

## SCHEDULE OF EVENTS

Time	Item	Location – Topic
8:30-9:00am	Registration & Refreshments	2 <sup>nd</sup> Floor Benson Lobby & Lounge
9:00-9:15am	Welcome: Luc Tremblay, Associate Dean, Research	Benson 307
9:30-11:15am	Session 1	Dietary Considerations for Activity & Performance (BN302) Acute Considerations of Exercise and Movement (BN304) Sociocultural Perspectives on Sport and Exercise (BN307) Human Movement and Attention (WS2007)
11:15-11:30am	BREAK	2 <sup>nd</sup> Floor Benson Lounge
11:30am-1:00pm	Session 2	Impacts of Long-term Exercise Training (BN302) Topics in Cellular/Mechanistic Physiology (BN304) Exercise and Physical Activity in Clinical Populations (BN307)
1:00-2:00pm	LUNCH	2 <sup>nd</sup> Floor Benson Lounge
2:00-3:30pm	Session 3	Program Development and Evaluation (BN302) Physical Activity and Sport Among Youth (BN304) Improving Physical Performance (BN307)
3:30-3:45pm	BREAK	2 <sup>nd</sup> Floor Benson Lounge
3:45-4:45pm	Keynote: Dr. Michael Atkinson	<i>“Fifty Shades of Grey: doing physical cultural studies in the era of Kinesiology”</i> (BN307)
4:45-5:00pm	Award Presentation & Closing Remarks	Benson 307

### ABOUT THE KEYNOTE SPEAKER

Michael Atkinson is a Professor in the Faculty of Kinesiology and Physical Education at the University of Toronto, where he teaches physical cultural studies and research methods. Michael's central areas of teaching and research pertain to the experience of human suffering in/as physical cultures, radical embodiment, existential phenomenology and ethnographic research methods. Michael's research efforts have included the study of ticket scalpers, tattoo enthusiasts, fell runners, cosmetic surgery patients, animal sport cultures, yoga practitioners, Parkour cultures, boys and body images, vegans and endurance athletes. He is author/editor of nine books, and his research has appeared in a range of diverse academic journals. Michael is a member of the University of Toronto's Center for Sport Policy Studies, and is an affiliated research Fellow at the Center for Physical Cultural Studies at Florida State University. He is past Editor of the *Sociology of Sport Journal* and has served on editorial boards including *Deviant Behavior*, *Sport in Society*, *Qualitative Research in Sport, Exercise and Health*, and *Qualitative Sociology Review*.



In this talk, Michael Atkinson discusses the academic sociogenesis of the physical cultural studies (PCS) movement in North America, and contextualizes its emerging history within the unfolding of a more 'scientific Kinesiology'. He presents an overview of the potential roles and mandates of PCS both within and outside the university, while highlighting its humanist and empathetic ethics of practice. Michael addresses the fragmented and at times seemingly tangential structural and cultural location of PCS in Kinesiology programs while making a case for not only its retention in the academic realm, but also for its growth as the veritable cultural conscience of Kinesiology. Michael weaves two of his recent field research efforts (yoga practitioners and young people living with epilepsy) into the discussion as a means of articulating core PCS theoretical and substantive concerns such as emplacement, cultural inscription, the fluidity of power, corporeal bioethics, and social justice.

## ORDER OF THE DAY

**Registration and Refreshments:** 8:30-9:00am (2<sup>nd</sup> Floor Benson Lobby & Lounge)

**Welcome:** 9:00-9:15am (BN307)

**Session I:** 9:30-11:15am

- Dietary Considerations for Activity & Performance (BN302)
- Acute Considerations of Exercise and Movement (BN304)
- Sociocultural Perspectives on Sport and Exercise (BN307)
- Human Movement and Attention (WS2007)

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### Dietary Considerations for Activity and Performance

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Session Moderator: Sidney Sawan

Room BN302

9:30am

*The Effect of Omega-3 Supplementation on Endurance Performance*

Student Researcher: Vanessa Dizonno, Faculty Advisor: Dr. Greg Wells

University of Toronto

9:45am

*Caffeine: Just a buzz or a great performance enhancer?*

Student Researcher: Tarun Fernandez, Faculty Advisor: Dr. Mazen Hamadeh

York University

10:00am

*The effects of L-carnitine supplementation on endurance and resistance exercise performance*

Student Researchers: Philip Antonian & Erfan Hamidi, Faculty Advisor: Dr. Mazen Hamadeh

York University

10:15am

*Amount, Type, and Timing of Habitual Dietary Protein Intake in Active Populations*

Student Researcher: Sarkis Hannaian, Faculty Advisor: Dr. Daniel Moore

University of Toronto

10:30am

*Intramuscular Carnitine and Its Implications on Exercise Performance*

Student Researchers: Ghazal Aghvami & Cameron Mattice, Faculty Advisor: Dr. Mazen Hamadeh

York University

10:45am

*Nitric Oxide Based Supplements on Human Performance*

Student Researcher: Robert Talarico, Faculty Advisor: Dr. Mazen Hamadeh

York University

11:00am

*Re-Evaluating Dietary Protein Requirements in Highly Active Young Adult Males*

Student Researcher: Denise Wooding, Faculty Advisor: Dr. Daniel Moore

University of Toronto

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### Acute Considerations of Exercise and Movement

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Session Moderator: Elaine Cook Room BN304

9:30am

*Caffeine as an Ergogenic Aid: A Systematic Review*

Student Researcher: Mehras Motamed, Faculty Advisor: Dr. Mazen Hamadeh  
York University

9:45am

*The Effect of Posture Performance Shirt Providing a Passive Stretch to the Thoracic Region and Its Affect on Physiological Performance*

Student Researcher: Nouredin Chahrouh, Faculty Advisor: Dr. Jack Goodman  
University of Toronto

10:00am

*Examining the Effects of an Acute Bout of Exercise on Learning and Long-Term Memory in Younger Adults*

Student Researcher: Alexandra Chen, Faculty Advisor: Dr. Jennifer Heisz  
McMaster University

10:15am

*Influence of Verbal Coaching Cues on the "Lifting" and "Lowering" Phases of a Lifting Task*

Student Researcher: Steven Hirsch, Faculty Advisor: Dr. David Frost  
University of Toronto

10:30am

*University Exams on the Dance Floor: Studying the Disco*

Student Researcher: Michelle Ocfemia, Faculty Advisor: Dr. Michael Atkinson  
University of Toronto

10:45am

*Post Exercise Hemodynamics in Children Following Moderate Aerobic Exercise*

Student Researcher: Divya Patel, Faculty Advisor: Dr. Scott Thomas  
University of Toronto

11:00am

*Differences in Post-Exercise Hemodynamics with Arm versus Leg Ergometry*

Student Researcher: Cindy Nguyen, Faculty Advisor: Dr. Scott Thomas  
University of Toronto

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### Sociocultural Perspectives on Sport and Exercise

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Session Moderator: Bahar Tajrobehkar Room BN307

9:30am

*Psychological Factors of Injury and Return-to-Dance: A Review*

Student Researchers: Nana-Adjoa Bourne, Faculty Advisor: Dr. Lynda Mainwaring  
University of Toronto

9:45am

*Fear of Re-Injury, Mood Disturbance and Pain Catastrophizing during Different Stages of Injury Recovery and Return to Play Amongst Varsity Athletes*

Student Researcher: Kyle Bowers, Faculty Advisor: Dr. Lynda Mainwaring  
University of Toronto

10:00am

*Experiences of Bullying and Cyberbullying in Inter-University Athletics*

Student Researcher: Rachel Jewett, Faculty Advisor: Dr. Gretchen Kerr  
University of Toronto

10:15am

*Kinesiological notions of the Human Body: A critical analysis of the formation of perspectives in an undergraduate program*

Student Researcher: Derek Johnston, Faculty Advisor: Dr. Michael Atkinson  
University of Toronto

10:30am

*Barriers to Active Lifestyles Among University of Women of South Asian Heritage*

Student Researcher: Leila Keshavjee, Faculty Advisor: Dr. Margaret MacNeill  
University of Toronto

10:45am

*Athletic Identity and Contingent Self-Worth in Highly Elite Athletes*

Student Researcher: Zoe Poucher, Faculty Advisor: Dr. Katherine Tamminen  
University of Toronto

11:00am

*A Qualitative Examination of the Lived Experiences of Student Athletes Retired because of Concussions*

Student Researcher: Tiffany Toong, Faculty Advisor: Dr. Lynda Mainwaring  
University of Toronto

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### Human Movement and Attention

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Session Moderator: Malinda Hapuarachchi

Room WS2007

9:30am

*Motor Contagion and the Effects of Sensorimotor Training*

Student Researcher: Orion Katayama, Faculty Advisor: Dr. Timothy Welsh  
University of Toronto

9:45am

*Comparison of Lower Extremity Joint Kinematics and Kinetics between Single-Leg Squat Variations: Incorporating Biomechanical Criteria in the Processes of Injury Risk Assessment and Exercise Prescription*

Student Researcher: Steven Khuu, Faculty Advisor: Dr. Tyson Beach  
University of Toronto

10:00am

*A "Light" Task: An Optimal Limb Velocity for Limb Regulation Processes?*

Student Researcher: Tiffany Lung, Faculty Advisor: Dr. Luc Tremblay  
University of Toronto

10:15am

*Inter-group differences in visual accuracy between undergraduate kinesiology students when observing lifting tasks via video based on their year of study*

Student researcher: Ernest Manalo, Faculty Advisor: Dr. David Frost  
University of Toronto

10:30am

*Attention Shift of Humans when Observing a Dog's Eye Gaze*

Student Researcher: Anna McPhee, Faculty Advisor: Dr. Timothy Welsh  
University of Toronto

10:45am

*Individual Interpretations of Verbal Instructions During the Performance of a Simple Lifting Task*

Student Researcher: Rachel Micay, Faculty Advisor: Dr. David Frost  
University of Toronto

11:00am

*Is There A Relationship Between Starting Block Configuration and Foot-Block Interactive Forces During A Sprint Start?*

Student Researcher: Jackie Zehr, Faculty Advisor: Dr. Tyson Beach  
University of Toronto

## **BREAK**

11:15 -11:30am (2<sup>nd</sup> Floor Benson Lounge)

**Session II:** 11:30am-1:00pm

- Impacts of Long-term Exercise Training (BN302)
- Topics in Cellular/Mechanistic Physiology (BN304)
- Exercise and Physical Activity in Clinical Populations (BN307)

### **Impacts of Long Term Exercise Training**

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Session Moderator: Lindsay Musalem

Room BN302

11:30am

*Characterizing Arterial Stiffness in Individuals with Postural Orthostatic Tachycardia Syndrome and Ehlers-Danlos Syndrome Type III*

Student Researcher: Jem Cheng, Faculty Advisor: Dr. Maureen MacDonald  
McMaster University

11:45am

*The Influence of Reduced Daily Ambulation on Skeletal Muscle and Physical Function in Older Adults*

Student Researcher: Micaela Gregory, Faculty Advisor: Dr. Stuart Phillips  
McMaster University

12:00pm

*Heart Rate Recovery Remains Unchanged Following 12 Weeks of Either Traditional Endurance Training or Sprint Interval Training in Sedentary Men*

Student Researcher: Stacey Priest, Faculty Advisor: Dr. Maureen MacDonald  
McMaster University

12:15pm

*Understanding the Relationship Between Arterial Stiffness and Cognition in Older Adults*

Student Researcher: Daria Shkredova, Faculty Advisor: Dr. Ada Tang  
McMaster University

12:30pm

*The Effects of High Repetition vs. Low Repetition Resistance Exercise Training on Body Composition in Young, Resistance Trained Men*

Student Researcher: Christopher Wavell, Faculty Advisor: Dr. Stuart Phillips  
McMaster University

12:45pm

*Vitamins as Possible Ergogenic Aids: A Focus on Vitamin D and Antioxidants*

Student Researcher: Keshna Sood, Faculty Advisor: Dr. Mazen Hamadeh  
York University

## Topics in Cellular/Mechanistic Physiology

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Session Moderator: Michael Mazzulla Room BN304

11:30am

*Characterizing the Location and Extent of Muscle Damage Following Lengthening Contractions at Variable Velocities*

Student Researcher: Danielle Hirsh, Faculty Advisor: Dr. Marius Locke  
University of Toronto

11:45am

*The effect of statins on the production of ATP via oxidative phosphorylation in pancreatic insulin secreting MIN6 clonal cells*

Student Researcher: Maansi Malhotra, Faculty Advisor: Dr. Robert Tsushima  
York University

12:00pm

*Quantifying the Extent and Location of Cellular Muscle Damage Following Lengthening Contractions at Variable Velocities Through Analysis of Heat Shock Protein Content*

Student Researcher: Elizabeth Piccoli, Faculty Advisor: Dr. Marius Locke  
University of Toronto

12:15pm

*Aquaporin-4 in Rat Tibialis Anterior Muscle Following Lengthening Contractions*

Student Researcher: Emily Vecchiarelli, Faculty Advisor: Dr. Marius Locke  
University of Toronto

12:30pm

*The Effect of Massage Therapy on the Inflammatory Response Following High-Intensity Intermittent Exercise and Rest*

Student Researcher: Hayley Warren, Faculty Advisor: Dr. Greg Wells  
University of Toronto

## Exercise and Physical Activity in Clinical Populations

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Session Moderator: Krysten Orr Room BN307

11:30am

*Coping with Breast Cancer and the Role of Physical Activity from the Perspective of Patients, Partners and Children*

Student Researcher: Madison Ardizzi, Faculty Advisors: Dr. Catherine Sabiston & Dr. Katherine Tamminen  
University of Toronto

11:45am

*The Utility of a Comprehensive Vision Assessment in Baseline and Post-Concussion Testing*

Student Researcher: Shaylea Badovinac, Faculty Advisors: Dr. Michael Hutchison & Dr. Tom Schweizer  
University of Toronto

12:00pm

*Health Intervention Strategies to Help Prevent Musculoskeletal Disorders of Neck and Shoulder Pain*

Student Researcher: Nouredin Chahrour, Faculty Advisor: Dr. Margaret MacNeill  
University of Toronto

12:15pm

*Managing Knee Osteoarthritis in an Academic Primary Care Practice: Opportunities for Improvement*

Student Researcher: Leila Keshavjee, Faculty Advisors: Dr. Greg Wells & Dr. Noah Ivers  
University of Toronto

12:30pm

*Coping Strategies Employed by Athletes with Sport Concussion*

Student Researcher: Marina Pavelic, Faculty Advisor: Dr. Lynda Mainwaring  
University of Toronto

12:45pm

*Baseline Blood Biomarkers Profile in Varsity Athletes: Implications for Concussion Research*

Student Researcher: Kathryn Taberner, Faculty Advisor: Dr. Michael Hutchison  
University of Toronto

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## **LUNCH**

1:00 – 2:00 pm (2<sup>nd</sup> Floor Benson Lounge)

**Session III:** 2:00 – 3:30pm

- Program Development and Evaluation (BN302)
- Physical Activity and Sport Among Youth (BN304)
- Improving Physical Performance (BN307)

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## **Program Development and Evaluation**

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Session Moderator: Patrick Jachyra

Room BN302

2:00pm

*MoveU Match: Focus Groups*

Student Researcher: Joanna Goulas, Faculty Advisor: Dr. Guy Faulkner  
University of Toronto

2:15pm

*The Influence of Workplace Training Fulfillment on Learning Outcomes in Career Firefighters*

Student Researcher: Christine Rad, Faculty Advisor: Dr. David Frost  
University of Toronto

2:30pm

*Move for Two: Examining the effects of a pregnancy and exercise DVD intervention*

Student Researcher: Jagriti Sharma, Faculty Advisor: Dr. Anita Cramp  
University of Western Ontario

2:45pm

*Assessing the Effectiveness of Student-Led Simulation in Enhancing Learners' Interprofessional Competencies*

Student Researcher: Alexis Sharp, Faculty Advisor: Dr. Ian Newhouse  
Lakehead University

3:00pm

*Examining the Relationship Between Autonomy Support and Health Behaviour Change in HealthSteps™ Program Participants*

Student Researcher: Justine Tempelman, Faculty Advisor: Dr. Erin Pearson  
Lakehead University

## Physical Activity and Sport Among Youth

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Session Moderator: Alvin Ma Room BN304

2:00pm

*Examining the Viewpoints of Grade 5/6 Students on Self-Efficacy and Perceived Exertion in Relation to Daily Physical Activity Participation: A Mixed Methods Study*

Student Researcher: Jacqueline Harvey, Faculty Advisor: Dr. Erin Pearson  
Lakehead University

2:15pm

*Igniting Fitness Possibilities: An Evaluation of the Challenge Module on Youth of all Abilities*

Student Researcher: Georgina Nicolopoulos, Faculty Advisors: Dr. Kelly Arbour-Nicitopoulos & Dr. Virginia Wright  
University of Toronto

2:30pm

*Keeping Score: A Qualitative Evaluation of the Effect Competition has in Youth Sport*

Student Researcher: Cecily Osborne, Faculty Advisor: Dr. Michael Atkinson  
University of Toronto

2:45pm

*Self-Care Through Physical Activity: A Preventative Measure for Substance Abuse Among Youth?*

Student Researcher: Anna Petersson, Faculty Advisors: Dr. Fataneh Farnia & Dr. Nancy Cohen  
University of Toronto

3:00pm

*A Review of Trends in Youth Sport Psychology Research.*

Student Researcher: Shannon Pynn, Faculty Advisor: Dr. Nicholas Holt  
University of Alberta

3:15pm

*The Convergence of Culture and Curriculum: Piloting Bikes into High School Physical Education*

Student Researcher: Jeffrey Trieu, Faculty Advisor: Dr. Caroline Fusco  
University of Toronto

## Improving Physical Performance

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Session Moderator: Stephen Bested Room BN307

2:00pm

*Performance Changes in Swimmers with Age*

Student Researcher: Nicole Bianchi, Faculty Advisor: Dr. Tim Taha  
University of Toronto

2:15pm

*The Effect of Kinesiotaping on Vertical Jump Height and Muscle Electromyographic Activity of the Gastrocnemius and Soleus*

Student Researcher: Ian MacDowall, Faculty Advisor: Dr. Paolo Sanzo  
Lakehead University

2:30pm

*The effect of resistance exercise load on changes in muscular strength and hypertrophy in young, resistance-trained males*

Student Researcher: Nicole Mazara, Faculty Advisor: Dr. Stuart Phillips  
McMaster University

2:45pm

*Cooling the Palms Enhances Bench Press Performance*

Student Researcher: James O'Brien, Faculty Advisor: Dr. Ira Jacobs

University of Toronto

3:00pm

*The Impact of Muscle Cooling and Compression on Peripheral Force Generation and Neuromuscular Recovery Post Exercise in Trained Population*

Student Researcher: Peter Radonic, Faculty Advisor: Dr. Greg Wells

University of Toronto

**BREAK**

3:30-3:45pm (2<sup>nd</sup> Floor Benson Lounge)

**KEYNOTE SPEAKER**

3:45-4:45pm (BN307)

Dr. Michael Atkinson: *"Fifty Shades of Grey: doing physical cultural studies in the era of Kinesiology"*

**AWARD PRESENTATION & CLOSING REMARKS**

4:45 – 5:00pm (BN307)

## **Intramuscular carnitine and its implications on exercise performance**

Student Researchers: Ghazal Aghvami and Cameron Mattice

Faculty Advisor: Dr. Mazen Hamadeh

York University

Carnitine is an endogenous compound essential for energy production, playing dual roles as a component of fatty acid translocation through the mitochondrial membrane and as a buffer for accumulating acetyl CoA. In addition, carnitine supplementation improves muscle recovery, up-regulates androgen receptors, and has various effects on the brain. In the absence of either primary or secondary deficiencies, it is rare for healthy individuals to become deficient in carnitine. Chronic training may decrease muscle carnitine below basal levels, thus supplementation is recommended to at least stabilize muscle carnitine levels. We review clinical studies that assess the effect carnitine has on exercise performance and metabolism in aerobic, anaerobic, and resistance training. Although findings have been inconsistent, research has demonstrated carnitine's ability to improve exercise performance by increasing fatty acid oxidation, sparing glycogen, reducing lactate accumulation, increasing efficiency of glycogen utilization, decreasing rate of perceived exertion, and allowing a higher work output. More studies are necessary to determine optimal dosing of carnitine, optimal amount of carbohydrates ingested with carnitine, the effect of carnitine on specific sports, and the effect of prolonged carnitine supplementation on resistance training. We conclude that prolonged supplementation, at least 12 weeks, of 30-56 mg/kg/d of carnitine taken with carbohydrates can effectively increase muscle total carnitine concentration, enabling its ergogenic effects.

