

The Kinesiology and Health Science Graduate
Student Association Presents the 3rd Annual

BROADEN HORIZONS

**A CROSS-DISCIPLINARY
RESEARCH CONFERENCE**

Open to all Kinesiology and Health Science Students



July 14, 2022

Bethune 320



www.yukahsgsa.com

Outreach Booklet

Table of contents

Conference Description.....	3
Conference Committee.....	4
Sponsors and Supporters.....	5
Award Recipients.....	5
Keynote and Guest Speakers.....	5
Program at a Glance.....	6
Abstracts.....	7

Conference Description

The Graduate Student Association's third annual, and first in-person, Broaden Horizons Conference was a huge success. The goal of this conference was to provide a space for Kinesiology and Health Science graduate students to showcase the cutting-edge research they are participating in with fellow colleagues, graduate students, faculty, and staff, and given the pandemic, to bring together a sense of community within the Faculty of Health. A special feature of this conference was its hybrid format, such that students who were unable to attend the conference in-person could participate in the event virtually.

With 11 presenters and many attendees, the conference highlighted some of the most fascinating work taking place within the Faculty of Health. Seeing this strong attendance demonstrates the resilience and determination of our graduate students.

We hope that incoming graduate students are interested in joining the KAHS GSA and continue the tradition of Broaden Horizons for years to come.



Conference Committee

Conference Co-Chairs

Katerina Disimino
Victoria Sanfrancesco

GSA President

Luca Delfinis

GSA Members

Deanna Vervaecke, Jonathan Memme, Shiv Gandhi, Christina Amaral, Shalini Iyer, Ryan Cortez, Mikhaela Slavin, Matthew Le, Sebastian D'Amario, and Tia Rogers-Jarrell

The committee would like to extend a special thank you to the following individuals:

Our faculty advisor, Dr. Heather Edgell, for her commitment, guidance, and unwavering support to the GSA.

Stephanie Marston, for displaying the highest fortitude in answering our barrage of emails and providing any and all support during the planning of this conference.

Sponsors and Supporters

Thank you to the Graduate Program in Kinesiology and Health Science for their generous donation of prize monies to support KAHS graduate students in future conference travel.

Award Recipients

First Place Presentation:

Luca Definis

Second Place Presentations:

Emily Frascetti

Madison Garibotti

People's Choice Award

Jon Herskind

Keynote Address

Dr. Chris Perry, Professor, York University

Program at a Glance

Broaden Horizons: Kinesiology and Health Science Research Day

July 14th, 2022

Location: Bethune 320

Time	Agenda	
9:45 - 10:00	Sign In	
10:00 - 10:05	Welcome Remarks from GSA President, Luca Delfinis	
10:05 - 10:50	Verbal Presentations Chaired by Luca Delfinis	Tania Pereira Pierre Lemieux Jon Herskind
10:50 - 11:20	Break	
11:20 - 11:50	"A Good Science Day" from Dr. Chris Perry	
11:50 - 12:05	Break	
12:05 - 1:05	Verbal Presentations Chaired by Katerina Disimino	Omar Adil Arshdeep Thuhan Emily Fraschetti Olivia Ramraj
1:05 - 1:20	Break	
1:20 - 2:05	Verbal Presentations Chaired by Deanna Vervaecke	Madison Garibotti Matthew Le & Alexander Michelberger Luca Delfinis
2:05 - 2:10	Closing Remarks from GSA Faculty Advisor, Dr. Heather Edgell	
2:10 - 2:20	Awards Ceremony from GSA President, Luca Delfinis, and Conference Co-Chairs, Katerina Disimino and Victoria Sanfrancesco	

Abstracts

Broaden Horizons 2022

Abstracts are arranged in order of presentation within each session.

Abstracts are published as received.

The Cardiorespiratory Response to Upper or Lower Body Metaboreflex Activation in Women and the Influence of Oral Contraceptives

Tania J. Pereira, Heather Edgell

Background: Women do not increase ventilation (VE) during post-exercise circulatory occlusion (PECO) of the forearm (i.e., post-handgrip exercise), potentially due to insufficient metabolite accumulation due to smaller muscle size compared to men. Interestingly, oral contraceptive (OC) users display a greater VE response during forearm PECO compared to naturally cycling women (non-OC users (NOC)). The purpose of this study is to investigate the role of muscle size by also performing PECO in the leg (i.e., post plantar flexion).

Methods: OC (n=7) and NOC (n=16) were recruited to participate in 2 randomized trials, consisting of 2mins isometric exercise (arm ~40%MVC; leg ~80%MVC) followed by 3mins PECO in the forearm and lower leg, respectively. Cardiorespiratory variables (HR, MAP, VE) were continuously measured.

Results: Women were not different between groups, in terms of anthropometrics or fitness (all $p>0.07$), although OC users had a higher resting MAP than NOC ($p=0.01$). Arm volume was significantly smaller than leg volume ($p<0.001$), although not different between groups ($p=0.08$). During PECO, 1) HR did not increase from baseline regardless of OC use or limb (all $p>0.1$), 2) MAP increased from baseline in both OC and NOC (all $p<0.001$), equally between groups ($p=0.368$), regardless of limb ($p=0.288$), and 3) VE did not increase from baseline, regardless of OC use or limb (all $p>0.5$).

Conclusion: Since there was no difference in cardiorespiratory response between arm and leg metaboreflex, it is unlikely that muscle size accounts for the lack of ventilatory response in women.

