

THE 19TH ANNUAL BERTHA ROSENSTADT

**NATIONAL UNDERGRADUATE  
RESEARCH CONFERENCE**

KINESIOLOGY AND PHYSICAL EDUCATION

**MARCH 23, 2018 • [KPE.UTORONTO.CA](http://KPE.UTORONTO.CA)**



UNIVERSITY OF TORONTO  
FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION



## SCHEDULE OF EVENTS

Time	Item	Location – Topic
8:30-9:00 a.m.	Registration & Refreshments	2 <sup>nd</sup> Floor Benson Lobby & Lounge
9:00-9:10 a.m.	Welcome	Benson 307
9:15-10:30 a.m.	Breakout Sessions I	Dealing with Concussions (BN302) Skeletal Muscle and Exercise Physiology (BN307) Sensorimotor Function and Accessibility (WS2007)
10:30-10:45 a.m.	<b>BREAK</b>	2 <sup>nd</sup> Floor Benson Lounge
10:45-12:15 p.m.	Breakout Sessions II	Enhancing Athletic Performance (BN302) Physical Activity and Physical Literacy at University (BN304) Muscle Recovery Mechanisms (BN307) Anatomical and Functional Research Methods (WS2007)
12:15-1:15 p.m.	<b>LUNCH</b>	2 <sup>nd</sup> Floor Benson Lounge
1:15-2:15 p.m.	Breakout Sessions III	Emotions in Sport and Physical Activity (BN302) Socio-Political Aspects of Sport (BN304) Skeletal Muscle Stress Responses (BN307) Cognition in Action (WS2007)
2:15-2:30 p.m.	<b>BREAK</b>	2 <sup>nd</sup> Floor Benson Lounge
2:30-3:45 p.m.	Breakout Sessions IV	Using Physical Activity to Identify, Tackle and Prevent Health Risks (BN302) Gendered Experiences and Representations (BN304) Physical Activity, Health and Fitness (BN307) Biomec Assessment in Patient Population (WS2007)
3:45-4:00 p.m.	<b>BREAK</b>	2 <sup>nd</sup> Floor Benson Lounge
4:00-5:00 p.m.	Keynote: Dr. Milos R. Popovic	<i>“Three contrasting clinical interventions that use electrical stimulation”</i> (BN307)
5:00-5:15 p.m.	Award Presentation and Closing Remarks	Benson 307

### ABOUT THE KEYNOTE SPEAKER



Milos R. Popovic received his Ph.D. degree in mechanical engineering from the University of Toronto, Canada in 1996, and the Dipl. Electrical Engineer degree from the University of Belgrade, Serbia in 1990.

Dr. Popovic is the Institute Director, Research at the Toronto Rehabilitation Institute - University Health Network. He is also a Professor in the Institute of Biomaterials and Biomedical Engineering at the University of Toronto. Dr. Popovic is the co-founder and director of (i) MyndTec; (ii) the Center for Advancing Neurotechnological Innovation to Application (CRANIA) at the University Health Network and the University of Toronto; (iii) the Neuromodulation Institute at the University of Toronto; and (iv) the Canadian Spinal Cord Injury Rehabilitation Association. He is also the founder of the Rehabilitation Engineering Laboratory at the Toronto Rehabilitation Institute - University Health Network. Dr. Popovic held the Toronto Rehab Chair in Spinal Cord Injury Research appointment from 2007 until 2017.

In his keynote presentation, Dr. Popovic will discuss three different applications of electrical stimulation. In one embodiment, electrical stimulation is used as a tool to improve voluntary locomotion. In the second embodiment, electrical stimulation is used to change mood and in the third embodiment, electrical stimulation is used to navigate stem cells and direct their movement. All three interventions have one thing in common; they use identical electrical stimulation pulses and identical software-hardware systems to deliver very different clinical interventions. These interventions belong to a broader spectrum of neuromodulation interventions. Hence, this lecture will be focused on presenting unique and unusual neuromodulation interventions of great relevance to diverse patient populations.

## ORDER OF THE DAY

**Registration and Refreshments:** 8:30 a.m. – 9:00 a.m. (2<sup>nd</sup> Floor Benson Lobby & Lounge)

**Welcome:** 9:00 a.m. – 9:10 a.m. (Benson 307)

**Session I:** 9:15 a.m. – 10:30 a.m.

- Dealing with Concussions (BN302)
- Skeletal Muscle and Exercise Physiology (BN307)
- Sensorimotor Function and Accessibility (WS2007)

### Dealing with Concussions Room BN302

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9:15 a.m.

*The Comparison of Neck Strength Between Healthy and Concussed Adolescent Athletes on Measures of Linear Acceleration Across Helmet Impact Locations Using a Surrogate Headform*

Student Researcher: Jasmine Ferdousi

Faculty Advisor: Dr. Carlos Zerpa

Lakehead University

9:30 a.m.

*Retrospective Review of Post-Concussion Syndrome Symptomatology*

Student Researcher: Sabrina Campbell

Faculty Advisor: Dr. Michel Rathbone

McMaster University

9:45 a.m.

*The Effects of a Previous Concussion on Target Accuracy and Dynamic Stability During a Stone Stepping Task*

Student Researcher: Jacqueline Nestico

Faculty Advisor: Dr. Michael Cinelli

Wilfrid Laurier University

10:00 a.m.

*Examining the Relationship Between Prior Concussion and Heart Rate Variability in Healthy Athletes*

Student Researcher: Kyla Pyndiura

Faculty Advisor: Dr. Michael Hutchison

University of Toronto

10:15 a.m.

*Heart Rate Variability Responses Post-Concussion: Serial Assessment Throughout Recovery*

Student Researcher: Danielle Corallo

Faculty Advisor: Dr. Michael Hutchison

University of Toronto

### Skeletal Muscle and Exercise Physiology Room BN307

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9:15 a.m.

*Characterizing Skeletal Muscle Biology During Disease Progression in Spinal Muscular Atrophy Mice*

Student Researcher: Andrew Mikhail

Collaborator: Sean Y. Ng

Faculty Advisor: Dr. Vladimir Ljubicic

McMaster University

9:30 a.m.

*The Impact of Co-Activator-Associated Arginine Methyltransferase 1 During Fasting-Induced Decrements in Muscle Cross-Sectional Area*

Student Researcher: Zack Moll

Collaborators: Derek W. Stouth, Tiffany L. vanLieshout

Faculty Advisor: Dr. Vladimir Ljubicic

McMaster University

9:45 a.m.

*Effect of Chronic Exercise on the Subcellular Localization of Muscleblind-Like Protein 1 in a Preclinical Model of Myotonic Dystrophy Type 1*

Student Researcher: Donald Xhuti

Collaborator: Alexander Manta

Faculty Advisor: Dr. Vladimir Ljubicic

McMaster University

10:00 a.m.

*Metabolic and Hormonal Responses with Ingestion of Casein, Whey, and Casein-Whey Blend in Young Men*

Student Researcher: Hannah Hopper

Collaborators: DA Traylor, SHM Gorissen, T Prior

Faculty Advisor: Dr. Stuart Phillips

McMaster University

10:15 a.m.

*The Impact of Exertional Heat Stress Exposure on Systemic Biomarkers of Hemostasis in a Healthy Military Sample*

Student Researcher: Hussein Fawzy

Faculty Advisors: Dr. Scott Thomas, Shawn Rhind

University of Toronto

### **Sensorimotor Function and Accessibility Room WS2007**

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9:15 a.m.

*Processing of Somatosensory Information by the Central Nervous System*

Student Researcher: Hamza Ahmad

Faculty Advisor: Nada Abu Merhy

McGill University

9:30 a.m.

*Fatigue and Discomfort During Sequential Stimulation of Tibialis Anterior*

Student Researcher: Matthew G. Heffernan

Collaborators: Austin J. Bergquist, Matheus J. Wiest, Taro Yamashita, Milos R. Popovic

Faculty Advisor: Dr. Kei Masani

University of Toronto

9:45 a.m.

*Grasping Reactions Following Induced Balance Loss for Handrails of Varying Shapes and Sizes*

Student Researcher: Mackenzie L. Collins

Collaborator: Philippa Gosine

Faculty Advisor: Dr. Alison Novak

University of Waterloo and University of Toronto

10:00 a.m.

*Environmental Scan of Stairs in Non-Accessible Building Entrances of Small Businesses in Toronto, Ontario: A Pilot Study*

Student Researcher: Tyler King

Faculty Advisor: Dr. Alison Novak

University of Toronto and Toronto Rehabilitation Institute

10:15 a.m.

*A Proposed Traffic Light Solution for the Colour Blind Population*

Student Researcher: Sam Stillie

Faculty Advisor: Dr. James Lyons

McMaster University

**BREAK:** 10:30 a.m. – 10:45 a.m. (2<sup>nd</sup> floor Benson Lounge)

**Session II:** 10:45 a.m. – 12:15 p.m.

- Enhancing Athletic Performance (BN302)
- Physical Activity and Physical Literacy at University (BN304)
- Muscle Recovery Mechanisms (BN307)
- Anatomical and Functional Research Methods (WS2007)

**Enhancing Athletic Performance  
Room BN302**

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10:45 a.m.

*Quantifying the Warm-Up Relative to Total Session Demands During Women's Field Hockey Matches*

Student Researcher: Alexander Klas

Faculty Advisors: Dr. Ira Jacobs, Dr. Jason D. Vescovi

University of Toronto

11:00 a.m.

*Acute Physiological Responses to Sprint Training in Normobaric Hypoxic Conditions*

Student Researcher: Naomi Maldonado-Rodriguez

Faculty Advisors: Dr. David Bentley, Dr. Ira Jacobs

University of Toronto and Canadian Sport Institute Ontario

11:15 a.m.

*Use of Heart-Rate Monitoring in Managing Training Loads and Preventing Injuries in University Male Soccer Players*

Student Researcher: Luca Martial

Faculty Advisor: Andreas Bergdahl

Concordia University

11:30 a.m.

*Pro-Swim Study*

Student Researchers: Katherine McKee, Ken Nguyen

Faculty Advisor: Panagiota (Nota) Klentrou

Brock University

11:45 a.m.

*Impact of Habitual Protein Intake on Estimates of Dietary Protein Requirements in Resistance Trained Athletes*

Student Researcher: Cassidy Tinline-Goodfellow

Faculty Advisor: Dr. Daniel Moore

University of Toronto

12:00 p.m.

*Ergogenic Effects of Beetroot Juice on Supramaximal Exercise and Recovery in Trained Athletes*

Student Researcher: Carolyn Adams

Collaborator: Mackenzie McLaughlin

Faculty Advisor: Dr. Ira Jacobs

University of Toronto

**Physical Activity and Physical Literacy at University  
Room BN304**

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10:45 a.m.

*Examining the Relationship Between Kinesiology Students' Self-Perceived Physical Literacy and Their Actual Physical Literacy Capabilities*

Student Researcher: Goran Perkić

Faculty Advisor: Dr. David Frost

University of Toronto

11:00 a.m.

*An Evaluation of Changes in the Domains of Physical Literacy Used in a Physical Literacy-Based Intervention for First-Year University Students*

Student Researcher: Rianne Perinpanayagam

Faculty Advisor: Dr. Matthew Kwan

McMaster University

11:15 a.m.

*Examining the Relationship Between Nutritional Literacy and Nutritional Labeling Among Undergraduate Students*

Student Researcher: Michelle Borgal

Faculty Advisor: Dr. Erin Pearson

Lakehead University

11:30 a.m.

*Exploring Physical Activity Opportunities and Health-Related Resources on Campus for International Students*

Student Researcher: Dong Hyuk (Chris) Park

Faculty Advisor: Dr. Catherine M. Sabiston

University of Toronto

11:45 a.m.

*The Effect of a Physical-Literacy Based Intervention on the Mental Health of First Year University Students: The PLUS Study*

Student Researcher: Cierra Healey

Faculty Advisor: Dr. Matthew Kwan

McMaster University

12:00 p.m.

*Enhanced Learning Through Exercise Breaks: Creating Feasible Protocols for Implementation into Classrooms*

Student Researchers: Alice Chan, Brynley Hanson-Wright

Collaborators: Barb Fenesi, Michelle Ogradnik

Faculty Advisor: Dr. Jennifer Heisz

McMaster University

**Muscle Recovery Mechanisms  
Room BN307**

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10:45 a.m.

*Changes in Specific Force in Response to Hypertrophic and Atrophic Stimuli in Young Males*

Student Researcher: Kevin Murphy

Faculty Advisor: Dr. Stuart Phillips

McMaster University

11:00 a.m.

*Impaired Recovery of Skeletal Muscle Size Following Two Weeks of Immobilization in Young Women*

Student Researcher: Ravninder Bahniwal

Collaborators: Kamal M., Gorissen S., Hector A., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

11:15 a.m.

*Investigating the Ability of Skeletal Muscle Co-Activator-Associated Arginine Methyltransferase 1 to Regulate Central Myonuclei Positioning After Hind Limb Denervation*

Student Researcher: James P. Thoms

Collaborators: Derek W. Stouth, Tiffany L. vanLieshout

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

11:30 a.m.

*A Gut Feeling for Exercise: The Effects of Exercise and the Gut Microbiota on Skeletal Muscle Morphology*

Student Researcher: Irfan Khan

Faculty Advisors: Dr. Gianni Parise, Dr. Stephen Collins

McMaster University

11:45 a.m.

*The Effect of Using Cold Water Immersion Therapy on Protein Synthesis Following Lengthening Contractions in the Extensor Digitorum Longus of Sprague-Dawley Rats*

Student Researcher: Melissa Stapleton

Faculty Advisor: Marius Locke

University of Toronto

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**Anatomical and Functional Research Methods  
Room WS2007**

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10:45 a.m.

*A Novel Surgical Treatment for Anterior Cruciate Ligament Tears*

Student Researchers: Veeral Desai, Yixi (Kevin) Ren

Collaborators: Jamshied Shamlou, Mark Georgy

Faculty Advisor: Michael Wong

McMaster University

11:00 a.m.

*Ultrasonography Is Comparable to Magnetic Resonance Imaging in the Assessment of Skeletal Muscle Atrophy Due to Immobilization*

Student Researcher: Tom Tripp

Collaborators: Murphy K., Stokes T., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

11:15 a.m.

*Accuracy of Clinical Goniometric Measures of Coronal and Axial Alignment of the Lower Extremity*

Student Researcher: Tate Newmarch

Faculty Advisor: Dr. Doug Richards

University of Toronto

11:30 a.m.

*The Effect of Taping on the Foot to Determine Centre of Pressure and Sway While Balancing on a Stable Versus Foam Surface over an AMTI Force Platform*

Student Researcher: Kaitlynn Gilmor

Faculty Advisor: Paolo Sanzo

Lakehead University



11:45 a.m.

*Mechanical Characterization of a Novel Method for Craniofacial Stabilization Utilizing Dopamine-Based Adhesives*

Student Researcher: Prabjit Ajrawat

Faculty Advisors: Dr. Doug Richards, Dr. Cari Whyne

University of Toronto

12:00 p.m.

*Relationship Between Rate of Perceived Exertion and Heart Rate Within a Cardiac Rehabilitation Population Completing a Stair Climbing-Based High Intensity Interval Training Intervention*

Student Researcher: Jessica Morris

Collaborators: Dunford E.C., Valentino S.E., Dubberley J., Phillips S.M., Lonn E.

Faculty Advisor: Dr. Maureen MacDonald

McMaster University and Hamilton Health Sciences

**LUNCH:** 12:15 p.m. – 1:15 p.m. (2<sup>nd</sup> Floor Benson Lounge)

**Session III:** 1:15 p.m. – 2:15 p.m.

- Emotions in Sport and Physical Activity (BN302)
- Socio-Political Aspects of Sport (BN304)
- Skeletal Muscle Stress Responses (BN307)
- Cognition in Action (WS2007)

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**Emotions in Sport and Physical Activity  
Room BN302**

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1:15 p.m.

*Exploring the Role of Family Support in Military Personnel's Recovery From Physical and Mental Illnesses and Injuries Through Sport Participation*

Student Researcher: Sabrina E. Ribau

Faculty Advisors: Dr. Kelly Arbour-Nicitopoulos, Dr. Celina Shirazipour

University of Toronto

1:30 p.m.

*Parental Perceptions of the Impact of DCD on Everyday Functioning in Young Children*

Student Researcher: Anne Mienkowski

Faculty Advisor: Dr. John Cairney

University of Toronto

1:45 p.m.

*Coaches' Interpersonal Emotion Regulation with Varsity Sport Athletes*

Student Researcher: Sing-Yan Ng

Faculty Advisor: Dr. Katherine Tamminen

University of Toronto

2:00 p.m.

*Examining Identity, Personality, Stress and Social Support Among Varsity Student-Athletes*

Student Researcher: Zacharie Holmes

Faculty Advisor: Dr. Katherine Tamminen

University of Toronto

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**Socio-Political Aspects of Sport  
Room BN304**

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1:15 p.m.

*Defining and Understanding Success of National and Provincial Level Sport Tournaments*

Student Researcher: William Kinney

Faculty Advisor: Dr. Simon Darnell

University of Toronto

1:30 p.m.

*Socioeconomic Status and the Availability of School-Based Sports*

Student Researcher: Alanna Sadri

Faculty Advisor: Dr. Peter Donnelly

University of Toronto

1:45 p.m.

*Sport Is Not Enough: Why Outdoor Education Can Make a Valuable Contribution to the Field of Sport for Development*

Student Researcher: Katya Smirnova

Faculty Advisor: Dr. Simon Darnell

University of Toronto

2:00 p.m.

*The "Taking a Knee" Protest: Media Representations of Black Athletes During the NFL Protests and Audience Understandings*

Student Researcher: Barinderjit Sangha

Faculty Advisor: Dr. Margaret MacNeill

University of Toronto

**Skeletal Muscle Stress Responses  
Room BN307**

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1:15 p.m.

*Fibre Type Analysis of Damage and HSP Localization Following Lengthening Contractions*

Student Researcher: John-Peter Bonello

Faculty Advisor: Dr. Marius Locke

University of Toronto

1:30 p.m.

*Time-Course Changes in Skeletal Muscle Gene Expression During Two Weeks of Unilateral Leg Immobilization in Young Women*

Student Researcher: Michael Kamal

Collaborators: Bahniwal R., Gorissen S.M.H., Hector A., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

1:45 p.m.

*The Role of Co-Activator-Associated Arginine Methyltransferase 1 in Skeletal Muscle During Denervation-Induced Atrophy*

Student Researcher: Naomi S. Misquitta

Collaborators: Derek W. Stouth, Tiffany L. vanLieshout

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

2:00 p.m.

*Exercise-Induced Signalling in Skeletal Muscle of Myotonic Dystrophy Type 1 Mice*

Student Researcher: Mark Mackie

Collaborator: Alexander Manta

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

1:15 p.m.

*Attentional Focus Instructions for Golf-Putting Accuracy and Precision*

Student Researcher: Sadiya Abdulrabba

Collaborators: Valentin Crainic, Gerome Manson, Stephen Bested

Faculty Advisor: Dr. Luc Tremblay

University of Toronto

1:30 p.m.

*The Influence of the Presence of One's Own Smartphone on Social Inhibition of Return*

Student Researcher: Jacqueline Brillantes

Faculty Advisor: Dr. James Lyons

McMaster University

1:45 p.m.

*"Bet Your Bottom Dollar" Do People Emphasize Value or Probability When Choosing Between Alternatives?*

Student Researcher: Saba Taravati

Faculty Advisor: Dr. Tim Welsh

University of Toronto

2:00 p.m.