## **The effects of L-carnitine supplementation on endurance and resistance exercise performance**

Student Researchers: Philip Antonian and Erfan Hamidi

Faculty Advisor: Dr. Mazen Hamadeh

York University

The objective of our research presentation was to examine the literature of L-carnitine supplementation on athletes/non-athletes. We investigated 6 anaerobic/resistance exercise studies along with 9 aerobic/endurance exercise studies to determine the efficacy of L-carnitine supplementation. Nearly all the subjects that participated in the chosen studies were male and between the ages of 18 and 35. Historically, L-carnitine was discovered in the early 20<sup>th</sup> century and its first uses in humans were for lipid storage myopathy. L-carnitine is synthesized in the liver and kidneys but it is primarily stored in the muscle. Exogenous sources of L-carnitine are food products such as red meat and dairy. Absorption is affected by the gut flora and dosage, while excretion is regulated by the renal system. Both processes are affected by saturation capacity so a greater or lesser intake of L-carnitine, whether through dietary or supplementary means will result in greater excretion or reabsorption. L-carnitine is comprised of 1 lysine and 3 methionine residues and its function is to take up acyl fatty acids into the inner mitochondrial matrix, enabling fatty acid oxidation to take place in either Krebs' cycle or the electron transport chain so ATP (Adenosine Tri-Phosphate) can be produced. L-carnitine is also used in detoxification, perhaps preventing apoptosis (cell death), and improving vascular function. The bottom-line conclusion to the resistance literature is that it does not increase 1 RM (Repetition Maximum) or resistance performance, but it does increase androgen receptor transcription along with testosterone uptake. L-carnitine is also postulated to improve recovery based on loading during resistance exercise. With regards to the endurance exercise literature, L-carnitine supplementation displays a trend towards increasing fatty acid oxidation, increased time to fatigue, reduced lactate concentrations, and reduced RPE (Rate of Perceived Exertion). All the studies that were investigated used a range between 2 grams and 6 grams of L-carnitine taken twice or three times per day. The greatest discrepancy in the overall literature is the lack of long-term L-carnitine dosages being utilized in studies longer than 3 months. The majority of the studies also concluded their supplementation protocol within 2 months which is not enough time to elicit greater concentrations of intramuscular carnitine. With higher levels of intramuscular carnitine, an endurance athlete can improve their fatty acid metabolism and bypass the saturation levels of a non-supplemented individual, because of the presence of carnitine being readily available in the muscle. Currently, gaps in the literature that need to be addressed are a lack of female participants, a lack of chronic L-carnitine supplementation, and L-carnitine supplementation in master's athletes (athletes over the age of 45). To summarize the current literature, L-carnitine supplementation is more effective for endurance athletes than athletes participating in strength or anaerobic sports, as well as compared to non-athletes. A regular dose of 1 gram supplemented twice a day is the recommendation.

## **Coping with breast cancer and the role of physical activity from the perspective of patients, partners and children**

Student Researcher: Madison Ardizzi

Faculty Advisors: Dr. Catherine Sabiston & Dr. Katherine Tamminen

University of Toronto

The purpose of this study was to explore social support and physical activity in the context of coping with breast cancer. In phase one of the study, data from a pre-existing dataset was analyzed, whereby 199 women had completed a self-report questionnaire to assess family and social demographics, social support and physical activity [84.4% Caucasian, 63.4% currently married; 71.9% had children; of these, 53.3% had daughters and 48.2% had sons]. Based on Pearson correlation coefficients significant ( $p < 0.05$ ) associations were found between number of daughters and emotional and assistance support ( $r = .05 - .15$ ) and number of sons and emotional support ( $r = .17$ ). Based on Spearman's correlation coefficients significant ( $p < .05$ ) associations were found between being married and listening, emotional, and cancer support ( $r = .16 - .20$ ), people in home and listening, emotional and assistance support ( $r = .16 - .29$ ), children in home and emotional support ( $r = .20$ ), young adults at home and listening and reality confirmation support ( $r = .16 - .17$ ). There was a negative correlation between having no children in home and emotional and cancer support ( $r = -.16$  to  $-.21$ ). Furthermore, Pearson correlation coefficients found significant ( $p < .05$ ) associations between moderate to vigorous physical activity (MVPA) and emotional, reality confirmation, assistance and cancer support ( $r = .18 - .21$ ). With a regression model controlling for social demographic variables (Caucasian, BC stage diagnosed with, how many daughters, how many sons) and social support variables (cancer support and emotional support) a significant correlation to MVPA was found (.034,  $r^2 = .103$ ), with a major contribution from emotional support (Beta=.023). In conclusion, this study found that emotional and cancer support provided by partners and children positively influenced MVPA behavior. In phase two of the study the experience of breast cancer was qualitatively explored from the family's perspective. Four families consisting of a patient, child and partner were interviewed ( $n = 10$ ). Private semi structure interviews were conducted with each individual family member. Data analysis took the form of a thematic multiple case study approach whereby each family member's experience was analyzed separately, then analyzed with their family and with their family role position, i.e. all the mothers, all the partners and all the children. Patients understood the benefits of physical activity, however physical activity levels were not consistent before, during or after treatment. Children and partners reported no drastic change in their physical activity behavior while coping with breast cancer within the family. All family members reported other life issues that they needed to cope with when dealing with breast cancer, and all participants reported that their life is still affected by the breast cancer diagnosis. All participants reported support from immediate and extended family and individuals also reported learning life lessons from their breast cancer experience. Having supportive family members to help to cope with other life issues and deal with the effects of breast cancer was consistently reported as beneficial to all family members.

## **The utility of a comprehensive vision assessment in baseline and post-concussion testing**

Student researcher: Shaylea Badovinac

Faculty Advisors: Dr. Michael Hutchison & Dr. Tom Schweizer

University of Toronto

*Background:* Concussions are a mild form of traumatic brain injury that commonly occur in sport. Neuropsychological (NP) testing is currently the most common objective measure in concussion evaluation; however, this form of assessment may not capture the full range of impairments and functional complaints associated with concussions. As such, the value of additional objective measures is being investigated. Vision assessments are one such measure being considered, as they have been suggested as a means to identify abnormalities in concussed individuals. To date, the full scope of vision abilities impacted by concussion and the associated assessment tools have not been explored.

*Objective:* The purpose of this study was to establish normative vision assessment data for a healthy collegiate athlete population, identify differences in vision abilities between healthy and concussed athletes, and compare the recovery trajectory of vision to those of cognitive function and physical symptoms.

*Methods:* During Fall 2014, healthy collegiate athletes ( $n = 292$ ) completed the Automated Neuropsychological Assessment Metrics (ANAM), the Sport Concussion Assessment Tool (SCAT-3), and twelve different assessments of visual function. Throughout the following six months, a subset of athletes ( $n = 14$ ) sustained concussions and were recruited to participate in this study. These athletes were re-evaluated using the original measures at the following time points: i) within the first five days following

injury, ii) bi-weekly until receiving medical clearance to return to play, iii) at the time of medical clearance, and iv) one month following medical clearance.

**Results:** Preliminary results show that the performance of concussed athletes within the first five days following injury was significantly worse than that of healthy controls on tests of monocular and binocular accommodative facility, saccadic eye movement, and near point of convergence. Full data to-be presented will include: normal values for select vision tests in a sample of healthy collegiate athletes, a comparison of vision test performance of concussed and healthy athletes at various time points following concussion, and a comparison of vision impairment to cognitive impairment and physical symptoms at various time points following concussion. **Implications:** Easy-to-administer vision assessments may serve as valuable tools in the concussion management process by offering a more complete understanding of concussion symptoms and allowing for objectively informed decisions regarding removal from play and return to play.

### **Performance changes in swimmers with age**

Student Researcher: Nicole Bianchi

Faculty Advisor: Dr. Tim Taha

University of Toronto

As an athlete develops, so too do their energy systems, specifically their aerobic and anaerobic systems. It is possible, however, that these two systems may develop independently of each other. This study will be measuring the age at which peak critical power is reached, amongst elite male and female Canadian swimmers, using their performance results. Performance results, time in seconds, were obtained from the website [www.swimming.ca](http://www.swimming.ca) for the top ten male and female swimmers of all time in each of the following distances on the long course: 50m, 100m, 200m, 400m, 800m, and 1500m. A non-linear mixed effects model will be used to determine the critical power at each age. From the statistical analysis performed, it is expected that results will remain consistent with other previous studies, such as the one by Schulz and Curnow (1989), which found that peak performance occurs at younger ages in females than in males. In addition, it is also expected that peak performance ages will have remained relatively stable. Finally, it is hypothesized that the more explosive, and therefore the more anaerobically-driven, the event, the younger the age of peak critical power will be, and that the less explosive, and thus the more aerobically driven, the event is, the older the age of peak critical power will be.

#### **References:**

Schulz, R., and C. Curnow. "Peak Performance and Age among Superathletes: Track and Field, Swimming, Baseball, Tennis, and Golf." *Journal of Gerontology: Psychological Sciences* 43, no. 5 (1988): 113-20. Accessed July 4, 2014.

### **Psychological factors of injury and return-to-dance: A review**

Student Researcher: Nana-Adjoa Bourne

Faculty Advisor: Lynda Mainwaring

University of Toronto

**Background and Primary Objective:** Within the dance culture it is common practice to underreport injuries and continue dancing through pain. In sport cultures, it is also common to ignore certain minor strains and injuries in order to keep playing. However, in sport, injury reporting and seeking medical attention is much more common than in dance [Long et al., 2011].

Return-to-activity after injury has become a significant area of research, highlighting the importance of healing the body fully rather than risking further injury. There is little knowledge about dancers returning to practice after injury and what interventions are sought to remedy injuries in dance. Therefore, the purpose of this presentation is to review the literature related to dance injury and psychological factors pushing dancers to continue dancing.

**Research Design and Method:** Of the 48 articles initially selected by search criteria, 30 articles were reviewed based on the inclusion criteria. A key word search was conducted using Medline, PubMed and PsychInfo databases. Articles selected were between the years 1994-2014, and chosen in the initial search based on inclusion of keywords in the title and abstracts. The author later filtered the articles in terms of relevance to dance injury, recovery and return to dance or sport topics.

**Conclusion:** The prevalence of injuries in dancers is high, but typically dancers do not pursue medical treatment. Many studies acknowledge high injury rates in dancers but researchers emphasize that injuries

are underreported. This could be due to economic status, dance social culture or a lack of health professionals who understand the injury, all of which lead dancers to avoid seeking treatment. There is a gap in the literature related to the psychology of returning to dance and how the dancers are affected by injuries or their rehabilitation, not only physically, but psychologically as well. Further research is needed in terms of determining if the avoidance of seeking medical attention for injury is consistent among all levels and genres of dance. Determining if there is a distinction between individual drive to pursue dance and falling victim to dance culture norms will be beneficial in understanding dancers' motivation to avoid medical help.

*Keywords:* Dance, Injury, Injury rehabilitation, Injury reporting, Performance, Return to practice

### **Fear of re-injury, mood disturbance and pain catastrophizing during different stages of injury recovery and return to play amongst varsity athletes**

Student Researcher: Kyle Bowers

Faculty Advisor: Dr. Lynda Mainwaring

University of Toronto

*Background:* Considerable research has been completed on the relationship between antecedent psychological factors and recovery and rehabilitation from musculoskeletal injuries following various sports injuries (Ardern et al., 2013). However, much less is known about the psychological response associated with rehabilitation from, and return to sport, following injuries. Studies conducted on the topic of fear of re-injury (kinesiophobia) often note relationships between negative affect, fear, anxiety and an increased time to return to play (Prugh et al., 2012). Research also suggests that up to 66% of athletes who suffer from a severe musculoskeletal injury may not return to the same level of physical performance after a period of one year, despite full physiological recovery (Ardern et al., 2013), leading to questions centered around the importance of psychological recovery in return to sport.

*Purpose:* The current study aimed to measure fear of re-injury, mood disturbances and pain catastrophizing in injured varsity athletes with the goal of determining which psychological factors should be the target of intervention to improve psychological readiness in return to play.

*Methods:* Questionnaires were administered to participants at four different time points during their musculoskeletal injury recovery. Participants attended sessions to complete the questionnaires within 9 days of sustaining an injury ( $M=6.27$ ,  $SD=2.37$ ), immediately following medical clearance to progress [TO] exercise, immediately following full return to competition, and one week following return to competition. At each of the time point, participants completed the Shortened Profile of Mood States Questionnaire (S-POMS), the Tampa Scale of Kinesiophobia (TSK), the Pain Catastrophizing Scale (PCS) and an Assessment of Return to Sporting Activity questionnaire (ARSA), with the addition of a basic demographic questionnaire completed during the first session.

*Preliminary Results:* Although data analysis is ongoing, emergent trends suggest significant differences in Total Mood Disturbance, Kinesiophobia and Pain Catastrophizing at return to play and one week following return to play. This suggests that athlete's psychological readiness to return to play does not align with their physiological recovery timeline. Additional relationships have been found Pain Catastrophizing and sport activity level and intensity, as well as perceived injury commonness and fear of re-injury. Full results will be presented at the Undergraduate Research Conference and in a final research paper. Potential future research would be beneficial in developing interventions to ease the transition from recovery to return to play as well as decrease potential fears of re-injury during return to play.

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## **The effect of posture performance shirt providing a passive stretch to the thoracic region and its affect on physiological performance**

Student Researcher: Nouredin Chahrour  
Faculty Advisor: Dr. Jack Goodman  
University of Toronto

Inspiratory muscle fatigue (IMF) of the diaphragm and intercostal muscles can occur during exhaustive exercise and therefore can cause tachypnea (rapid shallow breathing). The metabolic cost of this muscular activity can approach 20% of the total energy cost of exercise (Aaron, Seow, Johnson & Dempsey, 1992). Theoretically, strategies to promote passive breathing during intensive exercise may improve exercise performance by reducing the cost of respiratory muscle work. A wearable garment that promotes passive inspiratory muscular activity may allow for greater transfer of air into the lungs with less energy, by pulling the shoulders back. Therefore, the purpose of this study is to investigate the physiological effects of wearing a purpose-designed shirt that increases passive shoulder and ribcage stretching on respiratory endpoints during exercise. It is hypothesized that the garment will lower the oxygen cost by 2.5-6% of submaximal exercise at 85%  $\text{VO}_2\text{max}$  (Escamilla, 2013).

Participants will be asked to warm up on a motorized treadmill for 5 minutes at a light jog, then the speed of the treadmill will be increased to a pace that can be tolerated comfortably, with the grade increased to 4% every 2 minutes until 85% of heart rate reserved is achieved. Maximal heart rate will be estimated ( $220 - \text{age}$ ), and heart rate will be monitored using the Polar heart rate monitoring device. During exercise (after 5 minutes), ratings of perceived exertion will be recorded. Measures of  $\text{VO}_2$ , breathing frequency and VE will be measured using a metabolic cart (Moxus) with expired gases averaged over a 20s period. The breathing frequency will be measured by taking a time segment of 10 seconds at the end of each 5 minute interval (5, 10, 15 minutes) and calculating an average of breaths per minute in the last minute of each interval. Participants will perform this protocol on two occasions, separated by 2 days but no more than 7 days, wearing the experimental Posture Performance Shirt with, or without the tensions elastic straps retracting the shoulders in random order. All participants need to be cleared and have gone through the PAR-Q+ and been cleared to participate in the study. It is anticipated that (N=10) participants will take part in this study with an equal ratio of males to females, age groups between 18-25. Statistical analysis of this study will be using the paired t-test to determine the difference between the two conditions of wearing the Posture Performance Shirt with the straps on vs. straps off for the dependant variables of  $\text{VO}_2$ , HR, VE. Values will be expressed as means  $\pm$ SD and an alpha level of 0.05 will be used to assess significance (Escamilla, 2013).

This study will provide proof of concept for further future studies. Data collection is ongoing with preliminary data to be presented. Future studies to assess whether the garment is beneficial to clinical populations for correcting postures and taking stress away from certain muscles (especially neck and shoulder muscles) that may be overly stressed during static sitting postures.

## **Health intervention strategies to help prevent musculoskeletal disorders of neck and shoulder pain**

Student Researcher: Nouredin Chahrour  
Faculty Advisor: Dr. Margaret MacNeill  
University of Toronto

*Background:* Musculoskeletal disorder are becoming an increasing burden and is costing the health care system in the US and Canada billions of dollars annually (McGee, 2007). Blangsted et al., (2008) found that self-reported neck pain in office workers was 45.5% in the past 12 months and 18.1% continuous pain. There was also 64.3% of all patients reporting a relationship between neck pain and their current job (Blangsted et al., 2008).

*Purpose:* To examine the ethics and effectiveness of different health communication strategies to prevent or cope with MSD's such as neck and shoulder pain.

*Methodology:* A variety of different communication strategies such as physical, social, and ergonomic factors were depicted. A key word search of the literature was conducted using Medline, PubMed and the University of Toronto Gerstein Library databases. Some articles in the grey literature will also be examined explore some new trends in health communication. Articles that were deemed relevant to the

research topic were included initially based on the abstract. The researcher would systematically read each article to determine its relevance to the topic further.

