2$ in Recreationally Active College Age Males

<sup>1</sup>Miltenberger, M., <sup>2</sup>Zipp, G., <sup>2</sup>Lombardi, V., <sup>2</sup>Parasher, R., <sup>1</sup>Davis, S., <sup>1</sup>East Stroudsburg University, East Stroudsburg, PA, <sup>2</sup>Seton Hall University, South Orange, NJ

**Purpose:** This study was designed to investigate the relationship between repeat sprint measures (peak sprint time, mean sprint time, fatigue index) and predicted  $VO_2$  (P $VO_2$ ) calculated from the Queens College Step Test (QCT). **Methods:** Eighteen recreationally active male college students (Age 20.9 years  $\pm$  1.5, Height 178.5cm  $\pm$  6.1, Mass 77.5 kg  $\pm$  9.8) volunteered to participate in this study. Each subject completed a repeat sprint protocol on an indoor track consisting of 12 x 30 meter sprints separated by 35 seconds of passive recovery. After a minimum of 48 hours subjects returned to complete a submaximal 3 minute step test consisting of 24 steps per minute. A 15 second recovery heart rate was recorded to determine P $VO_2$ . Relationships between sprint data (peak sprint time, mean sprint time, fatigue index) and P $VO_2$  were established using Pearson Product Moment Correlations (SPSS version 20.0).

**Results:** Statistical analysis revealed a significant negative relationship between mean sprint time and P $VO_2$  ( $p=0.011$ ,  $R= -0.586$ ) suggesting that those subjects with higher aerobic ability or P $VO_2$  would also have low mean sprint times. Correlations between peak sprint time and P $VO_2$  as well as fatigue index and P $VO_2$  failed to show statistical significance,  $p= 0.052$  and  $p= 0.120$  respectively. **Conclusion:** The findings of this study suggest that the QCT is a valid measure in the prediction of mean sprint ability. These results also provide further evidence to suggest that the aerobic energy system plays a key role in maintenance of performance across multiple sprint trials.

### A Comparison of Objective and Subjective Markers of Exertion using the Wii and Xbox Kinect

Mishler, A., Lo Bue-Estes, C., Patrick, E., Tobin S., Mercyhurst University, Erie, PA

**Purpose:** The aim of this study was to determine objective and subjective levels of exertion during exergaming using two different gaming systems, Wii and Xbox Kinect, between exergames of similar content. **Methods:** Ten Female University students (age 19  $\pm$  1.3 years) of varying activity levels without contraindication to safe aerobic exercise participation were recruited via campus advertising. Body composition was assessed via Bod Pod (body fat %

24.7 ± 4.16 kg/m<sup>2</sup>). Participants played Wii Just Dance (WJD), Wii Sports (WS), Xbox Dance Central (XBD) and Xbox Kinect Motion Sports (XBS). Participants played three dance games and three sports games for each gaming system. Games were chosen for similarity in duration and perceived similarity of exertion. Order of games and gaming systems were counterbalanced. Heart Rate (HR) was assessed using Polar HR monitors. Subject levels of exertion were assessed using the Subjective Exercise Experience Scale (SEES) and Rating of Perceived Exertion (RPE) using the Omni Scale. **Results:** Average HR was significantly higher during XBS (127 ± 10, *P* = 0.016) compared to WS (112 ± 18). Average RPE was not significantly different between WS and XBS. There was no significant difference for average HR or RPE between the gaming systems for the dance games. When comparing only boxing games, HR was significantly higher during the Xbox boxing (148 ± 16, *P* = 0.005) compared to Wii boxing (121 ± 19), while RPE was not significantly different. On the SEES, subjects rated feelings of fatigue higher following the Xbox games compared to Wii games (*P* = 0.030), while there was no difference between systems for positive well-being or psychological distress dimensions. Additionally, a significantly greater proportion of subjects answered that the Xbox games were “harder” compared to Wii games (*P* = 0.039). **Conclusion:** In exergames of similar content there may be a different level of both objective and subjective exertion based on the gaming system used. For certain games, it is possible that HR is higher but not subjective level of exertion. This warrants further exploration and may have implications increasing fitness levels while improving exercise adherence, as subjects may achieve higher exercise intensity during certain games with no increase in perceived effort.

---

#### **Effects of Manganese Administration on Breathing.**

<sup>1</sup>Mohamed, Z., <sup>1</sup>Gorczynski, D., <sup>1</sup>Glausen, T., <sup>2</sup>DeRuisseau K., <sup>1</sup>DeRuisseau, L.

<sup>1</sup>Department of Biological Sciences, Le Moyne College, Syracuse, NY

<sup>2</sup>Department of Exercise Science, Syracuse University, Syracuse, NY

**Purpose:** Manganese (Mn) is an important trace element involved with biological functions including macronutrient metabolism and antioxidant defenses. We hypothesized that short term Mn administration would alter the ventilatory response to hypoxia compared to saline administration. **Methods:** Eleven week old male mice were injected with MnCl<sub>2</sub> (intraperitoneal, 12mg/kg body mass; n=6) or saline (n=4) for 7 days followed by unrestrained barometric plethysmography on the 8<sup>th</sup> day. Mice were acclimated to the chamber and a baseline with room air (BASE) was collected followed by 10 minutes of hypoxia (10% O<sub>2</sub>, HYP) exposure. **Results:** Data are presented control vs. experimental and mean ± sem. Breathing frequency (breaths/min, BASE: 101 ± 18 vs. 140 ± 10; HYP: 176 ± 19 vs. 197 ± 12), tidal volume (ml/breath, BASE: 0.26 ± 0.01 vs. 0.35 ± 0.06; HYP: 0.25 ± 0.02 vs. 0.43 ± 0.07), and minute ventilation (ml/min, BASE: 25.8 ± 3.2 vs. 49.8 ± 10.0; HYP: 44.2 ± 5.4 vs. 86.3 ± 18.1) were not different (*p*<0.05) between groups during baseline or hypoxia. In addition, there was no difference in V<sub>E</sub>/V<sub>CO2</sub> during baseline conditions (BASE: 56.5 ± 5.2 vs. 80.0 ± 17.7). The percent change from baseline approached significance for tidal volume (control vs. experimental, 0.25 vs. 0.43; *p*=0.08). **Conclusions:** These preliminary findings indicate that MnCl<sub>2</sub> does not alter the ventilatory response during baseline, although the tidal volume percentage change may reveal differences as the study is expanded.

Funding provided by: Le Moyne College Student Research Committee, Biological Sciences Department, and American Physiological Society STRIDE Program; ZM is a 2013 STRIDE Fellow.

---

### **Ketorolac Attenuates the Blood Pressure Response to Plantar Flexion Exercise in Peripheral Arterial Disease Patients**

Muller, M., Drew R., Heffernan, M., Blaha C., Sinoway, L. Penn State Hershey Heart and Vascular Institute, Penn State College of Medicine, Hershey, PA

Prostaglandins are produced during skeletal muscle contraction and subsequently stimulate muscle afferent nerves, thereby contributing to the exercise pressor reflex (EPR). Humans with peripheral arterial disease (PAD) have an augmented EPR but the metabolite(s) responsible for this augmented response are not known. **Purpose:** We tested the hypothesis that intravenous infusion of ketorolac (a non-selective cyclooxygenase inhibitor that reduces prostaglandins) would attenuate the rise in mean arterial blood pressure (MAP) and heart rate (HR) in response to low-intensity plantar flexion exercise in humans with PAD. **Methods:** Six PAD patients underwent four minutes of one-legged rhythmic plantar flexion (30 contractions/min) in the supine posture. The workload began at 0.5 kg and progressed by 0.5 kg each minute. The leg with more severe PAD was always tested first, followed by a rest period and then the opposite leg. MAP and HR were measured on a beat-by-beat basis; changes from baseline in response to exercise were determined. Rating of perceived exertion (6-20) and leg pain (0-10) were also obtained. **Results:** Ketorolac did not affect resting MAP ( $97 \pm 3$  versus  $94 \pm 4$  mmHg) or HR ( $58 \pm 2$  versus  $55 \pm 2$  bpm). During the first 20 seconds of exercise with the most diseased leg,  $\Delta$ MAP was significantly attenuated with ketorolac ( $2 \pm 2$  mmHg) as compared to control ( $8 \pm 2$  mmHg,  $P = 0.017$ ) but  $\Delta$ HR was similar ( $7 \pm 2$  versus  $6 \pm 1$  bpm). During the second and third minutes of exercise,  $\Delta$ MAP was also significantly attenuated under ketorolac. The less diseased leg displayed similar results. Importantly, subjects rated the exercise bout as “very light” to “fairly light” and average pain ratings were 1 out of 10. Neither perceived exertion nor pain ratings were altered by ketorolac. **Conclusions:** These data indicate that prostaglandins contribute to the augmented EPR in patients with PAD. Because this response occurred at very low workloads, we speculate that muscle mechanoreceptors are sensitized by cyclooxygenase products under conditions of chronic limb ischemia.

Supported by NIH P01 HL096570 and UL1 TR000127

---

### **Vigorous and High Intensity Training with an Anti-Gravity Treadmill**

Muñoz, E., Figueroa, M., Manning, J., William Paterson University, Wayne, NJ

**Purpose:** The purpose of this study was to compare two different training intensities on and anti-gravity treadmill and to determine whether or not one elicited changes that were more favorable. **Methods:** Pre and post measures of oxygen consumption ( $VO_{2peak}$ ), body fat (BF)% and body mass index (BMI) were collected on twelve subjects, which were divided into 2 groups. Group 1 trained at 80% body weight (BW) 3 x / week, for 8 weeks, at 70% heart rate reserve (HRR) for 30 minutes. Group 2 trained at 90% BW, 2 x / week, for 6 weeks, using an interval protocol of high intensity. This protocol consisted of a 30 second sprint, followed by a 1.5 minute walk, which was repeated for a total of 8 sets. **Results:** No significant differences were found between groups prior to or after training. Weight, absolute  $VO_2$  ( $L \cdot min^{-1}$ ), BF% and BMI were significantly different after training within group 1, but not group 2.