*Hunting the SNARC: Does the Roll You Want Influence How You Roll*

Student Researchers: Miranda Guo, Anthony Sitas

Faculty Advisor: Dr. James Lyons

McMaster University

**BREAK:** 2:15 p.m. – 2:30 p.m. (2<sup>nd</sup> floor Benson Lounge)

**Session IV:** 2:30 p.m. – 3:45 p.m.

- Using Physical Activity to Identify, Tackle and Prevent Health Risks (BN302)
- Gendered Experiences and Representations (BN304)
- Physical Activity, Health and Fitness (BN307)
- Biomec Assessment in Patient Population (WS2007)

**Using Physical Activity to Identify, Tackle, and Prevent Health Risks  
Room BN302**

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2:30 p.m.

*Sport and Physical Activity Levels in Indigenous Populations of Canada*

Student Researcher: Sam Stillie

Faculty Advisors: Dr. Philip White, Dr. Peter Kitchen

McMaster University

2:45 p.m.

*The Effect of Perinatal Risk Factors on Developmental Coordination Disorder (DCD) in Young Children*

Student Researcher: Stephanie Babij

Faculty Advisor: Dr. John Cairney

University of Toronto

3:00 p.m.

*Does Mandatory Physical Education Affect Physical Activity, Obesity, and Health-Related Outcomes?*

Student Researcher: Rachel Pham

Faculty Advisor: Dr. John Cairney

University of Toronto

3:15 p.m.

*Assessing the Validity of the CANRISK Questionnaire in Detecting Prediabetes and Undiagnosed Type 2 Diabetes Using HbA1c in a Rural Northwestern Ontario Community*

Student Researcher: Felicia Lotsios

Collaborator: Heidi West

Faculty Advisor: Dr. Ian Newhouse

Lakehead University and Mary Berglund Community Health Centre Hub

3:30 p.m.

*Increased Levels and Perceptions Regarding Exercise Following Surgery in Colorectal Cancer Patients: A 12-Month Follow-Up Study*

Student Researcher: Anthony Cinquino

Faculty Advisor: Dr. Celena Scheede-Bergdahl

McGill University

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**Gendered Experiences and Representations  
Room BN304**

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2:30 p.m.

*Inexperienced Female Ultimate Players' Perspectives on Spirit of the Game*

Student Researcher: C. Lindsay Edward

Faculty Advisor: Dr. John Gotwals

Lakehead University

2:45 p.m.

*PyeongChang 2018 Olympic Media: Gendered Representations of Women's Ice Hockey and Figure Skating Events*

Student Researcher: Natalie Bo-Yan Hui

Faculty Advisor: Dr. Margaret MacNeill

University of Toronto

3:00 p.m.

*One of These Is Not like the Other: Lived Experiences of Female Athletes Playing on Male Sport Teams*

Student Researcher: Karly Zammit

Faculty Advisor: Dr. Catherine Sabiston

University of Toronto

3:15 p.m.

*A Phenomenological Study to Describe the Experiences of Female Police Officers in Thunder Bay, Ontario*

Student Researcher: George Makrides

Faculty Advisor: Dr. K. Sinden Co-supervisor: Dr. B. TeHiwi

Lakehead University

3:30 p.m.

*Masculinity at Summer Camp: An Ethnofiction*

Student Researcher: John Hannant-Minchel

Faculty Advisor: Dr. Michael Atkinson

University of Toronto

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**Physical Activity, Health and Fitness  
Room BN307**

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2:30 p.m.

*The Impact of Age and Aerobic Fitness on Heart Rate Recovery in Children*

Student Researcher: Megan Bittner

Collaborators: Proudfoot N.A., Caldwell H.A.T., Di Cristofaro N.A., Bacauanu J.P., Timmons B.W.

Faculty Advisor: Dr. Maureen MacDonald

McMaster University

2:45 p.m.

*Do Brief Daily Bouts of Stair Climbing Exercise Improve Cardiorespiratory Fitness?*

Student Researcher: Leah Nairn

Collaborator: Madi Jenkins

Faculty Advisor: Dr. Martin Gibala

McMaster University

3:00 p.m.

*Examining the Relationship Between Central and Peripheral Fatigue in Individuals with Multiple Sclerosis*

Student Researcher: Jessica McGrath

Faculty Advisor: Dr. Audrey Hicks

McMaster University

3:15 p.m.

*Quantitative Analysis of Older Women Participating in Physical Activity*

Student Researcher: Angela Lam

Collaborator: Konstantina Katsoulis

Faculty Advisor: Dr. Catherine Amara

University of Toronto

3:30 p.m.

*Exercise and Obesity in a Nursing Student and Registered Nurses Cohort*

Student Researcher: Malika Ganguli

Faculty Advisor: Dr. Sarah West

Trent University

**Biomechanical Assessment in Patient Population  
Room WS2007**

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2:30 p.m.

*Wheelchair Propulsion Performance - Relationship Between Over-Ground and Ergometer-Based Testing*

Student Researcher: Yasmine Belkadi

Collaborators: Lindsay Musalem, Devon Frayne

Faculty Advisor: Dr. Tyson Beach

University of Toronto

2:45 p.m.

*Validation and Reliability of Inertial Measurement Units for Determining Trunk Flexion*

Student Researcher: Adam Pinos

Faculty Advisor: Dr. Scott Thomas

University of Toronto

3:00 p.m.

*Traumatic Lower-Limb Amputees Display Greater Variability in Angular Excursion of the Supporting Foot in a Balance Perturbation Task*

Student Researcher: Michael Wright

Collaborator: Elyse Courville

Faculty Advisor: Dr. Nancy St-Onge

Concordia University

3:15 p.m.

*Using the Shoulders to Balance Following a Perturbation in Lower Limb Amputees*

Student Researcher: Kristina Amja

Collaborator: Elyse Courville

Faculty Advisor: Dr. Nancy St-Onge

Concordia University

3:30 p.m.

*Is Pressure Distribution in the Feet Associated with Imaging Evidence of Disease Activity in Patients with Early Rheumatoid Arthritis?*

Student Researcher: Ashley M. Bergman

Collaborators: James Tanzil, Hanyan Zou, Monica R. Maly, Maggie J. Larche

Faculty Advisor: Dr. Karen A. Beattie

McMaster University

**BREAK:** 3:45 p.m. – 4:00 p.m. (2<sup>nd</sup> Floor Benson Lounge)

**KEYNOTE:** 4:00 p.m. – 5:00 p.m. (BN307)

Dr. Milos R. Popovic

*“Three contrasting clinical interventions that use electrical stimulation”*

**AWARDS AND CLOSING REMARKS:** 5:00 p.m. – 5:15 p.m. (BN307)

## **Attentional Focus Instructions for Golf-Putting Accuracy and Precision**

Student Researcher: Sadiya Abdulrabba

Collaborators: Valentin Crainic, Gerome Manson, Stephen Bested

Faculty Advisor: Dr. Luc Tremblay

University of Toronto

What attentional strategy is most critical for motor performance accuracy and precision? One can take an internal focus, shifting attention to proprioceptive cues arising from the body (e.g., force cues from the muscles). Or one can take an external focus, shifting attention to cues from the environment (e.g., visual cues). Wulf and Prinz (2001) suggested that an internal focus of attention interferes with control processes while an external focus of attention avoids such interference. More recently, Munzert et al. (2014) did report an advantage of an external focus on putting performance but not on putting kinematics. Because Munzert et al. (2014) calculated the ball endpoint absolute error, which can confound performance bias and variability (Schutz & Roy, 1973), the present study separately assessed the impact of attentional focus instructions on golf-putting accuracy and precision. Novice participants performed a putting task over 3 experimental phases: a pre-test consisting of 10 trials; an attentional training protocol involving 90 trials; and a 10-trial immediate post-test. Before the acquisition phase, participants were provided with either internal or external focus of attention instructions. Both groups were told that their attentional focus strategy would lead to better performance (see Reinking et al., 1974). Interestingly, some individuals provided with internal attention focus instructions revealed adopting an external focus strategy during the acquisition phase. Putting accuracy and precision data were analyzed using 2 group (internal, external) by 2 test (pre, post) ANOVAs. These analyses were performed using both the attentional focus instructions and the strategy that appeared to be adopted by the 55th trial during acquisition. Preliminary results indicate that an external focus of attention yields acute improvement in precision but not accuracy of the ball endpoint. In contrast, the internal focus of attention yielded no acute effects on ball endpoint precision or accuracy.

## **Ergogenic Effects of Beetroot Juice on Supramaximal Exercise and Recovery in Trained Athletes**

Student Researcher: Carolyn Adams

Collaborator: Mackenzie McLaughlin

Faculty Advisor: Dr. Ira Jacobs

University of Toronto

*Study Aim:* Beetroot juice (BRJ) consumption has been shown to confer ergogenic benefits in aerobic exercise through reducing oxygen cost of exercise and prolonging time to exhaustion. These effects have been attributed to the increased bioavailability of nitric oxide (NO) which enhances distribution of oxygenated blood by vasodilation. The present study examined the potential ergogenic effects of BRJ supplementation on high-intensity anaerobic cycling exercise and short duration recovery.

*Methods:* Thirteen aerobically trained athletes ages 18-30 years have been recruited to participate. The study followed a single-blind, randomized, crossover design with a 5-day consumption period of concentrated BRJ, or placebo drink (PL). On the fifth day of beverage consumption, subjects performed an incremental cycle ergometer test consisting of: 4 min at 75 W, 4 min at 150 W, and then increasing resistance at 25W/min to exhaustion. After a 4-min recovery, participants resumed cycling at the highest power output completed in the previous test. Oxygen uptake ( $\text{VO}_2$ ), time to exhaustion (TTE), heart rate (HR) and lactate concentrations were measured before, during, and after exercise.

*Results to Date:* While data collection is currently ongoing, preliminary observations have indicated that the exercise protocol is associated with peak aerobic power ( $\text{VO}_{2\text{peak}}$ ) from 3.2-4.6L/min and post-exercise blood lactate concentrations ranging from 9.5 to 11.3mmol/L. TTE on the second exercise bout ranged from 1.83 to 2.75 minutes. These early results confirm that the protocol is effective for the purpose of testing the hypothesis.

*Conclusions:* A cycle ergometer incremental power test to maximal aerobic power, followed by a 4-minute rest period and subsequent constant supramaximal intensity test to exhaustion is an appropriate exercise protocol for examining the potential ergogenic effects of chronic BRJ supplementation on high-intensity exercise performance and recovery.

**Keywords:** nitric oxide, maximal aerobic power, supramaximal exercise.

## **Processing of Somatosensory Information by the Central Nervous System**

Student Researcher: Hamza Ahmad

Faculty Advisor: Nada Abu Merhy

McGill University

The study was designed to investigate how quickly the central nervous system can process somatosensory signals originating from the hand and generate hand movement. We measured the delay between the onset of an unexpected change in the slope of a virtual surface created by a small robot and the resulting change in muscle activation. EMG was recorded from nine hand muscles and averaged to establish a 95% confidence interval. The earliest departure from the confidence interval following the change in slope provided a measure of the delay. We found that the minimum delay was 55-60 ms, which is sufficiently long to conclude that the pathway for transforming the somatosensory signal to a motor command most likely involves a transcortical integration.

*Keywords:* central nervous system, somatosensory processing,

## **Mechanical Characterization of a Novel Method for Craniofacial Stabilization Utilizing Dopamine-Based Adhesives**

Student Researcher: Prabjit Ajrawat

Faculty Advisors: Dr. Doug Richards, Dr. Cari Whyne

University of Toronto

*Introduction:* Surgical treatment of craniomaxillofacial (CMF) skeleton fractures often involve restoring both the form and function of the bony facial skeleton. Currently, titanium Plate Fixation systems are considered the gold standard technology for CMF skeleton fracture stabilization. Despite this, the rigidity of these metal implants complicates the alignment of bone fragments and the non-degradable nature of these devices may impede fracture healing. Alternatively, "Bone Tape" is a novel construct designed for fracture fixation in the CMF skeleton. It is a multi-phase heterogeneous composite material consisting of 4 phases: a polymer resin matrix, porous ceramic Calcium Polyphosphate tabs, Glass Ionomer Cement and a light curable polymer veneer. Combining "Bone Tape" mechanical strength, low-profile, ease of use, and versatility allows for simultaneous alignment and stabilization of multiple articulated bone fragments. The purpose of this study is to evaluate the mechanical shear performance of "Bone Tape" with the application of a dopamine-based adhesive.

*Methods:* Five separate "Bone Tape" pieces (n=5) were mechanically shear tested using the MTS Bionix 858 servohydraulic testing machine. Each "Bone Tape" piece was adhered to two bone pieces using a novel dopamine-based adhesive and the Stress Strain curves were obtained from the shear testing to determine the composite's Young's Modulus, yield and ultimate strain and the breaking force per unit CPP tab attached to the broken surface.

*Results:* Data collection and analysis is on-going. However, we hypothesize from *in vivo* data that "Bone Tape" while adhering with a dopamine-based adhesive will provide sufficient stability, stiffness, and have the ability to sustain high physiological loads.

*Discussion:* The results for this *in vivo* experiment will yield valuable qualitative and quantitative insights into potentially progressing surgical treatment of CMS fractures. Once results are obtained, refinement and redesigning this novel biotechnology can be made to improve "Bone Tape" practicality in CMS fracture repair.

## **Using the Shoulders to Balance Following a Perturbation in Lower Limb Amputees**

Student Researcher: Kristina Amja

Collaborator: Elyse Courville

Faculty Advisor: Dr. Nancy St-Onge

Concordia University

*Introduction:* Balance is altered in individuals with a lower limb amputation. Most studies have focused on the effect of amputation on balance during quiet standing in double-legged stance. However, few studies have looked at balance in perturbed single-legged stance. Our goal was to assess the role of shoulder positioning in maintaining balance in traumatic transtibial amputees in response to a perturbation, while standing on the non-amputated leg.

*Methods:* Six traumatic transtibial amputees and six able-bodied controls participated in the study. They stood on a perturbation platform and remained as stable as possible for 30 seconds with the eyes open. The participants with an amputation stood on the non-amputated leg and the controls stood on a self-selected limb. Ten trials were recorded for each participant. During some randomized trials (n=5), the perturbation platform moved anteriorly by 9 cm between the 10<sup>th</sup> and the 20<sup>th</sup> second.



Kinematics were recorded using reflective markers that were placed on anatomical landmarks. Position of markers was used to compute shoulder positioning through the trials. Three variables were computed: i) shoulder position relative to the supporting foot, ii) shoulder angular motion in the frontal plane, iii) shoulder angular motion in the transverse plane.

*Results:* The opposite shoulder was usually positioned above the foot the participant was standing on. In response to perturbations, shoulders rotated and came back to almost the initial position; participants rotated their shoulders internally (towards the lifted leg) and dipped down the shoulder that was on the same side as their supporting leg.

*Conclusion:* Studying and examining shoulder position/motion during a platform perturbation in individuals with an amputation can have significant clinical meaning such as understanding how the body re-establishes and maintains balance.

## **The Effect of Perinatal Risk Factors on Developmental Coordination Disorder (DCD) in Young Children**

Student Researcher: Stephanie Babij

Faculty Advisor: Dr. John Cairney

University of Toronto

Developmental Coordination Disorder (DCD) is a prevalent, neuro-developmental condition, affecting approximately 5-6% of children (Missiuna, Rivard, & Pollock, 2004). DCD is primarily characterized by impairments in both fine and gross motor skills, resulting in deficits in overall motor coordination and activities of daily living (Visser, 2003). The etiology of DCD remains uncertain, however studies have shown that perinatal risk factors may have an effect on the likelihood of a child developing DCD (Hua et al., 2014). While there is a growing body of evidence that perinatal risk factors such as alcohol exposure (Landgren et al., 2010) and second-hand smoke exposure (Hua et al., 2014) are correlated with DCD diagnosis, there is limited empirical research on the cumulative effect of multiple perinatal risk factors. The purpose of this study was to examine the effect of single versus cumulative perinatal risk factors in the development of DCD in young children. Participants (N=587, 333 boys) in the current study are part of a larger cohort study, the Coordination and Activity Tracking in Children (CATCH) study. Six perinatal risk factors were measured in this study: (1) alcohol exposure, (2) smoking exposure, (3) gestational diabetes, (4) weight concerns, (5) high blood pressure and (6) other, unspecified medical conditions. A multinomial logistic regression revealed that the odds of a child having DCD are significantly higher with a greater total number of perinatal risk factors, after adjustment for mother's age at child's birth, child's sex, child's age, marital status and approximate current household income (OR=1.48,  $p=0.01$ ). These findings warrant further investigation into perinatal risk factors such as gestational diabetes and weight concerns, and their effect on DCD in children. Furthermore, these findings may provide additional insight for women on prenatal care and enhance their knowledge on the risk factors for a child developing DCD later in life.

## **Impaired Recovery of Skeletal Muscle Size Following Two Weeks of Immobilization in Young Women**

Student Researcher: Ravninder Bahniwal

Collaborators: Kamal M., Gorissen S., Hector A., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

*Introduction:* A number of clinical scenarios necessitate a period of limb immobilization. Reports in men show that immobilization promotes losses in skeletal muscle mass and strength; however, comparable data in women are sparse, despite evidence of women experiencing greater declines in strength with immobilization. Thus, we aimed to examine the impact of immobilization and recovery on skeletal muscle size and isometric knee extensor torque in young women.

*Methods:* Twenty healthy women ([all data mean $\pm$ SD] age: 22 $\pm$ 3 y, body mass 63 $\pm$ 8 kg) underwent 14 d of unilateral limb immobilization followed by 14 d of return to ambulation. Muscle size using magnetic resonance imaging and isometric knee extensor torque were measured before (Pre) and after (Post) immobilization, as well as following 14 d of recovery (RC). Dietary protein intake was controlled during immobilization at 1.0 g/kg/d.

*Results:* Peak quadriceps cross-sectional area was reduced from Pre to Post (61.4 $\pm$ 8.9 to 54.3 $\pm$ 7.1 cm<sup>2</sup>,  $p<0.05$ ), and did not return to Pre levels at RC (57.4 $\pm$ 8.0 cm<sup>2</sup>,  $p<0.05$ ). Quadriceps volume was decreased from Pre to Post (975 $\pm$ 193 to 865 $\pm$ 155 cm<sup>3</sup>,  $p<0.05$ ) and failed to return to Pre levels at RC (913 $\pm$ 180 cm<sup>3</sup>,  $p<0.05$ ). Isometric knee extensor torque was decreased from Pre to Post (176 $\pm$ 44 to 126 $\pm$ 31 N·m,  $p<0.05$ ) but returned to Pre levels at RC (181 $\pm$ 30 N·m,  $p>0.05$ ). Similarly, specific

strength decreased from Pre to Post ( $1.7\pm 0.4$  to  $1.4\pm 0.3$  N·m/(cm<sup>2</sup>·m),  $p<0.05$ ) and returned to Pre levels at RC ( $1.9\pm 0.2$  N·m/(cm<sup>2</sup>·m),  $p>0.05$ ).

*Discussion:* These data demonstrate that 14 d of unilateral limb immobilization in young women leads to a decrease in muscle size and strength. In addition, strength but not muscle size returned to baseline levels following 14 d of free-living recovery.

*Conclusion:* Strategies are required to expedite recovery of muscle following acute immobilization in young women.