*Findings:* Health and wellness social media applications (apps) are the number one apps that are being downloaded by mobile users (Kobayashi, 2014). As a consequence some of the apps are infiltrating the users privacy and outsourcing personal information to third parties. Some of the conventional back belts used to reduce back injuries have shown to be causing more harm than good. A study by NOISH (1994) found that back belts gave the workers a false sense of security while wearing the belt. Long term habitual use of the back belt may cause a loss in strength in abdominal muscles which may lead to back injuries when not wearing the belt (OHSA, 2012). Work Station designs for ergonomic interventions in office workers showed positive findings in reducing neck pain (Rempel, Krause, Goldberg, Benner, Hudes, Goldner, 2006) however redesigning work stations can cost a lot.

*Conclusions:* When designing a work style intervention to reduce MSD more research needs to focus on both upstream and downstream approaches to reducing such disorders. More research needs to be conducted on the different intervention strategies.

### **Examining the effects of an acute bout of exercise on learning and long-term memory in younger adults**

Student Researcher: Alexandra Chen  
Faculty Advisor: Dr. Jennifer Heisz  
McMaster University

*Introduction:* School curricula are increasingly prioritizing scholastic education over physical education, leading to a progressively sedentary lifestyle among students. Accumulating evidence suggests that regular physical activity is associated with better academic performance; however, the underlying mechanisms remain unclear. One hypothesis is that the long-term benefits of physical activity on academic performance reflect the accumulation of repeated acute bouts of exercise. An acute bout of exercise improves memory retention for simplistic stimuli, such as pictures and word lists, but has not been examined for more complex academic material. The primary aim for the current study was to examine the effects of an acute bout of exercise on comprehension performance of university lecture content.

*Methods:* Participants consisted of 47 healthy first year undergraduate students of various fitness levels (mean age = 18.5). Participants were randomly assigned to one of three groups: control, exercise prior to learning, and exercise post learning. All participants completed a VO<sub>2</sub>max test to assess aerobic fitness, maximum workload and maximum heart rate. Learning exposure consisted of a 9-minute university web lecture. Comprehension was assessed using two different versions of a multiple-choice test. The test was administered follow a 14-minute delay versus a 48-hour delay to assess the impact of exercise over varying retention intervals.

*Results:* After a 14-minute delay, the exercise and control groups did not differ in their comprehension of the lecture material. However, after a 48-hour delay, comprehension increased for the exercise groups but decreased for the control group, although these differences were not statistically significant.

*Conclusion:* The results of this study suggested that an acute bout exercise has improved memory consolidation over the long-term. This may be due to the neurophysiological stress response induced by exercise. One prominent exercise-induced stress response is the elevation of cortisol levels, which interacts with the hippocampus to impact memory consolidation. Although we only tested a single acute bout of exercise, the cumulative memory benefits built up from regular bouts of physical exercise may underlie the positive association between physical activity and academic performance

## **Characterizing arterial stiffness in individuals with postural orthostatic tachycardia syndrome and Ehlers-Danlos syndrome type III**

Student Researcher: Jem Cheng

Faculty Advisor: Dr. Maureen MacDonald

McMaster University

**Cheng, J.L.**, Au, J.S., Choi, H.L., Guzman J.C., Morillo, C.A., MacDonald, M.J.

**Background:** Postural orthostatic tachycardia syndrome (POTS) is a cardiac autonomic disorder that presents clinically as an abrupt and exaggerated increase in heart rate with a change in posture from supine to upright. Research to date has been inconclusive with respect to the etiology of POTS, but one study suggests that orthostatic intolerance may result from a combination of localized autonomic denervation and increased vascular compliance, both in the lower limb region. Furthermore, a subset of this population tends to have the associated comorbidity Ehlers-Danlos Syndrome type III, a joint hypermobility syndrome that is thought to be a result of abnormal collagen synthesis and deposition. The combination of these disorders may preclude an altered vascular phenotype, which has yet to be investigated in terms of conduit artery stiffness. Characterizing arterial stiffness in this population will lead to a better understanding of the physiology behind POTS+EDS type III, which may allow us to devise more effective treatment strategies.

**Purpose:** To characterize traditional measures of arterial stiffness in POTS+EDS type III individuals compared to healthy age- and sex-matched controls.

**Methods:** A cross-sectional design was applied in a cohort of 6 clinically diagnosed individuals with POTS+EDS type III, and 6 age- and sex-matched controls, between the ages of 18-65 without a history of heart failure. Several vascular properties and characteristics were measured after 10 minutes of supine rest. Primary outcome measures include central, upper limb, and lower limb pulse wave velocity (PWV) obtained using applanation tonometry; local carotid arterial distensibility measured with simultaneous ultrasound imaging and applanation tonometry; and carotid intima-media thickness (IMT) measured with ultrasound imaging 2-5 cm proximal to the carotid bifurcation.

**Preliminary Results:** No differences were observed between the POTS+EDS type III and control groups in carotid elasticity including compliance ( $0.1223 \pm 0.0636$  vs.  $0.1311 \pm 0.0531$  mm<sup>2</sup>/mmHg,  $p \geq 0.05$ ), distensibility ( $0.0045 \pm 0.0027$  vs.  $0.0047 \pm 0.0015$  mm/mmHg,  $p \geq 0.05$ ), and beta-stiffness ( $6.82 \pm 2.65$  vs.  $6.43 \pm 2.24$  mmHg,  $p \geq 0.05$ ). There were also no differences between groups in regional PWV including central ( $7.18 \pm 1.13$  vs.  $6.66 \pm 0.81$  m/s,  $p \geq 0.05$ ), upper limb ( $8.17 \pm 0.66$  vs.  $7.25 \pm 1.11$  m/s,  $p \geq 0.05$ ), and lower limb ( $8.17 \pm 1.49$  vs.  $10.01 \pm 2.71$  m/s,  $p \geq 0.05$ ) pulse wave velocity. Additionally, there were no significant differences in IMT between groups ( $0.52 \pm 0.07$  vs.  $0.52 \pm 0.07$  mm,  $p \geq 0.05$ ).

**Conclusions:** Arterial stiffness is not significantly different between individuals with POTS+EDS type III and healthy controls. It is possible that any medication that these individuals are taking to mediate their symptoms of orthostatic intolerance may be masking some characteristics of their vasculature. In addition, there appears to be a large range in symptomology experienced by these individuals, which may be linked to individual variability in arterial stiffness.

## **The effect of omega-3 supplementation on endurance performance**

Student Researcher: Vanessa Dizonno

Faculty Advisor: Dr. Greg Wells

University of Toronto

**Background and Objective:** Essential fatty acids are critical for proper cell functioning and are known to be an important component in cell membranes. Specifically, omega-3 (n-3) fatty acids have many clinical implications due in part to their anti-inflammatory properties, but its capacity as an ergogenic aid has not typically been considered. Limited research has been conducted to examine the effect of n-3s on adaptations to endurance training measured by changes in endurance performance. The objective of the study was to evaluate the effects of an oral n-3 supplement on endurance performance following 6 weeks of endurance training.

**Methods:** Using a placebo controlled, randomized double-blind study design, recreationally active males ( $n = 7$ , age =  $24 \pm 4$  years, height =  $177 \pm 8$ cm, BMI =  $25 \pm 3$ kg•m<sup>-2</sup>) were either assigned to a n-3 group (sea oil: 2500mg n-3, 255mg DHA and 187.5mg EPA, 2500 IU vitamin D3 and 2500 IU vitamin A) or a placebo group (olive oil: with matched vitamin D3 and A), to be taken twice daily for the duration of the

training period. Anthropometric measurements and maximal oxygen consumption ( $\text{VO}_2\text{max}$ ) data were determined using a graded cycling test during the initial visit, and a 10 km time trial occurred 48 hours after. The exercise intervention for both groups consisted of four training sessions per week for 6 weeks. The first 5 minutes was warm-up cycling at 50W, then 30 minutes of continuous cycling at a heart rate corresponding with 70%  $\text{VO}_2\text{peak}$ . There followed five 2-minute sprint intervals at 95-100% maximal heart rate, each interspersed with a 4-minute period of active recovery at 50%. At least 48 hours after the participants' last training session, a  $\text{VO}_2\text{max}$  test and 10K time trial were completed. Data was analyzed using a two-way ANOVA, and all results are presented as the mean $\pm$ SD. Statistical significance was set at  $p < 0.05$ .

*Results:* Six participants completed the study, with 4 in the n-3 group ( $n = 4$ , weight =  $74\pm 14\text{kg}$ ) and 2 in the placebo group ( $n = 2$ , weight =  $79\pm 7\text{kg}$ ). After training, cycling peak power significantly increased ( $262\pm 77$  vs.  $300\pm 65\text{W}$ ,  $p = 0.002$ ) but a difference between supplement conditions was not apparent. There were no significant changes in absolute  $\text{VO}_2\text{max}$  ( $3.5\pm 1.3$  vs.  $3.3\pm 0.99\text{L/min}$ ,  $p = 0.63$ ), relative  $\text{VO}_2\text{max}$  ( $47\pm 19$  vs.  $44\pm 14\text{mL}\cdot\text{min}^{-1}\cdot\text{kg}^{-1}$ ,  $p = 0.96$ ), or time trial time ( $1107\pm 176$  vs.  $1085\pm 176\text{secs}$ ,  $p = 0.92$ ) following training or between supplement conditions.

*Conclusion:* The present study showed an increase in cycling peak power with 6 weeks of endurance training, but n-3 supplementation had no additional benefit to improvements in endurance measures. Further studies should aim to include larger sample sizes in order to advance scholarly research in the field.

### **Caffeine: Just a buzz or a great performance enhancer?**

Student Researcher: Tarun Fernandez  
Faculty Advisor: Dr. Mazen Hamadeh  
York University

Caffeine is a stimulant drug that is found in products such as coffee, chocolate, painkillers, and colas. Caffeine activates the pleasure centers in the brain, increases heart rate and causes arterial constriction, which are hypothesized to be the cause of the ergogenic effects observed. Studies on resistance training remain scarce and more clarity is required due to both significant and not significant results (muscle endurance has shown to be significant, while 1 RM have mostly not). The literature for caffeine and high intensity exercise are limited as well; however, it currently shows a strong correlation between caffeine intake and improved performance in sprints and jump height. Research on caffeine in sport has mostly been conducted on endurance-based exercise and has shown significant increases in performance in users and nonusers. Lastly, caffeine has shown to be ergogenic in maintenance of skill and cognitive function, such as field hockey dribbling, accuracy, passing, alertness, etc.), following fatiguing protocols. The doses found to produce ergogenic effects for resistance and high-intensity exercise have the potential of producing side effects such as insomnia, jitters, and nausea, which is why caution is advised for high intakes of caffeine. Caffeine capsules, gum, and powder have shown to produce significant effects on performance, while caffeinated mouthwash (possibly due to not enough absorption), coffee (potential interference from other compounds), and energy shots (no way to isolate caffeine), have conflicting results. To address the gaps in the literature, future research should focus on resistance training, effects of various modes of caffeine supplementation, the use of coffee as a supplement, and reaction time/skill maintenance.

### **MoveU Match: Focus groups**

Student Researcher: Joanna Goulas  
Faculty Advisor: Dr. Guy Faulkner  
University of Toronto

MoveU Match is a community-partnered university-wide health initiative that looks to increase physical activity participation amongst female undergraduate students. MoveU Match will be developed as an exercise partner matching system for female university students and will examine the changes in physical activity, social support and connectedness, and physical and mental health outcomes. This research project is phase one of MoveU Match, consisting of semi-structured focus groups that will create a list of qualities and characteristics that individuals look for in an exercise partner and the effect that social support may have on exercise interventions. The focus groups will consist of first year female undergraduate students at the University of Toronto, to target the specific transitional period into undergraduate life. This transitional period is a time where physical activity interventions may not be of the highest priority as students are learning to balance school and social aspects of their lives. The data

obtained from these focus groups will be utilized in the implementation of the MoveU Match program to offer crucial information of the characteristics and qualities that females look for in an exercise partner. This project is a work in progress.

### **The influence of reduced daily ambulation on skeletal muscle and physical function in older adults**

Student Researcher: Micaela Gregory  
Faculty Advisor: Dr. Stuart Phillips  
McMaster University

The age related loss of muscle mass and strength, collectively termed sarcopenia, is a major risk factor for increased disability and mortality (Suetta et al., 2009). The ability to preserve muscle mass and function is therefore vital to support healthy aging and maintenance of quality of life in the elderly. Sarcopenia commences in the 5<sup>th</sup> decade of life and proceeds based on current estimates at 0.8% annually with strength losses occurring at an even more precipitous rate of 2-5% per year (Hughes et al., 2001). However, it is important to highlight that this loss of muscle mass and strength with advancing age does not occur linearly (Janssen, Heymsfield, & Ross, 2002). In fact, elderly individuals often experience brief bouts of inactivity exacerbating sarcopenia from which they often fail to fully recover (Suetta et al., 2009; Wall, Dirks, & Loon, 2013). These periods of inactivity or muscle disuse manifest from a variety of situations such as homebound convalescence and/or hospitalization and our laboratory has shown that even two weeks of reduced ambulation, amounting to 1500 steps per day resulted in an average loss of muscle of 4% per day in both older men and women (Breen et al., 2013). Moreover, this loss was associated by a 26% reduction in postprandial rates of muscle protein synthesis (MPS). Taken together with others these data demonstrate the potentially serious implications physical inactivity and muscle disuse has for long-term health and function. Yet, what requires further investigation is how decrements in physical activity impact long-term rates of MPS between sexes. It has been shown that older women may be less responsive to anabolic stimuli, such as protein ingestion and resistance exercise than males rendering them at higher risk for age-related muscle loss (Smith et al., 2012). Additionally, little work has been conducted that characterizes the time course of recovery of skeletal muscle mass and strength in older adults following a period of inactivity. Therefore, we aim to capture changes in rates of MPS that incorporates periods of fasting and feeding during, and in recovery from, two weeks of step reduction. We also will assess changes in skeletal muscle function and mass at corresponding time-points as secondary measures. We hypothesize that; 1) two weeks of step reduction will cause a reduction in rates of MPS and 2) after a two-week return to habitual activity skeletal muscle mass and function will not be fully recovered and that this effect will be more pronounced in women vs. men. It is hoped that these data will provide critical information for scientists and medical practitioners alike who aim to develop countermeasures to combat sarcopenia.

### **Amount, type, and timing of habitual dietary protein intake in active populations**

Student Researcher: Sarkis Hannaian  
Faculty Advisor: Dr. Daniel Moore  
University of Toronto

Protein is the macronutrient that is often deemed to be most essential for resistance trained populations given its role in stimulating protein synthesis (MPS) for the repair and accretion of skeletal muscle. The current recommendations for dietary protein in resistance-trained athletes are ~60-125% greater than the Recommended Daily Allowance (RDA) for sedentary individuals. Regardless, both sedentary and resistance trained populations generally meet or exceed these values of protein ingestion when consuming a diet with adequate energy. Although a recommendation of how much protein a population should ingest has been established, there is no indication regarding how the recommended intake should be distributed throughout the day. Contemporary research has shown that the typically unbalanced protein intake of Western diets results in a suboptimal stimulation of MPS (which primarily regulates muscle mass in healthy individuals) both at rest and after exercise. In addition, consuming a moderate (~0.25g/kg) amount of protein after exercise is essential to enhance MPS during recovery. Therefore, it is important to understand how different populations consume protein to determine if it is optimal or can be refined to meet their goals for muscle tissue accretion. To assess the habitual dietary patterns of different active populations, we aim to recruit 20 resistance trained (T) and 20 non-resistance trained (UT) males aged 18-30. Based on questionnaires related to training habits, resistance trained individuals will be defined as those who participate in resistance exercise (e.g. bodybuilding, power lifting or weightlifting) for at least 6 months at a frequency of  $\geq 3$  times a week. Using air displacement plethysmography (BOD POD), body composition measures will be collected to determine fat mass and fat free mass (FFM).

Participants will be required to complete a 4-day training log and food record. Total macronutrient consumption and distribution throughout the day will be analyzed on an online nutrition database (MyFitnessPal). Macronutrient distribution throughout the day will be determined by assessing intakes over six consecutive 4-hour periods (beginning at midnight) and around training by  $\pm 1$  hour before and after exercise. Data over the 4-days will be averaged and normalized to both body weight and FFM. A two-way ANOVA (group x time) will be used to determine differences in total macronutrient consumption and distribution between T and UT. Independent t-tests will be used to determine differences in macronutrient intake around exercise. For all tests, significance will be accepted at  $P \leq 0.05$ , to understand the habitual dietary patterns of populations. We hypothesize that resistance trained populations will consume a greater daily amount and will more evenly distribute dietary protein consumption throughout the day compared to untrained populations.

**Examining the viewpoints of grade 5/6 students on self-efficacy and perceived exertion in relation to daily physical activity participation: A mixed methods study**

Student Researcher: Jacqueline Harvey

Faculty Advisor: Dr. Erin Pearson

Lakehead University

*Background:* The physical education (phys-ed) curriculum is not implemented consistently within Ontario's Public Schools. Furthermore, the Active Healthy Kids Canada 2014 Report Card indicates that only 7% of children between the ages of 5 and 11 years, and 4% of youth between the ages of 12 and 17 are meeting physical activity guidelines. Thus, school boards strive to engage all elementary students in 20 minutes of daily physical activity (DPA), which has been shown to increase health and self-efficacy for physical activity (PA). In school-based PA interventions, data have revealed that children with higher self-efficacy scores for phys-ed and DPA are more likely to continue to participate. Moreover, children are more likely to participate in vigorous-intensity exercise at school if they completed the activity previously and did not perceive their perceived exertion (PE) to be too high. In light of the important links between self-efficacy, PE, PA participation, and health, more research is needed to explore the PA culture within elementary schools in order to determine optimal methods for increasing engagement.

*Purpose:* It is the aim of this mixed methods research project to examine the relationships between self-efficacy, PE, and student DPA levels as they relate to PA engagement among Lakehead Public School elementary students. Specifically, the perspectives of elementary students will be explored using focus groups to identify facilitators and barriers to PA; a series of validated questionnaires will be used to examine self-efficacy for PA and PE. Based upon the results of previous studies, the quantitative hypothesis of this research project is that individuals with higher self-efficacy will have lower levels of PE and higher levels of PA engagement.

*Methods:* A trained moderator will use a semi-structured interview guide to conduct the focus groups with Lakehead Public School grade 5/6 students. Preceding each focus group, participants will be asked to complete a series of questionnaires assessing self-efficacy (Sports, Play, and Active Recreation for Kids Student Survey), PE (Pictorial Children's Effort Rating Table), and PA engagement (Physical Activity Questionnaire - Children). Quantitative data analysis will integrate SPSS analytic software to calculate descriptive statistics, and a Pearson bivariate correlation analysis will be used to identify relationships between the dependent variables.

*Findings:* Data analysis is ongoing. Preliminary findings from the focus groups indicate that barriers to PA participation at school include a lack of PA opportunities, technology (e.g., cell phones) being permitted at recess, and heightened emphasis being placed on academics. Preliminary quantitative results have shown that students have varied self-efficacy scores, and low PE in relation to phys-ed and DPA participation.

*Conclusion:* By examining student PA views, it is anticipated that the results will be used to inform the development of future interventions whereby a holistic approach to increasing PA engagement within schools can be taken.