	Group	Pre	Post	P
Weight (kg)	1	77.9 ± 18.0	76.0 ± 17.6	0.001
	2	77.9 ± 12.8	77.5 ± 12.6	NS
Peak VO <sub>2</sub> (L·min <sup>-1</sup> )	1	2.9 ± 0.6	3.2 ± 0.7	0.048
	2	3.7 ± 0.8	3.8 ± 0.8	NS
Peak VO <sub>2</sub> (ml·kg <sup>-1</sup> ·min <sup>-1</sup> )	1	38.2 ± 9.4	41.8 ± 10.8	NS
	2	46.5 ± 2.8	48.7 ± 3.0	NS
%BF	1	19.6 ± 5.5	19.0 ± 5.7	0.027
	2	17.3 ± 2.7	15.3 ± 3.6	NS
BMI	1	27.2 ± 4.8	26.6 ± 4.7	0.006
	2	25.9 ± 2.1	25.7 ± 2.0	NS

**Conclusion:** Training on an anti-gravity device was able to maintain and/or improve weight, aerobic capacity and body composition values using a lower percentage of BW. This is favorable for individuals who are either injured or require lower impact training.

### Effects of Beetroot Juice Supplementation on Performance during a Repeated-Sprint Rest in Active Males

Murphy, S., Witmer, C.A., Davis, S.E., Sauers, E.J., East Stroudsburg University, East Stroudsburg, PA

Previous research has suggested that dietary nitrate (NO<sub>3</sub><sup>-</sup>) in the form of beetroot juice may enhance particular physiological responses that result in improvement in aerobic exercise performance. **Purpose:** The purpose of this study was to evaluate the effects of beetroot juice on fatigue, peak power output (PPO), mean power output (MPO), delta blood lactate (ΔHLA), and oxygen uptake (VO<sub>2</sub>) during a repeated-sprint test (10 x 6 second sprints interspersed with 30 second recovery periods) in active males aged 18-24 years. **Methods:** Thirteen recreationally active, healthy males participated in the study. Subjects were assigned in a double-blind randomized, crossover design consuming 70 ml of beetroot juice (1 shot) containing .4-.5g of NO<sub>3</sub><sup>-</sup> or a nitrate depleted placebo 2.5h prior to testing. A 10-day wash-out was completed during the crossover. During testing days, subjects completed a standardized warm-up followed by 10-6s repeated-sprints on a cycle ergometer interspersed with 30s passive recovery periods. **Results:** Statistical analysis ( $p \leq 0.05$ ) found no significant difference in mean VO<sub>2</sub>, ΔHLA, PPO, MPO, and fatigue between treatments. **Conclusion:** In conclusion, the present study showed that there was no significant difference in fatigue during a repeated-sprint cycling test after acute supplementation with beetroot juice (~5mmol of NO<sub>3</sub><sup>-</sup>). The researchers believe that the low acute dose of beetroot juice and/or differences in data reduction between previous studies and the current study may be possible explanations for the lack of effect on performance.

### Predictability of Muscle Fiber Characteristics using the Biodex System 3

Nannapaneni, N., Schmidt, G. (FACSM), Cox, M., Boutote, R., William Paterson University, Wayne, NJ.

**Purpose:** The purpose of this study was to examine whether the isokinetic dynamometer is capable of distinguishing muscle fiber characteristics between men and women. **Methods:** 14 participants (7 men and 7 women) of various fitness levels volunteered for this study. Isokinetic testing was conducted using the BIODEX System 3 dynamometer. Each participant was secured in the chair; seat height was adjusted; knee alignment was set at the lateral joint line adjacent to the dynamometer. Power Test: Participants performed 5 sets of 1 maximal voluntary contraction (MVC) repetition with a 30 sec rest period between sets at 60°/sec. Fatigue Test: Participants performed 1 set of 50 (MVC) repetitions at 180°/sec. Prior to this test

there was a 2 minute rest period. **Results:** There were significant differences between men and women for Power and Peak Torque. When comparing the fatigue test results, men showed a greater decrease in peak torque and at a faster time to fatigue compared to women from their first 25 repetitions to their final 25 repetitions.

**Table 1. Power Test Results for men and women (mean ± SD) at 60°/sec.**

	Total (N=14)	Men (N=7)	Women (N=7)
Age	25.7 ± 4.7	25.1 ± 2.1	26.3 ± 6.6
Height (m)	1.7 ± 0.1	1.8 ± 0.1*	1.6 ± 0.1*
Weight (kg)	75.8 ± 20.9	92.5 ± 14.7*	59.0 ± 8.9*
Peak Torque (ft-lbs)	130.3 ± 49.4	172.3 ± 28.7*	88.3 ± 18.7*
Time to Peak Torque (msec)	572.1 ± 232.1	487.1 ± 214.8	657.1 ± 231.6
Total Work (ft-lbs)	144.5 ± 64.8	168.8 ± 31.4	120.2 ± 82.1

\* Significantly different,  $P \leq 0.001$

**Conclusions:** The results of this study demonstrated that men fatigue faster and at an increased rate compared to women. The results of the tests were inconclusive in determining muscle fiber composition. This study did provide valuable data in regards to quadriceps muscle characteristic differences amongst. In the power test, the male subjects on average produced greater peak torque values in their quadriceps. The males produced peak torque values that were approximately 150% greater than those produced by their female counterparts. These differences can be attributed to the fact that males on average have greater muscle mass than females.

### The Influence of Prophylactic Ankle Strategies on Vertical Jump Performance

Nelson, C., Paulson, S. Shippensburg University, Shippensburg, PA

**Purpose:** This study examined the effects of prophylactic ankle taping (PAT) and bracing (PAB) on lower extremity kinematics during vertical jump (VJ) performance. **Methods:** Eighteen volunteers ( $M \pm SD$  = age: 21.4±0.9, height 170.9±10.0 cm, mass 73.2±14.5 kg, body fat 17.3±6.7%) completed the VJ under three conditions: standard PAT, lace-up PAB, and no treatment (CON). Each testing session was separated by a min of 24 hrs in a randomized and counter-balanced order. Prior to testing, the prophylactic ankle condition was applied and six reflective markers were placed along the right side of the body. The subject completed a 5-min warm-up on a Monark 824E cycle ergometer (0.5 kp) in a range of 50-60 rev/min and then performed three VJ. Each VJ was filmed (60 Hz) from the sagittal plane and a Vertec was used to measure jump height. A one-way repeated-measure ANOVA was used to analyze the variables. A paired *t*-test was used to assess for statistically significant differences ( $p < .05$ ).

**Results:** The ANOVA yielded statistically significant difference in VJ height (M: PAT = 49.7 cm; PAB = 49.6 cm; CON = 52.2 cm;  $p = .02$ ). The average VJ height was higher during the CON by 4.85% and 4.22% as compared to the PAT and PAB, respectively. There was also a statistically significant difference in the ankle angle at takeoff ( $p = .04$ ) as well as ankle (AROM;  $p < .01$ ) and knee range of motion (KROM;  $p < .01$ ). During the PAB, the ankle was more dorsiflexed then the CON. AROM was greatest in the CON and least in the PAB. KROM was greater during CON as compared to the PAT and PAB conditions.

Condition	Kinematic Variables (M±SD)					
	Max Knee Flexion		Take-off		Range of Motion	
	Ankle Angle (°)	Knee Angle (°)	Ankle Angle (°)	Knee Angle (°)	Ankle (°)	Knee (°)
Tape	-	102.7±12.	41.8±8.8	176.3±7.	62.1±11.1	70.8±14.8
Brace	-	102.3±14.	38.5±9.6	176.1±7.	57.9±7.9	70.4±12.8
Control	-	100.0±11.	44.2±8.9	179.2±4.	67.2±9.1	77.4±12.3

**Conclusion:** This study suggests that both PAT and PAB decreased AROM and KROM; which may have resulted in a lower VJ height. In addition, the PAB placed the ankle in a more dorsiflexed position as compared to the CON.

### Increased Frequency of Moderate Intensity Walking Increases Consumption of Low Energy Density Foods

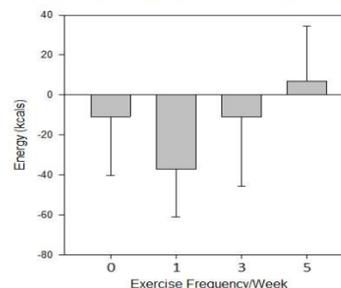
Panek-Scarborough, L., Temple, J., University at Buffalo, Buffalo, NY

**Background:** There is evidence that exercise has an effect on the type and amount of food consumed. One factor that regulates eating is the reinforcing value of food. While previous studies have demonstrated interactions between exercise and eating, to date, no one has investigated the influence of exercise frequency on the reinforcing value of food.

**Purpose:** The purpose of this study was to test the hypothesis that varying frequencies of a short-term exercise regimen alters the reinforcing value of low energy density (LED) and high energy density (HED) foods in sedentary male and female adults. In addition, we predicted that increased frequency of physical activity would be associated with greater intake of LED foods and reduced intake of HED foods. **Methods:** Eighteen to 50 year old sedentary adults were randomized to 0, 1, 3, or 5 days/week of exercise. We measured the reinforcing value and intake of LED and HED foods at baseline and again after two weeks of exercise.

**Results:** We found no effect of exercise frequency on the reinforcing value of HED or LED food over time (all  $p > 0.05$ ). However, exercise frequency effected the amount of energy consumed from LED food ( $p = 0.002$ ) with the 5 days/week group consuming significantly more LED food after two weeks of exercise compared to the other groups. There was no significant effect of exercise frequency on energy intake from HED foods. **Conclusion:** This study suggests that increasing exercise frequency in sedentary adults may increase consumption of healthier food options, such as fruits and vegetables. Future studies will examine the impact of

Change in Energy Consumed from HED Foods



Change in Energy Consumed from LED Foods

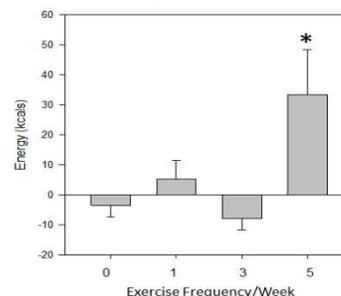


Figure 1: Mean + SEM change in laboratory energy consumed from pre to post exercise intervention from HED foods (top) and LED foods (bottom). The 5 day/week group consumed significantly more energy from LED food from pre- to post-exercise treatment ( $p = 0.002$ ) compared to the other groups.

a longer exercise intervention and/or a higher intensity or interval type training on the reinforcing value of food and on LED and HED food intake.

### Comparison of Young and Functional Fit Older Adults on Temporal Spatial Gait Parameters

<sup>1</sup>Paulson, S., <sup>2</sup>Gray, M. <sup>1</sup>Shippensburg University, Shippensburg, PA; <sup>2</sup>University of Arkansas, Fayetteville, AR

Gait speed (GS) has been recognized as an integral component of functional independence. Further, step length (SL), cadence (CAD) and the percentage of the gait cycle in spent in stance (%ST) have been associated with risk of falls and mobility disability among older adults.