### **Wheelchair Propulsion Performance – Relationship Between Over-Ground and Ergometer-Based Testing**

Student Researcher: Yasmine Belkadi  
Collaborators: Lindsay Musalem, Devon Frayne  
Faculty Advisor: Dr. Tyson Beach  
University of Toronto

Ergometer-based (ERG) testing is increasingly being used for wheelchair athletes because variables such as speed, power output and resistance can be more tightly controlled than during over-ground (OG) testing [1]. However, previous authors have questioned the agreement between ERG and OG testing results due to a discrepancy in rolling resistance between both modes [2]. It is important that the relationship between ERG and OG testing results be established to allow sport scientists and coaches to monitor performance. Accordingly, the study objective was to compare the OG and ERG wheelchair propulsion performances to determine if these testing modes could be used interchangeably.

Ten members of the Canadian National Wheelchair Basketball Academy performed 20m wheelchair sprints during both OG and ERG testing sessions. The time to complete 2.5, 5, 10, and 20m was recorded during OG and ERG testing. Regression analyses and paired t-tests were used to assess the strength of the relationship and magnitude of the differences, respectively, between the ERG and OG split and total times. Significant ( $p<0.001$ ), positive correlations were present between ERG and OG total time ( $r=0.89$ ) and 2.5-5m ( $r=0.90$ ), 5-10m ( $r=0.89$ ), and 10-20m ( $r=0.94$ ) splits. The 0-2.5m split time was not significantly correlated between the testing modes ( $r=0.28$ ,  $p=0.43$ ). Strong positive correlations in most split and total times indicate that the same athletes were faster regardless of mode of testing. The lack of correlation during the 0-2.5m split could be due to inter-individual variability in push technique when overcoming rolling resistance from a stand-still. Every ERG split and total time exceeded that of OG, suggesting that test mode can be corrected for, and that both modes can be used to test athletes.

[1] Goosey-Tolfrey VL, Leicht CA. (2013). *Sports Med* 43(2):77-91.

[2] Faupin A, et al. (2004). *J Rehabil Res Dev* 41(3B):421-428.

### **Is Pressure Distribution in the Feet Associated with Imaging Evidence of Disease Activity in Patients with Early Rheumatoid Arthritis?**

Student Researcher: Ashley M. Bergman  
Collaborators: James Tanzil, Hanyan Zou, Monica R. Maly, Maggie J. Larche  
Faculty Advisor: Dr. Karen A. Beattie  
McMaster University

*Objectives:* We assessed the association between pressure distribution in the feet and imaging outcomes of disease activity in patients with early RA. We hypothesized that those with higher pressure in the forefoot (FF) relative to the hindfoot (HF) would have more evidence of active disease.

*Methods:* 41 participants with early RA, mean (SD) age = 51.9 (10.3) years. The 2<sup>nd</sup>-5<sup>th</sup> metatarsophalangeal (MTP) joints were scanned using Magnetic Resonance Imaging (MRI) and Ultrasonography (US). MTPJs on MRI were graded for synovitis, erosions, and bone marrow edema (BME). Using US, the same joints were graded for Power Doppler (PD). Pressure distribution in the foot was obtained during barefoot standing using a capacitance mat (Matscan, Tekscan, Boston MA). Using TekScan software, a ratio of HF to FF peak pressure was calculated for each participant.

Pearson correlation analyses determined associations between each MRI outcome and pressure distribution. Patients were also grouped according to total PD ( $\leq 1$  and  $\geq 2$ ) score and a t-test examined potential differences in pressure distribution between those with and without active inflammation.

*Results:* The HF:FF ratio appeared lower in patients with a total PD score  $\geq 2$  than PD  $\leq 1$ , although the difference was not significant ( $p=0.18$ ). This may have been affected by sample size and the relatively large standard deviations around the means. No notable associations were observed between pressure distribution and MRI measures of synovitis, erosions and BME ( $p>0.05$ ).

*Conclusions:* Our data did not demonstrate that those with more active disease had preferential pressure distribution in the forefoot. However, potential differences in pressure distribution between

patients with higher and lower PD scores warrant further investigation. The cross-sectional nature of our data do not allow us to determine if people with more active disease compensate by putting more pressure in their heels. Thus, the collection of longitudinal data is warranted.

### **The Impact of Age and Aerobic Fitness on Heart Rate Recovery in Children**

Student Researcher: Megan Bittner

Collaborators: Proudfoot NA, Caldwell HAT, Di Cristofaro NA, Bacauanu JP, and Timmons BW

Faculty Advisor: Dr. Maureen MacDonald

McMaster University

Heart rate recovery (HRR) is defined as the fall in heart rate (HR) after a period of exercise, and calculated as the difference between peak HR achieved during exercise and HR after one minute of recovery. Studies suggest that HRR attenuation is an index of autonomic dysfunction, which may lead to increased cardiovascular disease risk. Higher aerobic fitness (AF) has shown to mediate the age-related decline in HRR in adults; however, it is unknown if AF influences the age-related decline in HRR in children. Healthy children were recruited to participate in the Health Outcomes and Physical activity in Preschoolers (HOPP) study when they were 3-5 years old and a follow-up study, School-age Kids' health from early Investment in Physical activity (SKIP) study when they were 8-10 years old. During the HOPP and SKIP studies, children completed annual assessments of health-related fitness. Each assessment included a maximal exertion treadmill test according to the Bruce protocol, with time-to-exhaustion used as an indicator of AF. HRR was calculated after one minute of seated, passive recovery. Two hundred and thirty-seven participants (122 boys) were included in our analysis in their first year of the study (baseline: age  $4.5 \pm 0.9$ ) and 5 years later (follow-up: age  $9.5 \pm 0.8$ ). HRR was found to be faster at baseline ( $63 \pm 14$  beats/min) compared to follow-up ( $59 \pm 13$  beats/min,  $p < 0.001$ ). There were significant positive correlations between AF and HRR at baseline ( $r = 0.169$ ,  $p < 0.01$ ) and follow-up ( $r = 0.161$ ,  $p < 0.05$ ); however, AF at follow-up was not associated with the change in HRR between the 2 time points ( $r = 0.069$ ,  $p = 0.288$ ). These preliminary results suggest that HRR is attenuated with age when examined longitudinally in children, and while AF impacts HRR in preschool and school-aged children, it does not impact the age-related decline over a 5-year span.

Funded by CIHR.

### **Fibre Type Analysis of Damage and HSP Localization Following Lengthening Contractions**

Student Researcher: John-Peter Bonello

Faculty Advisor: Dr. Marius Locke

University of Toronto

*Introduction:* Skeletal muscle responds to excessive exercise by the rapid synthesis of cytoprotective proteins known as heat shock proteins (HSP). HSPs function as chaperones, guiding the synthesis of new proteins and attenuating the aggregation of denatured proteins. Muscle fibres are commonly delineated by myosin heavy chain type. Type 1 (slow) fibres, are initially recruited during exercise, and commonly activated in daily activity. Type 2 (fast) fibres, subsequently recruited once exercise demands increase. Categorized by function, HSP families tend to act at different locations of muscle cells, although their distribution by fibre type remains unclear.

*Purpose:* This study attempted to localize HSPs to fibre type, and characterise their relationship to damage following lengthening contractions (LC).

*Method:* One tibialis anterior (TA) muscle of male Sprague-Dawley rats was electrically stimulated to contract while being actively lengthened over  $38^\circ$ . A treatment group underwent a total of 60 repetitions in sets of 20. Eight hours after the treatment, TA muscles were removed and assessed for HSP content by Western Blotting. Fibre type distribution and damage were evaluated by histochemical techniques. *Results:* HSP 72 content was increased in type 1 and 2 fibres following LCs, with type 2 fibres exhibiting minimal basal levels. Qualitative analysis shows an unbiased distribution of damage throughout muscle cross sections, but dorsal-medially biased distribution of type 1 fibres. Morphological measures show an increase in fibre area for treated muscles ( $p < 0.001$ ) while circularity and roundness remained unchanged.

*Discussion:* Based on Western Blot analysis, type 1 fibres appeared to exhibit higher amounts of basal HSP 72, possibly aiding them in combating and recovering from damage. Coupled with the histological distribution of fibre type, the mobilization of HSP 72 following LCs may favour type 2 fibres in attempts to attenuate the damage more easily sustained by type 1 fibres.

## **Examining the Relationship Between Nutritional Literacy and Nutritional Labeling Among Undergraduate Students**

Student Researcher: Michelle Borgal  
Faculty Advisor: Dr. Erin Pearson  
Lakehead University

*Background:* Nutrition labels are a primary source of nutritional knowledge. The recently implemented Healthy Menu Choices Act indicates that calorie labeling on menus is required to target weight management efforts in Ontario. Since one third of meals are eaten away from home, there is an increasing need to promote nutrition-based information on menus. To date, there is limited research on the inclusion of calorie labeling on menus and how it relates to food consumption choices among undergraduate students.

*Purpose:* This study is exploring the relationships between nutritional literacy (i.e., understanding of food label content) and labeling among undergraduate students who eat regularly in the school cafeteria. Students' food choices in relation to their nutritional literacy will also be examined.

*Methods:* Students ( $n = 65$ ) have been recruited from multiple faculties to enhance sample representativeness. To enroll, participants must be: aged 18-24, completing their first undergraduate degree, and not diagnosed previously with an eating disorder. Participants complete three questionnaires (Demographics, Newest Vital Signs, and Modified General Nutrition Knowledge); data will be analyzed using correlational analysis. Questions focus on the students' ability to read and understand food labels, and select healthy food options. Recruitment and data analysis are ongoing.

*Results:* It is anticipated that higher nutritional literacy scores will relate to healthier food choices and higher understanding of calorie labelling on menus. Preliminary results show trends toward the inability of students to understand serving sizes on a nutrition facts label; approximately half the participants answered this question incorrectly.

*Conclusion:* Participants had difficulty with nutritional literacy questioning, regardless of their educational background. This suggests that food choices may be related to personal experience rather than discipline specific learnings. It is hoped that the results of this study can be used by campus food vendors to provide healthier food options to the student body.

## **The Influence of the Presence of One's Own Smartphone on Social Inhibition of Return**

Student Researcher: Jacqueline Brillantes  
Faculty Advisor: Dr. Jim Lyons  
McMaster University

Inhibition of return (IOR) refers to the slowing of responses to targets that are presented at the same location as a previous attention-capturing event (Posner & Cohen, 1984) or response (Maylor & Hockey, 1985). It has been suggested that the mechanisms underlying IOR bias selective attention away from previously attended locations (e.g., Klein, 1988) resulting in a stimulus-driven perceptual process that is dependent upon the capture, and eventual disengagement, of selective attention. Presumably, any additional spatially relevant stimulus elements that also serve to attract (and subsequently inhibit the disengagement of) selective attention may serve to increase IOR driven response latencies. For example, recent research has suggested that the mere proximal presence of one's smartphone can attract and maintain attentional resources (Clayton [et.al.](#), 2015, Ward [et.al.](#), 2017). Thus, the purpose of this study is to explore the effect of covert distraction (i.e., one's own smartphone) on individual motor control processes in a two person social inhibition of return (SIOR) context (see Welsh et al. 2005). Our goal is to extend and combine these findings to explore whether, and to what degree, the presence of one's own smartphone will influence the perceptual motor control processes when psuberving SIOR. We expect that increasing the salience of one's smartphone (i.e., placing it on the desk to their left where it is in sight) will increase the cognitive costs that is associated with its presence. More attentional resources will be required to inhibit one's own smartphones influence, however, their partner's phone should not affect them at all. If one is highly dependent on their own smartphone, as demonstrated by Ward et. al., (2017), we hypothesize that the presence of one's own smartphone will attract and hold more attentional resources thereby increasing SIOR latencies. Results will be discussed in terms of both theory (IOR) and application (distraction).

## **Retrospective Review of Post-Concussion Syndrome Symptomatology**

Student Researcher: Sabrina Campbell

Faculty Advisor: Dr. Michel Rathbone

McMaster University

*Introduction:* Concussion is a traumatically induced alteration in mental status with or without the loss of consciousness. It is followed by a myriad of symptoms collectively known as post-concussion syndrome (PCS) that commonly includes headaches, anxiety, fatigue, emotional and cognitive deficits. Affecting millions of people worldwide of all ages, it is estimated that 15-20% will suffer from chronic symptoms. PCS symptoms are largely non-specific and are seen in many other conditions, making their etiology controversial.

*Hypothesis:* Because PCS symptoms are non-specific, we hypothesized that (1) not all patients presenting to a concussion clinic have sustained a true concussion, and (2) those with a concussion should have predominantly cognitive and/or emotional symptoms, and in those not concussed other symptoms would predominate.

*Methods:* Charts of 86 consecutive patients referred to a concussion clinic were reviewed. Patients older than 50 years or who had clear structural brain damage were excluded leaving 52 patients. Using the American Congress Rehabilitation Medicine (ACRM) criteria they were categorized as "Concussion" or "No Concussion" and the symptoms of each classified into categories (cognitive, pain, emotional, sensory, etc.).

*Results:* 37 of 52 included patients met the ACRM criteria for concussion, and presented with predominantly cognitive, sensory and headache complaints (78.4%, 75.7%, 67.6%, respectively). Patients that did not meet ACRM criteria (n=15) presented with predominantly headache, sensory and pain complaints (86.7%, 80.0%, 66.7%, respectively).

*Conclusion:* Not all patients that present to a concussion clinic meet the medical diagnostic for concussion. Patients that satisfied the ACRM criteria for concussion presented primarily with cognitive complaints, whereas those who did not satisfy the ACRM criteria presented primarily with sensory and pain related symptoms. These results may provide insight towards the treatment of patients that have diagnostically sustained a concussion compared to those that have not.

## **Enhanced Learning Through Exercise Breaks: Creating Feasible Protocols for Implementation into Classrooms**

Student Researchers: Alice Chan, Brynley Hanson-Wright

Collaborators: Barb Fenesi, Michelle Ogrodnik

Faculty Advisor: Dr. Jennifer Heisz

McMaster University

Previous research has shown that taking five-minute high-intensity exercise breaks during an online university lecture facilitates on-task attention and comprehension of lecture material. However, many university students are sedentary and may be reluctant to participate in such strenuous exercise. The current project aimed to determine whether lower intensity exercise breaks could still enhance attention and learning while also providing more feasible activities for classroom implementation. Participants performed five-minute low, moderate, or high intensity exercise breaks at three points during an online Introductory Psychology lecture. Following the lecture, they were tested on their understanding of the lecture material both immediately after exposure and 48 hours later. Preliminary findings suggest that those who complete low intensity aerobic exercise breaks (48%) outperform those who complete moderate intensity breaks (42%) or no breaks (42%). Additionally, low intensity may be a more feasible alternative to high intensity exercise (46%), while still improving academic success. A follow-up study surveyed 102 undergraduate students at McMaster University to assess student perceptions of exercise breaks. Low-intensity breaks were favoured by 64% of students while fewer than 5% considered high-intensity breaks to be most desirable. Interestingly, while literature suggests that exercise can help refocus attention and boost memory, nearly one quarter of students were worried that exercise breaks would disrupt their focus and interfere with learning. However, lecture time may influence students "buy-in" to exercise breaks; when assessing survey responses, 92% of students supported implementing exercise breaks during three hours lectures whereas only 45% supported exercise breaks in 50-minute lectures. This research is an important first step towards ensuring instructional interventions are not only effective at promoting learning, but are also well received by students. By incorporating student perspectives, the alignment between efficacy and enjoyment will ultimately lead to optimal implementation, improving academic success and classroom experiences.

## **Increased Levels and Perceptions Regarding Exercise Following Surgery in Colorectal Cancer Patients: A 12-month Follow-Up Study**

Student Researcher: Anthony Cinquino

Faculty Advisor: Dr. Celena Scheede-Bergdahl

McGill University

Colorectal cancer remains an important concern for both patient and the health care system at large as it is the second leading cause of cancer related mortality in males and third in females (Navaleenan et al., 2017). Treatment predominantly involves tumor resection, which poses an additional challenge as 30% of patients face post-operative complications. Even in the case of a relatively “complication-free” surgery, patients may still anticipate an approximate 40% loss of functional capacity (Christensen et al., 1993). There is a growing body of evidence that highlights the role of exercise as a means of mitigating poor surgical outcomes, improving both pre-surgical and post-surgical functional capacity, as well as the prevention of colorectal cancer itself (Carli, & Scheede-Bergdahl, 2015). Prehabilitation, which involves a targeted multi-modal intervention in the pre-surgical phase of the cancer trajectory, has been shown to improve functional capacity prior to tumor resection, enhance post-surgical recovery (Minella et al., 2017), as well as a potential means of reducing complication rates and length of hospital stay (Santa Mina et al., 2017). Despite these emerging benefits, exercise adherence remains a challenge (Ferreira et al., in press). Even more elusive is whether an intervention, such as prehabilitation, results in long term changes in exercise behaviour. These long-term changes are critical to establish since it serves the patients’ best interest to both maintain functional capacity for the full duration treatment and beyond, and to minimize the chance of cancer reoccurrence. In order to investigate the long-term effects of prehabilitation on patient exercise habits, the goal of this study was to interview individuals who had completed prehabilitation at least 12 months prior. The hypothesis is that a 4-week prehabilitation program, implemented in a period of time that can be considered a conducive “teaching moment”, can result in long term improvements in exercise behaviour.

## **Grasping Reactions Following Induced Balance Loss for Handrails of Varying Shapes and Sizes**

Student Researcher: Mackenzie L. Collins

Collaborator: Philippa Gosine

Faculty Advisor: Dr. Alison Novak

University of Waterloo and University of Toronto

*Purpose:* Handrails are a readily available source of support to stair users. The building code suggests that a handrail must be “graspable” in order to fulfill this primary function (National Research Council Canada, 2015). The objective of the current study is to classify grasping reactions related to different handrail shapes and sizes following induced forward and backward balance loss.

*Methods:* Data analysis is on-going in the Challenging Environments Assessment Laboratory at Toronto Rehabilitation Institute. Six younger adults (18-35 years) and 6 older adults (60-85 years) were instructed to stand in a neutral position and grasp an adjacent handrail without stepping when the platform randomly accelerated forward or backward. The handrails included round, straight and decorative handrails (2.5” and 3” diameter for each type), and a 1.5” round handrail. Video coding is being used to classify the grasping types and errors associated with each handrail cross-section. The grip types include parallel extension, fixed hook, disk, small cylindrical and large cylindrical, defined by distal and proximal phalanx involvement and curvature and palm involvement (Feix et al., 2016). Error types include collisions, grip adjustments, overshoots and sliding.

*Expected Results:* A correlation between handrail type and grip type is expected. Based on preliminary analysis (n=6), the round handrails primarily resulted in a large or small cylindrical grip, while the straight and decorative handrails primarily resulted in a disk grip. The majority of trials which resulted in a fixed hook grip included an observable grip adjustment.

*Conclusion:* Further analysis will allow for a better understanding of how shape and size of handrail influence the handrail’s ability to fulfill its primary function.

## **Heart Rate Variability Responses Post-Concussion: Serial Assessment Throughout Recovery**

Student Researcher: Danielle Corallo

Faculty Advisor: Dr. Michael Hutchison

University of Toronto

*Background Information:* Heart rate variability (HRV) is a measure of variability in the time between consecutive heart beats. HRV is influenced by the sympathetic and parasympathetic nervous system and has been shown to be affected following concussion; however, it remains unclear whether HRV dysfunction post-concussion is uniquely different from musculoskeletal (MSK) injuries.

*Purpose:* The purpose of this study is to investigate potential differential responses in HRV measures between concussion and musculoskeletal injuries, specifically acutely after injury and at medical clearance.