## **Influence of verbal coaching cues on the “lifting” and “lowering” phases of a lifting task**

Student Researcher: Steven Hirsch

Faculty Advisor: Dr. David Frost

University of Toronto

*Introduction:* Since work-related musculoskeletal loading demands are perhaps the most practical of all mechanical exposures in the workplace to control, efforts to prevent lumbar spine injuries could reduce the direct and indirect costs associated with injury while also increasing workplace safeness and productivity. Because perceptions of task instructions may vary among individuals (Wulf et. al, 1998), the influence of different coaching cues may vary unless a worker considers how a weight is both lifted and *lowered*. The global aim of this study is to examine the influence of different verbal lifting-task instructions by contrasting lumbar spine motion during the lifting and lowering phases of a lifting task.

*Methods:* Data was collected from a population of 13 males aged 21.15 +/-1.06 years and 14 females aged 22.17 +/-2.74 years with majority having a kinesiology background. Participants were instructed to lift first with a verbal cue that did not draw attention to maintain a neutral spine throughout the lift and another verbal cue that did draw attention to maintaining a neutral spine. Retro-reflective spherical markers were taped to the skin overlying medial and lateral aspects of their upper- and lower-body segment endpoints. An optoelectronic motion capture system (Oqus 100, Qualisys AB, Gothenburg, Sweden) was used to continuously track the trunk, knee, and lumbar spine angle throughout the lifting and lowering phases within a calibrated measurement volume of 64hz. The marker coordinates were then incorporated into a commercial biomechanical modeling software package (Visual3D, C-Motion, Inc) to construct a linked-segment representation of participants' lower- and upper-body. The two-way ANOVA test with a Tukey's post hoc test was used in order to determine the differences in trunk, knee, and lumbar spine motion between the lifting and lowering phases, with and without a load, with respect to the two verbal cues utilized.

*Results:* There was a statistically significant reduction in trunk ( $p<.01$ ), knee ( $p=.03$ ), and spine motion ( $p<.0001$ ) throughout both the lifting and lowering phases when attention was drawn to a neutral spine with a verbal cue. There was no statistical significance between the trunk ( $p>.05$ ), knee ( $p>.05$ ), and spine ( $p>.05$ ) motion when comparing both the lifting and lowering phases with and without a load regardless of whether or not a verbal cue was used to draw attention to a neutral spine. The results of the Tukey's post hoc test are still pending.

*Discussion/Conclusion:* Although a verbal cue to maintain a neutral spine reduced trunk, knee, and lumbar spine flexion in the participants, there was still a large amount of lumbar spine flexion present during both the lifting and lowering phases. Also, there was great variability between trunk, knee, and spine motion when contrasting the lifting versus the lowering phase regardless of the verbal cue utilized. Besides using a verbal cue to coach workers into a neutral lumbar spine, other interventions should be considered when attempting to cue workers to safely lift and lower a load in order to decrease the likelihood of workplace injury. In addition, a verbal cue drawing attention to a neutral spine influences varies how an individual lifts versus lowers a weight, highlighting the importance of matching intervention strategies to each individual person.

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## **Characterizing the location and extent of muscle damage following lengthening contractions at variable velocities**

Student Researcher: Danielle Hirsh

Faculty Advisor: Dr. Marius Locke

University of Toronto

Lengthening muscle contractions are known to damage human and animal skeletal muscles. The extent of damage depends on a number of factors and may not be uniformly distributed throughout a muscle. At present, the effect of the velocity of contraction on the extent and the distribution of damage remains

unclear. To investigate this relationship, male Sprague-Dawley rats had one tibialis anterior (TA) electrically stimulated 60 times (3 sets of 20 repetitions) while being forcefully lengthened at either a fast (n=1), medium (n=1), or slow (n=1) velocity of contraction. Twenty-four hours later, both stimulated and non-stimulated (contra-lateral control) muscles were removed and divided into 5 approximately equal portions that were processed for Hemotoxylin and Eosin staining. It was hypothesized that the velocity of contraction will moderate the extent of muscle damage and that differences in the distribution of damage will be evident at the musculotendinous junction. This influence may be related to the time under tension which is increased at slower velocities or the elastic role of the tendon during eccentric loading. Experiments are ongoing and the distribution of muscle damage and force data will be extracted and analyzed concurrently. Preliminary data indicates a loss of peak force in all velocity conditions. Hemotoxylin and Eosin stains will be analyzed and muscle damage quantified using ImageJ software. Findings may permit a better understanding and characterization of experimental muscle damage. Should results indicate that velocity affected the extent of muscle damage, further experiments should control for time under tension to elucidate the mechanism.

*Keywords:* eccentric exercise, muscle damage, skeletal muscle

### **Experiences of bullying and cyberbullying in inter-university athletics**

Student Researcher: Rachel Jewett

Faculty Advisor: Dr. Gretchen Kerr

University of Toronto

Bullying is a form of intentional and repetitive aggression which can be direct or indirect, and includes hostile physical, verbal, or relational behaviours (Olweus, 1993). Cyberbullying is the use of information and communication technologies as a vehicle by which to bully (Bonanno & Hymel, 2013). Negative outcomes related to being a victim and/or perpetrator of bullying include substance use, engagement in unsafe sexual practices, violent or suicidal behaviour, feelings of sadness and anxiety, low self-esteem, and depression. The existing literature on bullying and cyberbullying focuses primarily on students in elementary and secondary schools while a significant gap remains in the study of such behaviours in tertiary education and specifically in sport contexts. The purpose of this study therefore was to investigate the nature of inter-university athletes' experiences with bullying and cyberbullying through the perspectives of team captains. Seven male (n=4) and female (n=3) team captains were interviewed from four different sports and their responses were analyzed thematically. Results indicated that team captains were extremely confident in their awareness of interpersonal conflicts among the athletes on their teams and they perceived themselves as having a unique role in mediating such issues. A variety of bullying experiences were reported with relational bullying behaviours being the most common. Finally, power imbalances, age of athletes, skill level, and team culture influenced vulnerability for victims and perpetrators of bullying. Implications of this study include an awareness of the bullying experiences of a population which has been understudied in contemporary bullying literature, those of inter-university athletes.

### **Kinesiological notions of the Human Body: A critical analysis of the formation of perspectives in an undergraduate program**

Student Researcher: Derek Johnston

Faculty Advisor: Dr. Michael Atkinson

University of Toronto

Kinesiology as a field of study is one that ostensibly focuses on the scientific study of human movement, performance and function through anatomical, physiological, biomechanical and psychological means. Thus, with the dominant form of human movement related study shifting from 'physical education' to 'kinesiology', hard science conceptualizations are becoming favored as the dominant way for students of human movement to know and perceive the human body. This shift signifies a need for inquiry into how kinesiology education and curriculum influences students and how this translates to future educational and clinical praxis. Therefore, this descriptive study set out to explicate the relationship between undergraduate kinesiology pedagogy and students' perceptions of the body from 1st to 4th year. The goal of this study is not to present an incontrovertible account of how kinesiology programs shape students' perceptions of the human body, but rather a theoretically informed and empirically grounded illustration of how the epistemological hierarchy found within kinesiological academia (Andrews, 2008) normalizes how students 'see' the body.

The theoretical framework of this study draws on sociological discourses of power and ideology in dialogue with Goffman (1959) and Blumer (1969) interactionist theory and Elias (1987) notion of the hinge. As such, this study holds true to an interactionist interpretive paradigm by employing a mixed methods approach that integrates autoethnographic reflexivity with qualitative techniques of surveying and interviewing. The findings indicate that students value objective and quantifiable knowledge about the body more than subjective and interpretive knowledge, and that this perception is largely a product of the contextual nature of kinesiology within the dominant social structure. More research is needed to illuminate how this perception becomes embodied in clinical and educational practice in order for bioethical considerations to be explored that will allow for further well-informed development of this field.

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#### **Motor contagion and the effects of sensorimotor training**

Student Researcher: Orion Katayama

Faculty Advisor: Dr. Timothy Welsh

University of Toronto

Performing a movement while simultaneously observing another similar but incongruent movement has been shown to elicit an involuntary deviation towards the observed incongruent action. This phenomenon is referred to as motor contagion and is thought to arise from activation of the mirror neuron system interfering with the action. Previous research has demonstrated that motor contagion is sensitive to prior sensorimotor experience with the observed movement, but it has yet to be determined if this is a result of experience from sensory-specific information. It has been suggested that all perception-action coupling is specific to the sensorimotor experience attained, and therefore action-observation tasks should be specific to the visual domain. The present study was conducted to identify if sensorimotor experience in the visual domain is required to induce motor contagion, and if this effect is heightened subsequent to practice. Participants completed horizontal and vertical cyclical arm movements while simultaneously watching video sequences of an actor making either congruent or incongruent arm movements with the same trajectory and timing. Participants were instructed to match the timing of the actor in the video as they completed the instructed movements (i.e., either horizontal or vertical), and were randomly assigned to either a vision or no vision condition. In the vision condition, participants would practice horizontal arm movements while fixating on their distal 1<sup>st</sup> digit. In the no vision condition, participants would practice horizontal arm movements while blindfolded. Analyses of the variance in movement from pre-test to post-test revealed that the stimuli failed to induce a significant motor contagion effect that has been demonstrated consistently in previous research. Reasons for this may be attributed to a lack of statistical power with respect to the number of participants, or could have been a problem with how the actor in the video was presented to the participants. Contrary to our hypothesis, a non-significant trend of decreased congruency over time for the practiced movement was observed, suggesting a decrease in motor contagion after training in this condition. This may be because as participants increase their familiarity of the movement pattern and timing, they require less cognitive resources to complete the task, thus; reducing the motor contagion effect from the video stimuli while completing the movement. Future research is necessary to clarify how sensorimotor specific training effects motor contagion.

#### **Barriers to active lifestyles among university women of South Asian heritage**

Student Researcher: Leila Keshavjee

Faculty Advisor: Dr. Margaret MacNeill

University of Toronto

*Background/Rationale:* South Asians are one of fastest growing ethnic groups in Canada (Statistics Canada, 2007). Research clearly indicates this group is at a high risk for cardiovascular disease, diabetes and other metabolic diseases throughout the lifespan (Gholap, Davies, Patel, Sattar, & Khunti, 2011). Moreover, there are many barriers facing minority women that hinder participation in physical activity

(Nakamura, 2003; Joseph, 2003). While there has been 40 years of research into gender issues in physical culture, very little research has examined the intersections of race and gender (Darnell, Joseph, & Nakamura, 2012). This research seeks to fill this significant gap in the literature.

*Purpose:* The purpose of this research is to investigate opportunities and barriers to living physically active lifestyles among young women of South Asian heritage, between the ages of 18 and 25, who are students at the University of Toronto

*Methods:* A qualitative and semi-structured interview approach was employed. Snowball sampling was used to recruit 20 participants.

*Preliminary Findings:* Engagement in physical activity by women of South Asian heritage at the University of Toronto varied significantly. The interviews revealed specific barriers to participating in physical activity. All participants state 'lack of time' as the primary reason for not engaging in physical activity. Many research participants were unaware that campus programs for women-only exist and the majority of interview participants did not feel comfortable in the Strength and Conditioning Centre at the Athletic Centre or the Weight Room at Hart House. Finally, some individuals feel they cannot utilize the women-only times because they do not know how to swim or how to use weights.

*Conclusion and Recommendations:* Based on the findings, participants who are physically active come from physically active families. Less physically active individuals state that the current drop-in options do not interest them and cost limits them from paid programs. Some recommendations would be to offer drop in South Asian dance classes and more women-only programs. In addition, since many participants are not familiar with some of the intramural sports, free beginner programs would give them an opportunity to later join intramural teams or attend drop-in sports.

### **Managing knee osteoarthritis in an academic primary care practice: opportunities for improvement**

Student Researcher: Leila Keshavjee  
Faculty Advisors: Dr. Greg Wells & Dr. Noah Ivers  
University of Toronto

*Purpose:* To describe the current management of knee osteoarthritis (OA) at Women's College Hospital as a first step to optimize the management of knee OA in primary care environments.

*Methods:* An algorithm was developed to identify patients with knee OA in the electronic medical record (EMR). The initial search criteria identified 2210 patients. The exclusion criteria included patients 40 and under and patients with a diagnosis of inflammatory arthritis (rheumatoid arthritis or lupus). A chart review was then conducted and patients were excluded if the chart did not indicate a diagnosis of knee osteoarthritis. A diagnosis of knee OA was confirmed by x-ray or family practice/specialist clinical assessment. This resulted in a final cohort of 814 patients with a confirmed diagnosis of knee OA. Patient characteristics and management of the knee OA were then extracted.

*Results:* 814 (8%) family practice patients over the age of 40 had knee OA. Of those with confirmed knee OA, 183 (22.4%) were male and 631 (77.5%) were female. The mean age of patients was 65. BMI was reported in 513 (63%) patients. The mean BMI was 29.6. 450 (55.3%) patients had OA indicated in their current problem list and 561 (68.9%) patients had a knee x-ray completed. 436 (53.6%) patients were being managed in family practice and had not been referred to sports medicine, orthopedics or rheumatology. 495 (60.8%) patients received counselling on lifestyle interventions for their knee OA which included weight loss and/or physiotherapy. 397 (48.8%) patients were recommended to try acetaminophen and/or an oral anti-inflammatory, 45 (5.5%) opioids, 76 (9.3%) steroid injections and 100 (12.3%) topical medication.

*Conclusion:* Knee OA is a prevalent medical problem in family practice. Counselling on lifestyle interventions for knee OA is not optimized given the evidence of its effectiveness and the prevalence of obesity in the population. These results formed the basis of a quality improvement project to optimize the management of knee OA in primary care that is currently being piloted.

## **Comparison of lower extremity joint kinematics and kinetics between single-leg squat variations: Incorporating biomechanical criteria in the processes of injury risk assessment and exercise prescription**

Student Researcher: Steven Khuu  
Faculty Advisor: Dr. Tyson Beach  
University of Toronto

*Introduction:* The bodyweight single-leg squat (SLS) is commonly used as a qualitative movement-screening tool during clinical assessments, and movement patterns exhibited during these assessments are used to assess injury risk and guide exercise prescription (Kritz, 2012). Despite widespread use of the SLS as both a movement-screen (Kritz, 2012) and lower-extremity strengthening exercise (Beacehle & Earle, 2008; Clark & Lucett, 2010), it is unknown if/how the position of the elevated foot influences SLS performance and associated interpretations.

*Objective:* The objective of this proposed research is to quantify stance-leg joint kinematics and kinetics during three variations of the SLS.

*Methods:* Twenty (10 men, 10 women) recreationally active and injury-free individuals will be recruited to participate in a one-hour testing session. Retro-reflective markers will be attached to the participant's feet, shanks, thighs, pelvis, and trunk before they perform three variations of the SLS (i.e., elevated foot behind, beside, and in front of the stance leg). Using Visual 3D™, kinematic and kinetic signals will be smoothed ( $F_c = 12$  Hz) and input into an inverse dynamical linked-segment model of the body to yield estimates of the net joint moments about the hip, knee, and ankle. The SLS motion will be separated into eccentric ("downward") and concentric ("upward") phases. Using a within-participant design, discrete kinematic and kinetic values (i.e., peaks and averages) will be extracted and compared between each SLS condition and phase using a general linear model ANOVA ( $\alpha = 0.05$ ). Least square means procedures will be run to interpret any significant main and/or interaction effects.

*Expected Results:* Internal biomechanical load-sharing patterns are highly sensitive to the way in which movements are coordinated and controlled because the kinematics and kinetics of complex mechanical systems are intrinsically linked (Zajac, 1993). Therefore, we hypothesize that stance-leg kinematics and kinetics will differ significantly between the SLS variations. The findings from this research will be relevant to practitioners in two ways: (1) the sensitivity and specificity of lower extremity injury risk assessments may be improved by controlling position of the elevated foot during the SLS; and (2) more targeted training adaptations may be elicited by systematically varying the position of the elevated foot during the SLS.

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## **A "light" task: An optimal limb velocity for limb regulation processes?**

Student Researcher: Tiffany Lung  
Faculty Advisor: Dr. Luc Tremblay  
University of Toronto

Most activities of daily living benefit from the use of visual information. In experimental settings, unconsciously displacing feedback about the hand position during upper-limb reaching movements can be adequately corrected (e.g., Saunders & Knill, 2003; Saunders & Knill, 2005; Sarlegna et al., 2004; Proteau, Roujoula, & Messier, 2009). These investigations found that there is a consistent latency before the use of perturbed information for corrective action, regardless of when in the reaching trajectory this perturbation occurs. As a result, these studies were viewed as supporting the pseudocontinuous model of online control (Elliott et al., 1991). One possible explanation for the support of this control model is because the hand position perturbations were based on time, and consequently results in the perturbations occurring at different limb-velocities. This contrasts the importance of velocity in goal-directed movement planning (e.g., Churchland et al., 2006). However, Tremblay et al. (2013) showed that

manipulating vision availability when the limb velocity was in the vicinity of 0.8 m/s significantly altered endpoint variability; thus, providing evidence for an optimal moment for limb impulse regulation (i.e., within the multiple processes model of online control: Elliott et al., 2010). The current study aimed to re-assess impulse regulation and determine if it occurs pseudocontinuously throughout a movement and/or optimized at critical limb velocities. Participants were asked to point as fast and accurate as possible to a LED target 30 cm away in the sagittal plane, which was shown prior to movement start, in an otherwise completely dark room. Critical to this study, participants were pointing while seeing one of two LED(s) secured to their finger (i.e. 2 cm apart). The proximal LED was viewed prior to each trial but the distal LED could be lit after movement initiation (i.e. jump or perturbed trial). In the familiarization phase, electrooculography was employed to ensure participants were fixating at the target location throughout the movement. The order of perturbed and non-perturbed trials was randomized such that there would be no more than two consecutive perturbed trials. The experimental phase consisted of four experimental conditions presented in blocked order: full vision (i.e. vision of the target and finger LEDs), and windows of vision (i.e. vision of only the finger LED for 20 ms) at limb velocities of 0.4, 0.8, and 1.2 m/s. All participants started with the full vision block, followed by the window blocks in a counterbalanced order. It was hypothesized that if impulse regulation is optimized at a limb velocity of 0.8 m/s (cf. 0.4 or 1.2 m/s), then the shift in endpoint bias would be greater and the deceleration phase duration (i.e. time after peak velocity) would be shorter when perturbing the limb LED at 0.8 m/s compared to 0.4 or 1.2 m/s. The results will be reported and discussed in the context of the pseudocontinuous and multiple-processes models of online control.

### **The effect of statins on the production of ATP via oxidative phosphorylation in pancreatic insulin secreting MIN6 clonal cells**

Student Researcher: Maansi Malhotra  
Faculty Advisor: Dr. Robert Tsushima  
York University

*Background:* Mitochondria are vital for synthesizing ATP through oxidative phosphorylation. ATP is required to maintain cell viability and cellular processes. In pancreatic beta cells, ATP is an important factor for regulating insulin secretion. Elevation in extracellular glucose and fatty acids stimulate the release of insulin through the increased production of ATP, which can be regulated via the cholesterol biosynthesis pathway. Therefore, manipulation of the cholesterol synthesis pathway leads to changes in mitochondrial ATP production. In skeletal muscle, inhibition of cholesterol synthesis impairs ATP production, however less is known about how this pathway controls oxidative phosphorylation in beta cells.