**Purpose:** This study examined temporal spatial gait variables in young and low and high functionally fit older adults. **Methods:** Twenty older and 12 younger adults (CON; M±SD = age: 22.3±1.8, height 1.7±0.1 m, mass 66.1±11.8 kg) completed two 20 m habitual walking trials and the fastest time was recorded. Selected gait variables were averaged from the foot strikes across a gait mat. Functional fitness (FF) was assessed using a stair climb test and relative power was used to create the low (LFF; n = 8; M±SD = age: 73.9±6.9, height 1.6±0.2 m, mass 76.6±15.5 kg) and high (HFF; n= 12; M±SD = age: 70.1±4.2, height 1.75±0.1 m, mass 72.1±14.9 kg) functionally fit older adult groups. A one-way ANOVA was used to assess differences between the groups on the dependent variables of gait. **Results:** The results yielded a statistically significant difference ( $p < .05$ ) between the groups for GS, SL, and percentage of swing (%SW) and %ST. The LFF group walked significantly slower than both the CON and HFF group but, there was not a difference in speed between the CON and HFF. The LFF group also spent more time in stance, less time in swing, and had a shorter SL than the CON; however, there was not a difference between the LFF and HFF groups on these variables. The HFF group was not different from the CON on GS, SL, %SW or %ST.

Group	Gait Speed (m·s <sup>-1</sup> )	Stride Length (m)	Cadence (steps·min <sup>-1</sup> )	Percent Stance (%)	Percent Swing (%)
LFF (n = 8)	1.23±0.09	0.66±0.06	117.29±8.45	61.25±4.14	38.75±4.14
HFF (n = 12)	1.42±0.19	0.72±0.07	119.14±11.83	57.58±6.36	42.42±6.36
CON (n = 12)	1.42±0.06	0.74±0.03	114.85±3.85	54.54±5.90	45.46±5.91

**Conclusions:** The findings of this study suggest that as one ages if they maintain a higher level of FF then they do not express the same age-related changes in gait as those with a lower level.

### Endothelium-Dependent Dilation is Lower in Salt Resistant Males than Females on a High Sodium Diet

Ramick, M.G., Lennon-Edwards, S.L., Matthews, E.L., Brian, M.S., Farquhar, W.B., Edwards, D.G., University of Delaware, Newark, DE

**Purpose:** The purpose of this study was to test the hypothesis that endothelial-dependent dilation (EDD) following a high sodium diet would be lower in healthy salt-resistant males than in females. **Methods:** 30 healthy, normotensive adults (16 males, 35±3 yrs and 14 females, 39±2 yrs) were recruited to participate in a controlled feeding study. Subjects first completed a 7 day run in diet of 100mmol sodium/day followed by 7 days of a low sodium (LS) diet (20mmol sodium/day) and 7 days of a high sodium (HS) diet (300mmol sodium/day) in random order. Diets were designed to be eucaloric and consistent in macronutrient distribution and potassium content. During the last 24-hour period of the LS and HS diets, subjects collected all urine and wore an ambulatory BP monitor on their non-dominant arm. Subjects were classified as salt-resistant as defined by a change in 24-hour ambulatory mean arterial pressure (MAP) of ≤ 5

mmHg between the LS and HS diets. On the final day of the LS and HS diets, EDD was assessed using brachial artery flow-mediated dilation (FMD). **Results:** By design, 24-MAP was not different between LS and HS conditions for males or females whereas urinary sodium excretion increased significantly in both males and females on the HS diet ( $p < 0.01$ ). Serum sodium concentration increased in the males on the HS diet ( $137.6 \pm 0.6$  mmol/L vs.  $139.8 \pm 0.5$  mmol/L;  $p < 0.05$ ) but did not change in the females. FMD was not significantly different between males and females on the LS diet ( $10.2 \pm 0.7\%$  vs.  $10.7 \pm 0.74\%$ ;  $p > 0.05$ ). A significant decrease in FMD from the LS to HS diet was observed in both males and females ( $p < 0.001$ ), however FMD was lower in males than females ( $5.7 \pm 0.7\%$  vs.  $8.6 \pm 0.74\%$ ;  $p < 0.01$ ) on the HS diet. **Conclusion:** A high sodium diet significantly impairs EDD in both males and females, independent of BP. However, we observed a lower FMD on HS in males suggesting a greater vascular effect of a high sodium diet in males.

Research funded by NIH grant R01 HL104106.

---

### **Effect of Bisphenol A (BPA) on Skeletal Muscle Oxidative Stress**

Receno, C., Benson, M., Liang, C., Keslacy, S., DeRuisseau, K. Syracuse University, Syracuse, NY

**Purpose:** Bisphenol A (BPA) is a chemical used in many plastics and food-contact materials that has been linked to several health conditions, including type II diabetes. BPA is classified as an “endocrine disruptor” for its potential to exert estrogen-like activity and has been linked to the development of oxidative stress. BPA exposure may be particularly important to skeletal muscle since changes in redox status can have large implications for contractile and metabolic properties. Therefore, the aim of this study was to determine the impact of BPA exposure on indices of oxidative stress in skeletal muscle. **Methods:** Mouse myoblast C2C12 cells were cultured and exposed to BPA or a 0.1% ethanol vehicle. The BPA concentrations examined included 1nM, 10nM or 100nM for incubation times of 24 hours, 6 hours, 40 minutes or 15 minutes. Triplicate samples within each experiment were pooled, and each experiment was conducted three times. Using the Western Blot technique, samples were analyzed for oxidant levels using 3-nitrotyrosine (3-NT) and 4-hydroxynonenal (4-HNE) antibodies as well as key antioxidant enzymes; superoxide dismutase-1 (SOD1) and glutathione peroxidase (GPX). Data were analyzed via 2-way or 1-way ANOVAs with SPSS v21. **Results:** No significant differences were detected in dose/exposure groups for oxidant levels (3-NT and 4-HNE) or GPX. However, at 24 hours, 100 nM BPA resulted in greater SOD1 ( $11.28 \pm 2.8$  fold change,  $p < 0.05$ ) compared to the vehicle, and was also different from 1nM BPA and 10nM BPA ( $1.05 \pm .38$  and  $1.94 \pm .66$  fold change, respectively;  $p < 0.05$ ). The 24 hour 100nM dose resulted in elevated SOD1 compared to all other time points ( $p < 0.05$ ). **Conclusion:** BPA exposure for 24 hours at 100nM concentration elevated SOD1 levels compared to all other time points and doses but did not increase markers of oxidant injury. These data suggests that chronic long term BPA exposure could alter the skeletal muscle antioxidant status.

Research funded by Syracuse University, School of Education.

---

### **Effect of Vocalization on Static Handgrip Force Output.**

Rodolico, C., Oberholzer, R., Smith, S. Drexel University, Health Science Department, Philadelphia, PA

**Purpose:** This study examined differences in maximal static handgrip force between three conditions: passive breathing, forced exhalation, and vocalized exhalation. We hypothesized that handgrip force would be greater during vocalized exhalation compared to passive breathing and forced exhalation. **Methods:** Eighteen women and 12 men ( $24.9 \pm 5.9$  years) performed

maximal-effort, two-second static handgrip exercise during a passive breathing, forced exhalation, and vocalized exhalation condition. Three trials were conducted, each with a different condition order. There were twenty-second rest intervals between each condition and ninety-second intervals between each trial. A handgrip dynamometer and chest ventilation strap were used to measure force (N) and relative chest expansion during trials (*AD Instruments, Powerlab 26T*). A two-way repeated measures ANOVA was used to determine differences across conditions and trials with a 0.05 significance level (mean  $\pm$  SD). **Results:** The average handgrip force during vocalization ( $251.2 \pm 76.0$  N) was greater than both passive breathing ( $201.2 \pm 118.4$  N;  $p < 0.0001$ ) and forced exhalation ( $225.5 \pm 77.2$  N;  $p = 0.007$ ). Peak force during vocalization ( $324.3 \pm 90.1$  N) was greater than both passive breathing ( $264.8 \pm 90.6$  N;  $p < 0.0001$ ) and forced exhalation ( $296.8 \pm 93.1$  N;  $p = 0.013$ ). Relative chest expansion was greater during forced and vocalized exhalation compared to passive breathing ( $p < 0.0001$ ). **Conclusion:** Vocalized exhalation increased average static handgrip force by 25% compared to passive breathing and by 11% compared to forced exhalation. We hypothesize that vocalization increases sympathetic drive which may enhance overall motor unit activation increasing muscle force production. Further study investigating the effect of vocalization on muscle potentiation and sympathetic drive is suggested.

---

### Is Postural Stability Compromised in Women with Urinary Incontinence?

Rondini, S., McCrory, J. West Virginia University, Morgantown, WV

**Purpose:** Women with urinary incontinence (UI) have an increased risk of falling compared to their age-matched peers without UI. Due to the anatomical location of the pelvic floor muscles, they are suspected to contribute to the maintenance of postural stability during everyday activities. Women with UI have weak or dysfunctional pelvic floor muscles. The purpose of this study was to determine if women with UI, specifically stress, urge, and mixed UI, have deficits in postural stability during static tasks and in response to postural perturbations of the support surface. **Methods:** To measure static stability, 14 women (7 with UI: age  $51.75 \pm 17.85$  yrs, height  $164.94 \pm 5.40$  cm, mass  $79.38 \pm 19.45$  kg, number of falls  $0.714 \pm 1.89$ , number of pregnancies  $1.29 \pm 0.76$ ) and 7 controls: age  $51.71 \pm 18.20$  yrs, height  $163.29 \pm 6.64$  cm, mass  $60.47 \pm 8.32$  kg, number of falls  $0.00 \pm 0.00$ , number of pregnancies  $1.29 \pm 0.76$ ) stood quietly on a force plate with their eyes open and then eyes closed. These same women had their dynamic stability measured by undergoing perturbations of the force plate in both the toes up and toes down directions. A two-factor MANOVA (group  $\times$  eyes open/closed) was performed on the following static variables: anteroposterior sway, mediolateral sway, length of the path of the center of pressure (COP), sway velocity in quiet stance, and elliptical sway area. Another two-factor MANOVA (group  $\times$  toes up/down) was performed on the following dynamic variables: initial sway, total sway, and sway velocity. The alpha value for all statistical analyses was 0.05. **Results:** No differences in the static stability variables of anteroposterior sway, mediolateral sway, length of the path of COP, sway velocity in quiet stance, and elliptical sway area were seen between groups. Results of the dynamic stability assessment revealed that the UI group had significantly less initial sway ( $p = 0.006$ ), total sway ( $p = 0.008$ ), and sway velocity ( $p = 0.001$ ) compared to the controls. **Conclusion:** Women with UI have less COP movement in response to postural perturbations compared to an age and parity-matched control group. Further studies are needed to determine muscular compensations and co-contractions that may be contributing to this response.