*Participants and Methods:* University of Toronto intercollegiate athletes were prospectively recruited and stratified into three groups: concussion (n=12), musculoskeletal injury (n=14), and uninjured athletes (n=26). HRV measures were collected in the supine and seated position using the Polar Heart Rate V800 sports watch and chest strap (Polar®, QC, Canada) and symptom severity scores were obtained by the Sport Concussion Assessment Tool 5 (SCAT5).

*Results:* HRV measures of interest include mean R-R intervals (ms), mean heart rate (bpm), very low frequency power ( $ms^2$ ), low frequency power ( $ms^2$ ) (LF), high frequency power ( $ms^2$ ) (HF) and low frequency to high frequency ratio. To examine the difference of HRV measures between the three groups, a one-way ANOVA/Kruskal-Wallis will be used. A Pearson Correlation will examine the relationship between symptom severity and HRV.

*Conclusions:* Study findings will advance our understanding on how different types of injuries are affected by HRV. Results of this study will also help understand the role of HRV as an objective marker to help in the safe return to play of athletes to sport.

## **A Novel Surgical Treatment for Anterior Cruciate Ligament Tears**

Student Researchers: Veeral Desai, Yixi (Kevin) Ren

Collaborators: Jamshied Shamlou, Mark Georgy

Faculty Advisor: Dr. Michael Wong

McMaster University

The anterior cruciate ligament (ACL) in the knee prevents excessive forward movement and rotation of the tibia relative to the femur. Injuries to the ligament typically occur due to rapid deceleration, twisting, or landing during athletic competition. Currently, the standard surgical treatment is a procedure known as ACL reconstruction, involving the replacement of torn ACL with a graft harvested from the patient's own tendons (Shaerf, Pastides, Sarraf, & Willis-Owen, 2014). However, a novel surgical technique developed at the Sports Medicine Research Laboratory may prove to be a better alternative. Bridge-enhanced ACL repair (BEAR) uses a bioactive scaffold to complement standard suturing techniques. Unlike ACL reconstruction, BEAR seeks to preserve rather than remove the remaining ACL tissue (Murray et al., 2016). Post-injury, the ACL cannot heal by itself due to the premature dissipation of the scaffold that naturally forms when blood fills up damaged tissue. However, BEAR surgically implants a substitute collagen-based scaffold that forms a "bridge" between the two torn ACL ends. The patient's own blood is then injected into this scaffold, providing proteins and growth factors, while promoting clot formation (Kiapour, Fleming, & Murray, 2015; Proffen, Perrone, Roberts, & Murray, 2015). Within six to eight weeks, the torn ends of the ACL grow back into the scaffold, ultimately replacing it with new tissue.

BEAR presents several benefits over traditional ACL reconstruction. Most notably, it decreases rates of post-traumatic joint pain and stiffness. Moreover, preserving the torn ends of the ACL also offers potential advantages, as the preserved ligament may retain proprioceptive function. During the healing process, small stresses on the ligament tissue can activate proprioceptive fibres, triggering micro-corrections that restore normal knee dynamics and kinematics. However, further research and assessment is still required before BEAR can transition into a surgical standard (Kiapour et al., 2015; Proffen et al., 2015).

## **Inexperienced Female Ultimate Players' Perspectives on Spirit of the Game**

Student Researcher: C. Lindsay Edward

Faculty Advisor: Dr. John Gotwals

Lakehead University

*Background:* Young women's engagement in sport is associated with low rates of participation and high rates of dropout (Dwyer et al, 2006). Reasons for this include the win-at-all costs and masculinized atmosphere of traditional sport (Spencer-Cavaliere et al., 2017). The alternative sport of Ultimate (Frisbee), with its emphasis on spirit of the game (SOTG), may address these concerns. This claim has not been explored among those who may benefit most: namely, young women who are new to the sport.

*Purpose:* The purpose of this study is to explore how young women who are relatively new to ultimate view and experience the sport.

*Methods:* Twenty females between 18-30 years old, who are relatively new to ultimate, and registered for the local ultimate league are targeted to participate in this study. Data will be collected through semi-structured interviews that address participants' background, perspective on, and experiences with ultimate and SOTG. After each interview reflective notes will be taken.

*Preliminary Results:* Data collection began in February; nine interviews have been conducted to date, with two more scheduled this week. Data will be analyzed through thematic analysis following a six-step process outlined by Braun and Clarke (2006). Step one of the process, transcribing each interview verbatim, is currently taking place. Although analysis is at a very early stage, a theme reflecting the encouraging atmosphere of ultimate has been identified. As data collection and analysis proceeds, it is expected that additional themes will emerge.

*Conclusion:* Results from this study may be used to identify if ultimate, and specifically SOTG, encourages female participation in sport. This information may be applicable to other sports and used to enhance young women's engagement in sports and physical activity. Results from this study may help find ways to decrease the dropout rates of young women from sport.

## **The Impact of Exertional Heat Stress Exposure on Systemic Biomarkers of Hemostasis in a Healthy Military Sample**

Student Researcher: Hussein Fawzy

Faculty Advisors: Dr. Scott Thomas, Dr. Shawn Rhind

University of Toronto

*Introduction:* Exertional Heat Illness (EHI) is a condition that ranges from mild heat exhaustion to life-threatening heat stroke and typically occurs in young, athletic, and generally healthy individuals as a result of physical exertion (Leon & Bouchama, 2015). EHI is difficult to predict and can have long-term cardiac, electrolyte, acid-base, hematological, and cognitive health repercussions (Leon & Bouchama, 2015). Hyper-coagulation is suspected to be a key factor in EHI-related health deterioration and there is strong evidence that demonstrate a state of systemic hyper-coagulation following exertional heat sessions in healthy individuals (Veltmeijer et al., 2017). The objective of this study is to assess global changes in systemic coagulation parameters following an exertional heat stress exposure in healthy military volunteers and examine potential correlations with health and performance variables that may aid in identifying heat tolerance using a standardized test.

*Methods:* Participants will engage in a walking exercise at 5 km/h within a climactic chamber controlled at 40° C and 40% relative humidity for a period of 2 hours (or until reaching one of the contra-indications). Blood samples will be acquired during familiarization, immediately pre- and post-exertion, 15 minutes post-exertion, and 24 hours post-exertion. Rotational thromboelastometry (ROTEM) will be used to assess coagulation and fibrinolysis properties. Hemostatic profiles will then be compared with the following physiological variables for correlation: core-body, skin surface, and rectal temperature; oxygen consumption; skin perspiration; body composition; anthropometry; hematology; sex; and age.

*Results:* Data collection is in-progress. We hypothesize that hyper-coagulation may be correlated with the following variables: higher core-body, skin, and rectal temperatures; higher oxygen consumption; and lower perspiration.

*Discussion:* Using hemostatic profiles and other physiological variables, the results of this trial will yield valuable insight into the characterization of heat intolerance to better predict susceptibility to EHI and subsequent recovery from this complex condition.



## **The Comparison of Neck Strength Between Healthy and Concussed Adolescent Athletes on Measures of Linear Acceleration Across Helmet Impact Locations Using a Surrogate Headform**

Student Researcher: Jasmine Ferdousi

Faculty Advisor: Dr. Carlos Zerpa

Lakehead University

*Background:* Concussions are traumatic brain injuries, which affect children and youth due to the lack of concussion prevention techniques in sports and recreational activities. The underlying mechanisms of concussions are linear and rotational accelerations. These forces cannot be decreased with helmet equipment alone, therefore to protect young athletes' functionality in sports, another solution must be implemented. Neck musculature plays a critical role in head stabilization, to prevent the brain from hitting the skull during impact, the neck must be strong enough to withstand external forces (Hrysomallis, 2016; Lavallee, 2012).

*Purpose:* To examine via simulation the effect of neck strength in minimizing linear impact acceleration by using healthy and concussed adolescent athlete's neck strength secondary data.

*Methods:* Using secondary data from Collins et al. 2014, the neck strength measures of concussed adolescent athletes (M= 8.04lbs, 3.65kg, 35.77N) and healthy adolescent athletes (M= 9.54lbs, 4.34kg, 42.53N) will be translated to a mechanical neckform. The neckform will be mounted under a pediatric surrogate headform attached to a linear impactor. The headform will be impacted at specific locations multiple times and the linear acceleration will be recorded at various speeds. The dependent variable is linear acceleration and independent variables are impact location, neck strength, and speed.

*(Anticipated or Preliminary) Results:* It is anticipated that the healthy athletes will sustain a lower linear acceleration than the concussed athletes. This outcome is expected because of the stronger neck strength of the healthy athletes. A two-way ANOVA will be conducted to examine the interaction effect between the independent variables on the dependent variable.

*Conclusion:* Decreased impact acceleration to the head due to neck strength may relate to decreased severity of a concussion. This type of outcome may have implications for researchers, coaches, and athletes to better understand the limitations of helmets in protecting the head against impacts based on individuals' neck strength.

## **Exercise and Obesity in a Nursing Student and Registered Nurses Cohort**

Student Researcher: Malika Ganguli

Faculty Advisor: Dr. Sarah West

Trent University

*Introduction:* Obesity is a pressing global health concern, with over 300 million adults classified as overweight or obese as of 2000. Current physical activity guidelines recommend 150 minutes per week of moderate-to-vigorous exercise for adults. Nurses, amongst other healthcare professionals, are not meeting exercise guidelines and have higher incidences of obesity. Currently, literature lacks data on physical activity and obesity levels of Canadian registered nurses (RN) and nursing students. Our primary objective is to characterize exercise and obesity levels in a Canadian RN and student cohort.

*Methods:* A sample of nursing students from Trent University and RNs from the Peterborough Regional Health Centre were studied. We conducted a demographic survey and The World Health Organization's Global Physical Activity Questionnaire to record Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR). A BMI of 25-30 kg/m<sup>2</sup> indicated overweight and a BMI > 30 kg/m<sup>2</sup> indicated obesity. A WHR of > 0.9 (women) and > 0.85 (men) indicated upper body obesity. Objective exercise levels were assessed by accelerometry, recorded for seven days.

*Results:* We currently have data on 40 students and 3 RNs, and are completing data collection. Accelerometry endpoints will characterize intensity of exercise in participants. We will examine differences in physical activity levels between RNs and students, and examine the correlations between exercise and obesity in our cohort. Final data will be presented at the conference.

*Conclusions:* This data set will provide the first set of information on Canadian nursing students and RNs. Current literature does not report exercise and obesity levels in these cohorts. We intend to submit the results for publication in late 2018.

## **The Effect of Taping on the Foot to Determine Centre of Pressure and Sway While Balancing on a Stable Versus Foam Surface Over an AMTI Force Platform**

Student Researcher: Kaitlynn Gilmore  
Faculty Advisor: Dr. Paolo Sanzo  
Lakehead University

*Background:* The first metatarsophalangeal joint in the foot is essential for weight-bearing activities, absorbing twice the amount of weight in relation to the other digits. Turf toe is a common toe injury among athletes who play on artificial and grass surfaces; however, there is limited research exploring treatment effects of corrective taping commonly applied and how this alters biomechanics and performance. *Purpose:* This pilot study examined the effects of taping on the area, velocity, and length of centre of pressure sway under different taping conditions (Leukotape™, zinc oxide, no tape) and surfaces (stable versus foam surface).

*Methods:* Participants were asked to stand on an AMTI force platform on two different surfaces (stable, foam) and balance on one foot with and without tape for 15 seconds. The trajectory plots of the dependent variables; area (cm<sup>2</sup>), average velocity (cm/sec), and length (cm) under each condition were recorded. A two-way ANOVA was used to analyze the data with a significance level of  $p < .05$ .

*Results:* Thirty-three individuals participated in this study (19 male, 14 female; aged  $M=20.73$  years,  $SD=1.65$ ; height  $M=175.59$  cm,  $SD=8.70$ ; mass  $M=81.39$  kg,  $SD=15.70$ ). There were no statistically significant interaction effect between taping condition and surface type and simple main effects for taping condition on area, velocity, and length of centre of pressure sway. There was a statistically significant simple main effects for surface type on area,  $F(1, 192)=54.1$ ,  $p=.0001$ , velocity,  $F(1,192)=38.34$ ,  $p=.0001$ , and length,  $F(1,192)=38.31$ ,  $p=.0001$  of centre of pressure sway.

*Conclusion:* There was no significant effect on the balance measures of centre of pressure sway for area, velocity, and length for the different taping conditions; however, there was significant main effects for the surface type on each dependent measure. Future research should consider using electromyography to explore changes in muscle activation patterns with and without tape using a larger sample.

## **Hunting the SNARC: Does the Roll You Want Influence How You Roll**

Student Researchers: Miranda Guo, Anthony Sitas  
Faculty Advisor: Dr. James Lyons  
McMaster University

Evidence from Langer (1975) and others suggests that humans often have unrealistic perceptions of control over the outcome of certain situations even when that outcome is entirely and knowingly a function of chance. Previous studies from our lab (e.g., Lyons et al., 2013; D'Amore et al., 2019) suggest that these illusions of control extend to motor actions and may have a neurobiological locus. In a similar vein, The Spatial Numerical-Compatibility (SNARC) effect refers to an automatic association that occurs between the location of a response effector and the semantic magnitude of a modality-independent number. It is thought that this effect results as a function of a hypothetical number line and is organized with small magnitude numbers leftward in space and large magnitude numbers rightward in space (Dehaene, et al. 1993). The purpose of this research is to further explore these automatic (and illusory) influences on goal-directed motor behaviors by investigating how both the illusion of control and spatial numerical compatibility effects may work in parallel within the sensorimotor task of throwing dice in a simulated gambling task. If the illusion of control is present, we would predict throws of greater velocity in the high number conditions when compared to the low number conditions (see also D'Amore et al., 2009). Further, if participants are subconsciously instantiating SNARC associations, we would expect that participants will throw the dice more rightward when presented with a high magnitude goal and vice versa under low magnitude conditions. Preliminary data support these hypotheses. Specifically, the mean terminal position of dice tosses under the low matrix payout condition is more leftward, and the dice are thrown with a lower mean velocity, relative the high matrix payout condition. Results are discussed in the context of models of ideomotor and conceptual stimulus-response compatibility.

### **Masculinity at Summer Camp: An Ethnofiction**

Student Researcher: John Hannant-Minchel

Faculty Advisor: Dr. Michael Atkinson

University of Toronto

Discussions of masculinity in the current literature seem to be in some ways disconnected from the lived experiences of real people. Even ethnographic accounts appear to be mediated by layers of academic jargon and abstract theories, which can blur the connections between the study of masculinity, and people's masculine experiences. This presentation strives to close this gap and clarify these connections by (re)presenting ethnographic data taken at a summer camp in the form of a fictional narrative. The story itself focuses on the ways in which male staff members put on various masculine performances and how these performances can change based on their settings. To accomplish this, the story follows a number of fictional characters through some of the activities that make up a day in their lives as camp staff members. It draws upon the dramaturgical framework outlined by Erving Goffman in *The Presentation of Self in Everyday Life* (1959), as well as current theories of masculinity and gender. This ethnofiction allows for the merger of fictive and non-fictive elements into a single narrative that, in many ways, more clearly illustrates a lived reality of masculinity in an outdoor recreation setting than any traditional sociological investigation could. Instead of a boringly mechanical listing of observations, the piece is able to present the experiences of the author and their findings in a coherent story that is hopefully relatable and understandable. An accompanying commentary allows the researcher to contextualize the narrative with relevant theories of gender and identity, as well as other accounts of masculinity.

### **The Effect of a Physical-Literacy Based Intervention on the Mental Health of First Year University Students: The PLUS Study**

Student Researcher: Cierra Healey

Faculty Advisor: Dr. Matthew Kwan

McMaster University

The transition into university has been associated with significant declines in physical activity (PA) and corresponding changes in mental health (MH) (Bray & Kwan, 2006). It has not yet been established how to best prevent or attenuate the declines in PA, and what impact it may have on MH. One hypothesis is that many emerging adults lack physical literacy (PL), the competence, confidence, motivation, and knowledge to engage in lifelong activities (Whitehead, 2007). PL is amenable to change, and it is the investigators contention that an intentionally developed PL program can improve PA and MH outcomes. The current study will investigate the impact that a PL-based intervention, called PLUS, has on students' MH.

This pilot study involved 65 first-year university students (n=29 intervention; n=36 control), and utilized a quasi-experimental design to test the 12-week intervention program. Participants completed motor and fitness testing, as well as a questionnaire comprised of several MH outcomes prior to and following the intervention. Specifically, the investigators assessed the Rosenberg Self-Esteem Scale (Rosenberg, 1979), the Beck Anxiety Inventory (Beck and Steer, 1990), the Perceived Stress Scale (Cohen, Kamarack, & Mermelstein, 1983), and the Kessler 6 (Kessler et al., 2002).

Preliminary analyses will be presented using repeat ANOVAs to determine whether the PL-based intervention led to changes in MH outcomes for students during their first semester. Considering the coinciding decline in PA and MH during this time period, and the established PA and MH relationship, it is hypothesized that the PLUS study will have a positive impact on students' activity levels, as well as their overall MH.

### **Fatigue and Discomfort During Sequential Stimulation of Tibialis Anterior**

Student Researcher: Matthew G. Heffernan

Collaborators: Austin J. Bergquist, Matheus J. Wiest, Taro Yamashita, Milos R. Popovic

Faculty Advisor: Dr. Kei Masani

University of Toronto and Toronto Rehabilitation Institute

*Introduction:* Neuromuscular electrical stimulation is "conventionally" (CONV) applied through a pair of electrodes over the muscle belly. CONV stimulation is limited by discomfort and incomplete motor-unit recruitment, restricting electrically-evoked torque and promoting premature fatigue-induced torque-decline. "Sequential" (SEQ) stimulation, involving rotation of pulses between multiple pairs of electrodes, has been proposed as an alternative. The present objective was to compare discomfort, maximal-tolerated torque and fatigue-related outcomes between CONV and SEQ stimulation of tibialis anterior.

*Methods:* Ten healthy participants completed two experimental sessions (CONV and SEQ stimulation). Maximal-tolerated torque, self-reported discomfort at sub-maximal torque, fatigue-induced torque-decline during, and doublet-twitch torque at 10- and 100-Hz before and after, 300 intermittent (0.6-s-ON-0.6-s-OFF) isokinetic contractions were compared between CONV and SEQ stimulation.

*Results:* SEQ stimulation increased discomfort, reduced maximal-tolerated torque, but minimized fatigue-related outcomes.

*Discussion:* SEQ stimulation holds promise for minimizing fatigue, but restricted torque production and associated discomfort may limit its utility for rehabilitation/training.

### **Examining Identity, Personality, Stress and Social Support Among Varsity Student-Athletes**

Student Researcher: Zacharie Holmes

Faculty Advisor: Dr. Katherine Tamminen

University of Toronto

*Objective:* The purpose of this study was to explore the influence of student and athletic identity on perceptions of stress and social support among varsity student-athletes.

*Methods:* An online survey was completed by 102 varsity student athletes (M = 20.28 years of age, SD = 3.12; 57.8% females). The survey included measures of athletic and student identity, perceived athletic and academic social support, perceived levels of stress, and support-seeking behaviour. The data were analyzed using descriptive statistics and multiple regression analyses.