Cholesterol synthesis can be reduced using HMG-CoA reductase inhibitors (i.e. statins). HMG-CoA reductase plays a significant role in the production of cholesterol in the liver as it is the rate limiting enzyme. Although statins effectively treat CVD in the early stages of the disease, they may be associated with an increased risk of diabetes due to the dysregulation of ATP production in beta islet cells. Hence, manipulating ATP production could possibly affect the regulation of insulin secretion.

*Objective:* The purpose of this study was to investigate the impact of inhibiting the cholesterol synthesis pathway via HMG CoA reductase inhibitors on mitochondrial ATP production.

*Methods:* Mitochondrial O<sub>2</sub> respiration was measured using Oroboros high resolution respirometer from MIN6 clonal beta-cells treated in the absence or presence of statins under very acute (instant), acute (2 h) or chronic (48 h) periods. Three statins were used to analyze this phenomenon: fluvastatin, pravastatin and atorvastatin. A one-way ANOVA was used to determine the difference between the treatments, with Neuman-Keuls used as a post hoc test. Significance was established at  $P \leq 0.05$ .

*Preliminary Results:* There were no significant results, however they were physiologically relevant. For the acute treatment (2 h), O<sub>2</sub> consumption was lower by 22% and 14% when treated with fluvastatin and pravastatin, respectively, compared to the control. Under chronic treatment (48 h), O<sub>2</sub> consumption was lower by 38% and 34% when treated with fluvastatin and pravastatin, respectively, compared to the control.

*Conclusion:* This ongoing study has shown that some statins decrease O<sub>2</sub> consumption. Further analysis is required to clarify the effect of statins under very acute conditions. Thus, this study may reveal the importance of the cholesterol synthesis pathway in regulating mitochondrial function in pancreatic beta-cells.

## **The effect of kinesiotaping on vertical jump height and muscle electromyographic activity of the gastrocnemius and soleus**

Student Researcher: Ian MacDowall  
Faculty Advisor: Dr. Paolo Sanzo  
Lakehead University

*Background:* The Achilles tendon is the strongest tendon in the human body, however, many individuals suffer from pain and discomfort in this region due to Achilles tendinopathy. There are a variety of conservative treatments that are used to both prevent and treat Achilles tendinopathy including therapeutic taping. Kinesio tape has become increasingly popular in recent years in the treatment of musculoskeletal injuries including Achilles tendinopathy.

*Purpose:* The purpose of this study was to examine the effect of kinesio tape on vertical jump height and calf electromyographical (EMG) muscle activity in healthy varsity athletes.

*Methods:* Twenty healthy subjects free of lower extremity injuries or surgeries participated in the study (15 females and 5 males; aged 20.45 +/- 2.45 years; height 176.26 cm +/- 6.49; weight 66.65 kg +/- 8.52). These participants were members of the varsity basketball, volleyball, and/or track and field teams. After completing a uniform warm-up, each participant performed four different maximal vertical jumps: a one footed countermovement jump, a two footed countermovement jump, a one footed static jump, and a two footed static jump. Upon the completion of these four jumps, an Achilles tendinopathy kinesio taping technique was applied to the dominant leg of the individual. Once the tape was applied, the individual performed the same four jumps in an identical order. Three trials were performed for each jump type with and without the application of tape, and the mean height of the three jumps (cm) was compared. The mean EMG value (mV) of the three trials was also recorded and compared. The vertical jump height was measured using a Vertec device while EMG activity was measured by a Delsys Trigno Wireless EMG System with wireless EMG sensors placed on the gastrocnemius and soleus muscles.

*Analysis and Discussion:* The data obtained from the study has yet to be quantitatively analyzed. However, it has been evident that there are trends within the results. There is a distinct improvement in the one footed static and two footed countermovement vertical jump heights in many of the participants with tape, in comparison to no tape. It was also found in many of the participants, that the application of the kinesio tape did not affect the vertical jump height in either the two footed static jump or the one footed countermovement jump. The results of the EMG activity of the gastrocnemius and soleus muscles are also awaiting further examination. It is hypothesized based on our preliminary evaluation of the data, that the EMG values will increase in the gastrocnemius and soleus muscles and that there will be an increase in the vertical jump height with the application of tape for each jumping technique compared to the no tape condition.

*Conclusions and Future Direction:* Future research on a pathological population with Achilles tendinopathy comparing different types of tape would be beneficial to determine the effect of therapeutic taping on the vertical jump height and calf EMG muscle activity.

## **Inter-group differences in visual accuracy between undergraduate kinesiology students when observing lifting tasks via video based on their year of study**

Student Researcher: Ernest Ralph Manalo  
Faculty Advisor: Dr. David Frost  
University of Toronto

*Purpose:* The ability to observe spine flexion range of motion is critical to the evaluation and interpretation of an individual's movement patterns, and thus to the design of exercise- and education-based musculoskeletal injury prevention training interventions. This project aims to contrast the visual accuracy of first, second, third and fourth year undergraduate kinesiology students. It was hypothesized that fourth year students will exhibit superior observation skills compared to their junior peers.

*Methods:* Forty undergraduate kinesiology students will be recruited from the Faculty of Kinesiology and Physical Education at the University of Toronto. Each participant will complete an online survey that requires them to observe a series of videos of men and women performing a lifting task using a range of spine curvatures. After watching each video, participants will be asked to state the extent to which the performer flexed their lumbar spine (i.e. peak spine flexion angle). Visual accuracy of the participants will be measured by contrasting the qualitatively observed spine motion to the spine flexion angle computed

using a motion capture system in a biomechanics laboratory (i.e. quantitative measurement). The mean and standard deviation of the difference between the quantitative and qualitative score will be computed for each year of study. A one-way ANOVA will be used to examine the impact of year of study. Statistical differences will be described by p-values less than 0.05.

*Findings:* We hypothesize that there will be a positive trend between year of study and visual accuracy. It is expected that the fourth year students will exhibit a greater ability to visually estimate the maximum lumbar spine flexion angle while observing a lifting task. Further analyses will be conducted upon completion of data collection.

*Conclusion:* If a positive relationship is found between year of study and visual accuracy, the results of this study may help to inform the education of Kinesiology students, and the design of educational tools that improve the observation skills of professionals who rely on visual observation to make informed decisions (e.g. ergonomist, physical therapist, kinesiologist). Ultimately, the ability to observe motion characteristics such as spine motion could assist with the implementation and evaluation of any exercise- or education-based musculoskeletal injury prevention training intervention.

### **The effect of resistance exercise load on changes in muscular strength and hypertrophy in young, resistance-trained males**

Student Researcher: Nicole Mazara  
Faculty Advisor: Dr. Stuart Phillips  
McMaster University

*Background:* Resistance exercise training (RET) is known to promote skeletal muscle hypertrophy and strength. However, the prescription of RET that induces optimal increases in hypertrophy and strength remains unclear as results from current guidelines have produced conflicting findings. Previously, we have shown that repetition load has a limited effect in RET-induced gains in muscle strength and size in an untrained population as long as volitional failure is achieved<sup>1</sup>. Yet, this hypothesis remains to be experimentally corroborated in a trained population. The purpose of this study was to determine the effects of 12 weeks of supervised whole body RET on skeletal muscle strength and hypertrophy in trained individuals.

*Methods:* In a randomized, non-blinded design, 31 resistance-trained men (18-30 yr) were divided into a high-repetition load group (HRG, n=16) performing 20-25 repetitions per set to volitional failure and a low-repetition load group (LRG, n=15) performing 8-12 repetitions per set to volitional failure. Both exercise groups performed 3 sets per exercise with 1 minute of rest between sets. Skeletal muscle strength was assessed pre and post intervention using 1-repetition maximum (1RM) tests for leg press, bench press, shoulder press and dominant-limb leg extension. Changes in appendicular lean mass (ALM) were assessed pre and post RET using a dual-energy x-ray absorptiometry (DXA).

*Results:* In response to RET there were significant increases in strength pre- to post-training in both the HRG and LRG for leg press ( $p < .001$ ), leg extension ( $p < .001$ ), shoulder press ( $p < .001$ ) and bench press ( $p < .001$ ) with no significant differences between groups. Similarly, ALM increased significantly pre- to post-training in the HRG ( $0.847 \pm 0.317$  kg;  $p < .001$ ) and the LRG ( $1.282 \pm 0.329$  kg;  $p < .001$ ) with no significant differences between groups post-training ( $p = 0.364$ ).

*Conclusions:* These data show that RET performed to volitional failure with either a repetition range of 20-25 or 8-12 induces similar increases in both skeletal muscle size and strength.

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## **Attention shift of humans when observing a dog's eye gaze**

Student Researcher: Anna Michelle McPhee

Faculty Advisor: Dr. Timothy Welsh

University of Toronto

Social cues, particularly eye gaze, have a strong influence upon people and the interaction between humans. Previous studies have shown that when an individual suddenly shifts their visual gaze, the observer is likely to re-orient their attention to the cued location. When two individuals attend to the same location or object, this interaction is called joint attention. It has been shown that some animals are able to follow a human's gaze, which suggests that joint attention can exist between species. Few studies have examined if these findings regarding eye gaze and attention shift apply to humans when they are observing animals.

The purpose of this study is to explore whether the social cues that exist between humans regarding eye gaze and attention shift, exist between humans and dogs. The objective of this study is to determine if a dog's eye gaze affects a human's attention. It is expected that the social cues that exist between humans regarding eye gaze and attention shift will be shown when a human observes a dog's eye gaze; this will be observed through shorter reaction times for cued rather than uncued locations.

Participants ( $n=16$ ) performed a reaction time task for two conditions, human and dog, on a computer. Each trial began with a face, either human or dog dependent upon the condition, in a neutral position with the eye gaze directed forward. Immediately following this the eye gaze shifted to either the right or left. A target appeared to the left or right of the face at various stimulus onset asynchronies (SOA), at either 100, 300, 600, or 1000 ms after cue onset. Once the target was detected, the participant had to press either the 'x' or the '?' key if the target appeared on the left or right side, respectively. The reaction time to the target was measured from the target onset to the response. The trials were presented randomly with an equal number of trials for cue direction (eye gaze direction), target localization, and SOA.

The analysis consisted of repeated measures of ANOVA. These analyses were used to determine if there were differences in reaction times between cued and uncued trials. The analysis revealed that there were no main effects by compatibility. However, at 600 ms, reaction times to uncued trials were faster than cued trials; this effect disappeared at 1000 ms. This may have occurred due to an inhibition of return effect. Also, tests were used to examine if reaction times decreased as a function of various SOA. A facilitation effect was shown; as the SOA increased, the reaction times decreased.

If the study had found shorter reaction times for cued trials, this would have suggested that joint attention can exist between humans and dogs. Limitations of these studies may include a small sample size, the simplicity of the task, or the size of the stimulus and target. Further research should be conducted in this area to determine if a shift in a dog's visual gaze can influence a human's attention.

## **Individual interpretations of verbal instructions during the performance of a simple lifting task**

Student Researcher: Rachel Micay

Faculty Supervisor: Dr. David Frost

University of Toronto

*Background:* Low back disorders (LBD) are the most common and costly musculoskeletal complaint in the workplace (Plante et al., 1997). Given the well-established link that exists between lifting mechanics and the occurrence of LBD, preventative strategies have been developed to minimize the shear forces and tensile loading of the spine associated with poor lifting techniques (van Dieen et al., 1999). These prevention strategies are commonly administered to the general population through the publication of guidelines that attempt to explain and illustrate 'safe' lifting techniques, but it is still unclear if these types of instructions are effective at getting members of the general population to actually adopt a lifting technique that puts them at a lower risk of developing LBD.

*Aim:* The purpose of this study is to observe how individuals interpret and respond to various forms of verbal instruction during the performance of a simple lifting task. Based on the findings of this study, we hope to determine how to elicit the most desirable lifting technique within members of the general population from a spine injury prevention perspective.

*Methods:* A total of 9 males and 13 females ( $n = 22$ ) with an average age of 21.2 years participated in this study. Using pre-recorded instructions, participants were asked to lift a 16 lb. box in six different ways.

The types of lifting styles included in the protocol involved two versions of a conventional deadlift (CDL), two versions of a Romanian deadlift (RDL), and two non-specific types of lifts that instructed participants to 'lift with your legs' or 'lift with your back.' Data was collected using an optoelectronic motion capture system that continuously tracked the retro-reflective spherical markers placed on specific anatomical landmarks of the subjects' bodies as they performed these lifts. Kinematic data from the knee, trunk, and spine angles were obtained and analyzed using biomechanical software technology.

*Expected Results:* We expect that the knee, trunk, and spine angles observed in the 'lift with your legs' condition will closely resemble those observed in the CDL conditions. Similarly, we expect that the kinematics of the 'lift with your back' condition will be closely linked to those observed in the RDL conditions. Within the various CDL and RDL conditions, we expect to see a significant reduction in the risk of LBD when instructions specifically cued participants to maintain a neutral spine position throughout the lift. Furthermore, we expect to observe spine angles that are associated with a significantly lower risk of LBD in the 'lift with your legs' condition compared to the 'lift with your back' condition.

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### **Caffeine as an ergogenic aid: A systematic review**

Student Researcher: Mehras Motamed  
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York University

Caffeine is one of the most widely used legal psychoactive drugs, commonly known for its stimulatory effects, with consumption among Canadians being 210-238 mg/d and increasing annually. Around 74% of elite national and international athletes consume caffeine prior to competition. The International Olympic Committee has set an allowable upper limit of 12 µg of caffeine/mL of urine, equivalent to an intake of about 9 mg/kg body weight. Caffeine has a half-life of approximately 5-6 h in the blood, and is typically ingested 60 min prior to competition to allow for peak plasma caffeine concentration. There is no dose-dependent relationship between caffeine dosage and performance. Caffeine's primary mechanism of action for dosages ranging between 3-10 mg/kg involves adenosine receptor antagonism. By non-selectively blocking adenosine receptors, caffeine inhibits adenosine and produces an overall effect of central nervous system stimulation and increased pain threshold. Under aerobic conditions, 3 mg/kg of caffeine significantly improves performance in both trained and untrained subjects, specifically for low to moderate-intensity long-distance endurance exercise. For resistance exercise, caffeine consumption improves 1 RM and total volume lifted, with evidence that it is more effective in resistance-trained athletes. Furthermore, under anaerobic conditions, caffeine improves sprint time, maximal running velocity, and power output. A common thread needed for caffeine to exert its ergogenic effects in different exercise modalities is its necessity to induce fatigue, since caffeine reduces subjective measures of exertion (e.g. Borg's RPE). Caffeine exerts its ergogenic effects irrespective of the mode of administration (capsule, liquid, mouth rinse, powder, gum). The LD<sub>50</sub> of caffeine in humans is subject to individual differences, but is within the range of 150 to 200 mg/kg. Symptoms of toxicity include tremors, confusion, muscle rigidity, hallucination, irregular and fast heartbeat, and vomiting. Further research is needed to delineate caffeine's performance effects in the untrained, recreationally active, and female, elderly, and teen athlete.

### **Differences in post-exercise hemodynamics with arm versus leg ergometry**

Student Researcher: Cindy H. Nguyen  
Faculty Advisor: Dr. Scott Thomas  
University of Toronto

Cardiovascular disease (CVD) causes millions of premature deaths around the world. A common risk factor for CVD is high blood pressure (BP). One non-pharmacological lifestyle intervention that can be used to treat and manage hypertension is aerobic exercise. Acute post exercise reduction in BP, known as post-exercise hypotension, is correlated with long term BP reductions. The objective of this randomized, controlled cross-over study was to determine whether arm or leg ergometry elicited a larger or equal change in magnitude of post-exercise hypotension. The secondary objective was to determine if

there are different mechanisms involved with cardiovascular control with an acute bout of exercise. Eight young healthy, normotensive men, (mean age  $21.9 \pm 2.3$  years) were recruited. Six participants have completed all sessions however, two men are still in progress. Following a familiarization session, participants completed three separate randomized intervention sessions: control, arm cranking, and leg cycling. Both exercise interventions consisted of 15 minutes of exercise at 40% of their heart rate reserve while the control session consisted of 15 minutes of quiet, seated rest. Heart rate was monitored throughout the whole session and blood pressure was monitored for ten minutes prior to and 30 minutes following the intervention. Baseline control SBP, DBP, and HR values were  $109.6 \pm 8.5$  mmHg,  $73.9 \pm 5.3$  mmHg, and  $71.8 \pm 6.5$  bpm, respectively and were similar for the initial 15 minutes of post-intervention (0-15 minutes:  $108.5 \pm 9.7$  mmHg,  $76.5 \pm 7.0$  mmHg, and  $71.7 \pm 8.6$  bpm) and the latter 15 minutes (18-30 minutes:  $109.3 \pm 8.8$  mmHg,  $76.4 \pm 5.8$  mmHg, and  $67.7 \pm 6.6$  bpm). SBP was elevated following exercise relative to control for arm cranking, with the exception of the latter 15 minutes of post-intervention, (0-15 minutes:  $109.4 \pm 11.3$  mmHg; 18-30:  $107.6 \pm 14.9$  mmHg) and for leg cycling (0-15 minutes:  $114.9 \pm 12.5$  mmHg; 18-30 minutes:  $112.0 \pm 10.0$  mmHg). DBP declined relative to control for both arm cranking (0-15 minutes:  $69.1 \pm 9.3$  mmHg; 18-30 minutes:  $70.0 \pm 10.0$  mmHg) and leg cycling (0-15 minutes:  $74.4 \pm 8.0$  mmHg; 18-30 minutes:  $74.1 \pm 7.7$  mmHg). Heart rate was also elevated relative to control post-intervention for both arm cranking (0-15 minutes:  $82.1 \pm 11.0$  bpm; 18-30 minutes:  $76.7 \pm 11.2$  bpm) and leg cycling (0-15 minutes:  $83.1 \pm 12.9$  bpm; 18-30 minutes:  $76.9 \pm 11.3$  bpm). Further statistical analysis is currently in progress. From the preliminary data, it appears that there is no difference with blood pressure and heart rate response following exercise with arm and leg ergometry. These preliminary findings suggest that muscle mass does not influence cardiovascular control following aerobic exercise.