---

### Effect of Beta-Adrenergic Blockade on Coronary Blood Flow during Isometric Exercise in Older Adults

Ross A., Gao Z., Heffernan M., Leuenberger U., Sinoway L., Muller M.  
Penn State Hershey Heart and Vascular Institute, Pennsylvania State University College of Medicine, Hershey, PA

The rise in heart rate (HR) and cardiac contractility during exercise is due to activation of myocardial  $\beta$ -adrenergic receptors.  $\beta$ -receptors are also located on coronary blood vessels and are thought to participate in exercise hyperemia, thereby helping to preserve the balance between myocardial oxygen supply and demand. However, experimental data in human subjects are lacking. **Purpose:** We hypothesized that intravenous  $\beta$ -adrenergic blockade would attenuate the reflex tachycardia and coronary hyperemia in response to isometric handgrip (i.e., a stimulus known to increase both cardiac metabolism and coronary blood flow). **Methods:** Six men ( $66 \pm 2$  yrs) performed isometric handgrip exercise at 40% of maximal voluntary contraction for 2 minutes after receiving intravenous propranolol; control trials occurred on separate days. HR and blood pressure were monitored continuously and rate-pressure product (RPP) was calculated as an index of myocardial oxygen demand. Coronary blood flow velocity (CBFV) was measured by transthoracic Doppler echocardiography (left anterior descending coronary artery) and coronary vascular resistance (CVR) was calculated. The ratio of RPP/CVR was used as an index of myocardial oxygen supply. Physiological parameters were statistically compared at baseline and in response to exercise between conditions. **Results:**

	Control Resting	Control Exercise	Propranolol Resting	Propranolol Exercise
HR	$58 \pm 2$	$64 \pm 2^*$	$50 \pm 2 \dagger$	$53 \pm 2^{*\dagger}$
MAP	$92 \pm 2$	$110 \pm 2^*$	$89 \pm 2$	$104 \pm 3^*$
RPP	$6856 \pm 275$	$9083 \pm 453^*$	$5892 \pm 382 \dagger$	$7098 \pm 340^{*\dagger}$
CBFV	$17.2 \pm 1.5$	$20.4 \pm 2.0^*$	$14.2 \pm 1.8 \dagger$	$19.0 \pm 1.9^*$
CVR	$5.8 \pm 0.69$	$6.4 \pm 0.60^*$	$6.9 \pm 0.72 \dagger$	$6.0 \pm 0.70$
CVR/RPP	$0.85 \pm 0.09$	$0.65 \pm 0.07^*$	$1.2 \pm 0.14 \dagger$	$0.86 \pm 0.10 \dagger$

All values are reported as  $M \pm SEM$ . \*  $P < 0.05$  compared to resting values of same trial,  $\dagger P < 0.05$  compared to the control trial with same condition

**Conclusion:** The novel finding of this study is that under resting conditions propranolol raises coronary resistance (impaired oxygen supply) despite also lowering cardiac metabolism (reduced oxygen demand). These data support the concept that coronary  $\beta$ -adrenergic receptors contribute to myocardial blood flow regulation both at rest and during exercise in humans.

Supported by NIH P01 HL096570 and UL1 TR000127

### Effect of Submaximal Concentric and Eccentric Training on Torque Steadiness of the Ankle Plantarflexors

<sup>1</sup>Rozea G., <sup>2</sup>Tillman M., <sup>2</sup>Dodd S., <sup>2</sup>Chmielewski T., <sup>1</sup>Vanic, K., <sup>1</sup>East Stroudsburg University, East Stroudsburg, PA, <sup>2</sup>University of Florida, Gainesville, FL,

**Purpose:** This study was conducted to determine the effects of submaximal training of the plantar flexor muscles on the neural control and proprioception at the ankle during eccentric actions. Eccentric (ECC) muscle actions are a crucial part of movements during everyday activities and athletic competitions. Maximal ECC actions are up to 40% more forceful than maximal concentric (CON) actions and result in the greatest number of muscle injuries. Current knowledge of neural mechanisms controlling ECC is limited. The effects of submaximal training

on torque steadiness and neural control has not yet been investigated. The purpose of this study was to determine effects of submaximal CON/ECC training, movement speeds, and muscle actions on torque steadiness. **Methods:** Using the Kin-Com AP, participants performed a torque steadiness test using 40% MVIC torque during an ISOK CON/ECC plantar/dorsiflexion motion. Participants were tested pre- and post-training. Training consisted of one week of submaximal (40%) plantar/dorsiflexion torque steadiness training 3 sets of 10 repetitions at the three testing speeds. Fifteen participants and their matched controls (12 male, 18 female; age =  $22.0 \pm 3.2$  years, height =  $169.6 \pm 9.9$ , mass =  $75.0 \pm 13.7$ ) were tested. Independent variables included treatment (training and control), velocity (10°/s, 20°/s, 30°/s, 40°/s), and muscle action (CON and ECC). Three MANOVAs were used to determine differences in torque steadiness, mean EMG, and peak/mean EMG. The dependent variables for torque steadiness included coefficient of variation (CV) and absolute error scores; for muscle activity mean EMG and P/M EMG both for gastroc and soleus. **Results:** The submaximal training significantly improved both measures of participants' torque steadiness ( $F(6,852) = 32.636$ ,  $p < .001$ ), increased velocity significantly decreased torque steadiness ( $F(6,852) = 6.694$ ,  $p < .001$ ), and eccentric muscle actions had significantly decreased torque steadiness compared to concentric ( $F(2,425) = 6.055$ ,  $p = .003$ ). **Conclusion:** The training protocol improved measures of torque steadiness. Mean EMG increased with training demonstrating an improvement in muscle activation or increase in number of motor units recruited, a factor associated with muscle strain injuries. Peak EMG decreased possibly because muscle spindle afferent feedback increased resulting in improved efficiency of muscle contraction. By more fully activating the muscle, the participant appears to have greater control. The submaximal CON/ECC training may be beneficial in improving neural control and therefore in the prevention and treatment of muscle strain injuries. Underlying neural control mechanisms may be linked to muscle strains and improved prevention and rehabilitation.

### Examination of Exercise Behaviors, Exercise Barriers and Exercise Self-Efficacy of British Adults

Sadler, M., Brown, M., Dugan, K., Litchauer, J., Port, K., Smith, K., Slippery Rock University, Slippery Rock, PA

**Purpose:** To examine the exercise behaviors, barriers and self-efficacy of British adults.

**Methods:** A survey was constructed based upon previously validated questionnaires and was randomly administered to subjects in various British cities. Seventy nine subjects, with a mean age of  $31.92 \pm 12.03$  participated in this study. **Results:** Subjects reported engaging in vigorous physical activity  $3.5 \pm 2.94$  days/week. The table below illustrates the modes of exercise regularly performed by the subjects. Subjects could report participating in more than one mode of exercise.

EXERCISE	Days/Week	Distance (km)	Duration (min)
Walking (n=63)	5.5 $\pm$ 2.1	2.1 $\pm$ 2.8	19.4 $\pm$ 17.5
Running (n=34)	1.4 $\pm$ 1.6	2.8 $\pm$ 3.4	20.2 $\pm$ 24.3
Cycling (n=28)	2.2 $\pm$ 3.3	6.2 $\pm$ 14.3	23.3 $\pm$ 36.4
Swimming (n=13)	0.4 $\pm$ 0.8	0.5 $\pm$ 1.7	6.5 $\pm$ 18.1
Group Exercise (n=19)	0.5 $\pm$ 1.0		16.0 $\pm$ 25.8
Resistance Training (n=23)	1.3 $\pm$ 1.2		17.7 $\pm$ 25.1

The table below illustrates the most commonly reported exercise barriers in British adults.

BARRIER	N	% of responses
Lack of time	57	72.2
Poor weather	27	34.2
Lack of motivation	21	26.6
Lack of energy	17	21.5
Lack of priority	15	19

Lastly, subjects were asked to rate their confidence (self-efficacy) of exercising during various situations using a five point Likert scale (1=not confident; 5=extremely confident). Below are the average ratings for each situation.

SITUATION	MEAN SCORE
When in a bad mood	3.7±1.3
When on vacation	3.2±1.4
When it is raining or snowing	2.9±1.5
When tired	2.7±1.1
When I don't have time	2.3±1.2

**Conclusion:** While subjects reported moderate self-efficacy scores in each of the situations, lack of time and poor weather were reported as their greatest barriers. This information could be used to enhance future exercise programming for this population.

### Ventilatory Threshold Responses at Different Percentages of Body Weight on the Alter-G® Anti-Gravity Treadmill: A Pilot Study

Santillo, N., Figueroa, M., Lasala, T., Manning, J., William Paterson University, Wayne NJ

**Purpose:** The purpose of this study was to determine if changes occurred in the ventilatory threshold (VT) upon manipulation of body weight (BW) when comparing 80% to 100% of BW in healthy college aged individuals on the Alter-G® anti-gravity treadmill. **Methods:** A modified Bruce Protocol was used to measure oxygen consumption ( $VO_{2peak}$ ) on 10 subjects (5 males, 5 females) at 100%, and 80% of BW. Testing protocols were randomized with two weeks in between each test. VT was determined by the software algorithm in the MedGraphics Ultima Series (St. Paul, MN) open exchange spirometer. **Results:** Gender did not significantly affect relative  $VO_{2peak}$  or VT at either percentage of BW. No significant differences were found with regards to  $VO_{2peak}$  ( $ml \cdot kg^{-1} \cdot min^{-1}$ ) or VT at 100%BW & 80% BW.

	$ml \cdot kg^{-1} \cdot min^{-1}$	% $VO_{2peak}$ at VT
$VO_{2peak}$ 80%	42.2 ± 6.5	VT 80% 57.7 ± 18.7
$VO_{2peak}$ 100%	43.0 ± 8.7	VT 100% 54.0 ± 14.1

**Conclusion:** Upon the unweighting of a subject on the Alter-G® anti-gravity treadmill, individuals are able to train at similar intensities at 80% and 100% of BW. Since the unweighting produced similar metabolic responses, one could suggest that those with orthopedic limitations, who are not fully weight bearing, can maintain their cardiovascular conditioning. This type of

training may also be advantageous for athletes who wish to reduce musculoskeletal strain within their training.