*Results:* Regarding the participants' athletic stress and support, the regression predicting athlete stress was significant, with emotional stability as a significant negative predictor of athletes' stress. The regression predicting athletes' support seeking in sport was not significant; however, perceived athlete esteem support was a significant positive predictor of support seeking in sport. The regression predicting athletes' perceptions of available esteem support in sport was significant. Agreeableness, athletic identity, and emotional stability were all positive predictors of perceived available support in sport. Regarding student-athletes' academic stress and support, the regression predicting school stress was significant. Agreeableness and emotional stability were significant negative predictors of school stress. The regression of support seeking related to school stressors was significant, and available academic esteem support was a significant positive predictor of support seeking behaviour. The regression predicting academic esteem support was not significant.

*Conclusion:* These results indicate that emotional stability was associated with lower perceived stress in school and in sport, and agreeableness was also associated with lower stress in sport. Perceptions of higher esteem support in school and in sport settings was associated with an increased tendency to seek support when dealing with stress. Athletes who perceived greater esteem support in sport also had a stronger athletic identity, were more agreeable, and more emotionally stable.

### **Metabolic and Hormonal Responses with Ingestion of Casein, Whey, and Casein-Whey Blend in Young Men**

Student Researcher: Hannah Hopper

Collaborators: DA Traylor, SHM Gorissen, T Prior

Faculty Advisor: Dr. Stuart Phillips

McMaster University

*Introduction:* The aminoacidemic, insulinemic and glycemic responses to ingestion of various isolated proteins has been characterized; however, blends of proteins may provide an advantage in supplying amino acids for anabolism. Tailored blends could differentially influence aminoacidemia to maximize muscle protein synthesis.

*Methods:* Ten healthy men (mean [ $\pm$ SD] age: 24 $\pm$ 1 y, body mass: 83.4 $\pm$ 5.4 kg) completed three separate trials, consuming one of three test beverages containing: 25g micellar casein (MCAs); 25g native whey protein (Whey); and 25g of a 1:1 blend of native whey and micellar casein (Blend), in randomized order. Blood samples were drawn at baseline and regular intervals for six hours post-ingestion. Blood samples were analyzed for plasma concentrations of amino acids, glucose and insulin. Repeated-measures ANOVA and Fischer's least significant difference post hoc analysis were used to find significant differences in plasma curves, and t-tests were used to identify treatment differences in Cmax, Tmax, and AUC.

*Results:* Plasma AA concentrations increased following the ingestion of each protein. The increase of plasma EAA, BCAA and leucine levels was greater after Whey and Blend than MCAs ( $p < 0.001$ ). The Blend induced a greater availability of BCAA and EAA in the late postprandial phase than Whey and MCAs. Total amino acid concentrations did not differ between treatments. Plasma insulin levels increased over time with no significant difference between treatments. Blood glucose levels did not change following each treatment.

*Discussion:* The results of the present study indicate that the ingestion of the Blend induced a rapid rise in BCAA and EAA in which peak concentrations did not differ from Whey. In the late postprandial phase the Blend also produced the highest availability of EAA and BCAA which is a novel feature of native whey and micellar casein co-ingestion. Further study of this blend and the protein turnover responses it induces are warranted.

### **PyeongChang 2018 Olympic Media: Gendered Representations of Women's Ice Hockey and Figure Skating Events**

Student Researcher: Natalie Bo-Yan Hui

Faculty Advisor: Dr. Margaret MacNeill

University of Toronto

Canada's victories during the Winter Olympics do not go unnoticed as Canadian athletes bring glory and national pride to the nation. Issues of gender equality are continually struggled over as female athletes receive unequal representation in sport media coverage (Cooky et al., 2015). Gendered and racialized discourses are commonly employed to undermine and trivialize women's success (Wensing & Bruce, 2003). However, when nationalism is of utmost importance during the Olympics, gendered codes of representation are not the primary framing device (Wensing & Bruce, 2003). Instead, media employs national discourses to symbolize national unity through the success of their athletes (Vincent & Kian, 2014). Very little is known about why inequalities persist and the effects representations of Canadian role models have on audience perceptions of physical activity and health. Thus, media coverage of the PyeongChang 2018 Olympic Games is a valuable site to be studied regarding these issues. The purpose of this research is to understand how audience members negotiate heteronormative and binary media representations in relation to their own experiences in physical culture. Textual and content analysis has been conducted on media coverage by CBC between December 1<sup>st</sup>, 2017 to February 25, 2018. One-hour semi-structured interviews and a one-hour focus group session are in progress with 8-10 university students who regularly consume Olympic coverage on any media platform. The preliminary findings from content analysis and audience responses to the media coverage of women's ice hockey and figure skating events will be discussed in this presentation. The results of this study will offer insights about how images and textual content are consumed by, and affect, audience members. Recommendations will be presented to inform future research and health communication scholars for developing empowering ways to promote health and physical activity, and to media to improve representations of healthy athleticism.

### **Time-Course Changes in Skeletal Muscle Gene Expression During Two Weeks of Unilateral Leg Immobilization in Young Women**

Student Researcher: Michael Kamal

Collaborators: Bahniwal R., Gorissen S.H.M., Hector A., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

*Introduction:* Limb immobilization results in skeletal muscle atrophy. Genes related to both muscle protein breakdown and muscle protein synthesis are altered following the onset of immobilization that may contribute to muscle atrophy. However, the time-course change in the expression of such genes during immobilization and recovery remains poorly characterized. Thus, we aimed to examine the impact of immobilization and recovery on skeletal muscle gene expression in young women. *Methods:* Twenty-one healthy women ([all data mean±SD] age: 22.0±3.2 y, body mass 63.5±7.3 kg) underwent 14 d of unilateral limb immobilization followed by 14 d of return to ambulation. Serial biopsies were obtained from the *Vastus lateralis* before (Pre), at 3, 7, and 14 d of immobilization, as well as following 14 d of free-living recovery (RC). Dietary protein intake was controlled during immobilization at 1.0 g/kg/d. Expression of genes related to muscle protein turnover (MuRF1, MAFbx, LAT1, SNAT2, ATF4, p53, and p21) were assessed using RT-PCR. *Results:* The expression of amino acid transporters increased above Pre at 3, 7, and 14 d (LAT1;  $p < 0.05$ ) and at 14 d (SNAT2;  $p = 0.002$ ), and returned to Pre levels at RC ( $p > 0.10$ ). The expression of markers of protein breakdown (MuRF1 and MAFbx) were increased above Pre at 3, 7, and 14 d of immobilization ( $p < 0.05$ ). MuRF1 expression returned to Pre levels at RC ( $p = 0.35$ ), whereas MAFbx expression was lower at RC compared to Pre ( $P = 0.014$ ). ATF4 expression increased from Pre to 3 d ( $p = 0.0155$ ), but was otherwise not statistically different from Pre. p53 (a transcription factor) and p21 (mRNA target gene), both of which regulate muscle atrophy, had a drastically increased expression from baseline (approximately 5-fold and 26-fold, respectively) at 7 d ( $p < 0.001$ ). *Conclusion:* Muscle-specific gene transcription is altered in response to immobilization in a time-dependent manner.

## **A Gut Feeling for Exercise: The Effects of Exercise and the Gut Microbiota on Skeletal Muscle Morphology**

Student Researcher: Irfan Khan

Faculty Advisors: Dr. Gianni Parise, Dr. Stephen Collins

McMaster University

*Background and Objective:* Exercise is known to induce positive changes in the gut microbiota, correlating with systemic benefits in both mice and humans. The question remains whether or not an exercised microbiota can independently affect skeletal muscle morphology. Our first objective was to examine whether an endurance exercise program could modify the gut microbiota in donor mice. Second, we sought to determine if such an endurance-trained microbiota could be transferred to recipient mice via fecal inoculation. Finally, we sought to determine how the morphology and functional characteristics of skeletal muscle are influenced as a result of fecal inoculation.

*Hypothesis:* Our hypothesis was that mice transplanted with the microbiota from the endurance-trained donors would experience an overall shift in skeletal muscle physiology to reflect a more oxidative phenotype compared to mice transplanted with the microbiota from sedentary donors. *Methods:* Eight-week-old male C57BL/6NCrl donor mice ( $n = 20$ ) were randomized into two groups: one group completed an endurance exercise training protocol on a treadmill machine 3x/week for 11 weeks ( $n = 10$ ) while one group remained cage-bound ( $n = 10$ ). Donor and recipient mice were then subjected to an intra-peritoneal glucose tolerance test (IPGTT) to evaluate glucose metabolism. Muscle tissues of the tibialis anterior, extensor digitorum longus, soleus, gastrocnemius, and quadriceps on both legs were extracted for analyses of myogenic regulatory factors, mitochondrial protein content and activity, fibre type distribution, fibre cross-sectional area, and capillary density.

*Conclusion:* Our preliminary results demonstrate that endurance training improved blood glucose handling. We are currently conducting analyses of the muscle tissue from recipient mice.

## **Environmental Scan of Stairs in Non-Accessible Building Entrances of Small Businesses in Toronto, Ontario: A Pilot Study**

Student Researcher: Tyler King

Faculty Advisor: Dr. Alison Novak

University of Toronto and Toronto Rehabilitation Institute

*Purpose:* Stairs are a significant barrier and fall risk for many when accessing public buildings. Although ramps can create an accessible entrance, they are not always present. When stairs must be navigated to enter a building, the design is important to support safety and accessibility. This study aims to explore the current state of the stairs in non-accessible small businesses in Toronto, to understand if and how businesses provide additional stair safety features.

*Methods:* A sub-sample of 687 small-businesses in Toronto were evaluated, identified as having one or more steps, with no additional accessible entrance. The following information was extracted from photographs: number of and height of steps, presence of a visual contrast or friction-enhancing feature, presence of open risers, presence of a temporary ramp, presence of a handrail (and if present, number of handrails, and if the handrail extended to the ground). Descriptive (frequency) analyses were performed for all variables of interest.

*Results:* Of the buildings analyzed, 68% had one step, 13% had two steps, and 19% had  $\geq$  three steps. Of the 130 building with  $\geq$  three steps, 63% had a handrail; the presence of a handrail lessened when buildings had  $\leq$  two steps (2.3%). Of the handrails present, 24.7% extended to the ground, while 59 entrances had handrails on both sides (69.4%). Considering step height, 60.8% of the buildings had steps within legal limits (between 125mm and 200mm). For all stairs, 9.3% had a contrast strip, 4.4% had a visible friction strip, and 3.1% had both. Finally, 1.5% of the buildings had open risers, while 5.4% used a temporary ramp.

*Conclusion:* A large percentage of buildings meet safety codes, however very few businesses provide stairs which move beyond minimum requirements. Our pilot data indicate more can be done to enhance the safety of building entrances when only stairs are present.

## **Defining and Understanding Success of National and Provincial Level Sport Tournaments**

Student Researcher: William Kinney

Faculty Advisor: Dr. Simon Darnell

University of Toronto

*Background:* This study was designed to examine how National Sport Organizations (NSO) and Provincial Sport Organizations (PSO) define and understand success with regards to the hosting of tournaments in their respective sports. While the impact of sports mega-events has been studied, there is a lack of research on smaller and lower levels of events. Therefore, this study aimed to shed some light on how NSOs/PSOs define the success of their tournaments and to use these insights to consider policy recommendations.

*Design:* The study consisted of one semi-structured interview for each of the 3 NSOs/PSOs.

*Participants:* Participants were included in the research sample if they were employees of the NSO/PSO with a working knowledge of the issues related to tournament hosting and tournament hosting policies. These people included: CEOs, Executive Directors, Marketing Chiefs, and/or Communication Representative.

*Results:* The preliminary results demonstrate that NSOs/PSOs tend not to have a standardized way of defining and measuring success. Instead, they rely on anecdotal reports to define the success of the tournament.

*Conclusion:* As a result, this study concludes that a standardized post-mortem analyzing both the financial as well as the social impact of the tournament on the hosting community and on the NSO/PSO should be created and implemented. This will enable the NSOs/PSOs to grow and subsequently improve the impact of the tournament on the hosting region.

## **Quantifying the Warm-up Relative to Total Session Demands During Women's Field Hockey Matches**

Student Researcher: Alexander Klas

Faculty Advisors: Dr. Ira Jacobs, Dr. Jason D. Vescovi

University of Toronto

There are various physiological benefits to warming-up prior to exercise, but the proportion of total demands during team sports that are accounted for by the warm-up is currently unknown. The aim of this study was to quantify the relative amount of demands accounted for by the warm-up during competitive matches in female field hockey players. The Canadian women's U21 field hockey team ( $n=16$ ) were monitored during a 16-day European tour (8 matches) using GPS technology and heart rate monitors to assess the external (i.e., running distance) and internal (i.e., heart rate duration) demands. Distance and heart rate metrics were determined within various effort intensities and the warm-up demands relative to total session demands were calculated. A repeated-measures ANOVA with Bonferroni adjustment was conducted to determine between-match differences. Overall, warm-ups accounted for  $27\pm 2\%$  of the total distance (2,491 m of 9,376 m) and  $30\pm 2\%$  of the total session duration (39-minutes of 130-minute session). The distance accumulated in various running velocity bands during the warm-up accounted for  $30\pm 2$  (walking/jogging),  $26\pm 4$  (low/moderate speed running),  $9\pm 2$  (high-speed running), and  $6\pm 2\%$  (sprinting) of total session distance. The duration in each heart rate zone during the warm-up was,  $37\pm 3$  (50-80%  $HR_{peak}$ ),  $22\pm 9$  (80-90%), and  $3\pm 4\%$  (>90%) of the total session time. The warm-up TRIMP score accounted for  $24\pm 2\%$  of the total session. These results are the first quantification of the internal and external demands of the warm-up before U21 women's field hockey match play. The warm-up represented a substantial proportion of the total session demand. Over the course of a 2-3-week tour or major competition (e.g., Olympic Games) it may be important for coaching staff to consider the warm-up as a critical component of the overall demands experienced by players. In doing so, it may have implications regarding fatigue management for athletes.

## **Quantitative Analysis of Older Women Participating in Physical Activity**

Student Researcher: Angela Lam

Collaborator: Konstantina Katsoulis

Faculty Advisor: Dr. Catherine Amara

University of Toronto

The economic impact Canadian adults entering hospital care each year is estimated at 2 billion dollars due to malnourishment (Curtis et al., 2017). A third (34%) of Canadian seniors are at nutrition risk with women over 75 years of age at the highest risk of nutritional deficiency (41%) (Statistics Canada, 2015). Preventative screening of nutritional risk can prevent or lessen the effects of chronic

undernutrition, which can result in malnutrition, frailty, falls, lengthier hospitalization, institutionalization, and death (Statistics Canada, 2015). The purpose of this study is to quantitatively analyze nutritional intake data in comparison to recommendations for a cohort of healthy, independently-living, older Canadian women participating in a physical training study. Participants were instructed to self-report a 3-day diet record dietary record incorporating 2 weekdays and one weekend. Three measurements were assessed at different time points in the training study: baseline, post-control/baseline exercise, and post-exercise intervention. Outcomes of interest include but are not limited to: total caloric, macronutrient, and micronutrient intake, a comparison of weekday and weekend dietary habits, intake of macronutrients and calories in comparison to. Preliminary results (n=36) show that participants intake a mean of 1540 calories (SD=349 calories) that is comprised of 18% protein, 47% carbohydrate, and 34% fat which is within the recommended Dietary Reference Intake amount for Canadian men and women over 19 years old (Health Canada, 2006). Individuals in this cohort met recommendations for protein, carbohydrates, and fat at 100%, 58%, and 56% respectively. Further analyses will provide information regarding any changes in dietary patterns throughout the course of the physical training study. This nutritional data will add to the existing literature to provide insight on whether healthy older populations are meeting the recommended dietary intake levels in Canada.

### **Assessing the Validity of the CANRISK Questionnaire in Detecting Prediabetes and Undiagnosed Type 2 Diabetes Using HbA1c in a Rural Northwestern Ontario Community**

Student Researcher: Felicia Lotsios

Collaborator: Heidi West

Faculty Advisor: Dr. Ian Newhouse

Lakehead University and Mary Berglund Community Health Centre Hub

*Background:* Northwestern Ontario has a higher prevalence of diabetes when compared to the overall population of Canada. Although many preventative and treatment interventions exist, detection of type 2 diabetes is lacking.

*Purpose:* The purpose of this research study was to assess the validity of the Canadian Diabetes Risk Assessment Questionnaire (CANRISK) in a rural community by correlating with glycated hemoglobin (HbA1c). As well, a secondary objective was to educate, detect, and refer those with high-risk, prediabetes, or type 2 diabetes to professionals and resources within the community.

*Methods:* Participants consisted of 6 males and 14 females between the ages of 30 and 74 who were permanently living in Northwestern Ontario, particularly Ignace. Correlation between risk score calculated by the CANRISK and HbA1c for 14 participants was examined. An additional items survey also collected data pertaining to screening satisfaction, ease and clarity of the CANRISK, and usefulness of information from screening.

*Results:* Overall, due to a low number of HbA1c tests, there was not a significant correlation between the CANRISK and HbA1c ( $r = 0.256$ ,  $p > 0.05$ ,  $n = 14$ ). Nonetheless, 75% of participants strongly agreed that the CANRISK was clear and easy to understand, while 75% either strongly agreed or agreed with receiving useful information about how to lower their risk for prediabetes and type 2 diabetes.

*Conclusion:* It was concluded that this method of screening was well accepted by this rural Northwestern Ontario community and further research should examine its effectiveness as a means of early detection, education, and mobilizing community and regional resources.

### **Exercise-induced Signalling in Skeletal Muscle of Myotonic Dystrophy Type 1 Mice**

Student Researcher: Mark Mackie

Collaborator: Alexander Manta

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

*Introduction:* Myotonic dystrophy type 1 (DM1) is the most common adult-onset form of muscular dystrophy. It is a neuromuscular disorder characterized by myotonia, muscle wasting and weakness. DM1 is the result of a trinucleotide repeat expansion mutation in the 3' untranslated region of the DMPK gene. The repeat expansion generates a corrupted DMPK mRNA structure that becomes trapped within myonuclei and forms concentrated foci. These foci sequester RNA-binding proteins crucial for mRNA processing, which leads to the multisystem clinical presentation of DM1. Recent studies demonstrate that chronic pharmacological stimulation of AMP-activated protein kinase (AMPK) alleviates the severity of the DM1 phenotype in pre-clinical models. Our study investigates whether a single bout of exercise can activate AMPK signalling in DM1 skeletal muscle.

*Methods:* Eight groups of 3-6 month old mice were utilized: 1) sedentary wild-type (WT-SED) mice, 2) SED HSA<sup>LR</sup> mice that have DM1 (DM1-SED), 3) WT mice killed 0 hours post-exercise (WT-0PE), 4)



WT-3PE, 5) DM1-0PE, 6) DM1-3PE, 7) DM1-12PE, and 8) DM1-24PE. Mice in the exercise groups ran on a motor-driven rodent treadmill until the inability to continue exercise was empirically determined. Western blot and RT-qPCR analyses on tibialis anterior muscles will be employed to assess signalling and gene expression pathways.

**Results:** We hypothesize that AMPK activation status will increase in the DM1 group in response to acute exercise. Furthermore, we anticipate that peroxisome proliferator-activated receptor  $\gamma$  coactivator-1 $\alpha$ , a downstream target of AMPK activity, will translocate from the cytoplasm to the nucleus indicating an increase in its function.

**Discussion & Conclusion:** This is the first study to comprehensively investigate exercise-induced molecular responses in the compromised neuromuscular system of DM1.