### **Igniting Fitness Possibilities: An evaluation of the challenge module on youth of all abilities**

Student Researcher: Georgina Nicolopoulos

Faculty Advisors: Dr. Kelly Arbour-Nicitopoulos & Dr. Virginia Wright

University of Toronto

*Rationale:* There are many physical, psychological, and social health benefits that physical activity has to offer for youth of all abilities. However, inactivity among youth remains a concern, particularly for youth with disabilities. Igniting Fitness Possibilities (IFP) is a community-based initiative that is developed to inspire youth of all abilities to become more involved in physical activity within their neighbourhoods. The IFP program is composed of two phases: *QuickStart* (an 8-week program held twice weekly (after school) that reflects Stage 2 (FUNdamentals) of the Long-Term Athletic Development (LTAD) framework), and *Give It A Try* (a 10-week program that reflects Stage 3 (Learning to Train) of the LTAD framework that provides participants a focused opportunity to engage in a community-based physical activity that matches their interests and abilities based on their experiences in *QuickStart*). The *QuickStart* phase is structured into theme “blocks” allowing for the development of fundamental movement skills through games and activities. The current pilot study focuses on *QuickStart*.

*Purpose:* The purpose of this pilot study was to (1) evaluate the suitability of using an abbreviated version of the *Challenge Module (CM)* (Wilson et al., 2011), a motor skills-based instrument that was originally developed by IFP investigator V Wright’s team for youth with cerebral palsy, when used with participants in *QuickStart*, and (2) to evaluate change in abbreviated *CM* (called *CM-IFP*) scores from pre- to post-*QuickStart*.

*Methods:* Seven participants (2 females) from grades 6-8 ( $M_{age}=11.8$  years) were tested on the *CM-IFP*. Two had visual impairments, two had Autism Spectrum Disorder (ASD), and three were inactive children with no disability. Twelve of the *CM*’s 20 original motor skill items were included in the abbreviated *CM-IFP* and tested with the participants pre- and post- *QuickStart*. These 12 skills were timed advanced motor skills such as star jumps, bouncing/catching a tennis ball, and 2-footed hops along line. All test items were scored on a 5-point response scale from ‘0’ [ $\leq 50\%$  of task completed] to ‘4’ [task completed without error and within pre-targeted time].

*Results:* At baseline, the *CM-IFP* total mean score was 73.6%. Item mean scores varied from 1.86/4 (runs 10m, picks up object, runs back) to 3.86/4 (runs and weaves through 6 pylons). The four IFP participants with a disability had a *CM-IFP* total mean score of 67.4% while the three participants without a disability had a *CM-IFP* total mean score of 81.9%.

*Conclusions:* After conducting baseline testing using the *CM-IFP*, the participants showed enthusiasm in completing all of the test items. There was an overall positive participant reception and the test took approximately 30 minutes to complete. The baseline total mean score suggests that there is an

opportunity for improvement in advanced motor skills within the *QuickStart* phase of IFP. Post-test scores will allow further analysis of the participants' skill development and the overall suitability of the *CM-IFP* (results will be available March 27, 2015 and shared within the presentation).

### **Cooling the palms enhances bench press performance**

Student Researcher: James O'Brien

Faculty Advisor: Dr. Ira Jacobs

University of Toronto

This study investigated the effects of local palm cooling on rate of muscle fatigue during bench press exercise. It was hypothesized that local palm cooling activates the thermal nociceptors in the hand which close the gate to pain perception. Inhibiting the perception of pain in the exercising muscles allows the athlete to exercise longer before the onset of fatigue. Five male and three females accustomed to resistance training (mean  $\pm$  SD; age =  $20.7 \pm 1.3$  years; one-repetition maximum (1RM) =  $89 \pm 40$  kg) engaged in four sets of bench press exercise at 80% 1RM to muscle failure with 3 minutes rest between sets. During the rest intervals participants received treatment of a carbohydrate-electrolyte placebo drink (PLA), palm cooling (PC), or no treatment (NT). Treatments were conducted with a balanced order. PC was achieved by holding a cold gel pack. Total exercise volume during the PC trial ( $2077.13 \pm 950.85$  kg) was significantly higher ( $P < 0.05$ ) than during the PLA group ( $1801.63 \pm 930.27$  kg) and the CON group ( $1744.13 \pm 816.71$  kg). Subjective rating of perceived exertion (RPE) was significantly lower ( $P < 0.05$ ) for PC during the final set compared to PLA and trended toward significance ( $P = 0.06$ ) for NT. There were no significant differences between treatments for measures of power (W), force (N) and velocity (m/s). In conclusion, this study demonstrates that PC may delay the onset of fatigue during bench press exercise and thus, provide a greater stimulus to adapt to the benefits of training.

### **University exams on the dance floor: Studying the disco**

Student Researcher: Michelle Ocfemia

Faculty Advisor: Dr. Michael Atkinson

University of Toronto

The spectacle of the discotheque, or now mostly known as the night club, is a space that invites individuals to potentially engage in different behaviours in this environment. Music, dance, fashion, media, alcohol and drugs have all been combined into one space that has an influence on its participants. Indeed, as Malbon (1999) has highlighted, clubbing demands and allows a different set of codes of social interactions. This qualitative study of undergraduate University of Toronto students explores their experiences at night clubs, specifically university-hosted events throughout the year. Open-ended interviews were conducted with participants regarding their experiences at the disco and how night clubs fit into the context of their post-secondary school lives. Data was interpreted drawing upon sociological and critical theory, such as Erving Goffman's dramaturgical analysis and Judith's Butler's notion of performativity. Findings suggest that the night club functions as a place of compensatory escape from a stressful reality. Furthermore, it is conceived as a space in, what Elias and Dunning (1986) call, the "Quest for Excitement." As a setting that encapsulates a geography that may not be associated with "everyday life", the night club sets the stage for a theatrical performance that includes sexual harassment in the script.

### **Keeping score: A qualitative evaluation of the effect competition has in youth sport**

Student Researcher: Cecily Osborne

Faculty Advisor: Dr. Michael Atkinson

University of Toronto

The purpose of this study was to gain a clearer understanding of the relationship between competition and participation in youth sport. The study focused on competition in youth sport as having an effect on participants' long-term participation in sport (or lack thereof), and whether or not competition played a role in this. Through a series of 10 semi-structured interviews, this study focused on the effects of competition at different stages in participants' lives and within different sports/physical activities. The study also looked alternatives to competition in sport and to the delay or removal of scorekeeping. Interviews focused on youth participation and the effect to which differences in competition influenced their continuation (or cessation) of sport participation. The interview findings were compared with existing research to determine correlations and dominant themes. Three major themes were established from the interviews. The first established an importance between progression of competition and continuation of participation in sports. The second theme was the participants' lack of connection between competition

and enjoyment in participation in sport at any age. The third theme reveals a link between participation in organized sport and enjoyment of physical activity, regardless of the nature of the sport or the level of competition. Further, individuals who participated in both organized and unorganized sport placed higher value on organized sport, as it contributed more to their enjoyment of physical activity. When experienced in a progressive way, competition can have a positive influence on an individual's long-term participation in sport. The lack of research on youth sport welcomes many areas of athlete development to be explored. Further research focusing on individuals who did not engage in competitive youth sport could provide different insight into this specific topic.

### **Post exercise hemodynamics in children following moderate aerobic exercise**

Student Researcher: Divya S. Patel

Faculty Advisor: Dr. Scott Thomas

University of Toronto

*Background:* The purpose of this study is to investigate hemodynamics in children and to explore their cardiovascular responses following moderate aerobic exercise. Exercise has known effects on blood pressure and heart rate, and the ability to regulate blood pressure and experience a reduction in values following exercise has been linked to cardiovascular health. A characteristic decrease in blood pressure (post exercise hypotension, PEH), has been demonstrated in normotensive and hypertensive subjects. The degree of PEH is thought to be largely dependent on the intensity and duration of exercise, as well as the population being examined. Increased cardiac output and reduced systematic cardiovascular resistance have been demonstrated to be the primary contributors to the observed hemodynamics and PEH following exercise in adult participants. With age, these mechanisms become less efficient causing blood pressure to increase. The effects of exercise on subsequent cardiovascular responses is less well known in younger cohorts, thus this study will investigate the post exercise hemodynamics observed in normotensive children aged 7-10.

*Methods:* Participants recruited (n=7) were screened using PAR-Q+ and activity levels were determined using PAQ-C. Measures of heart rate (HR) and blood pressure (BP) were recorded continuously on the 3rd phalanx of the right hand using Finapres, and at 2 minute intervals on the brachial site of the left arm using BpTru, during pre-exercise seated rest, for 10 minutes. Moderate exercise was then performed by all participants using a cycle ergometer for 20 minutes, at a moderate intensity level of 30-45watts. Measures of HR and BP were recorded once again, continuously on the phalanx, and at 3 minute intervals on the brachial site, during post-exercise seated rest, for 21 minutes, immediately following the cessation of exercise.

*Results:* Preliminary analyses of the results reveal that there is an average increase of  $3\pm 5.6$ mmHg in post-exercise systolic BP compared to pre-exercise resting values, with 4 out of 7 participants experiencing an increase. Similar trends were seen in diastolic BP with an average increase of  $3\pm 5.9$ mmHg in post-exercise compared to pre-exercise resting values, with 6 out of 7 participants experiencing an increase. The observed increases in BP may be attributed to elevations in post-exercise HR values which were increased by  $7\pm 12.4$ bpm compared to pre-exercise resting values. The data suggests that unlike adult populations, children do not experience PEH. This may indicate that the mechanisms of cardiovascular response experienced in children is unique to those experienced by adults, and further data analysis of cardiac output will help to support this claim. It is hypothesized that further differences will be observed in the hemodynamics of children as there are prominent differences in the physiology and regulation of the cardiovascular system in a child compared to an adult.

### **Coping strategies employed by athletes with sport concussion**

Student Researcher: Marina Pavelic

Faculty Advisor: Dr. Lynda Mainwaring

University of Toronto

This study aimed to assess the forms of coping strategies that are used by athletes who have been concussed during sport. Following an injury, athletes will seek ways to cope with their injury and the stressors resulting from an injury setback. They will make use of coping responses when they are in their rehabilitative period and instructed not to play their sport until they are ready for return-to-play (RTP). Such a pattern of injury response is similar to athletes suffering from a mild traumatic brain injury (mTBI), including concussion. Existing literature reports concussed athletes use coping mechanisms such as self-blame, religious practices, behavioural disengagement and distraction (Covassin, Elbin, Crutcher, Burkhardt, & Kontos, 2013), although, they will engage in overall less coping strategies than orthopedic-

injured athletes (Kontos, Elbin, Newcomer Appaneal, Covassin, & Collins 2013). The authors hypothesized this may be due to the recovery period of a concussion not being long enough to induce a coping response. However, such findings are limited to few studies, and limited knowledge exists on the patterns of coping for concussed athletes.

Three consenting University of Toronto female athletes, aged 20, 21 and 22 years, were recruited to participate. Each athlete was interviewed once within the week of their concussion diagnosis. Thematic analysis was used to synthesize participant interview data into codes, themes, patterns and analytical narratives.

When emotions and feelings were discussed, the primary emerging themes included feelings and thoughts of life slowing down, sadness, stress, frustration and worry, a sense of the unknown, and feeling terrified/frightened of possible consequences in the long-term. Participants emphasized the importance of patience and perseverance with the concussion experience. Similarities existed with coping resources amongst the participants, including substantial sleep/rest during concussion periods, social interaction and support, and finding new activities or hobbies to try that were not physically exerting. Two of the participants dropped school courses in order to cope with their injury, and engaged in self-reflection, either regarding their or their futures. Overall, this study found female athletes who suffered from a concussion that is not their first, to engage in both emotion-focused and problem-focused styles of coping (Lazarus & Folkman, 1984). Because injured athletes cannot resolve a concussion through physiotherapy or the like (only rest and sleep according to current guidelines), they attempted to alleviate their feelings of distress more so by engaging in activities that distract them from their emotional journeys.

*Keywords:* concussion, coping, emotion, feelings, injury, mTBI, sports, athletes

### **Self-care through physical activity: A preventative measure for substance abuse among youth?**

Student Researcher: Anna Petersson

Faculty Advisors: Dr. Nancy Cohen & Dr. Fataneh Farnia

University of Toronto

This project aims to examine physical exercise as a self-care activity for youth engaged in an adaptation of a mental health promotion program, Handle with Care (HWC). The original Handle with Care program was developed for families and caregivers to promote mental health of children from birth to age 6. The Handle with Care project is led by Dr. Nancy Cohen and Dr. Fataneh Farnia from the Hincks-Dellcrest Institute and Bonnie Pape, a mental health promotion consultant. The program uses a strength-based interactive approach that assumes every parent and caregiver has problem-solving skills and wants what is best for the children in their care. HWC organizes vital concepts of mental health into four “Building Blocks”, each containing activities that are to be facilitated in a group setting. The Building Blocks are (1) building trust and attachment, (2) promoting and enhancing self-esteem, (3) expressing emotions, and (4) relationships with others. Attention is also given to the well being of the parents and caregivers themselves through focus on self-care.

Using the same approach and principles, work is currently underway to adapt the program for adolescents, under the direction of Dr. Fataneh Farnia. Multiple studies have shown a correlation between physical activity and reduced drug intake among youth and adults. Literature suggests that the nature of this correlation differs depending on the type of physical exercise and the context in which the exercise is performed. In fact, physical exercise may sometimes generate stress in itself. These findings suggest that the conceptualization of physical exercise is an important determinant for maximum mental health gain.

This study examines the possibility of maximizing the efficacy of physical exercise as a preventative measure for substance use and abuse in youth by transforming physical exercise into self-care. Self-care can be conceptualized as “the maintenance of personal well-being”. One key variable in determining whether physical exercise is categorized as self-care throughout this study is whether participation is voluntary, and whether the reasons for partaking in physical exercise are limited to the enjoyment of the exercise itself and/or any positive effects the exercise has on the participants. As the way physical exercise is implemented has an impact on its relationship with drug intake in youth the study objective is to introduce physical activities that are enjoyable and easily performed as part of the Handle with Care for Youth program. The assumption is that this will help to remove the label of physical activity as a stress-generating element or a “chore”. I have proposed several activities to be included in the HWC program for youth. Important components of each of these activities include: (1) an opening discussion to explore

potential benefits that can be gained from physical exercise; (2) a fun, easy-to-facilitate activity featuring an element of movement that encourages an appreciation of physical activity among youth; and (3) a post-discussion where participants can bring together elements from the other building blocks of HWC, in order to gain an integrated perspective of how different concepts of mental health are interrelated and often work in a synergistic manner.

### **Quantifying the extent and location of cellular muscle damage following lengthening contractions at variable velocities through analysis of heat shock protein content**

Student Researcher: Lizz Piccoli  
Faculty Advisor: Dr. Marius Locke  
University of Toronto

Cells are constantly exposed to stressors in their environment that disrupt proteostasis. Proteostasis can only exist when mis-folded and damaged proteins are cleared outside of cells, and constant protein concentrations are maintained for healthy cellular physiology. Stress proteins or heat shock proteins exist universally within all organisms in order to help provide rapid protection from environmental stressors. HSPs have been shown to prevent protein aggregation, play a role in cell growth, and assist with protein folding and unfolding. In muscle tissues Hsp72 and Hsp25 play an important role in protecting tissue from oxidative damage and phagocytic infiltration and an elevated count of HSPs has been linked to increased recovery. After stressing muscle fibres through lengthening exercise, muscle cells induce Hsp72 and Hsp25 and these HSPs translocate to the affected myofibrils. HSPs can thus be used as marker for identifying the presence of damaged cells within a muscle. To determine where damage occurs and the extent of that damage in muscle tissue following lengthening contractions at varied velocities (fast, medium, slow) three male Sprague-Dawley rats were subjected to electrical muscular stimulation in one tibialis anterior (1 set of 60 repetitions). TA muscles were removed and segmented into five sections before they were processed to examine HSP content (Western blot analyses). The results of this study hope to shine light on localizing where damage occurs within a muscle based on the speed of contractions.

### **Athletic identity and contingent self-worth in highly elite athletes**

Student Researcher: Zoe Poucher  
Faculty Advisor: Dr. Katherine Tamminen  
University of Toronto

*Objectives:* The purpose of this study was to address the gap in the literature regarding elite athletes' identity and their contingent self-worth as it relates to athletic successes and failures. *Methods:* Five high performance athletes, 4 males and 1 female, were individually interviewed on two separate occasions to discuss their athletic identity, their successes and failures, and how feelings of self-worth relate to those past experiences. An inductive data analysis process was used, and relevant themes were identified. *Results:* The findings demonstrate some differences between athletes who identified themselves as 'student athletes' versus those who identified solely as athletes. Some common themes surfaced regarding the behaviours of individuals with very strong athletic identities, such as going to bed on time, eating healthy meals and avoiding alcohol. Successes and failures were perceived to impact the athletes' identities, making it stronger or weaker depending on the importance and outcome of the event. Lastly the findings on contingent self-worth demonstrated that elite athletes' perceptions of their self-worth were connected to their athletic performances. *Conclusions:* The findings regarding athletic identity are consistent with previous work, and the novel findings on athletes' contingent self-worth expand this body of literature by suggesting that athletes' self-worth may be dependent on their performances, particularly for those athletes with a strong athletic identity. Future research examining unsuccessful athletes may provide additional insights into adaptive and maladaptive outcomes associated with elite athletes' contingent self-worth, which could aid elite athletes in achieving more positive psychological wellbeing.

### **Heart rate recovery remains unchanged following 12 weeks of either traditional endurance training or sprint interval training in sedentary men**

Student Researcher: Stacey Priest  
Faculty Advisor: Dr. Maureen MacDonald  
McMaster University

*Introduction:* Heart rate recovery (HRR) is the decline in heart rate that occurs after exercise and is reflective of autonomic control of the heart. A faster HRR is associated with a reduced risk of cardiovascular disease and all-cause mortality. A HRR of 12 beats/min or less at 1 minute post-exercise

is associated with increased risk of mortality. While some exercise training programs have improved HRR in clinical populations, the effect of training on HRR in healthy populations is currently unclear.

*Methods:* Nineteen sedentary, but otherwise healthy, men (aged  $28 \pm 8$  years) underwent 12 weeks of traditional endurance training (END) or sprint interval training (SIT) 3 times/week on a cycle ergometer. The END protocol consisted of 45 min of continuous cycling at  $\sim 70\%$  maximal HR, and the SIT protocol consisted of 3x20 sec sprints against 5.0% of body weight interspersed with 2 min of active recovery. Both protocols included a 2 min warm-up and 3 min cool-down. HRR at 1 minute post-exercise (HRR1) was calculated by subtracting HR at 1 minute post-exercise from the maximal HR attained during exercise. For each group, HRR1 was assessed at baseline, 6 weeks, and 12 weeks of training and analyzed with a one-way repeated measures ANOVA.

*Results:* Following 12 weeks of training HRR1 was unchanged in both the END (baseline:  $38 \pm 13$  beats/min; 6 weeks:  $45 \pm 9$  beats/min; 12 weeks:  $43 \pm 13$  beats/min;  $p=0.37$ ) and SIT groups (baseline:  $29 \pm 8$  beats/min; 6 weeks:  $27 \pm 9$  beats/min; 12 weeks:  $25 \pm 10$  beats/min;  $p=0.58$ ). Furthermore, all participants exceeded the clinical 12 beats/min HRR cut-off at all time points.