---

### **Effects of Training Status on Circulating Angiogenic Cell Paracrine Activity in Young Men and Women**

<sup>1</sup>Sapp, R., <sup>1</sup>Landers-Ramos, R., <sup>2</sup>Jenkins, N., <sup>1</sup>Roth, A., <sup>1</sup>Cancre, L., <sup>1</sup>Spangenburg, E., <sup>1</sup>Hagberg, J., <sup>1</sup>University of Maryland, College Park, MD, <sup>2</sup>University of Missouri, Columbia MO

Circulating angiogenic cells (CACs) are thought to play an integral role in the repair and maintenance of the vascular endothelium. **Purpose:** To determine if chronic endurance exercise affects the CD34+ and CD34-/CD31+ CAC paracrine activity contributing to *in vitro* angiogenic function. **Methods:** Healthy inactive (n=12), active (n=14) and endurance-trained (n=12) men and women aged 18-39 were categorized based on routine exercise level and maximal oxygen uptake ( $\dot{V}O_2\text{max}$ ). Body composition was assessed using the 7-site skinfold method and subjects were matched for age and BMI. Peripheral blood was drawn and mononuclear cells were isolated by density gradient centrifugation. CD34+ and CD34-/CD31+ cell fractions were purified by immunomagnetic selection and cultured for 48 hours. Conditioned media (CM) from both cell fractions was obtained after culture and used, respectively, in a human umbilical vein endothelial cells (HUVECs)-based angiogenesis assay plated in duplicate. The assay was cultured for 16 hrs at 37°C and 5% CO<sub>2</sub>, after which tube-formation was visualized under a light microscope. Each image was coded and measured for tube length and complexity by two blinded individuals. **Results:** CM from CD34+ CACs of endurance-trained subjects resulted in 27% greater tube length (P<0.05) and 49% greater complexity (P<0.05) than inactive subjects, and 16% greater length and 27% greater complexity than active subjects (P<0.05). CD34+ CM from active subjects produced greater length and complexity than inactive subjects (P>0.05, 11% and 23% respectively). Tube length was 21% greater and complexity was 40% greater (P<0.05) with CM from CD34-/CD31+ CAC of endurance-trained subjects compared to inactive individuals, and complexity was 24% greater in endurance trained vs. active subjects (P<0.05). **Conclusion:** These data suggest that chronic endurance exercise increases pro-angiogenic paracrine functions of CD34+ and CD34-/CD31+ CAC sub-populations.

Research supported by NIH AGT3200068 KNES Graduate Research Initiative Fund (GRIF) to RQL

---

### **Dynamic Stability in Gymnasts, Non-Balance Athletes, and Active Controls.**

Sloanhoffer, H.S., McCrory, J.L., FASCM. Division of Exercise Physiology, West Virginia University, Morgantown, WV

Gymnastics by nature is a balance sport requiring both static and dynamic stability. To our knowledge, static and dynamic postural stability of gymnasts has not been compared to other types of athletes of the same caliber and active non-athlete controls. **Purpose:** To investigate whether or not NCAA gymnasts have greater postural stability than NCAA athletes in other sports and non-athletes. **Methods:** Data were collected on 7 gymnasts (G), 7 non-balance athletes (NBA), and 6 active non-athlete controls (NAC). Following informed consent, subjects were tested on a posturography device to assess center of pressure (COP) movement during static and dynamic conditions. Static balance was measured using the 6-condition Sensory Organization Test (SOT) and dynamic balance (toes-up and toes-down tilt) was measured using the Adaptation Test (ADT). Mediolateral sway (ML sway), anteroposterior sway (AP sway), COP displacement (COPD) and COP velocity (COPV) were determined for the SOT, and initial

sway, total sway, and sway velocity were calculated for the ADT. A two factor ANOVA was performed (group x condition) on each of these variables ( $\alpha=0.05$ ). Tukey post-hoc tests were performed where appropriate ( $\alpha=0.05$ ). **Results:** ML sway was significantly less ( $p<0.01$ ) in the G and NBA groups ( $7.21\pm 4.33\text{mm}$  and  $6.95\pm 4.42\text{mm}$ , respectively) compared to NAC ( $9.58\pm 7.04\text{mm}$ ). All variables assessed on the SOT showed differences between the conditions ( $p<0.05$ ). The eyes open and eyes closed conditions had less ML sway than the other conditions. The eyes open, eyes closed, and surround moving conditions had less AP sway, COPD, and COPV than the other conditions, while the eyes open floor moving, eyes closed floor moving, and eyes open floor and surround moving conditions were significantly different from all other conditions for the COPD and COPV variables. The ADT showed differences ( $p<0.05$ ) between toes up and toes down tilt for initial sway, total sway, and sway velocity, but no differences were noted between groups. **Conclusion:** Based on these data, G and other NBA share similar dynamic stability. Both G and NBA display greater mediolateral stability compared to NAC. Future research should investigate the biomechanics of these athletes when their balance is challenge.

**Effects Of Plyometric and Endurance Training On Aerobic and Anaerobic Power.**

Snyder, T., Shaw, E., Mueller, A., Stoeckel, E., Strom, A., VanDerVeecken, T., Swensen, T., Exercise and Sport Sciences, Ithaca College, Ithaca NY

**Purpose and Methods:** Extending the work of Burgomaster and Gibala, we compared the effects of four weeks of plyometric and endurance training on various indices of aerobic and anaerobic performance in 29 active college age males and females ( $19.4 \pm 1.8$  years and  $69.9 \pm 13.8$  kg), who were assigned to a plyometric (6 males and 9 females) or endurance training group (6 males and 8 females). Endurance training consisted of 30 min of cycling at a heart rate corresponding to 75% of  $\text{VO}_2$  max; plyometric training consisted of various jumps and lunges, yielding 120 foot to ground touches. Both groups trained  $30 \text{ min}\cdot\text{d}^{-1}$ ,  $3 \text{ d}\cdot\text{wk}^{-1}$  for four weeks; workouts were preceded and followed by a warm-up and cool down. Cycle  $\text{VO}_2$  max, 2-mile cycling time trial (TT) performance, and Wingate 30 s peak (PPO) and mean power output (MPO) were assessed before and after training. Data were compared with a repeated measures ANOVA. **Results:** Mean (SD) for dependent variables and % change are shown. \* indicates significant changes across time.

		$\text{VO}_2\text{max}$ $\text{ml}\cdot\text{kg}\cdot\text{min}^{-1}$	TT time (s)	PPO (W)	MPO (W)
	Pre	39.2 (8.8)	496.3 (68)	668.1 (168)	437.5 (149)
Plyo (n=15)	Post	42.0 (7.8)*	479.5 (62)	742.0 (182)*	490.9 (157)*
	%Change	7.1	3.4	11.0	12.2
Endo (n=14)	Pre	39.2 (8.2)	500.3 (99)	673.2 (225)	454.4 (177)
	Post	42.7 (7.1)*	449.3 (72)*	783.1 (240)*	542.1 (186)*
	%Change	8.9	10.2	16.0	19.3

There were no differences between groups before and after training for any variable. Even though the magnitude of change for each variable was larger with cycle training, plyometric training did improve  $\text{VO}_2$  max by 7.1%, and PPO and MPO by 11 and 12%, respectively. Further, the 3.4% change in TT performance following plyometric training was nearly significant ( $p=0.063$ ). **Conclusion:** Plyometric training is an effective means by which to enhance indices of aerobic and anaerobic fitness.

This project was funded by Ithaca College.

**The Effects of Various Recovery Techniques on Collegiate Pitching Performance**

Snyder, B., Davis, S., Moir, G., Miltenberger, M., East Stroudsburg University, East Stroudsburg, PA

**Purpose:** This study was designed to compare pitching performance (velocity, accuracy), symptomology and functional movement across three recovery techniques (active recovery (pedaling on a stationary bike at 40% Max Age Predicted Heart Rate), passive recovery (sitting down with a jacket around the pitchers arm), and Electro muscular stimulation (sitting down with stim placed on the pitchers arm at the anterior and posterior deltoid) in NCAA Division II collegiate pitchers. **Methods:** Eight male Division II collegiate baseball athletes (Age: 20.1 ± 1.7 years, Mass: 84.8 ± 10.9 kg, average years of experience: 1.8 ± 1.3, % fat mass: 11.1 ± 4.9, Starter pitcher/relief pitcher: 4/4) volunteered to participate in this study. Each pitcher threw 15 pitches per inning for a total of 45 pitches per session (3 Fastball, 1 Curveball, 1 Changeup-3 times per inning). After each inning pitched a recovery was performed for 6 minutes to simulate the time in between innings. Prior to warm up, after warm up and after each of the three innings was performed each pitcher was tested for HLa, delta pain scale, internal rotation, external rotation, overall RPE and local RPE. **Results:** The electro muscular stimulation showed significantly greater amount of strikes thrown at p < 0.05. Overall the velocities (mph) were similar over all three recovery methods and all three innings thrown.

	% STRIKES-ACCURACY		
	PASSIVE	STIM	ACTIVE
INNING 1	50.8	61.7	54.2
INNING 2	55	59.2	50
INNING 3	57.5	56.7	51.7

**Conclusion:** Findings from this study suggest the importance of possibly implementing the use of electro muscular stimulation during pitchers recoveries times between innings. Since the velocity was not affected, different recovery methods may be useful to aid the accuracy of different individuals in game situations.

**Carotid Blood Pressure Reactivity is Associated with Carotid Intima-Media Thickness Independent of Central Adiposity**

Spartano, N., Augustine, J., Lefferts, W., Hughes, W., Morse, B., Martin, E., Bill, K., Gump B., Heffernan K., Syracuse University, Syracuse, NY

**Purpose:** Blood pressure (BP) reactivity in response to mental stress increases with age and contributes to vascular damage, manifesting as increased carotid intima-media thickness (IMT). Individuals with higher levels of central adiposity may be more reactive to stress, which may exaggerate age-associated BP reactivity, thus further damaging the artery wall. Whether higher central adiposity is associated with higher carotid BP reactivity to mental stress, in non-obese individuals, remains unexplored. The purpose of this study was to examine central adiposity as a moderator of the relation between carotid BP reactivity in response to mental stress and carotid IMT. **Methods:** Healthy young and middle aged adults (n=26, mean age 38±13, BMI≤30) without history of hypertension completed a color-word interference mental stress task. Carotid IMT was determined at rest, using ultrasonography. Applanation tonometry was performed on the carotid artery and used to measure carotid systolic BP at rest and during the 4-minute mental stress task. Carotid systolic (S)BP reactivity was determined as the difference between mean BP during mental stress minus resting BP. Central adiposity was determined by

measuring waist circumference (WC) with a tape measure immediately above the iliac crest.