### **A Phenomenological Study to Describe the Experiences of Female Police Officers in Thunder Bay, Ontario**

Student Researcher: George Makrides

Faculty Advisors: Dr. K. Sinden; Co-supervisor: Dr. B. TeHiwi

Lakehead University

**Background:** Police officers perform work that is inherently stressful, but also rewarding. Stress and work health are interrelated in that work-related stress can be detrimental to workers' health.

Moreover, policing remains a male dominated occupation. Women entering male dominated professions are at risk to experience negative psychological experiences, feelings of discrimination and inferiority, lesser compensation, and low self-efficacy.

**Purpose:** To understand the gendered nature of stress and work health as experienced by female police officers.

**Methods:** This project will use a phenomenological approach to understand the experiences of female police officers with a view on work health and stress. Data will be collected through semi-structured interviews conducted with female police officers in Thunder Bay, Ontario. Data will be analyzed using the constant comparative method; data will be examined, compared and contrasted, and categorized into relevant themes that relate back to the research purpose until no new themes emerge.

**Anticipated Results:** Results may indicate that females working in male dominant occupations, such as police services, are more inclined to be subjected to harassment, sexual discrimination, and feelings of inferiority. Furthermore, there may be potential to explore the ways in which female police officers are resilient in various contexts that display their strengths when faced with adversity.

**Conclusion:** This research may refine and expand our current understanding of female police officers' work health in Thunder Bay, Ontario and identify areas for future studies that are positioned to further explore and optimize occupational health of police officers. Additionally, this research may provide an important foundation that may be used to identify and/or understand work environments in other police services.

### **Acute Physiological Responses to Sprint Training in Normobaric Hypoxic Conditions**

Student Researcher: Naomi Maldonado-Rodriguez

Faculty Advisors: Dr. David Bentley, Dr. Ira Jacobs

University of Toronto & Canadian Sport Institute Ontario

Traditional 'altitude training', where athletes live and train at real or simulated altitude (1200-2400m), has focused on enhancing sea level endurance performance. Such training is neither time- nor cost-effective, and the reported effects on anaerobic performance have been equivocal. Sprint training in hypoxia has been proposed as a means to augment training adaptations. The acute response to different durations of anaerobic work intervals, controlling for work volume and work-to-rest ratio, has not been previously investigated. The purpose of this study is to compare acute physiological and performance responses to different sprint training protocols in normobaric hypoxic conditions. Healthy competitive female ( $n = 2$ ) and male ( $n = 4$ ) kayakers (19.8 yrs  $\pm$  2.17) performed 4 sprint training sessions on a kayak ergometer over 2 weeks, with a minimum of 48h between each session.

Participants performed 5 sets of 12x5s sprints (protocol 1) or 3x20s sprints (protocol 2) in both normobaric normoxia (0m altitude,  $F_iO_2 = 20.9\%$ ) and normobaric hypoxia (3500m altitude,  $F_iO_2 = 13.6\%$ ). Peak power output (PO), rate of perceived exertion (RPE), heart rate (HR), and muscle oxygenation (MO) levels of the latissimus dorsi were collected throughout the session. Blood lactate concentration (BLa), as well as blood gas and metabolites were collected pre-, and post-exercise. Data collection is ongoing. Preliminary results indicate that the hypoxic training induced greater overall physiological strain, compared to normoxia. Higher RPE, HR, and BLa, as well as reduced PO and MO were observed post-exercise in protocol 1, compared to protocol 2. The results from this study will help facilitate a better understanding of physiological responses to different duration of anaerobic work

intervals. This knowledge will provide empirical support for designing hypoxia training that will enable athletes to train at a sufficiently high intensity to induce positive adaptations likely to improve anaerobic exercise performance.

### **Use of Heart-Rate Monitoring in Managing Training Loads and Preventing Injuries in University Male Soccer Players**

Student Researcher: Luca Martial  
Faculty Advisor: Dr. Andreas Bergdahl  
Concordia University

Injuries are a common occurrence in team sports and have negative consequences on team success. As sudden increases and decreases in training loads enhance injury likelihood, monitoring training loads is essential. Markers such as the subjective Rating of Perceived Exertion (sRPE) and those based on heart rate measurement are commonly used methods in the quantification of training load for soccer players. When applying the acute:chronic workload ratio, sRPE has been established as an accurate injury prediction marker. However, no related work has been done involving heart rate-based measurements. The goal of this research project was to investigate the use of heart rate monitoring to manage training loads and predict injuries in university soccer players. Training load measures from fifteen university male soccer players were collected over a period of seven weeks. Results demonstrated that using the acute:chronic workload ratio for heart rate-based training loads such as Bannister's Training Impulse accurately predicted injuries. These findings are of high relevance to sports scientists working in a University setting as monitoring heart rate-based measurements may help reduce injury likelihood in male soccer players.

### **Examining the Relationship Between Central and Peripheral Fatigue in Individuals with Multiple Sclerosis**

Student Researcher: Jessica McGrath  
Faculty Advisor: Dr. Audrey Hicks  
McMaster University

*Background and Rationale:* Fatigue is present in up to 92% of individuals diagnosed with multiple sclerosis (MS), affecting both activities of daily living and quality of life. Fatigue experienced by individuals with MS cannot be clearly categorized as central or peripheral fatigue. Literature has observed a relationship between central and peripheral fatigue in the healthy population, where a mentally fatiguing task could lead to an increase in peripheral fatigue. This relationship has not yet been examined in the MS population. The goal of this study is to explore the interaction between central and peripheral fatigue in adults with MS compared with age- and sex-matched controls. *Methods:* Twenty male and female participants between the ages of 20-65 years old will be recruited. Ten participants diagnosed with MS will be matched with ten age-, sex- matched control participants. On two separate visits, participants will complete 2 submaximal fatigue tasks using a handgrip dynamometer, where they will be asked to sustain 50% of their maximal voluntary contraction (MVC) until task failure. In the rest period between the 2 tasks, participants will perform either a mentally fatiguing Stroop task or a congruent colour-word task for 5 minutes. Subjective measures of physical and mental fatigue will be evaluated using a visual analogue scale (VAS) at four-time points throughout the visit. Hand flexor muscle activity will be assessed using electromyography (EMG) throughout the submaximal handgrip tasks. *Hypotheses:* After the mentally fatiguing task we expect the MS group to have (1) higher EMG amplitude, (2) shorter time until failure in the handgrip task and (3) higher VAS mental fatigue scores, compared to age and sex matched controls.

### **Pro-Swim Study**

Student Researchers: Katie McKee, Ken Nguyen  
Faculty Advisor: Panagiota (Nota) Klentrou  
Brock University

*Background:* Protein supplementation is beneficial for the building of muscle mass, exercise performance, and recovery from exercise. These enhancements have been demonstrated mainly in young adults, athletes and non-athletes, with a wide range of habitual protein intake. *Purpose:* The purpose of the study is to examine whether recovery from a fatiguing exercise protocol is affected by consumption of whey protein immediately following (0-2hrs), compared with a non-protein beverage in pre-pubertal (9-12 years old) vs. circa-pubertal (13-16 years old) youth athletes. *Methods:* Recovery will be examined in terms of exercise performance (strength, swim performance), as well as in terms of muscle soreness, and biochemical markers (e.g., creatine kinase, myoglobin). A

secondary purpose is to examine whether protein supplementation following a fatiguing exercise session will affect endocrine and inflammatory markers during recovery. Study Procedures: All tests and measurements will be performed during four visits, swim performance tests will be performed in the pool (Brock University).

*Results:* This is an ongoing study.

*Anticipated Significance:* Results from the present study could impact current training and sports nutrition practices of young athletes. They may also affect public health and nutrition, as well as exercise science applications.

### **Parental Perceptions of the Impact of DCD on Everyday Functioning in Young Children**

Student Researcher: Anne Mienkowski

Faculty Advisor: Dr. John Cairney

University of Toronto

Developmental Coordination Disorder (DCD) is a prevalent neuro-developmental condition that typically impacts 5-6% of children, ages three onward. (Cermak & Larkin, 2001). Due to impaired and underdeveloped motor skills, children with DCD often struggle with activities of daily living (ADL's) such as brushing their teeth, dressing themselves, using utensils, and social interactions. It is imperative that parents are aware of their child's difficulties, as early intervention can improve motor development trajectories. Despite this, there is a paucity of research which currently exists about parent's perception of their child with DCD. The current study attempts to address this gap. Thirty parents were interviewed, all with children between the ages of four and five who were identified as having a probable DCD diagnosis. The interviews were transcribed verbatim and later coded for themes using a phenomenological approach. Preliminary analysis of the data reveals that parents do not attribute the child's struggles with everyday activities of living to be the result of a poor motor coordination. Specifically, four subthemes have emerged from the data. First, parents tended to view emotions (i.e., over-reacting) as a cause of everyday struggles. Parents also attributed to problems with everyday activities to be rooted in child's laziness or simply being clumsy. Lack of attention was also identified. Finally, parents did not view their child's development as atypical for his/her age. These findings reveal potential misconceptions parents hold about the nature of DCD. Better education and support to parents in the early years is required to better identify the sign and symptoms of DCD so that early intervention and treatment can begin.

### **Characterizing Skeletal Muscle Biology During Disease Progression in Spinal Muscular Atrophy Mice**

Student Researcher: Andrew Mikhail

Collaborator: Sean Y. Ng

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

*Introduction:* Spinal muscular atrophy (SMA) is the leading genetic cause of infant mortality, affecting ~1/6,000 live births. Survival motor neuron (SMN) protein deficiency in SMA patients due to mutations in the SMN1 gene results in the dysfunction and death of motoneurons, as well as skeletal muscle wasting. Due to this mutation, patients rely on the hypomorphic SMN2 gene which produces ~10% of functional SMN protein. Coincidentally, key proteins responsible for SMN2 gene expression are altered as a result of the SMA pathology. Furthermore, a slow, oxidative phenotype is resistant to skeletal muscle wasting in SMA. Molecules responsible for determining and maintaining this phenotype are also likely to be affected in SMA. However, these proteins have not been studied during SMA disease progression. Therefore, the purpose of this study is twofold: 1) to elucidate the protein expression for important molecules responsible for SMN2 expression, and 2) to identify the characteristics of muscle phenotype-modifying proteins over the progression of the SMA pathology.

*Methods:* Healthy wild-type mice and age-matched, type II SMA (*Smn<sup>2B/-</sup>*) littermates, which have a median lifespan of 28 days, were used in this study. The quadriceps muscles of mice from both genotypes were collected at presymptomatic [postnatal day (P) 9], early symptomatic (P13), and late symptomatic (P21, P25) time points. Immunoblotting and polymerase chain reaction techniques were utilized to assess intracellular signaling and gene expression pathways. *Expected results:* We anticipate that the expression of proteins responsible for SMN2 expression in skeletal muscle will decrease over time as the disease pathology progresses. Furthermore, we hypothesize that there may be an increase in proteins responsible for the phenotypic changes of muscle to a slower oxidative phenotype as a compensatory mechanism.

*Discussion:* The present study aims to characterize the expression of key proteins in SMA responsible for SMN2 expression, as well as phenotypic changes in skeletal muscle. This is important as a more

comprehensive understanding of skeletal muscle gene expression in SMA will allow for the development of novel therapies to enhance SMN2 expression and evoke a favourable muscle phenotypic change to further ameliorate the SMA pathology.

### **The Role of Co-Activator-Associated Arginine Methyltransferase 1 in Skeletal Muscle During Denervation-Induced Atrophy**

Student Researcher: Naomi S. Misquitta

Collaborators: Derek W. Stouth, Tiffany L. vanLieshout

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

*Introduction:* Co-activator-associated arginine methyltransferase 1 (CARM1) is an enzyme that catalyzes the methylation of target proteins and is important for mediating protein breakdown in non-skeletal muscle cells. Disuse-induced skeletal muscle atrophy is characterized by decrements in myofiber cross-sectional area (CSA). Although CARM1 expression has been shown to increase in myofibers following denervation, the mechanistic role of CARM1 during skeletal muscle atrophy remains unknown. Therefore, the purpose of this investigation is to examine the effect of CARM1 on muscle fiber CSA during denervation-induced skeletal muscle atrophy.

*Methods:* Wild-type (WT) and skeletal muscle-specific CARM1 knockout (MKO) mice underwent unilateral denervation of the hind limb for 3, 7 or 14 days. Soleus (SOL) and extensor digitorum longus (EDL) muscles in both denervated and innervated, control limbs were collected for fiber-type comparison. Muscle fibre CSA will be studied by staining transverse cryosections of whole muscle with hematoxylin and eosin. Moreover, we will measure the CSA of 150 individual muscle fibers per muscle section using digital analysis software.

*Results:* We anticipate that muscle fiber CSA of denervated SOL and EDL muscles relative to innervated, control muscles will be reduced in both WT and MKO mice at each time point. Since CARM1 regulates proteins that are known to be involved in muscle protein breakdown, we hypothesize that the denervation-induced reduction in CSA in SOL and EDL muscles will be blunted in MKO mice compared to WT mice.

*Discussion:* Our results will reveal whether CARM1 mediates denervation-induced alterations in skeletal muscle CSA.

*Conclusion:* The potential attenuation of muscle atrophy in MKO animals might suggest that CARM1 is a viable therapeutic target for neuromuscular disorders that are characterized by muscle atrophy.

### **The Impact of Co-Activator-Associated Arginine Methyltransferase 1 During Fasting-Induced Decrements in Muscle Cross-Sectional Area**

Student Researcher: Zack P. Moll

Collaborators: Derek W. Stouth, Tiffany L. vanLieshout

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

*Introduction:* Co-activator-associated arginine methyltransferase 1 (CARM1) catalyzes the methylation of arginine residues on target proteins and is critical for autophagy in non-skeletal muscle cells. Importantly, autophagy contributes toward skeletal muscle atrophy in response to food deprivation. In addition to reduced muscle mass, this process is characterized by decreased muscle fiber cross-sectional area (CSA). Although CARM1 has been shown to regulate autophagy in non-skeletal muscle cells, the impact of CARM1 on autophagy in skeletal muscle remains to be elucidated. Thus, the purpose of this study is to determine whether CARM1 governs muscle fiber CSA during fasting-induced skeletal muscle atrophy.

*Methods:* Wild-type (WT) and skeletal muscle-specific CARM1 knockout (MKO) mice were either fed or fasted for 48 hours. The extensor digitorum longus (EDL) and soleus muscles will be collected for fiber type comparison. Here, muscle fiber CSA will be examined in both CARM1 MKO and WT mice by utilizing a hematoxylin and eosin stain. We plan to measure the CSA of 150 muscle fibers per sample.

*Results:* Based on previous data, we expect decreased muscle fiber CSA in fed MKO relative to fed WT. In response to food deprivation, we anticipate that reductions in muscle fiber CSA will be blunted in MKO mice relative to the WT group. As per the fiber type comparison, we speculate that the greatest loss of CSA will occur in the glycolytic EDL in response to fasting.

*Discussion:* Attenuated reduction of muscle fiber CSA in MKO mice following fasting conditions would support the notion that CARM1 plays a key role during skeletal muscle autophagy. *Conclusion:* This study will further our understanding of skeletal muscle atrophy following food deprivation.

## **Relationship Between Rate of Perceived Exertion and Heart Rate Within a Cardiac Rehabilitation Population Completing a Stair Climbing-Based High Intensity Interval Training Intervention**

Student Researcher: Jessica Morris

Collaborators: Dunford E.C., Valentino S.E., Dubberley J., Phillips S.M., Lonn E.

Faculty Advisor: Dr. Maureen MacDonald

McMaster University and Hamilton Health Sciences

Cardiac rehabilitation aims to mitigate cardiovascular disease risk factors through interventions such as exercise. In cardiac rehabilitation populations, high intensity interval training (HIIT), consisting of multiple brief bouts of high intensity activity interspersed with short periods of active recovery, has been proven to elicit benefits similar to traditional endurance exercise. Heart rate (HR) can be used to objectively gauge intensity levels during exercise, however, Borg's 6-20 Rating of Perceived Exertion (RPE) Scale is a more feasible measurement to assess and prescribe exercise intensity levels in clinical settings. While RPE has been shown to correlate with HR intensity zones in healthy populations, this relationship has not been established in cardiac rehabilitation populations who have inconsistent and altered HR. Furthermore, most studies evaluating HIIT in cardiac rehabilitation occur in a supervised facility and require specialized equipment. In contrast, stair climbing-based HIIT is a more accessible exercise modality. As part of the Stair Climbing Outcomes in cardiac Rehabilitation Exercise (SCORE) trial, this project will evaluate whether RPE-predicted heart rate is comparable to objectively-measured HR in a cardiac rehabilitation population undergoing a stair climbing-based HIIT intervention. Twenty participants will be recruited from the Cardiac Health and Rehabilitation Center outpatient rehabilitation program operated out of the Hamilton General Hospital. Participants will complete 6 sessions of stair climbing-based HIIT over 2 weeks, with each session consisting of 3 high intensity bouts (6 flights/bout) separated by 1 min of active recovery (walking). At the beginning and end of each high intensity bout, HR and RPE data will be recorded. A Bland-Altman Plot analysis will be performed to assess the agreement between RPE level and measured HR following which a T-test will evaluate the difference between RPE predicted HR and measured HR. It is expected that Borg's RPE 6-20 scale predicted HR will be comparable to measured HR within subjects.

*Keywords:* cardiac rehabilitation, Borg's Rating of Perceived Exertion, heart rate, high intensity interval training

## **Changes in Specific Force in Response to Hypertrophic and Atrophic Stimuli in Young Males**

Student Researcher: Kevin Murphy

Faculty Advisor: Dr. Stuart Phillips

McMaster University

Skeletal muscle is the largest organ in the human body, serving critical mechanical and metabolic roles. Further, muscle exhibits dynamic properties shown to be malleable by various hormonal, contractile, and nutritional perturbations. Through habitual resistance training coupled with adequate protein ingestion, muscle hypertrophy will result. In contrast, through times of muscular unloading as a result of immobilization or bed rest, muscle atrophy will occur. Both loading and unloading of muscles are also accompanied by changes in strength, attributable in part to the inherent changes in cross sectional area (CSA) perpetuated by hypertrophic or atrophic stimuli. However, strength changes can be largely accounted for by neuromuscular adaptations such as increased or decreased neural drive, motor unit activation, and inter-muscular coordination required in more complex lifts. The trophic, and neuromuscular responses to these stimuli, especially hypertrophic ones, appear to be highly variable on an individual level, manifesting as widely varying CSA and strength changes. A relevant question is whether those who are more responsive (i.e. have high responses) to a hypertrophic stimuli, are also as responsive to atrophic stimuli. In this study, we addressed this question using a within-subjects design that permitted us to study the influence of hypertrophic (resistance exercise training) and atrophic stimuli (knee-brace mediated immobilization). Muscle CSA, isometric strength output, and specific force (a measure of strength per CSA of muscle) were assessed prior to, and following periods of unilateral resistance training and contralateral knee immobilization. We analyzed whether those who show high increases in response to resistance training also demonstrated relatively high decreases in specific force throughout immobilization. Further, we evaluated whether observed changes in specific force were more attributable to CSA or strength changes within individuals.