*Conclusions:* Our findings suggest that 12 weeks of END or SIT are insufficient to illicit improvements in HRR1 in sedentary, but otherwise healthy young men. Improvements in HRR may be more likely to occur following exercise training in populations with impaired autonomic control of the heart.

### **A review of trends in youth sport psychology research**

Student Researcher: Shannon R. Pynn  
Faculty Advisors: Kacey C. Neely & Dr. Nicholas L. Holt  
University of Alberta

The purpose of this study was to review trends in youth sport psychology research. Four major sport psychology journals (*The Sport Psychologist*, *the Journal of Sport and Exercise Psychology*, *the Journal of Applied Sport Psychology* and *Psychology of Sport and Exercise*) were reviewed to identify studies of youth sport. Articles were included in the review based on the age of the subjects ( $M_{age} = 5-18$  years) and their participation in organized youth sport. The title, abstract, and contents of each article were analyzed to derive the main themes, which were then organized by the journal and decade of publication. It is assumed that the content of the four major journals is representative of the discipline of sport psychology as a whole and an increase in published articles pertaining to youth sport indicates the growth of research in the area. A total of 3079 articles containing original data were published in the journals over a span of 35 years with 470 articles (15%) meeting the inclusion criteria. Articles on motivation ( $n=91$ ), social influences ( $n=84$ ), anxiety/stress ( $n=47$ ) and self-perceptions ( $n=43$ ) appeared most frequently across all four journals. A steady decrease in the number of articles about motivation and a gradual increase in the number of social influence articles published in the last decade suggests that motivation is a topic that has been exhausted by youth sport psychology researchers while research on social influences in youth sport is an emerging trend. The findings generate a discussion on why such trends occur and what impact they have on future research. Further analysis is required to examine trends in research methods and theoretical frameworks.

### **The influence of workplace training fulfillment on learning outcomes in career firefighters**

Student Researcher: Christine Rad  
Faculty Advisor: Dr. David Frost  
University of Toronto

*Introduction:* Workplace training programs are used to improve performance on the job, but are often ineffective and rarely lead to learning (Laberge et al., 2014). Given the dynamic and unpredictable work environments associated with physically demanding careers, such as firefighting, improving the effectiveness of workplace training may require alternative strategies to enhance learning. The purpose of this study is to examine the relationship between workplace training fulfillment – expectations, desires and perceptions (Tannenbaum et al., 1991) – and subsequent degree of learning.

*Methods:* Pilot data was collected from 23 firefighters of the Seattle Fire Department. All participants attended a musculoskeletal injury prevention workshop designed for fire and emergency services personnel. Prior to the workshop, each participant completed two questionnaires measuring training desires and training expectations; as well as a multiple-choice knowledge test. After the workshop, each participant completed a questionnaire measuring training perceptions and the same knowledge test.

Questionnaire and knowledge test responses were used to calculate trainee fulfillment and degree of learning.

*Results:* Following the workshop, trainees displayed a positive learning trend (18% increase in test score). The mean values for training expectations (scale of 1 to 7), desires (scale of -3 to 3), and perceptions (scale of 1 to 7) were 6.1, 2.3, 6.5, respectively. Although statistical analyses were not performed, pilot data show positive trends between training expectations, desires, perceptions and learning. However, there does not appear to be a relationship between overall training fulfillment and learning.

*Conclusion and Expected Outcomes:* Emergent trends from pilot data suggest no relationship between overall training fulfillment and learning, however larger-scale data collection is currently underway and is anticipated to yield more conclusive results. It is hypothesized that trainee fulfillment will be positively correlated with learning. If so, the results will provide an alternative strategy to increase learning in workplace training programs and, thereby improve performance and safety on the job.

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**The impact of muscle cooling and compression on peripheral force generation and neuromuscular recovery post exercise in trained population**

Student researcher: Peter Radonic

Faculty Advisor: Dr. Greg Wells

University of Toronto

Throughout an athletes training cycle, the only aspect of training that receives more scrutiny than the performed actions themselves is the act of recovery. Current forms of recovery include passive and active recovery, ice baths, compression wraps, stretching, and foam rolling. In this study we sought to determine the impact of the combination of cooling and compressive technologies in the form of a product called Cool'nTape®. Cool'nTape® is a silicone matrix with elastic properties that is comprised of approximately 96%.

This study investigated the effects of compressive wrapping using either Cool'nTape® or tensor bandage placebo for 2 hours after a session of high intensity resistance exercise.

Participants reported to the Human Physiology Research laboratory (HPRL) for 3 visits. The first, a familiarization for neuromuscular testing including interpolated twitch as well as determination of back squat 1 repetition max weight (RM). The neuromuscular testing included resting twitch stimulation and interpolated twitch during quadriceps maximal voluntary contractions (MVC). One week later, following a 24-hour rest period, participants returned to the HPRL for the first testing visit. Participants underwent neuromuscular testing on both legs, performed 10 sets of 10 repetitions squats at 60% of their determined 1RM with 90 second resting periods. Following squats, participants pushed a weighted sled for 25 meters until they reported having a RPE of at least 18. Neuromuscular testing was then repeated on the participant, and the wraps were applied to either the dominant or non-dominant leg using a randomized counter-balanced design. After, participants were asked to remain seated for 120 minutes, and refrain from movement. Water was allowed, but participants were prohibited from consuming food. Participants then warmed up on a stationary cycle ergometer for 5 minutes prior to repeating the neuromuscular testing. 24 hours later the participants returned to the HPRL for a final session of neuromuscular testing. Findings involved in this study will help to determine the effects of compounding cooling and compression therapies in a post-exercise situation.

## **Move for Two: Examining the effects of a pregnancy and exercise DVD intervention**

Student Researcher: Jagriti Sharma

Faculty Advisor: Dr. Anita Cramp

University of Western Ontario

*Background:* Exercise during pregnancy has been found to provide women with a wide variety of physical and psychological health benefits, including decreased risk of preeclampsia, chronic musculoskeletal conditions, gestational diabetes, unhealthy weight gain and various mental health issues [1]. In Canada, 85% of women participate in some form of leisure-time physical activity (LTPA) during pregnancy, however only 23% of Canadian women actually meet LTPA guidelines during pregnancy [2].

*Purpose:* The purpose of this study is to examine healthy pregnant women's exercise beliefs and behaviours using a DVD intervention titled *Move for Two*. Participants were given an exercise and pregnancy DVD, produced by the Middlesex London Health Unit (MLHU) and researchers at Western University, to use at home as part of an 8-week intervention. The DVD informs women about the risks of leading a sedentary lifestyle during pregnancy, the benefits of leading an active lifestyle and strategies on how to incorporate exercise in their daily activities. The DVD aims to increase awareness of the benefits of physical activity during pregnancy and secondly, helps facilitate exercise initiation and maintenance during pregnancy without the use of group-based methods.

*Methods:* All participants were given online questionnaires to complete at baseline, midpoint (4 week mark) and conclusion of the 8-week intervention. Half of the participants were randomly selected to receive and complete an additional behavioural training workbook, with a weekly lesson over the 8-week intervention, to complement the DVD. Participants who received the workbook also received encouraging cues and reminders to complete their weekly assignments during the intervention. All participants were asked to log their physical activity during the course of the intervention.

*Results:* Surveys disseminated to participants gathered information on a variety of measures, including the participants' self-reported volumes of exercise, confidence levels in their personal ability and completion of exercise planning. Results indicated that participants' ability to keep track of exercise and the percentage of participants who completed exercise tracking was greater for participants in Condition 2 (participants given the exercise DVD with a supplemental workbook) compared to those in Condition 1 (participants solely given the exercise DVD) at the mid-point of our intervention. Qualitative evaluation of the *Move for Two* DVD found that the content of the DVD is effective in terms of increasing awareness of the benefits of physical activity during pregnancy.

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## **Assessing the effectiveness of student-led simulation in enhancing learners' interprofessional competencies**

Student Researcher: Alexis Sharp

Faculty Advisor: Dr. Ian Newhouse

Lakehead University

Interprofessional education (IPE) occurs when students from two or more disciplines (i.e. nursing and kinesiology) learn about, from, and with each other to foster effective collaboration and improve future health outcomes. Teamwork promotes interprofessional collaboration (IPC), which improves communication and provides patient-centered, holistic care. Research on IPE is particularly important for the newly regulated profession of kinesiology; interprofessional learning experiences can provide excellent opportunities for health care team members to understand and appreciate the contributions that kinesiologists can make towards enhancing client health. On February 28<sup>th</sup> 2015, the Lakehead Interprofessional Student Society implemented the second annual student-led simulation challenge (SimChallenge) at Lakehead University. The goal of this event was to bring together health professions from different faculties to enhance interprofessional competencies.

The purpose of this research project was to examine the learning outcomes of the 2015 Simchallenge while expanding on the results from 2014. This was accomplished by comparing student interprofessional competencies before and after the SimChallenge and then by linking any enhancements to the organization of the SimChallenge. The knowledge gained from this research will be beneficial for future students who organize IPE events, especially simulations. It was hypothesized that effectively implemented student-led IPE would improve student interprofessional competencies.

The event was evaluated using the W(e)Learn Framework and a semi-structured questionnaire. The Interprofessional Collaborative Competencies Attainment Survey (ICCAS) is part of the W(e)Learn Framework and evaluated the learner's perceptions of changes in his/her IPC competencies, as a result of the IPE. The W(e)Learn Interprofessional Program Assessment is a 30 question survey inquiring about the student's IPE experience based on the atmosphere, facilitators, content, etc. Finally, the semi-structured questionnaire was adopted and expanded from the SimChallenge in 2014. It asked open-ended questions regarding the student's experiences with the SimChallenge. An example question from this questionnaire is: How could we improve the simulations?

Preliminary results indicate that the SimChallenge was a large success with 95% (n=36) of the participants reporting that they would recommend the experience to their peers. When asked about one aspect of the simulation that stood out as being beneficial, students said, "The collaboration was beneficial to develop a better understanding of other professional's scope of practice" and "I think it is a good experience to open your mind to IPE/develop clinical skills." Results will be further analyzed and presented at subsequent venues.

### **Understanding the relationship between arterial stiffness and cognition in older adults**

Student Researcher: Daria Shkredova

Faculty Advisor: Dr. Ada Tang

Co-Authors: Fang, H., D'Isabella, N.T., MacDonald, M.J., Heisz, J.J.

McMaster University

*Introduction:* The risk of cardiovascular disease and stroke increases with age, with Canadians over 65 having twice the risk of a heart attack or stroke compared to those aged 55-64. Arterial stiffness can be used to monitor the progression of underlying disease processes that culminate in these events, where greater arterial stiffness is an independent predictor of cardiovascular and all-cause mortality. Arterial stiffness increases with age, and increased stiffness has been shown to contribute to small vessel disease in the brain. These vascular changes are associated with decline in cognitive function through effects on the cerebral microvasculature. While these small cerebrovascular infarcts may not manifest in overt symptoms other than cognitive decline, they are associated with future risk of clinical stroke. To determine if vascular changes occur concurrently with cognitive decline in older adults, we sought to compare arterial stiffness between individuals with normal and impaired cognitive function.

*Methods:* Participants living in the community without significant cardiovascular or neurological conditions were recruited (n=27, mean±SD age 71.1±4.5 years, 48% men). Arterial stiffness was measured using central, upper and lower limb pulse wave velocity (PWV) assessed by the current criterion standard of applanation tonometry. Higher PWV values indicate greater arterial stiffness, with a central PWV threshold value of 10 m/s or greater indicating elevated risk for a future cardiovascular event. Cognition was assessed using the Montreal Cognitive Assessment (MoCA), a brief screening tool sensitive to detecting mild cognitive impairment. Participants were stratified into normal and impaired cognition groups (MoCA score ≥26 and <26 out of a maximum of 30 points, respectively). Independent *t*-Tests (*P*<0.05) were performed to examine PWV differences between the two cognition groups.

*Results:* Sixteen participants (59%) presented with impaired cognition (MoCA <26). Cognitively impaired participants were not significantly older than peers with intact cognition (71.6±4.9 vs. 70.5±4.1 years) but contained a higher proportion of males than peers with intact cognition (62% vs. 27% male). There were no differences between normal and impaired cognition groups in either central (9.7 vs. 10.8 m/s; *P*=0.15), upper limb (8.1 vs. 7.3 m/s; *P*=0.15), or lower limb (9.3 vs. 9.4 m/s; *P*=0.91) PWV.

*Conclusion:* Results from this study suggest that older adults with impaired cognitive function do not differ from their peers with intact cognitive function in terms of arterial stiffness. However, older adults with cognitive impairment had central PWV values exceeding the established threshold of 10 m/s, indicating elevated risk of cardiovascular events. Differences in arterial stiffness may have in part been mediated by

physical activity and fitness in this relatively active cohort. Future studies should include a larger sample with broader representation in the range of physical activity levels to include more sedentary individuals.

### **Vitamins as possible ergogenic aids: A focus on vitamin D and antioxidants**

Student Researcher: Keshna Sood

Faculty Advisor: Dr. Mazen Hamadeh

York University

Vitamins (namely A, C, E and D) have not been widely established as ergogenic aids. Supplementing with vitamin A, C or E can be understood as advantageous because of their anti-oxidizing role. While excessive antioxidant amounts lead to toxic effects in the liver and central nervous system, adequate levels serve to further clear free radicals that accelerate cell damage. Antioxidant supplementation is relevant to athletes because it holds the ability to lower levels of free radicals, which are increasingly exercise-induced. Current research, however, proves otherwise. Studies observing maximal oxygen uptake as a performance outcome show supplementation might hamper training adaptations. With this, it is important to note the limited understanding of antioxidant impact on mitochondrial biogenesis and the cascading effect of that influence on reactive oxygen species. Research on a non-antioxidant vitamin, vitamin D, interests athletes because of its multifunctional role in overall fitness and even more dominating involvement in muscle-related functions that mobilize calcium and up-regulate proliferative pathways: serving to facilitate muscle movement and growth. Vitamin D studies observed supplementation to decrease the number of falls in elderly populations, increase explosive peak performance in resistance training and also within endurance training. Currently, the optimal levels of vitamin D according to experts in the field still remain controversial. Because vitamin D supplementation did prove to be significantly beneficial, the need for studies that aim to narrow the range on optimal vitamin D dosage cannot be overstated. We propose a double-blind, randomized study to assess graded vitamin D supplementation in healthy individuals through a placebo-based controlled trial with treatments of cellulose, 2500 IU and 5000 IU of Vitamin D3 in resistance and endurance exercises. Due to vitamin D being fat-soluble, questions of toxicity resulting in hypercalcemic conditions are also valid. The study will also serve to help to provide evidence on toxicity occurrence in a dose-dependent controlled trial.

### **Baseline blood biomarkers profile in varsity athletes: Implications for concussion research**

Student Researcher: Kathryn Taberner

Faculty Advisor: Dr. Michael Hutchison

University of Toronto

*Background:* The diagnosis of concussion and determination for return-to-play (RTP) is often based on current practices in the diagnosis and management of concussions, which usually consists of clinical observations and subjective symptom reporting. Due to the challenges of accurate diagnosis and appropriate management of concussions, as well as the large number of concussions that go undiagnosed, there has been a demand in objective indicators of injury. There is optimism among the scientific and clinical communities that the use of novel and refined technology will aid in the detection and management of patients. This will be accomplished through the identification of novel biomarkers profiles, which reflect the underlying pathophysiology of concussion.

*Purpose:* The purpose of this study was to identify the pre-injury (baseline) inflammatory biomarker profile among varsity athletes. We also examined the relationships between both symptoms and history of previous concussions and inflammatory biomarker profiles.

*Methods:* 50 varsity athletes were recruited from the following sports: basketball, field hockey, football, lacrosse, soccer, rugby, and volleyball. The testing protocol consisted of blood acquisition, and the Sport Concussion Assessment Tool (SCAT 3). The blood samples were analyzed for the detection of 30 inflammatory markers, including a variety of interleukin (IL) molecules and chemokines, using a multiplex ELISA system (MesoScale Discovery®).

*Findings:* Preliminary data will be presented. Primary finding will display the inflammatory profiles for uninjured, healthy athletes. The differences in inflammatory profiles between athletes with a history of concussion and no prior history of concussion will also be discussed.

## **Nitric oxide based supplements on human performance**

Student Researcher: Robert Talarico

Faculty Advisor: Dr. Mazen Hamadeh

York University

Nitric oxide (NO) is released by endothelial cells and is a main vasodilator in the vascular system. It is formed via nitric oxide synthase (NOS) through L-arginine and O<sub>2</sub> (NOS-dependent), or via simple reduction of nitrates when O<sub>2</sub> falls (NOS-independent).

*NOS-Dependent:* **L-citrulline** is a by-product of NO synthesis, a non-essential amino acid and a component of the Urea Cycle. L-citrulline supplementation in humans has no effect on performance; in fact it had a negative impact on 12 of 17 participants in a particular study. Citrulline and malate are commonly given in tandem and research suggests that this method is most effective for increasing repetitions in resistance exercise by 52 %.

**L-arginine** is a conditionally essential amino acid and is endogenously synthesized by the kidney. L-arginine supplementation has a greater effect in untrained individuals, specifically a 12 % increase in phase II VO<sub>2</sub> kinetics. For trained persons, L-arginine does not consistently elicit benefits in exercise performance. L-Arginine is commonly studied in combination with other supplements to increase its effectiveness such as ARK-1, grape seed extract,  $\alpha$ -ketoglutarate, and GAKIC. Untrained or moderately active persons experience variable performance gains in exercise parameters such as a 5.4% increase in the Gas Exchange Threshold and 28% increase in mean resistance to fatigue compared to control. However, the benefits observed from these ergogenic aids could be derived from the other components combined with L-arginine. No nitric oxide biomarkers were assessed in any of the combination studies meaning it is impossible to attribute the increases in exercise performance solely to L-arginine. The same compounds observed in trained persons elicited no ergogenic effect as there were no changes between the L-arginine and placebo group. A paradox exists that suggests that under normal conditions, eNOS is fully saturated with intracellular L-arginine and will not respond to exogenous supplementation.

*NOS-Independent:* **Sodium nitrate** supplementation has been proven to increase plasma nitrates by 574 % and reduce SBP by 6.6 % but has no effect on performance parameters in trained men. **Beetroot juice** is commonly used because of its high nitrate concentration. This supplement increased plasma nitrates almost 30 fold and increased distance run by 4.2 % in a study on untrained individuals.

*Conclusion:* Training status seems to be the independent variable that has the greatest effect on the functionality of nitric oxide supplements. Therefore, trained athletes develop a nitric oxide system advantage that is more beneficial than supplementation which may only be effective in untrained individuals or those patients with cardiovascular disease. Future research should include supplementation in *healthy* adults >40 y, gender differences, diseased states, and atherosclerotic risk factors associated with exercise performance. Due to the gaps in the literature, the proposed study will examine the effect of 6 g of L-arginine or 500 mL of beetroot juice on exercise capacity in individuals with CAD.