**Results:** Carotid IMT was associated with age ( $r=0.651$ ,  $p<0.001$ ), WC ( $r=0.334$ ,  $p=0.048$ ), and carotid SBP reactivity ( $r=0.522$ ,  $p=0.003$ ). WC was not associated with carotid SBP reactivity ( $r=0.087$ ,  $p=0.337$ ). Adjusting for WC with partial correlation had no effect on the association between carotid IMT and age ( $r=0.640$ ,  $p<0.001$ ) or carotid IMT and carotid SBP reactivity ( $r=0.525$ ,  $p=0.004$ ). **Conclusion:** Advancing age is associated with exaggerated carotid SBP response to mental stress and greater carotid IMT. Increased pressure in the carotid artery, triggered by mental stress, may damage the artery wall over time. This process may not be affected by central adiposity in non-obese, young and middle aged adults.

Research funded by Dairy Research Institute Grant1154 and NIH R01 Grant HL109091

---

### **Alcohol Intake, Cardiorespiratory Fitness, Body Size, and Dietary Behaviors in Young Adults**

Steele, C.N., Fradkin, A.F., FACSM, Andreacci, J.L., FACSM, Rawson, E.S., FACSM, Bloomsburg University, Bloomsburg PA

The ingestion of alcohol in young adults is not uncommon; however, it is unclear if alcohol intake displaces the consumption of healthy nutrients from the diet. **Purpose:** To assess dietary behaviors, relative to alcohol intake, in apparently healthy young adults. **Methods:** Ninety-two college aged participants (59 men; 33 women) were assessed for dietary behaviors, cardiorespiratory fitness, and body size. Volunteers were placed into three groups based on percentage of daily kilocalories ingested from alcohol (Low < 5%, Medium 5 to 10%, High > 10%). ANOVAs were conducted to locate differences between the three groups. **Results:** Volunteers were  $20.3 \pm 1.6$  yrs., relative  $VO_2$ max was  $49.1 \pm 7.8$  ml/kg/min, and body mass index (BMI) was  $24.9 \pm 3.3$  kg/m<sup>2</sup> (mean  $\pm$  SD). There was no difference in age, relative  $VO_2$ max, or BMI between alcohol intake groups (all  $p > 0.05$ ). Alcohol intake was significantly different between groups (Low:  $1.9 \pm 1.6$  < Medium:  $7.7 \pm 1.6$  < High:  $15.7 \pm 7$  % of kilocalories) ( $p < 0.0001$ ). Kilocalorie ( $2636 \pm 1436$  vs.  $1856 \pm 793$ ), protein ( $109 \pm 66$  vs.  $68 \pm 64$  g), fat ( $97 \pm 59$  vs.  $60 \pm 32$  g), and carbohydrate ( $334 \pm 173$  vs.  $221 \pm 97$  g) (all  $p < 0.05$ ) intake were significantly greater in Low vs. High alcohol intake groups. Daily servings of grains ( $7.5 \pm 4.6$  vs.  $4.1 \pm 2.9$ ) ( $p=0.01$ ) and meat ( $3.6 \pm 2.8$  vs.  $1.9 \pm 1.3$ ) ( $p=0.04$ ) were significantly greater in Low vs. High alcohol intake groups. Dietary fiber from grains was significantly greater in Low vs. High ( $11.9 \pm 9.2$  vs.  $5.8 \pm 3.3$  g) ( $p=0.02$ ) alcohol intake groups. Dietary iron ( $20.2 \pm 12.7$  vs.  $11.3 \pm 5.0$  mg) ( $p=0.01$ ) and zinc ( $16.8 \pm 11.2$  vs.  $9.8 \pm 4.7$  mg) ( $p=0.02$ ) were significantly greater in Low vs. High alcohol intake groups. **Conclusion:** Although there were no differences in cardiorespiratory fitness or body mass index between Low, Medium, and High alcohol intake groups, there were many differences in dietary behaviors. Individuals in the High alcohol intake group ate fewer total calories relative to the low alcohol intake group, but also consumed lower amounts of the macronutrients, grains, and meats, which resulted in lower intake of fiber, iron, and zinc.

Funding: Bloomsburg University Foundation

---

### **The Effect of Anticipatory Anxiety on Performance in an Attention Task**

<sup>1</sup>Stevens, C., <sup>1,2,3</sup>Russell, B.A.H., <sup>1,2</sup>Hatfield, B.D., <sup>1</sup>Department of Kinesiology, School of Public Health, University of Maryland, College Park, <sup>2</sup>Neuroscience and Cognitive Science Program (NACS), University of Maryland, College Park, <sup>3</sup>Center for Advanced Study of Language (CASL), University of Maryland, College Park

**Purpose:** Stress and mental anxiety are common features of daily life, including professional and sporting contexts. The effects of anxiety can have serious consequences, yet how anxiety

affects performance in different contexts remains unclear. To better understand how anxiety affects performance the present study examined performance on a vigilance task during three levels of anticipatory anxiety. **Methods:** Over the course of two sessions, researchers measured the performance of college-age adults (N= 52) on a simple sustained attention task. One of the two sessions included “threat” (T) trials during which participants were at risk of receiving a mild electric finger shock, and “safe” (S) trials that included no threat of shock. The other session involved no shock and No Shock Day (NSD) trials. Self-report and magnitude of the eyeblink startle reflex to a white noise burst were measured to index anxious arousal. Efficiency and effectiveness were measured by reaction time (RT) and hit rate (HR), respectively and tested using a one-way, repeated-measures ANOVA. **Results:** Self report and mean startle amplitudes for each condition indicated the threat manipulation was effective in modulating anticipatory anxiety among participants. Participants exhibited the least anxiety during the NSD trials and the most during the T trials. Reaction time was significantly slower (RT) during the T condition compared to both the S and NSD conditions ( $RMANOVA: F_{(2,96)} = 7.72, p = .003^*$ ; *pairwise comparisons* T:S,  $p < .001^*$ , T:NSD,  $p = .004^*$ , S:NSD,  $p = .890$ ). There was no significant difference in effectiveness (HR) among the three conditions ( $F_{(2,96)} = .279, p = .709$ ). **Conclusion:** Longer reaction times during the threat condition show a decrease in performance efficiency under anxiogenic conditions. A lack of significant difference in hit rate for the three experimental conditions shows that performance effectiveness may be more resistant to changes in anxious arousal than efficiency. These findings are consistent with Processing Efficiency Theory’s (PET) prediction that performance efficiency may be compromised by threat even if effectiveness does not suffer in the short term. Further research may investigate whether reduced efficiency erodes effectiveness over a longer timescale by increasing the energy cost of performance.

---

### **The Association of Nutrition Intake and Physical Activity on Weight in Female College-Aged Students**

Stinchcomb, M., Bayles, M., Indiana University of Pennsylvania, Indiana, PA

**Purpose:** During the college years, individuals change their lifestyle habits which results in weight change, decrease in physical activity, and poorer eating habits. However, the association of physical activity and nutrition intake to weight has not been well established. This study is to determine the association between nutrition intake and physical activity on weight in female college-aged students. **Method:** A total of 41 freshman and senior female students ranging from 18 to 24 years of age within the business or nursing programs at Indiana University of Pennsylvania volunteered to participate. In order to conduct this study, the participants completed the Modifiable Activity Questionnaire to assess nutrition intake and the Food Frequency Questionnaire to assess physical activity. **Results:** Independent t-tests and chi squared and crosstabulation analyses were used in SPSS 20 software to determine the association of physical activity and nutrition intake to weight between academic status and major. For the freshman students (n=18), the mean high school weight was 61.82±10.69 kilograms. The average current weight value was 62.67±10.62 kilograms gaining an average of .85 kilogram (p=.450). The senior females had a mean of 58.74±8.31 kilogram during their senior year of high school. For their senior year of college weights, the mean value in kilograms was 64.60±13.89. On average, the senior subject’s (n=23) gained 5.86±11.15 kilograms between the end of their high school careers and the end of their senior year of college (p=.020). **Conclusion:** The results showed a significant increase in weight between senior year of high school and senior year of college as well as an increase in weight during freshman year of college.

---

### **The Bilateral Deficit and the Acute Effects of Heavy Bilateral and Unilateral Squats on Sprinting**

Tholis, M., Moir, G.L., East Stroudsburg University, East Stroudsburg, PA

**Purpose:** To evaluate differences in the bilateral deficit in the lower body of resistance-trained (RT) and sprint-trained (SP) athletes and to investigate the acute effects of heavy bilateral and unilateral back squats on straight-line sprint running performance. **Methods:** In a randomized cross-over design a group of RT men ( $n=5$ ; age:  $19.8 \pm 1.5$  years; height:  $1.83 \pm 0.03$  m; mass:  $100 \pm 9.5$  kg) and a group of SP men ( $n=7$ ; age:  $18.9 \pm 1.1$  years; height:  $1.77 \pm 0.08$  m; mass:  $74.4 \pm 5.5$  kg) attended four testing sessions during a two week period. Each subject had their 1-repetition maximum (1-RM) back squat assessed both bilaterally and unilaterally during the first two sessions. The bilateral deficit (BD) was calculated as the difference between the bilateral and unilateral 1-RM loads. During the final two sessions each subject performed three baseline 55 m sprints separated by two minutes of recovery. Following a further five minutes of recovery, each subject completed a series of heavy back squats performed with loads equivalent to 55, 75, and 90% of their bilateral (HBS) and unilateral (HUS) 1-RM. A further three 55 m sprints were completed four minutes after the heavy squat protocols. The order of the final two testing sessions was randomized. Differences in 1-RM values, BD, and the change in the fastest sprint times between the groups were assessed using an ANOVA model with  $p \leq 0.05$ . **Results:** The RT group produced greater 1-RM values compared to the SP group (mean difference: 28 kg;  $p = 0.012$ ) while the bilateral 1-RM loads were greater than the unilateral 1-RM loads (mean difference: 53.4 kg,  $p < 0.001$ ). The BD in the SP was less than in the RT (SP mean difference: 41.9 kg; RT mean difference: 65.0 kg;  $p = 0.12$ ). The SP group were significantly faster than the RT group (mean difference: -0.64 s;  $p = 0.006$ ). The HBS protocol resulted in an increase in 55 m sprint time (mean difference: 0.09 s;  $p = 0.038$ ) as did the HUS (mean difference: 0.12 s;  $p = 0.008$ ), with no statistical differences between the protocols or the groups. **Conclusion:** Neither HBS nor HUS protocols were useful in eliciting acute improvements in short sprint performance in RT or SP men.