## **Do Brief Daily Bouts of Stair Climbing Exercise Improve Cardiorespiratory Fitness?**

Student Researcher: Leah Nairn  
Collaborator: Madi Jenkins  
Faculty Advisor: Dr. Martin Gibala  
McMaster University

Cardiorespiratory fitness (CRF) refers to the functional capacity of the body to transport and utilize oxygen. It can be directly measured using a peak oxygen uptake ( $VO_{2peak}$ ) test. Low levels of CRF are associated with an increased risk of all-cause mortality and cardiovascular disease. Despite strong evidence showing that regular exercise can improve CRF, most Canadians do not meet current recommendations calling for 150 minutes of moderate to vigorous intensity aerobic physical activity per week. Lack of time and access to facilities are cited as common barriers to regular exercise. We recently examined the effects of a low-volume sprint interval training (SIT) protocol involving three 20-s cycling sprints set within a 10-min time commitment. Thirty-six sessions of training over 12 weeks improved CRF similar to traditional moderate-intensity continuous exercise involving 150 min per week. We also recently showed that six weeks of stair climbing SIT improved CRF in sedentary individuals by approximately one metabolic equivalent. It remains unclear whether breaking up the sprints throughout the day — a concept known as “exercise snacking” — is also effective to improve CRF. The purpose of this study is to determine if brief bouts of stair climbing spread throughout the day can improve CRF as measured by peak oxygen uptake ( $VO_{2peak}$ ). In a randomized controlled trial of 24 healthy, sedentary adults, we will compare changes in CRF following a six-week stair climbing protocol involving three ascents of a 60-step staircase spread throughout the day, performed three times per week to a control group who maintains their sedentary lifestyle for six weeks. To identify changes in CRF, we will be measuring  $VO_{2peak}$  using a cycle ergometer before and after the training period. We hypothesize that three ascents of a 60-step staircase spread throughout the day, performed three times per week for six weeks, will improve CRF.

## **The Effects of a Previous Concussion on Target Accuracy and Dynamic Stability During a Stone Stepping Task**

Student Researcher: Jacqueline Nestico  
Faculty Advisor: Dr. Michael Cinelli  
Wilfrid Laurier University

Sustaining a concussion can result in a myriad of signs and symptoms that can greatly impact the individual with respect to their balance control. While most symptoms usually resolve within a few weeks, some symptoms related to balance can persist. The present study aims to examine persisting balance impairments in a previously concussed population using an adaptive locomotion paradigm. Participants were divided into two groups; a control group, having no previous concussion history ( $n=10$ ), and an experimental group, or those who have sustained at least one concussion within the past 2 years, and were symptom free. Demographic data was obtained through two health history questionnaires. Participants were instructed to walk along a path of cutout footprints as accurately as possible. After they hit the 8<sup>th</sup> step, the following step (target footprint) shifts randomly either anteriorly, posteriorly, medially, laterally or not at all, with a time delay of 200ms or 400ms. This protocol is meant to perturb the individual while walking as a way to test their balance control. The Optotrak camera system was used to collect kinematic data. Variables being examined include foot placement accuracy, velocity of the task, and trunk pitch and roll. Based on current data collection, there are four main findings about the previously concussed group from the observational data. Firstly, they trip more at the target footprint, which results in greater trunk movements. Secondly, they miss the target footprint more often than the control group. Thirdly, they perform the task slower. Finally, they walk more cautiously compared to the control group, who walk with more confidence. A repeated measures mixed ANOVA will be used to determine statistical significance. In conclusion, the data suggests that a previously sustained concussion can result in persisting balance impairments.

## **Accuracy of Clinical Goniometric Measures of Coronal and Axial Alignment of the Lower Extremity**

Student Researcher: Tate Newmarch  
Faculty Advisor: Dr. Doug Richards  
University of Toronto

The etiology and management of injuries to the lower extremity is an area of controversy among clinicians and researchers. A growing body of evidence implicates dynamic axial and coronal plane misalignment of the lower extremity in probable causation of several different pathological entities (e.g.

- ACL rupture, patello-femoral pain, tibial stress, plantar fasciopathies, etc.). With this information, health practitioners have begun prescribing movement programs designed to facilitate increases in the ability to control alignment. These interventions have demonstrated some reductions in risk to various musculoskeletal disorders.

None of the research exploring these relationships has considered whether the risks associated with poor dynamic control of alignment, or the benefits of exercise programs intended to improve that dynamic control, are affected by an individual's underlying static skeletal alignment. This is significant as the latter is not a clinically modifiable risk factor.

The first step in evaluating this relationship is through accurate and reliable measurement. Clinical tests intended to measure static axial and coronal alignment of the lower extremity have been described, but not well compared to "gold standards" such as three-dimensional radiography. Our 2017 study observed both low inter-session and inter-rater reliability of clinical goniometric measures.

This study seeks to evaluate the accuracy of clinical goniometric measures of 4 axial-coronal lower extremity alignment properties (femoral anteversion, tibial torsion, tibio-femoral angle, quadriceps angle) against a bi-planar radiogram image of their bodies taken with the EOS stereoradiography system. Subjects from the 2017 study will undergo imaging via EOS bi-planar stereoradiography of the lower extremity in which their data will be compared to that derived clinically for the purposes of evaluating the validity of clinical measures.

Data collection is underway at the time of submission of this abstract, and some analyses of data will be available at the time of oral presentation.

### **Coaches' Interpersonal Emotion Regulation with Varsity Sport Athletes**

Student Researcher: Sing-Yan Ng

Faculty Advisor: Dr. Katherine Tamminen

University of Toronto

There is a growing body of literature addressing emotions in sport with a focus on athletes' intrapersonal emotions, and the effect of emotional self-regulation on performance. Adding to this, interpersonal emotion regulation (IER) among teammates has also been shown to affect performance and relationships among athletes in a team sport (Tamminen & Crocker, 2013). However, there is limited research on the effects of IER within the context of the coach-athlete relationship. Thus, the purpose of this study was to gain a better understanding of IER among coaches and athletes by analyzing the methods employed by coaches to regulate their athletes' emotions. The study involved two cases consisting of one male coach and two male athletes ( $N = 9$ ) from individual varsity sports. Participants engaged in two semi-structured interviews (i.e., pre and post), and a two-week audio diary period. The data were analyzed using thematic content analysis and integrated into a pre-existing model featuring (1) the athlete's immediate context, (2) the athlete's emotions, (3) Gross's (1998) process model of emotion regulation, (4) Jowett's (2005) 3C model of the coach-athlete relationship, and (5) external factors. Emergent themes included: the absence of IER in a practice setting compared to a competition setting; the frequency of IER depending on the physical nature and context of the sport; and the coaches' employment of positive reinforcement and goal setting as emotion regulation strategies. Findings suggest that coaches play an integral role in regulating their athletes' emotions, especially within the context of individual sports. Further research is required to understand how specific IER strategies, employed by coaches' and athletes', affect performance and the coach-athlete relationship.

### **Exploring Physical Activity Opportunities and Health-Related Resources on Campus for International Students**

Student Researcher: Dong Hyuk (Chris) Park

Faculty Advisor: Dr. Catherine M. Sabiston

University of Toronto

In Canada, there has been a consistent increase in enrolment of international students (IntS) at institutions of higher education (CBIE, 2017). As a result of IntS becoming a growing portion of the student body, it is essential to acknowledge that IntS have unique challenges upon their arrival to their new host country. Studies have shown that IntS experience challenges and stressors such as cross-cultural adjustment, language barrier, adjustment to new academic systems, and being apart from family and friends (Wilton & Constantine, 2003). However, there is currently limited research in how IntS are engaging in physical activity in post-secondary institutions and their experiences in physical activity. In addition, it has been reported that IntS significantly underutilize health-related resources on campus (Mori, 2000). Therefore, the purpose of this study is to understand IntS experiences and

perceptions toward physical activity and accessing health-related resources on campus. 10-15 University of Toronto students from different racial and ethnic backgrounds will be interviewed and their responses will be analyzed thematically. The anticipated outcome of this study is identification of the barriers that prevent IntS from engaging in physical activity and utilizing the health-related services on campus. The findings may be useful as resources to increase institutional support for IntS to promote physically active lifestyle.

### **An Evaluation of Changes in the Domains of Physical Literacy Used in a Physical Literacy-Based Intervention for First-Year University Students**

Student Researcher: Ryanne Perinpanayagam

Faculty Advisor: Dr. Matthew Kwan

McMaster University

*Background:* Individuals who cannot execute basic movement skills find difficulty participating in sport and activity, where more complex movement skills are required. The development of physical literacy (PL) is essential to lifelong sport and physical activity participation. While the individual PL domain of motivation, confidence, physical competence and knowledge are all independent correlates of physical activity, few studies have investigated PL in a holistic way. The current investigation examines the effect of an intentionally-developed PL-based program targeting first-year university students living in residence.

*Purpose:* The purpose of this study is to assess the impact of the 12-week PLUS program on changes across all domains of PL.

*Methods:* Utilizing a quasi-experimental study design, 65 first-year students were recruited to participate in either the PLUS Program or one of two control groups. All participants underwent the PLAYFun assessment for physical competence and completed a comprehensive questionnaire at baseline and 12-week follow-up. The questionnaire included Behavioural Regulation in Exercise Questionnaire-3 (BREQ-3) for motivation and Global Self Efficacy and Task-based specific Self Efficacy for confidence, and select items from the BREQ-3 were designated to assess the domain of knowledge and understanding.

*Results:* Findings from our preliminary data analysis will be presented at the conference, using repeated measures ANOVA to examine changes across the central constructs of PL.

*Implication:* This pilot study will investigate the impact of the PLUS Program to elicit increases in motivation, confidence, physical competence and knowledge and understanding in first-year university students, in the hopes that they can better sustain a healthy active lifestyle during their tenure at university.

### **Examining the Relationship Between Kinesiology Students' Self-Perceived Physical Literacy and Their Actual Physical Literacy Capabilities**

Student Researcher: Goran Perkic

Faculty Advisor: Dr. David Frost

University of Toronto

Physical Literacy (PL) is a term used to describe an individual's *motivation, confidence, physical competence, and knowledge to be physically active* (Canada's PL Consensus Statement, 2015). Sizeable investments in PL education are being made by governments to reduce the personal and economic burden on the healthcare system through improved physical and psychological well-being of the population, increased work-force productivity and raised levels of expertise in sport and exercise participation (Giblin, Collins, & Button, 2014). However, to date, there is little known about the relationship between an individual's perceived PL and their actual physical competence. The primary objective of this research is to examine the relationship between self-perceived PL and actual PL capabilities in fourth year kinesiology students who have been exposed to the notion of PL and its component parts throughout the undergraduate program. Participants (n=12) will complete a standardized PL questionnaire and be asked to document their involvement in sport and exercise. They will then be asked to perform a series of 15 bodyweight exercises that involve, squat, lunge, hinge, push and pull patterns, each with a specified set of physical demands (i.e. repetitions, tempo, or work duration). The data will be used to examine the relationship between participants' perceived and actual PL, and thus may provide insight into the level of practical knowledge possessed by students, their understanding of employing movement theory into practice, and their proficiency to self-evaluate poor movement patterns. These skills are fundamental to produce competent kinesiology students and can be used as a basis to better improve the design and curriculum of kinesiology programs with pertinence to PL education. Ultimately, further understanding the relationship between perceived PL and actual PL in physical activity, exercise, and sport will be crucial for students in the field to better



facilitate proper movement and exercise behaviour that better themselves and their services offered to future clients.

### **Does Mandatory Physical Education Affect Physical Activity, Obesity, and Health-Related Outcomes?**

Student Researcher: Rachel Pham  
Faculty Advisor: Dr. John Cairney  
University of Toronto

Statistics Canada reports that 31% of youth aged 5-17 years in Canada are either overweight or obese, as identified by Body Mass Index (BMI) (Statistics Canada, 2017). Not only is physical activity an effective and necessary component of maintaining health and body composition (Janssen & Leblanc, 2010), physical activity is also related to positive education outcomes (Owen, Parker, Astell-Burt, & Lonsdale, 2018). As all children are required in Canada to attend primary and secondary education, physical education (PE) within schooling systems seems like a logical method of ensuring all children meet or exceed the recommended amount of physical activity.

The purpose of this case study is to examine the effects of PE policy on physical activity levels by comparing two jurisdictions with differing policy regarding PE attendance. Using data from existing literature, policy documents, statistical collections, and stakeholder interviews, we will see if PE policy affects physical activity levels, health-related outcomes, and academic performance. We hypothesize that there will be a positive relationship between mandatory or increased PE participation and physical activity levels, health-related outcomes, and academic performance, more so than voluntary or decreased PE participation. The results of this case study will help policy makers and educators implement better and more effective PE programs to maximize physical activity's benefits and best serve Canadian students.

### **Validation and Reliability of Inertial Measurement Units for Determining Trunk Flexion**

Student Researcher: Adam Pinos  
Faculty Advisor: Dr. Scott Thomas  
University of Toronto

Tracking the movement of wheelchair team sports during practice and game-simulated scenarios has been researched in the past (Coultts et al., 1992) however no publication to date has quantified the trunk movement of wheelchair athletes within the chair using an inertial measurement unit (IMU). Understanding how much trunk movement occurs will provide crucial coaching and strength and conditioning information for athletes. Existing literature on tracking movement of the athlete using IMU technology has primarily focused on the observation of the athlete's chair movement (Pansiot et al. 2011) or propulsion kinematics of the upper extremities and chair of the athlete (Bergamini et al., 2015). The purpose of this study was to determine the level of agreement between IMUs and video analysis during a simulated trunk movement test. Pilot testing was carried out using a rigid moment arm to simulate trunk flexion and extension at a slow (100 bpm) and fast (176 bpm) rate, in which the movement (degrees/sec) was recorded using a camera-based system as well as two Nanotrak IMU devices. Over 12 trials at low speed, the Kinovea average velocity was  $38 \pm 4.6$  degrees per second, over 68 degrees and the IMU equivalent was  $34 \pm 4.6$  degrees per second over 61 degrees. For the high-speed trials, Kinovea averaged  $59 \pm 9.4$  degrees per second, over 65 degrees and the IMU averaged  $63 \pm 9.4$  degrees over a span of 60 degrees. Additional testing will occur in a similar fashion using human participants, with the IMUs secured to their chest, in a stationary wheelchair. Applications for this study could include IMU usage as a future method for tracking trunk flexion in a wheelchair. Output measures might help quantify differences in trunk movement based on classification and to quantify the extent of trunk movement in propulsion, blocking (picking) and shooting.

### **Examining the Relationship Between Prior Concussion and Heart Rate Variability in Healthy Athletes**

Student Researcher: Kyla Pyndiura  
Faculty Advisor: Dr. Michael Hutchison  
University of Toronto

*Background:* Sports-related concussions (SRC) are associated with a variety of clinical signs and symptoms that most frequently resolve within 2-3 weeks. However, recent research has highlighted physiological recovery extends beyond clinical recovery. To date, the research examining persistent autonomic nervous system (ANS) dysfunction in athletes with prior concussions is limited.

*Objective:* To identify any persistent HRV abnormalities associated with history of concussion in healthy athletes.

*Methods:* Healthy university athletes (n = 59: f = 30, m = 29) completed a 10-minute supine and 6-minute seated HRV collection, a symptom evaluation, and a health and wellness questionnaire. Between-group analyses stratified by concussion history and gender were performed.

*Results:* Both frequency (LF, HF, VLF, LF/HF ratio) and time (mean RR, STDRR, mean HR) domain measures for HRV were analyzed. In the supine position, athletes with a history of concussion had a lower VLF power (ms<sup>2</sup>) measure (uncorrected, p < 0.05) compared to athletes with no history of concussion. Results from the symptom evaluation and the health and wellness questionnaire are currently underway and will also be presented.

*Discussion:* These findings highlight that despite prior research identifying HRV abnormalities shortly after clinical recovery following concussion, the present results suggest these abnormalities are not persistent effects.

### **Exploring the Role of Family Support in Military Personnel's Recovery from Physical and Mental Illnesses and Injuries Through Sport Participation**

Student Researcher: Sabrina E. Ribau

Faculty Advisors: Dr. Kelly Arbour-Nicitopoulos, Dr. Celina Shirazipour

University of Toronto

Military personnel (including both current service members and veterans) with physical and/or mental illnesses and injuries compete in the Invictus Games, an adapted sporting event designed for service members and veterans. Physical activity (PA) participation for individuals with physical and mental health conditions can be an important tool for psychosocial recovery. The primary aim of this paper was to explore the role of family support on military personnel's sport participation as a means of recovering from illness and injury. A secondary aim was to generate items for a measure of family support for PA participation for military families. Eighteen (n=18) family members of Invictus Games competitors were interviewed (16 one-on-one interviews and 1 two-person interview) from 3 countries: Canada (n=11), the United Kingdom (n = 5), and Denmark (n = 2). Participants were primarily female (83%), mothers (33%) or wives (39%) of the competitors, and a mean age of 48.62 years (range = 27 to 83; n=13 for those who reported demographic information). A secondary inductive thematic data analysis was conducted on the interview transcripts using Nvivo® software to identify themes related to family support for service members with mental and/or physical illnesses and injuries and their families. This study is on-going and results will be presented. Given the need and desire for family support among military families, the anticipated findings from this work promote the need for family support for military personnel and their families. Further research on family support for PA among military personnel, as well as the need for the development of a measure to quantify this family support amongst military families, is recommended.

### **Socioeconomic Status and the Availability of School-Based Sports**

Student Researcher: Alanna Sadri

Faculty Advisor: Dr. Peter Donnelly

University of Toronto

*Background:* School-based sports are effective programs as they keep youth physically active. They are relatively inexpensive and they provide social networks for youth. However, limited schools offer a wide variety of school-based sports. The aim of this research study is to examine if the socioeconomic status of schools is a determining factor in the number of school-based extracurricular sports offered and the number of available sports facilities in the school.

*Methods:* Data will be collected from Toronto District School Board (TDSB) schools with a population of greater than 500 students. The TDSB Learning Opportunities (LOI) scores for each school will be used to rank socioeconomic status. Information on the variety of school sports offered will be collected from the TDSB website and the number of school sports facilities available will be determined over the phone. *Implications of Research:* This research will examine if the TDSB is providing enough funding through the LOI program to assist schools in mitigating the lower socioeconomic status of their student body to provide equal access to sports in all schools.

## **The 'Taking a Knee' Protest: Media Representations of Black Athletes During the NFL Protests and Audience Understandings**

Student Researcher: Barinderjit Sangha  
Faculty Advisor: Dr. Margaret MacNeill  
University of Toronto

*Background:* Issues of racism and media representations of athletes of colour have been understudied in the sport field until recently (Carrington, 2010; Joseph, Darnell & Nakamura, 2012). Moreover, very little is known about how audiences make sense of media coverage. A timely subject to study, therefore, is the 'Taking a Knee' protest that began with a 2016 tweet depicting Colin Kaepernick, a NFL quarterback for the San Francisco 49ers, kneeling during the US national anthem.

*Purposes:* The dual purposes of this study are to investigate media framing of the 'Taking a Knee' protest in coverage by ESPN, CNN and Fox Sports, and how audience members identifying as males understand the issues published.

*Theoretical Approach:* This case study adopts Goffman's (1974) framing theory using critical race theory (CRT) to thematically code racial prejudices, social martyrdom and human rights narratives.

*Methods:*

1. Content analysis has been conducted on media articles (n=240: 80 each from ESPN, CNN, and Fox News) from these outlets. This media data set breaks down to 30 articles gathered from the third week of the 2017 NFL season when the US President publicly commented about the protest, 105 articles from 2016 NFL season before President Trump's speech, and 105 articles published after the speech.
2. Interviews are underway with ten participants who regularly consume online NFL-related sport media.

*Results:* Preliminary findings from both the media framing analysis and audience responses to media coverage of the protest will be presented.