## **Examining the relationship between autonomy support and health behaviour change in HealthSteps™ program participants**

Student Researcher: Justine Tempelman

Faculty Advisor: Dr. Erin Pearson

Co-Author: Dr. Rob Petrella

Lakehead University

*Background:* Lifestyle interventions are cost-effective for reducing chronic disease risk. HealthSteps™, an eight month lifestyle prescription-based intervention delivered by trained “coaches,” aims to improve health behaviours among Canadians who are at risk for type 2 diabetes. Relatedness, derived from Self Determination Theory, involves one’s tendency to adopt behaviours promoted by trusted individuals. An important construct linked to relatedness is autonomy support. In a health care provider/client relationship, autonomy supportive behaviours can include acknowledging a client’s choices and initiatives, providing a rationale for advice given, minimizing judgment, and exploring how relevant health behaviours relate to life objectives. Fulfillment of relatedness through an autonomy supportive environment is important for sustained health behaviour change, which could subsequently assist in reducing the incidence of chronic disease.

*Purpose:* The objective of this research is to examine the relationships between perceived autonomy support (i.e., the motivational climate afforded via the coach-participant relationship), and indices of health behaviour change (e.g., duration and intensity of physical activity, water consumption, fruit and vegetable servings, frequency of healthy breakfast consumption, and body mass index) among HealthSteps™ participants over a four-month period.

*Methods:* Thirty-two participants 18 years of age or older (range = 25-67; mean = 49.9) with two or more risk factors for chronic disease (e.g., overweight, inadequate exercise, inadequate fruit/vegetable intake) have been recruited from Thunder Bay Regional Health Sciences Centre employees ( $n = 22$ ) and local WE-Can program graduates ( $n = 10$ ), an exercise-based program intended for cancer survivors. HealthSteps™ participants attend an initial screening and enrolment session (October), followed by three bi-monthly follow-up assessments (December, February, April). During each session, participants are ushered through the evaluation stations (i.e., completion of questionnaires; measurement of anthropometrics; performance of a self-paced Step Test to evaluate fitness; one-on-one coaching to establish goals and assess progress; and provision of a lifestyle prescription) alongside his/her designated HealthSteps™ coach. HealthSteps™ coaches (trained undergraduate students and hospital employees) are encouraged to interact with participants in a manner that parallels autonomy-supportive behaviours. After completing the session, participants complete the Health Care Climate Questionnaire to gather information on autonomy support and his/her HealthSteps™ coaching experience. In order to assess the relationships between autonomy support and change in health behaviours, the Pearson product correlation coefficient will be used.

*Anticipated Results:* Data analysis is ongoing. It is expected that greater autonomy support, derived through the coach-participant relationship, will correlate positively with healthy behaviour changes (e.g., increased physical activity/fruit and vegetable consumption).

*Projected Applications:* In health care, the practitioner-patient relationship is an important medium of change. The results obtained via the HealthSteps™ program might be important for guiding the future actions of healthcare providers with respect to facilitating effective health behaviour change using autonomy supportive practices in additional contexts.

### **A qualitative examination of the lived experiences of student athletes retired because of concussions**

Student Researcher: Tiffany Toong  
Faculty Advisor: Dr. Lynda Mainwaring  
University of Toronto

*Background:* In the past decade, there has been a flourish of research on concussions. Most of this research has focused on quantitative studies that examine the physiological and neurocognitive outcomes of concussions (Carron et al., 2013). There is limited qualitative research investigating the experiences of multiple concussions from the perspective of the athlete. Each year a significant number of student athletes are forced to retire because of multiple concussions (Guskiewicz et al., 2003; Mayers, 2013). Thus, a more in-depth analysis examining the lived experiences of these retired student athletes is warranted to inform and improve long term concussion management interventions.

*Purpose:* To explore the lived experiences of student athletes who have retired from sports because of multiple concussions.

*Methods:* Semi-structured interviews were conducted on five former student athletes who retired from their primary sports as a result of multiple concussions.

*Preliminary Findings:* Several common themes emerged from the interviews. Participants described various physical, cognitive and emotional difficulties as a result of their multiple concussions. Various avenues of social support were reported to have helped with adjustment to concussions, including, athletic trainers, friends and family. Multiple factors were reported to influence their decision to retire from their respective sports, including the number of concussions sustained and progressively more difficult recoveries from each subsequent concussion. Upon retirement, athletes shifted priorities from their sports to a greater focus on their academic and social lives. Adjustment was facilitated with engagement in other activities such as coaching and competing recreationally in their sport. With time, athletes found acceptance with their decision to retire, recognizing the health implications that would have endured had they continued to play.

*Implications:* These initial findings point to the importance of social support to help athletes cope with the physical, emotional and cognitive difficulties experienced as a result of multiple concussions. Due to the complexity of the retirement process for student athletes with concussions, further examination of factors that facilitate adjustment may help to improve long term concussion management.

### **The convergence of culture and curriculum: Piloting bikes into high school physical education**

Student Researcher: Jeffrey Trieu  
Faculty Advisor: Dr. Caroline Fusco  
University of Toronto

Contemporary urban cities are struggling with issues of car dependency, traffic congestion and sedentary lifestyles. These issues converge with growing concerns for global climate change. Consequently, cycling, an active and sustainable form of urban transportation, might be framed as a strategy to mitigate physical inactivity and car-dependency in cities. While we know that adult cycling mode share has seen a gradual increase despite a lack of substantial improvements in physical infrastructure in recent years, what is happening for youth? Can cycling act as a form of independent mobility for youth?

My project examined a pilot cycling curriculum, initiated by CultureLink's Bike to School Project and supported by Live Green Toronto, the Sustainability Office of the TDSB, in a Grade Nine Health and Physical Education class in a Toronto high school. My research asked: What impact (positive, negative, or none at all) will the Physical Education cycling classes have on the active transportation behaviors, perceptions, and attitudes related to cycling of this Grade 9 high school student cohort? Once ethical approval was granted by the TDSB's External Research Review Committee and U of T's ORE, three modes of data collection were employed: i) Semi-structured interviews (N=2 teachers/program coordinators); ii) Written surveys (N=61 Grade 9 students); and iii) A focus group (N=2 students).

Findings suggest that cycling in Toronto high schools may only gain popularity if the school's cycling culture is supportive. I found that student and staff interest in cycling has led to the organization of social events and infrastructure related to cycling. Despite interest and uptake, however, cycling was a gendered practice. Interview data points to the lack of young women cyclists and this was supported by the survey data. For example, the average weekly cycling frequency to school for boys is 1.7 days while it is only 0.4 days for girls. Regarding the efficacy of the pilot intervention, group differences in survey items related to active transportation behaviours, attitudes, and social norms were measured using the Mann-Whitney U test between students who did (Grade 9) and did not (Grade 10) participate in the pilot cycling curriculum. Students who participated in the cycling curriculum were: i) more likely to believe helmet use in cycling was important ( $p=0.089$ ), ii) less likely to fear bike theft ( $p=0.012$ ); iii) less likely to think about cycling as a means to be(come) healthy ( $p=0.085$ ); iv) less likely to perceive cyclists as stylish ( $p=0.033$ ); and v) less likely to admire cyclists ( $p=0.055$ ). No inter-group differences were found between frequencies of cycling use for school travel or non-school travel purposes. Although no *actual* difference in cycling behaviour was evident between groups, the pilot curriculum itself was very positively received. Indeed 91% of participating students believed that it was beneficial for their peers. My hope is that this study will help to inform future cycling educational programming specifically those that target youth and high school students. However, future programming needs to account for high school cycling as a gendered practice, which has implications for young women's active transportation in the city of Toronto.

### **Aquaporin-4 in rat tibialis anterior muscle following lengthening contractions**

Student Researcher: Emily Vecchiarelli  
Faculty Advisor: Dr. Marius Locke  
University of Toronto

Muscle lengthening contractions, or eccentric exercise, are characterized by sarcomere disruption, force decrement, the loss of intracellular proteins and increases in water content and muscle cell swelling. Exercise can act as a stressor on the working muscle. Under elevated demands such as exercise, the simple diffusion of water is insufficient for the maintenance of the cellular milieu. Specialized proteins must exist to facilitate water conduction across tissue and cell membranes. The Aquaporin family of trans membrane channel proteins are widely distributed in tissues and function as selective, bi-directional water transporters facilitating the passive movement of water across membranes and tissue compartments. However, the expression and significance of Aquaporin (AQP) has been less defined in skeletal muscle, particularly in response to the stress of exercise.

The present study sought to define the expression of AQP-4 in skeletal muscle tissue, post-lengthening contractions. Male Sprague-Dawley rats had one tibialis anterior (TA) muscle electrically stimulated while being passively lengthened for a total of 20, 40 or 60 repetitions. At 24 hours after the eccentric contractions, both the stimulated TA muscles and the contralateral TA muscles were extracted and processed to examine the AQP4 content by Western Blot analyses. A visible, positive trend was observed between the presence of AQP4 and the number of contractions elicited. Although, when normalized to contralateral controls AQP4 content was not significantly different at 20 contractions ( $1.06 \pm 0.1514$  fold-increase), 40 contractions ( $1.065 \pm 0.077$  fold-increase), or 60 contractions ( $1.30 \pm 0.359$  fold-increase). These data suggest that AQP4 may contribute to maintaining cell volume homeostasis during muscle activity and may be functionally related to the muscular swelling that is observed with exercise.

### **The effect of massage therapy on the inflammatory response following high-intensity intermittent exercise and rest**

Student Researcher: Hayley Warren

Faculty Advisor: Dr. Greg Wells

University of Toronto

Massage therapy is considered an effective therapeutic modality for reducing soreness and improving recovery of acute musculoskeletal injuries. More recently, it has become accepted as a post-exercise recovery modality amongst athletes attempting to promote the return of pre-exercise muscle function and perceptions of soreness/impairment. Furthermore, it has been considered to induce anti-inflammatory gene up-regulation when used following a bout of high-intensity eccentric contractions. While this finding supports the use of massage as an anti-inflammatory intervention, the downstream effects of massage on systemic inflammatory mediator production and activity has yet to be established. Additionally, the functional implications of any anti-inflammatory effect of massage also remains to be arbitrated. We are investigating the effects of a massage treatment following high-intensity sprint exercise to determine its efficacy to reduce plasma levels of inflammatory markers and facilitate recovery of decreased performance. In a randomized study, we will compare a massage therapy protocol with passive recovery control to establish the effectiveness of massage therapy for reducing plasma markers of inflammation and facilitating recovery of impaired performance following high intensity sprint exercise. N=8 varsity-level male athletes competing in power/sprint sports were recruited to the study. Participants performed 10x120 m sprints every 3 minutes on a 200 m indoor track. Immediately following exercise, subjects were randomly assigned to 30 minutes of a massage treatment or passive seated rest. Performance on squat jumps (SJ) and drop jumps (DJ), subjective measures of muscle soreness, and plasma levels of inflammatory cytokines (IL-6, IL-8, IL-1, TNF- $\alpha$ , IL-4, IL-10) were measured at time points pre-exercise, post-exercise, 1 h, 2 h, and 24 h post-exercise. Data collection is underway and is yet to be analyzed. It is expected that measures for soreness will positively correlate with pro-inflammatory markers and DJ performance, SJ performance, and ratings of perceived recovery will negatively correlate with pro-inflammatory markers. It is also expected that massage will reduce all markers of inflammation and increase DJ performance and SJ performance following exercise, whereas passive rest will have a lesser effect. The significance of these results will reinforce the beneficial therapeutic effects of massage following exercise, encouraging this intervention to be applied to an array of inflammatory diseases.

### **The effects of high repetition vs. low repetition resistance exercise training on body composition in young, resistance trained men**

Student Researcher: Christopher Wavell

Faculty Advisor: Dr. Stuart Phillips

McMaster University

*Background:* Resistance exercise training (RET)-induced skeletal muscle hypertrophy precipitates a wide-range of health benefits in numerous populations. Many of these benefits are related to increasing the ratio of lean body mass relative to fat mass, thus improving body composition. We have previously shown that performing RET consisting of high repetition numbers confers the same hypertrophic response as compared with low repetition numbers in untrained individuals<sup>1</sup>. The aim of this study is to examine if the same is true in a trained population.

**Methods:** Thirty three males (18-30,  $23.6 \pm 0.41$ yr) with a history of RET were randomly allocated to either a high repetition group (HRG, n=17) at 20-25 reps/set or a low repetition group (LRG, n=16) at 8-12 reps/set, all for 3 sets to volitional failure. Participants completed a 12-week progressive RET program that included 4 training sessions per week. Total body mass (TBM), total lean mass (TLM), appendicular lean mass (ALM), total fat mass (TFM) were assessed using Dual Energy X-Ray Absorptiometry. Percent body fat (%BF) was calculated using Lohman's 4-compartment model. Body composition measurements were performed both prior to, and upon completion of the intervention.

**Results:** The HRG and LRG significantly increased LBM ( $0.869 \pm 0.196$  and  $1.438 \pm 0.409$  kg;  $p=.002$ ) with no significant interaction between groups ( $p=.276$ ). Similarly, there was a significant increase in ALM in both the HRG and LRG respectively ( $0.847 \pm 0.317$  and  $1.282 \pm 0.329$  kg;  $p<.001$ ) with no significant interaction between training groups ( $p=.364$ ). TFM ( $-1.291 \pm 1.449$  vs.  $-0.226 \pm 0.168$  kg;  $p=.376$ ) and %BF ( $-0.122 \pm 0.665$  vs.  $1.506 \pm 0.856$ ;  $p=.213$ ) did not change significantly as a result of the intervention. There was however, a significant interaction for TBM between the HRG ( $-0.334 \pm 0.625$  kg) and the LRG ( $1.568 \pm 0.442$  kg)( $p=.020$ ), although no significant time effect ( $p=.121$ ). **Conclusions:** These data suggest that performing RET using 8-12 reps/set or 20-25 reps/set results in similar changes in LBM, ALM, TFM, and %BF corroborating our previous findings in untrained individuals.

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### Re-evaluating dietary protein requirements in highly active young adult males

Student Researcher: Denise Wooding

Faculty Advisor: Dr. Daniel Moore

University of Toronto

Consumption of adequate protein is important for athletes given its major role in repairing and/or remodeling body proteins (including within skeletal muscle), which ultimately impacts the maintenance or deposition of fat-free mass. Protein requirements in athletes have been estimated to be 1.2-1.4 g/kg/d for endurance athletes and 1.6-1.7 g/kg/d for strength athletes, which is considerably greater than the current recommended daily allowance (RDA) of 0.8 g/kg/d in healthy, sedentary adults. However, protein requirements have traditionally been determined using the nitrogen balance technique, which has been reported to underestimate true requirements. The Indicator Amino Acid Oxidation (IAAO) technique has recently emerged as an alternate method for estimating protein requirements in a variety of populations but has yet to be applied to athletes. Moreover, no research to date has specifically investigated the protein requirements of variable intensity sprint-based athletes who would perform exercise with both endurance (e.g. repeated sprints) and resistive (e.g. high muscle forces) components. Therefore, this study will determine the protein requirements of highly active young adults using, for the first time, the IAAO technique. Moreover, we will employ a variable intensity sprint-based exercise stimulus to bridge a continuum between pure resistance or endurance-based exercise. Six highly active (Energy Expenditure =  $3700 \pm 433.59$  kcal/d; Height =  $176.9 \pm 7.13$ cm; Weight =  $84.7 \pm 6.2$ kg) young adult males (22-24yr) were recruited to participate in the study. Participants will be required to complete seven different trial days each with a different protein intake ranging from deficient to excess (0.2-2.3 g/kg/d). Prior to each trial, participants will consume a 2-d adaptation diet that will provide their estimated caloric needs (determined by Sensewear BodyMedia Armband Accelerometer) and 1.2 g/kg/d protein. After consuming a protein-free breakfast, participants will perform a variable intensity running protocol designed to imitate the demands of a soccer match. After exercise, participants will consume 8 hourly meals each providing 1/12 of their daily energy and protein requirement, the latter of which will be provided as crystalline amino acids (AA) and modeled after the nutritionally complete egg protein. Phenylalanine (Phe) intake will be constant and will contain the stable isotope tracer [ $1-^{13}\text{C}$ ]-phenylalanine during the final 4h of feeding, which will serve as the indicator amino acid. Baseline and plateau breath samples will be and analyzed for  $^{13}\text{CO}_2$  enrichment (by isotope-ratio mass spectrometry) and  $\text{CO}_2$  production to determine the rate of Phe oxidation. We expect Phe oxidation to be highest when the protein intake is below the requirement (i.e. the excess Phe will be oxidized when the other AA are limiting for protein synthesis) but will gradually decrease at greater intakes (i.e. Phe will be directed towards protein synthesis as the other AA become less limiting). Phe oxidation will eventually reach a plateau with the breakpoint (modeled using bi-phase linear regression) representing the estimated average requirements (EAR). We hypothesize that EAR will be higher than that previously determined in sedentary populations by IAAO and in active populations by NBAL indicating an increased protein requirement for this active population.

## **Is there a relationship between starting block configuration and foot-block interactive forces during a sprint start?**

Student Researcher: Jackie Zehr  
Faculty Advisor: Dr. Tyson Beach  
University of Toronto

**Introduction:** Starting block configurations have been recognized as an important consideration in optimizing sprint start performance (Harland & Steele, 1997; Schot & Knutzen, 1992). However, little is known about the relationship between starting block configurations and kinetic determinants of sprint start performance. Without this knowledge, it is challenging to devise and evaluate intervention strategies.

**Aim:** The objective of this proposed study is to quantify the direction and strength of the relationship between starting block configurations and foot-block force-time characteristics of the sprint start.

**Methods:** Twenty athletes from the Canadian national track and field team (10 males: 10 females) and the University of Toronto varsity track and field team (10 males: 10 females) will be recruited. All data collection will take place during routine sprint start practice sessions. Foot-block interactive forces will be collected during maximal effort sprint starts using custom-built start blocks with instrumented force plates (Bertec Corporation, Columbus, OH). Starting block configurations will be characterized in two ways: (1) Inter-block distance, defined as the distance between the face of the rear block and the face of the front block; and (2) distance between each block and the starting line. Peak vertical and horizontal foot-block magnitudes of the combined force will be derived from the time histories (i.e., left and right foot-block forces will be summed at each instant in time). Correlational analyses will be carried out to determine if statistically significant ( $P < 0.05$ ) linear relationships exist between each positional variable of the starting block configuration and combined (left and right foot) peak vertical and horizontal foot-block force magnitudes. In cases where statistically significant relationships are detected, the direction and strength of the relationships will be assessed on the basis of the correlation coefficients.

**Expected Results:** A well-known method for selecting positional variables of the starting block configuration has yet to be established with respect to athlete-specific anthropometrics or optimizing individual foot-block interactive force magnitudes. A relationship between combined horizontal and vertical force magnitudes and positional variables is expected given that inter-block distance, in addition to front and rear starting line distances, can directly influence the musculoskeletal structures of the foot and indirectly influence the position of proximal segments in the set position (Lee & Piazza, 2009). Consequently, these results may invite researchers and coaches to consider how starting block configurations might influence the way force-time profiles of the sprint start are achieved and serve as tools to guide technical intervention strategies of the starting block phase.

### **References:**

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