---

### **Cardiovascular and Metabolic Responses to Treadmill and Elliptical Exercise**

Timmons, K., Mason, S., Peterson, M., Venters, E., Hoover, K., Crehan, L., McCole, S.D., and McKenzie, J.A., Department of Exercise Science & Physical Education, McDaniel College, Westminster, MD

**Purpose:** The current study's purpose was to compare the cardiovascular and metabolic responses to a maximal treadmill and maximal elliptical exercise test. **Methods:** Healthy, physically active females ( $n = 10$ ) and males ( $n = 10$ ) each performed a  $VO_{2max}$  test on a treadmill and on an elliptical, on separate occasions, at least 48 hours apart. To be considered a  $VO_{2max}$ , participants had to attain at least 3 of 5 standard maximal test criteria. Each test was preceded by 10 minutes of quiet rest for measurement of baseline values. Every 15 s throughout the test,  $VO_2$  and respiratory exchange ratio (RER) were measured using the ParvoMedics TrueOne metabolic measurement system, whereas cardiac output (Q), stroke volume (SV), and heart rate (HR) were assessed every 10 s using the PhysioFlow Enduro impedance cardiography system. Rate of perceived exertion (RPE) was reported at the end of each test stage, and blood pressure (BP), via the Tango+ Automated BP Monitor, was measured at the end of the test. A finger stick blood sample drawn 2 minutes post-test was used to determine blood lactate. Mean arterial pressure (MAP), arterio-venous oxygen difference (A- $VO_2D$ ), and total peripheral resistance (TPR) were calculated using standard formulae. Peak values were analyzed for significant differences ( $p < 0.05$ ) using paired samples t-tests, ANCOVA, or nonparametric tests, as appropriate. **Results:** Data are reported as means  $\pm$  SEM. Participants averaged  $23 \pm 1$  yr,  $78.3 \pm 4.5$  kg, and  $1.73 \pm 0.02$  m. With the exception of

systolic BP ( $129 \pm 3$  vs.  $123 \pm 2$  mmHg;  $p < 0.05$ ), resting values did not differ on the testing days. Peak values for HR ( $196 \pm 1$  vs.  $192 \pm 1$  bpm;  $p = 0.001$ ),  $VO_2$  ( $49.8 \pm 2.0$  vs.  $44.7 \pm 1.9$  mL/kg/min;  $p < 0.001$ ), systolic BP ( $174 \pm 6$  vs.  $156 \pm 5$  mmHg;  $p < 0.05$ ), and MAP ( $98 \pm 3$  vs.  $88 \pm 3$  mmHg;  $p < 0.001$ ) were higher during the treadmill test than during the elliptical test. In contrast, RER was higher during the elliptical test than the treadmill test ( $1.21 \pm 0.01$  vs.  $1.16 \pm 0.01$ ;  $p < 0.001$ ). All other variables were similar between the tests. **Conclusion:** Although participants met at least 3 of the standard criteria for a  $VO_{2max}$  test, the results from the treadmill maximal exercise test were slightly different than those obtained via an elliptical maximal exercise test.

Research supported by the McDaniel College Student-Faculty Collaborative Summer Research Fund

---

### **Normative Data for Overhead Back and Between-the-Legs Front Throws**

Todora, J., Meyer, B. Shippensburg University, Shippensburg, PA

**Purpose:** Overhead back (OHB) and between-the-legs front (BLF) throws are components of total body power training programs. The distance of a throw, as a raw score, is difficult to evaluate. Percentiles permit the evaluation of raw scores and facilitate the comparison of two sets of data that are based on different units of measurement. By obtaining normative data for OHB and BLF throws, it will be possible to make comparisons with other power assessments. The purpose of this study was to obtain normative data for OHB and BLF throwing techniques in an undergraduate student population. **Methods:** Thirty-six male and thirty-three female undergraduate students participated in the study. For both throwing techniques, males used a 14 lb (6.35 kg) medicine ball and females used an 8 lb (3.63 kg) medicine ball. Subjects performed three trials for each technique, and distances were measured using a fiberglass tape. For each technique, the best of the three throws was used in the analysis. Percentiles were computed using the SPSS 18.0 default method. Paired t-tests were used to check for statistically significant differences between the two throws. The cut-off chosen for statistical significance was  $p = 0.05$ . **Results:** Males threw farther ( $p < 0.05$ ) in the BLF ( $8.9 \pm 1.5$  m) than in the OHB ( $8.6 \pm 1.6$  m). Females also threw farther ( $p < 0.05$ ) in the BLF ( $6.5 \pm 1.3$  m) than in the OHB ( $5.8 \pm 1.3$  m). Individuals who threw far using one technique tended to throw far using the other technique ( $r = 0.847$ , males;  $r = 0.845$ , females). **Conclusion:** The results of this project indicate that male and female undergraduate students are able to throw a medicine ball farther using the between-the-legs front technique than using the overhead back technique. The normative data obtained in this study provide a basis for classification of throwing proficiency and comparisons to other power assessments.

---

### **Effects of Kickboxing Exercise on Muscular Fitness, Balance and Quality of Life in Older Individuals**

Tokarz, M., Fisher, M. Montclair State University, Montclair, NJ

**Purpose:** The purpose of this study was to compare the effects of traditional exercise incorporating resistance/balance training and kickboxing training on muscular fitness, balance, and quality of life in older individuals. **Methods:** Nineteen older adults (60 to 80 years of age) were randomly assigned to a kickboxing group ( $n=9$ ) or traditional exercise group ( $n=10$ ) for an 8-week exercise program. All participants were tested on static and dynamic balance, muscular endurance of the upper and lower body, and quality of life prior to and after the exercise program. The 8-week traditional exercise program consisted of a general warm-up followed by strength and balance training of the upper and lower body (two sets of 10 repetitions, twice a week). Participants in the kickboxing group, in addition to the traditional exercise training,

performed alternate front punch, cross punch, upper-cut punch, and front and back kick exercises. Both groups completed each training session with a cool-down and stretching. A mixed design 2 x 2 factorial analysis of variance was computed, comparing the traditional exercise group and the kickboxing group before and after the 8-week training program. A level of  $p < 0.05$  was used as the criteria for achieving statistical significance. **Results:** There were no significant interactions with respect to exercise group and time, however a significant main effect for time ( $p < 0.05$ ) was observed for many of the fitness parameters collapsed across exercise groups. An increase in muscular endurance was noted for the bicep curl (Pre  $11.217 \pm 0.476$  curls, Post  $13.750 \pm 0.827$  curls) and chair stand test (Pre  $9.361 \pm 0.650$  stands, Post  $11.711 \pm 0.383$  stands). Both measures of balance were also improved post exercise training. Times for the agility test were lowered (Pre  $9.081 \pm 0.289$  s, Post  $8.224 \pm 0.323$  s), while scores for the Berg static balance test were raised (Pre  $7.994 \pm 0.630$  points, Post  $11.072 \pm 0.326$  points). Quality of life was unchanged at the conclusion of the exercise program. **Conclusion:** Both traditional and kickboxing exercise programs were equally successful in enhancing muscular fitness and balance in older adults.

---

### **Cardiovascular and Metabolic Responses to Combined Upper and Lower Body Exercise**

Venters, E., Mason, S., Peterson, M., Timmons, K., Hoover, K., Crehan, L., McCole, S.D., and McKenzie, J.A. Department of Exercise Science & Physical Education, McDaniel College, Westminster, MD

**Purpose:** The purpose of this study was to compare cardiovascular and metabolic responses during combined upper body and lower body exercise to lower body exercise performed at the same exercise equipment setting. **Methods:** Healthy, physically active females ( $n = 10$ ) and males ( $n = 10$ ) each performed a  $VO_{2max}$  test and two elliptical exercise sessions, one using combined upper and lower body (ARMS) and one using just the lower body (NO ARMS), on separate occasions at least 48 hours apart. Each test was preceded by 10 minutes of quiet rest for measurement of baseline values.  $VO_2$ , caloric expenditure, and respiratory exchange ratio (RER) were measured throughout the sessions using the ParvoMedics TrueOne metabolic measurement system, whereas cardiac output (Q), stroke volume (SV), and heart rate (HR) were measured every 10 s using the PhysioFlow Enduro impedance cardiography system. Rate of perceived exertion (RPE) and blood pressure, via the Tango+ Automated Blood Pressure Monitor, were measured every 5 minutes. Mean arterial pressure (MAP), arterio-venous oxygen difference (A- $VO_2D$ ) and total peripheral resistance (TPR) were calculated using standard formulae. The overall averages (calculated from the 5, 10, 15, and 20 minute values) from the exercise sessions were analyzed for significant differences ( $p < 0.05$ ) using paired samples t-tests. **Results:** Data are means  $\pm$  SEM. Participants averaged  $23 \pm 1$  yr,  $78.3 \pm 4.5$  kg,  $1.73 \pm 0.02$  m, with a  $VO_{2max}$  of  $49.8 \pm 2.0$  mL/kg/min. Resting values did not differ between ARMS and NO ARMS (data not shown; all  $p > 0.05$ ). In addition, the average speed ( $6.5 \pm 0.3$  vs.  $6.5 \pm 0.3$  mph) and distance ( $2.2 \pm 0.1$  vs.  $2.2 \pm 0.1$  miles) did not differ for the ARMS and NO ARMS sessions, respectively. HR ( $157 \pm 3$  vs.  $152 \pm 3$  bpm;  $p < 0.02$ ),  $VO_2$  ( $27.6 \pm 1.4$  vs.  $26.2 \pm 1.5$  mL/kg/min;  $p = 0.001$ ), and caloric expenditure ( $207 \pm 13$  vs.  $196 \pm 14$  kcal;  $p < 0.04$ ) were slightly higher during the ARMS elliptical session than during the NO ARMS session. None of the other variables differed between the exercise sessions. **Conclusion:** Although exercise intensity and duration were consistent, exercising using ARMS evoked a slightly greater metabolic demand than exercising with NO ARMS.