*Conclusion & Recommendations:* This presentation will conclude with key observations about the framing of mainstream sport stories that debate human rights issues through a critical race studies lens. Recommendations for future research, journalistic practice, audience feedback and activism.

## **Sport Is Not Enough: Why Outdoor Education Can Make a Valuable Contribution to the Field of Sport for Development**

Student Researcher: Katya Smirnova  
Faculty Advisor: Dr. Simon Darnell  
University of Toronto

In 2003, the United Nations released a report that identified sport as a tool for achieving the Millennium Development Goals (MDGs). A couple of years later, 2005 was named the Year of Development and Peace through Sport. The world has since approved of the UN's use of sport as a powerful tool for development, but the sport for development (SFD) sector has failed to recognize the potential of outdoor education in this development role. There has since been no literature published on the convergence of SFD and outdoor education (OE), leading to a considerable gap between these two fields. Therefore, this study sought to find out why these two fields are not collaborating, and whether there is a possibility for them to do so. Semi-structured interviews were conducted with practitioners from OE and researchers from SFD in an attempt to find commonalities between the two fields. Viewpoints were both similar and different amongst researchers and practitioners about the potential connections between SFD and OE. Although participants from OE and SFD had different understandings of sport and of development, which at times created a discrepancy in knowledge and understanding between participants, interviewees from both fields believed that SFD and OE could benefit one another in some way. Furthermore, the results of this study indicate that OE could indeed have a place in SFD but that there are some barriers that prevent their integration at this time. These barriers include, but are not limited to, lack of resources to create joint programs, limited knowledge surrounding SFD in the OE sector and vice versa, and uncertainty around the definitions and implications of both these fields. Further research, ideally using critical observation of existing programs, is required to assess the feasibility of these fields merging in a practical setting.

## **The Effect of Using Cold Water Immersion Therapy on Protein Synthesis Following Lengthening Contractions in the Extensor Digitorum Longus of Sprague-Dawley Rats**

Student Researcher: Melissa Stapleton  
Faculty Advisor: Dr. Marius Locke  
University of Toronto

Cold therapy may help manage pain and injuries; however, there is minimal research demonstrating the effectiveness of cold therapy on preventing skeletal muscle damage. The rate of skeletal muscle recovery is dependent on protein synthesis. Muscle protein synthesis following lengthening contraction was analyzed by the SUnSET technique, using the biomarker puromycin. The purpose of this experiment was to assess the effect cold water on protein synthesis following eccentric contractions in damaged extensor digitorum (EDL) muscles. Fifteen male Sprague-Dawley rats participated in eccentric contraction consisting of either 20 contractions (n=6), 40 contractions (n=6) or controls (n=3). Within the lengthening contraction group, the animals were further divided into either a cold-water group (n=3) or exercise only group (n=3) and assigned a recovery time of zero, three, or eight hours. Differences in the overall rate of protein synthesis between exercise only and cold-water treatment was only observed following eight hours of lengthening contraction. Cold water treated EDLs demonstrated an increased protein synthesis compared to the exercise only EDL. The trends from this study suggest that applying cold water to relatively undamaged muscles may increase protein synthesis after eight hours post exercise. Implications of the benefits to using cold water treatment as a tool to manage skeletal muscle injuries are still unknown.

## **A Proposed Traffic Light Solution for the Colour Blind Population**

Student Researcher: Sam Stillie  
Faculty Advisor: Dr. James Lyons  
McMaster University

Vision is the primary sensory modality used while driving. Any impairment in the visual system can leave the driver vulnerable to potentially fatal errors. Drivers from the colour blind population (CVD) find themselves subject to errors particularly associated with their ability to distinguish traffic light colour and the associated traffic command (Atchison, Pedersen, Dain, & Wood, 2003; Tagarelli, Piro, Tagarelli, Lintier, Risso and Olivieri, 2004; Chan, Goh, & Tan, 2014). The objective of this research is to examine the effectiveness of a newly designed traffic light system that aims to maximize response accuracy and minimize hesitation in the colour vision deficient population when responding to traffic signal commands. The experiment includes eight individuals with colour vision deficiency, and eight without. Their task is to verbally respond ("Stop", "Go", "Slow") as quickly and accurately as possible to both traditional and our newly designed traffic lights simulated on a computer screen. Preliminary results suggest that CVD participants reacted faster, and made fewer errors in the newly proposed traffic light system when compared to the traditional system. Reaction times and error rates in the normal colour vision (NCV) group were similar and consistent across both design conditions. These results show early evidence suggesting that our proposed traffic light system (one that takes advantage parallel information processing, increased signal salience and colour redundancies) promotes and facilitates the use of spatial location cueing in the colour blind population while not negatively impacting NCV participants. These results are discussed in the context of individual difference driven user-centred design principles.

## **Sport and Physical Activity Levels in Indigenous Populations of Canada**

Student Researcher: Sam Stillie  
Faculty Advisors: Dr. Philip White, Dr. Peter Kitchen  
McMaster University

It is known that involvement in sport and physical activity leads to positive health benefits, and this is seen across populations (Public Health Agency of Canada [PHAC], 2011; Reiner, Niernann, Jekauc, & Woll, 2013). 'Indigenous peoples of Canada' is the collective name used to describe original peoples of Canada who are recognized as First Nations, Métis, or Inuit (Indigenous and Northern Affairs Canada [INAC], 2017). In comparison to other Canadians, Indigenous peoples are more likely to suffer from conditions associated with poor health, (Katzmarzyk, 2008; Rosenberg, Wilson, Abonyi, Wiebe, & Beach, 2009), and have lower life expectancy (Statistics Canada, 2015). Considering that physical activity is a direct, modifiable risk factor for many chronic diseases (such as obesity and CVD) (World Health Organization, 2012), along with all-cause mortality (Wen et al., 2011; Samitz, Egger, & Zwahlen, 2011), it might be expected that participation levels would be lower in Indigenous populations; however, there has been very little research conducted on this potential relationship. This

report compares physical activity levels of Indigenous and non-Indigenous populations in Canada. The investigation will later progress to exploring the associations between physical activity levels and health outcomes in these populations. Our preliminary findings suggest that levels of physical activity are significantly lower in Indigenous populations than in non-Indigenous populations. Remarkably, for both males and females, markedly more Indigenous than non-Indigenous respondents indicated they had not participated in any physical activity, including leisure time physical activity, in the 3 months prior to completing the survey. The investigation has been using the 2014 Canadian Community Health Survey (CCHS) data to perform cross tabulations, and linear combinations to test levels of significance. The investigators have fortunate access to the recently released 2015-2016 CCHS survey data for the purpose of analysis.

### **"Bet Your Bottom Dollar" Do People Emphasize Value or Probability When Choosing Between Alternatives?**

Student Researcher: Saba Taravati  
Faculty Advisor: Dr. Tim Welsh  
University of Toronto

It has been previously found that when participants are presented with a pair of target-penalty motor prospects, they tend to rely more on probability (spatial) information over negative value (penalty) information (Neyedli & Welsh, 2015). However, this selection task was based on a motor aiming task where participants had to physically aim to the target. The purpose of the present study was to explore whether the participants held the same tendency if they had to make the same selection task via a key-press without prior aiming experience. Participants were presented with a pair of prospects that 1) differed in maximum expected gain (MEG) with either only the values or only the probabilities differing between prospects; and 2) had similar MEG with one prospect having a larger probability of hitting the target and a higher penalty value and the other prospect a smaller probability of hitting the target but a lower penalty value. These configurations were presented based on a previous study by Neyedli and Welsh (2015). In 400 key-press trials, participants had 400 milliseconds to choose between the prospects. It was found that participants successfully choose the prospect with the highest MEG when the prospects differed in MEG ~90% of the time in the Different-Penalty-Larger MEG pairs, and ~85% of the time in the Different Distance-Larger MEG pairs. When the MEG of the prospects were similar, participants most often chose the prospect that had the larger distance (~60% of the time). In the pair where the MEG, distance and penalty all differed, the configuration with the larger distance was chosen more often than the lower penalty (~60% of the time). Thus, the data collected thus far indicate that participants are still relying more on spatial information to make their decision even when they do not have direct aiming experience.

### **Investigating the Ability of Skeletal Muscle Co-Activator-Associated Arginine Methyltransferase 1 to Regulate Central Myonuclei Positioning After Hind Limb Denervation**

Student Researcher: James P. Thoms  
Collaborators: Derek W. Stouth, Tiffany L. vanLieshout  
Faculty Advisor: Dr. Vladimir Ljubcic  
McMaster University

*Introduction:* Co-activator-associated arginine methyltransferase 1 (CARM1) catalyzes the methylation of target proteins and is required for satellite cell-mediated muscle regeneration. Muscle injury induced by nerve transection has been shown to initiate the regenerative process. Indeed, denervation-induced muscle atrophy is accompanied by increased centrally positioned nuclei in myofibers, a marker of ongoing repair. Although CARM1 is indispensable in satellite cells for muscle regeneration, the importance of CARM1 biology in myofibers during denervation-induced muscle regeneration is unknown. Thus, the purpose of this study is to determine whether skeletal muscle CARM1 influences nuclear positioning following denervation.

*Methods:* Unilateral denervation of the hind limb was performed in wild-type (WT) and skeletal muscle-specific CARM1 knockout (MKO) mice in order to induce muscle regeneration. To enable muscle fiber type comparisons, both the extensor digitorum longus (EDL) and soleus (SOL) muscles were collected at 3, 7 and 14 days post-denervation. To measure centrally located myonuclei, we will carry out hematoxylin and eosin staining. For each sample, 150 muscle fibers will be quantified.

*Results:* Based on previous denervation studies, we expect that the SOL muscle will have more centrally positioned nuclei compared to the EDL muscle. Due to the results from earlier work investigating CARM1 biology during muscle regeneration and repair, we anticipate that the MKO group will have more centrally located nuclei compared to the WT group under basal conditions. Throughout

the time-course, we hypothesize that the difference in centrally located nuclei between groups will increase as muscle atrophy progresses.

*Discussion:* This study will expand our understanding of the role of CARM1 during muscle regeneration. *Conclusion:* Our research may provide evidence that CARM1 is a potential therapeutic target for improving regeneration and repair following muscle injury.

### **Impact of Habitual Protein Intake on Estimates of Dietary Protein Requirements in Resistance Trained Athletes**

Student Researcher: Cassidy Tinline-Goodfellow

Faculty Advisor: Dr. Daniel Moore

University of Toronto

*Background:* Resistance-trained individuals generally consume protein above their elevated daily requirements. Increased habitual dietary protein consumption may lead to upregulation of enzymatic activity in metabolic pathways involved in utilization of amino acids for energy, increasing both amino acid oxidation and urinary nitrogen excretion.

*Objective:* The present study aims determine the impact of a high habitual protein diet on estimates of protein requirements using the novel stable-isotope indicator amino acid oxidation (IAAO) and traditional nitrogen balance (NBAL) methods.

*Methods:* Resistance-trained participants (5 males and 5 females) will be randomized to consume a high (H) and low (L) protein diet while performing whole body resistance exercise every other day. During H, participants will consume 2.2g protein/kg/d for 3 days, which will approximate their habitual intake. Whole body protein metabolism [by the oral indicator amino acid (IAA) [1-<sup>13</sup>C]-phenylalanine] and 24-h NBAL will be measured after exercise on day 3 (H1). During L, participants will consume 2.2g protein/kg/d for two days prior to consuming 1.2g protein/kg/d for five days. Whole body protein metabolism and NBAL will be measured on days 3, 5 and 7 (L1, L2, and L3, respectively).

*Hypotheses:* It is hypothesized that the oxidation of the IAA will be greatest on L1 (suggestive of an attenuated whole body protein synthesis) but will subsequently decrease so that L3 will be similar to H1. Similarly, it is hypothesized that NBAL will be lowest on L1 but will subsequently increase so that L3 is higher than L1 and L2, indicating adaptation has occurred.

*Implications:* Findings from this study have important implications on the use of the IAAO method to determine protein requirements, as they may be overestimating the true value. Further, this study will help illustrate the time course of adaptation when decreasing dietary protein intake.

### **Ultrasonography Is Comparable to Magnetic Resonance Imaging in the Assessment of Skeletal Muscle Atrophy Due to Immobilization**

Student Researcher: Tom Tripp

Collaborators: Murphy K., Stokes T., McGlory C.

Faculty Advisor: Dr. Stuart Phillips

McMaster University

*Introduction:* The ability to accurately detect changes in skeletal muscle size has important clinical application. The gold-standard method to assess changes in skeletal muscle size is magnetic resonance imaging (MRI); however, MRI requires highly-specialized equipment and is often cost-prohibitive. Recent advances in ultrasonography (US) offer a simple, cost-effective alternative, but how changes in muscle size measured using MRI compare to those of US is unknown. Thus, our aim was to compare changes in *vastus lateralis* muscle cross-sectional area (VL-CSA) in response to atrophic stimuli assessed using MRI and US.

*Methods:* Fourteen healthy, young men ([all data mean  $\pm$  SD] age: 21  $\pm$  3 y, body mass: 72  $\pm$  13 kg) underwent 14 d of single limb immobilization. Measurement of VL-CSA using MRI and US were made before (Pre) and after (Post) immobilization. Images were localized at 50% of femur length, defined as the length between the greater trochanter and lateral epicondyle.

*Results:* In response to immobilization there was a  $-8.7 \pm 6.0\%$  change in VL-CSA when assessed by MRI, compared to a  $-8.2 \pm 6.0\%$  change when assessed by US. A strong correlation was found between US and MRI-derived % changes in CSA ( $r=0.883$ ). The mean difference between the two measures was 0.5332%, that was not significantly different from zero ( $p=0.505$ ). Bland-Altman analysis showed that limits of agreement ( $1.96 \times SD$ ) are 5.70 and -5.18%.

*Discussion:* These preliminary data suggest that ultrasound-derived % changes in VL-CSA are comparable to those obtained by MRI and that there is strong agreement between methods. Future work comparing changes in muscle size using US and MRI following hypertrophic stimuli would add to our findings.

*Conclusion:* Assessment of changes in muscle size in response to immobilization using US represents a cost-effective alternative to MRI.

### **Traumatic Lower-Limb Amputees Display Greater Variability in Angular Excursion of the Supporting Foot in a Balance Perturbation Task**

Student Researchers: Michael Wright

Collaborator: Elyse Courville

Faculty Advisor: Dr. Nancy St-Onge

Concordia University

*Introduction:* Balance control requires proper foot placement and minimal muscle co-contraction; however, information regarding foot placement and co-contraction on balance in lower-limb amputees remains scarce. This investigation examined foot angular positioning/excursion and muscular co-contraction in a platform perturbation task while amputees stood on the non-amputated leg.

*Methods:* Six individuals with traumatic lower-limb amputation and six age-matched controls participated in this study. They stood on one foot on a perturbation platform; amputees stood on the non-amputated limb, and controls on a self-selected limb. Ten 30-s trials were recorded; five randomly-assigned trials included a forward translation which occurred at any point between the 10<sup>th</sup> and 20<sup>th</sup> second of the trial. Mean angular position and excursion of the foot was computed using reflective markers positioned on the toe and heel. Muscle activity was collected using surface electrodes from eight trunk and lower-limb muscles on the supporting side and was used to compute co-contraction in antagonistic muscles. Foot motion and muscular co-contraction were analyzed over three time blocks: before, during, and after the perturbation.

*Results:* There were no differences between groups with regards to foot angular position and excursion within any time blocks. However, amputees displayed greater variability in mean angular position and angular excursion of the foot during the perturbation compared to controls whose values were clustered in a lower range. There were also visual trends in co-contraction in a quadriceps/hamstrings muscle pair with amputees displaying a decrease in co-contraction and controls displaying an increase in co-contraction after the perturbation.

*Conclusions:* Greater variability in angular position and excursion among amputees, and lower levels of co-contraction after perturbations may suggest inconsistency in compensatory strategies and stability amongst lower-limb amputees.

### **Effect of Chronic Exercise on the Subcellular Localization of Muscleblind-Like Protein 1 in a Preclinical Model of Myotonic Dystrophy Type 1**

Student Researcher: Donald Xhuti

Collaborator: Alexander Manta

Faculty Advisor: Dr. Vladimir Ljubcic

McMaster University

*Introduction:* Myotonic dystrophy type 1 (DM1) is the most common muscular dystrophy in adults with a prevalence of 1:8,000. DM1 is caused by a microsatellite repeat mutation in the dystrophin myotonica

protein kinase (DMPK) gene that results in a CTG expansion within the DMPK 3' untranslated region. Upon transcription, the CUG repeats aggregate to form hairpin loops, resulting in the myonuclear sequestration of the critical RNA-binding protein muscleblind-like 1 (MBNL1). This MBNL1 loss-of-function leads to the missplicing of various genes responsible for characteristics of DM1, such as muscle wasting and weakness, myotonia and insulin resistance. There currently is no cure for DM1, however previous studies have revealed therapeutic benefits of exercise on muscle strength and function in DM1 patients. Our understanding of the cellular mechanisms of exercise-induced adaptations in DM1 is limited. Thus, this study will explore the effect of chronic exercise on MBNL1 expression in DM1 skeletal muscle.

*Methods:* Three groups of mice were employed in this study: 1) sedentary wild-type (SED-WT) mice, 2) sedentary DM1 (SED-DM1) animals, and 3) exercised DM1 (EX-DM1) mice. The EX-DM1 animals had daily, volitional access to running wheels for 6-8 weeks. Gastrocnemius muscles from mice in all groups were fractionated into cytosolic and nuclear compartments, and Western blot analyses will be employed to assess the subcellular localization of MBNL1, as well as key exercise-responsive molecules peroxisome proliferator-activated receptor  $\gamma$  coactivator-1 $\alpha$  (PGC-1 $\alpha$ ) and AMP-activated protein kinase (AMPK).

*Results:* We hypothesize that chronic exercise will liberate MBNL1 from myonuclei and increase its levels in the cytosolic compartment. In addition, we speculate that AMPK and PGC-1 $\alpha$  will accumulate in the

nuclear fraction, potentially accounting for a novel pathway by which chronic exercise attenuates the DM1 molecular signature.

*Discussion and Conclusion:* This study aims to further our understanding of the mechanisms by which exercise serves as a potential therapeutic modality for DM1.

### **One of These Is Not like the Other: Lived Experiences of Female Athletes Playing on Male Sport Teams**

Student Researcher: Karly Zammit

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Despite the numerous benefits that sport offers in adolescence, girls are more likely to drop out of sport, and report significantly lower perceptions of sport enjoyment than boys. The experience of sport may be different for females who participate in non-traditional sport contexts, such as on male sport teams. The objective of this study is to gain insight into female athletes' experiences on male sport teams and how these experiences have shaped and contributed to their current sport participation. Qualitative semi-structured individual interviews were conducted with eleven female athletes who played on various male sport teams. Female athletes who played on co-ed teams and those who played at a young age were excluded from this study. Average length of the interviews was thirty-one minutes, and the sports explored included curling, ice hockey, flag football, tackle football, baseball, and soccer. The interview guide was developed to explore the physical, social, and emotional aspects of their male sport experiences. Participants described many positive experiences while playing on a male team (e.g., support from teammates and coaches, acquiring life-long friendships, gaining independence). Participants also discussed challenges specific to segregation. Five main themes were identified in preliminary analyses, including: confidence, skill acquisition, acceptance and respect, belonging, and individuality. The preliminary findings suggest females playing on male sport teams may experience positive elements of sport that may not be otherwise experienced while playing on a female sport team. Interestingly, there was also discussion about how many of the more negative sport experiences occurred once the participants played on female sport teams.





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