Research supported by the McDaniel College Student-Faculty Collaborative Summer Research Fund

---

### **Pedometer-assessed Workplace Walking Program Improves Cardio-Metabolic Profile Among the University's Workforce**

Weiss, H., Veerabhadrapa, P., Shippensburg University, Shippensburg, PA

**Purpose:** The cost of physical inactivity in the workplace setting is significant. The purpose of this study was to evaluate the association between pedometer-assessed physical activity with cardio-metabolic outcomes such as, body weight, blood glucose levels, lipid profile among the University's academic faculty and staff. **Methods:** Twenty nine (9M/20F, 50±6yrs; BMI 28.4±4.2 kg/m<sup>2</sup>) apparently healthy participants who were sedentary, non-smoking, non-diabetic, free of cardiovascular disease, not on antihypertensive or cholesterol medications were recruited from the University workforce. Fasting blood glucose and lipid profile were analyzed using Cholestech LDX analyzer, before and after intervention. Pedometer settings were personalized and participants were instructed to maintain their regular diet during the study period. Participants completed a pedometer-based walking intervention (step-goal: 10,000-steps/day, 5-days/week, 4-weeks). **Results:** Baseline vs. post-intervention (Mean±SD) for total cholesterol (202.2±40.1 vs. 193.1±42.1 mg/dl; p≤0.05), blood glucose (101.2±8.7 vs. 97.8±8.9; mg/dl; p=0.032), systolic blood pressure (BP; 120.7±11.1 vs. 115.1±11.1 mmHg; p=0.003) and diastolic BP (78.6±6.6 vs. 73.8±5.5 mmHg; p<0.0001) were statistically significant. Step-counts significantly increased from baseline to post-intervention (9057.7±3588.9 vs. 10319.2±3177; p=0.021). Change in step-count (wk 1 to wk 4) were associated with changes in blood glucose (r=-0.39; p=0.048); diastolic BP (r=-0.43; p=0.029) and BMI (r=-0.45; p=0.022).

**Conclusion:** Our preliminary study modestly increased workday walking by ~12% and significantly improved the cardio-metabolic outcomes among the University workforce. This suggests that workplace physical activity programs could contribute to the achievement of 10,000 steps/day which might maximize increases in physical activity participation.

Research funded by Carlisle Area Health and Wellness Foundation, APSCUF, and SURE Grant

---

### **Effectiveness of an Exercise Is Medicine (EIM)<sup>TM</sup> referral program to change exercise behaviors and efficacy.**

Wilhelm, N., Kelly, J., Kovacs, S., Urda, J., Winters, C., Larouere, B., Smith, K., and Lynn, J. Slippery Rock University, Slippery Rock, PA.

**Purpose:** The purpose of the project was to examine changes in physical activity, self-efficacy, and program satisfaction for participants of the EIM Referral Program.

**Methods:** As part of the EIM referral Program at Slippery Rock University, students utilizing the Student Health Center were screened by a nurse practitioner for a "sixth vital sign", which was reported as frequency and duration of physical activity (PA) per week. Students reporting fewer than 150 minutes of PA per week were eligible for referral to a senior Exercise Science Intern. At the beginning of the program, the Exercise Science Intern provided participants with motivational interviewing and coaching to create goals and initiate behavior change. Participants completed pre and post fitness assessments and six weeks of individualized exercise prescription, meeting with the Exercise Science Intern twice per week. At the end of the program, participants completed a confidential program evaluation. **Results:** Twenty participants (age = 24.55 ± 12.61; 4 males, 16 females) who had no regular exercise program completed the intervention. Two non-traditional participants referred through their physician were included in the data. There was 85% program compliance among participants within the six week timeframe. One hundred percent of participants reported feeling more confident about exercising regularly, and 100% reported having a plan in place to continue to exercise.

**Conclusion:** Based on the results, the exercise intervention through the EIM Referral Program at Slippery Rock University was successful to increase physical activity levels and self-efficacy. Additionally, the intervention was successful to facilitate positive behavior change and establish a plan to continue a regular exercise program.

---

### **Forward and Reflected Waveform Amplitudes during Static Handgrip Exercise**

<sup>1</sup>Wiltshire, M.H., <sup>1</sup>Farquhar, W.B., <sup>1</sup>Edwards, D.G., <sup>1,2</sup>Greaney, J.L., <sup>1</sup>University of Delaware, Newark, DE, <sup>2</sup>Pennsylvania State University, State College, PA

**Purpose:** Central aortic systolic and pulse pressures are clinically important predictors of cardiovascular disease and are determined by the interaction of a forward-traveling and a reflected wave. We tested the hypothesis that exercise pressor reflex (EPR) activation would increase wave reflection in older normotensive adults by examining the effects of static hand grip exercise on ascending aortic forward and reflected wave amplitudes. Importantly, the pressor response to EPR activation alters wave reflection in young adults; however, to our knowledge, this has not been examined in healthy older adults. **Methods:** Beat-by-beat peripheral blood pressure (BP; Finometer) was measured continuously during EPR activation, which was elicited by static handgrip (HG) at 40% maximal voluntary contraction followed by post-exercise ischemia (PEI) to isolate the metabolic component of the EPR. Central aortic waveforms were derived from the peripheral pressure waveforms (HemoLab; Harald Strauss Scientific). Waveform analysis, which separates aortic pressure into its forward and backward components using a measured peripheral pressure wave and an estimated triangular flow wave, was used to non-invasively quantify wave reflection. Data were analyzed at baseline, during the last minute of HG, and during PEI. **Results:** Data were collected from thirteen older normotensive subjects ( $63 \pm 2$  years; resting BP  $117 \pm 2 / 70 \pm 2$  mmHg). Central systolic pressure increased during HG ( $\Delta 28 \pm 4$  mmHg) and remained elevated during PEI ( $\Delta 26 \pm 4$  mmHg;  $P < 0.05$  for both). Baseline reflected ( $36 \pm 2$  mmHg) and forward-traveling ( $38 \pm 2$  mmHg) wave amplitudes increased during HG (reflected  $\Delta 10 \pm 2$  mmHg; forward  $\Delta 14 \pm 4$  mmHg;  $P < 0.05$  for both) and remained elevated during PEI (reflected  $\Delta 10 \pm 3$  mmHg; forward  $\Delta 15 \pm 4$  mmHg;  $P < 0.05$  for both). **Conclusions:** The reflected wave magnitude increased during isometric exercise as hypothesized, likely due to increased peripheral vasoconstriction during exercise. These data suggest that forward traveling and reflected waves contribute to the central blood pressure response to EPR activation in older healthy adults.

Research supported by an AHA 11PRE7580029 and an ACSM Foundation Grant.

---

### **Exercise and Calorie Restriction Protect Against Changes in Intestinal Morphology Induced by High-fat Diets**

Wisniewski, P.J.<sup>1</sup>, Shikhel, S.<sup>1</sup>, Lightfoot, S.A., MD<sup>2</sup>, Campbell, S.C., PhD<sup>1</sup>. <sup>1</sup>Department of Exercise Science and Sports Studies, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901, <sup>2</sup>VAMC – OKC, Oklahoma Health Sciences Center, Oklahoma City, OK 73104

Our lab has previously shown that diet induced obesity (DIO) can alter intestinal morphology, producing villi that are significantly shorter and wider than their lean counterparts. In addition, DIO induces inflammation as evident by plasmacytoid and lymphoid infiltrate into the villi. **Purpose:** The goal of this project was to understand if diet (calorie restriction) or exercise can protect the villi from these changes even in the presence of high-fat feeding. **Methods:** For this study, 30 male C57 mice (6-weeks old) were acclimated for 2-weeks and randomly assigned to one of five groups (n=6) as follows; 1) lean sedentary; 2) DIO sedentary; 3) lean exercise; 4) DIO exercise; and 5) high-fat calorie-restriction (CR). Animals were gradually acclimated to

motorized treadmill running which culminated with the animals running 4 days/week for 40 minutes per day at 15m/min. CR animals consumed 70% of the ad libitum fed mice, which was approximately 1.91 g/day. Food intake was monitored every other day and body weight every week to ensure CR maintenance and health of the animals. Upon sacrifice weight was recorded and duodenal sections were removed and quickly placed in 3% sucrose, 2% paraformaldehyde for immunohistochemistry. **Results:** Results showed that both exercise and CR reduced weight gain of DIO animals compared to their sedentary ad libitum fed counterparts. Furthermore, both exercise and CR protected the villi from the morphological changes caused by DIO. Specifically villi appeared to be tall and thin, which is consistent with lean animals and indicative of a healthy duodenum. **Conclusion:** These results support that CR and exercise is health promoting even in the presence of high-fat feedings. Future studies should examine the impact of combining exercise and CR on intestinal health and inflammation.

---

### Validation of OMNI-Walk/Run RPE in Overweight and Obese Adults

<sup>1</sup>Wisniewski, K., <sup>2</sup>Goss, F. (FACSM). <sup>2</sup>Rubinstein, E., <sup>2</sup>Davis, K., <sup>2</sup>Nagle, E. (FACSM), <sup>2</sup>Storti, K., <sup>2</sup>Jakicic, J.(FACSM). <sup>1</sup>Saint Francis University, Loretto, Pa, <sup>2</sup>University of Pittsburgh, Pittsburgh, Pa

The Adult OMNI-Walk/Run RPE Scale (OMNI RPE) is considered a valid and reliable metric for measuring aerobic exercise intensity. Previous validation studies of OMNI RPE have been conducted on physically active young adults with normal body weights, or obese adults with metabolic syndrome. The metric has not been validated in apparently healthy overweight or obese adults. **Purpose:** The purpose of this investigation was to examine concurrent and construct validity of OMNI RPE in overweight and obese adults. **Methods:** Fifty nine (males, n = 22, age = 37.18 ± 9.70 yrs; females, n = 37, age = 34.11 ± 7.75 yrs) sedentary to physically active overweight and obese (males BMI = 31.50 ± 3.56 kg·m<sup>-2</sup>; females BMI = 29.86 ± 3.12 kg·m<sup>-2</sup>) adults participated in this study. Subjects were considered Low or Moderate Risk based upon ACSM cardiovascular disease risk factor stratification. A single observation, cross-sectional research design was employed where subjects performed a progressively incremented submaximal graded treadmill exercise test to 85% of age predicted maximal heart rate (APMHR). HR and oxygen consumption (VO<sub>2</sub>) were regressed against OMNI RPE responses at 50%, 70%, and 85% APMHR to examine concurrent validity. OMNI RPE responses were regressed against the Borg (6 – 20) RPE scale to establish construct validity at the same three intensities. **Results:** A strong relation between OMNI RPE and HR was observed for males (r = 0.879, p < 0.001), females (r = 0.859, p < 0.001), and the total sample (r = 0.866; p < 0.001). A moderate-strong relation between OMNI RPE and VO<sub>2</sub> was also observed for males (r = 0.733, p < 0.001), females (r = 0.795, p < 0.001), and the total sample (r = 0.731; p < 0.001). OMNI RPE displayed a very strong relation with Borg RPE for males (r = 0.962, p < 0.001), females (r = 0.965, p < 0.001), and the total sample (r = 0.963; p < 0.001). **Conclusions:** Concurrent and construct validity of OMNI RPE were established in overweight and obese adults. Therefore, OMNI RPE may be used to assess exercise intensity during treadmill exercise in apparently healthy overweight and obese adults.

---