Keywords: Autonomic Nervous System, Metaboreflex, Cardiorespiratory, Exercise physiology

Move or freeze? Elucidating the angiogenic relationship between mouse skeletal muscle endothelial cells and differentiated C2C12 myotubes

Pierre Lemieux, Emilie Roudier, Olivier Birot

Background: Capillaries are a key determinant of skeletal muscle function by matching the blood supply to the metabolic demands of the myofiber. Skeletal muscle angiogenesis is a highly coordinated and dynamic process. Two cell types are

particularly important, muscle cells representing an important source of angiokines and skeletal muscle endothelial cells (SMECs) the main constituents of muscle capillaries. Cold-stress has recently been proposed as an ergogenic aid in the context of exercise-induced muscle angiogenesis, however, a few studies have solely measured the expression of the vascular endothelial growth factor-A (VEGF-A) with mixed results.

Methods: Here we investigate: (1) The direct effect of cold-stress on the expression of angiokines secreted by C2C12 myotubes; and (2) how cold-stress can indirectly affect SMECs migration via these myotube-derived angiokines; (3) The direct effect of cold-stress on the migratory activity of SMECs; (4) If the myocyte response to direct cold-stress reflects that of whole muscle exposed to cold (ex-vivo muscle incubation assay).

Results: We did not observe any effect of cold-stress exposure on myotubes. Cold-stress pre-conditioning however enhanced SMECs migratory activity in a re-warming environment. Proteomic results from whole muscle tissue exposed to cold-stress suggests an anti-angiogenic effect.

Conclusion: Our experimental model suggests that direct application of cold-stress may be anti-angiogenic for the muscle tissue, whereas a combination of cold stress pre-conditioning and re-warming might prime SMECs for greater angiogenic response. These findings bring an intriguing new perspective with the possible use of pre-cooling strategies prior to exercise to potentiate the exercise-induced angiogenic response.

Keywords: angiogenesis, proteome, THBS-1, VEGF-A, myotube, endothelial cell, migration, angiokine

Piperine Induces Enhancement of Contractile Properties in Slow and Fast Twitch Muscle

Jon Herskind, Kristian Overgaard

Background: Piperine has been shown to increase the resting metabolic rate through changes in myosin conformation changes. No study has yet investigated its effect on muscle force production. In our study, we aimed to investigate the effect of piperine on the skeletal muscle force frequency relationship, its timecourse, and its ability to mitigate the negative effects of fatigue.

Methods: Whole extensor digitorum longus (EDL) and soleus muscles were dissected out of 4-week old wistar rats and mounted in an isolated muscle dynamometer. The dose-dependent effects of piperine on the force-frequency relationship was established using 10^{-5} , 5×10^{-5} , and 10^{-4} M and using electrical stimulation at 2-200 Hz.

Timecourse experiments were carried out using 5×10^{-5} M and testing force production every 15 min. In a final set of experiments, muscles were fatigued using eccentric contractions and then exposed to piperine after 60 min rest.

Results: Piperine caused a marked and dose-dependent left-shift of the force-frequency relationship. Stable potentiated force levels were generally observed after 30-90 minutes of exposure to piperine. Force levels also returned to baseline after approximately 60-90 minutes of washout. A second exposure to piperine caused a similar increase in force as the first exposure. In EDL muscles, 5×10^{-5} M piperine

caused a complete recovery of force at 2 and 50 Hz of stimulation, while soleus muscles recovered only partially at 2 and 20 Hz.

Conclusion: Piperine left-shifts the force-frequency relationship in both fast- and slow-twitch skeletal muscle, also mitigating the effect of fatigue.

Keywords: Skeletal muscle, Force-frequency relationship, Potentiation, Fatigue

Associations between weight discrimination and metabolic health: A cross sectional analysis of middle aged adults

Omar Adil, Jennifer L. Kuk, Chris I. Ardern

Background: Concurrent with the rise in overweight-and-obesity, weight discrimination is rising. Individuals who experience weight discrimination report a host of deteriorations related to physical and psychological health, which may co-exist with behaviours such as increased food consumption and decreases in physical activity making weight management difficult. What remains less clear is the extent to which metabolic health may be affected, and how this may vary by setting and perceived intensity of lifetime history of weight discrimination.

Method: Secondary data analysis was performed on 1365 participants from year 25 of the Coronary Artery Disease in Young Adults study (CARDIA) living with overweight-and-obesity. Descriptive statistics, logistic regression analyses were performed on the presence of metabolic syndrome, diabetes, and abdominal obesity, as well as their experience of weight discrimination.

Results: Prevalence of the metabolic syndrome, diabetes, and abdominal obesity was higher among those reporting low and high stress weight discrimination compared to those with no history of weight discrimination. In adjusted analyses, weight discrimination was associated with a 65% greater likelihood for metabolic syndrome, 85% greater likelihood of diabetes, and between a 2.5- and 3.9-times greater likelihood of abdominal obesity for low and high stress experiences, respectively.

Conclusion: Exposure to weight discrimination may worsen metabolic health, as characterized by higher rates of metabolic syndrome and abdominal obesity. These associations may be greater with levels of stress experienced from weight discrimination. Further longitudinal work is necessary to understand the temporal sequence, time lag, and any possible critical periods for weight discrimination on metabolic health.

Keywords: Abdominal obesity, Diabetes, Metabolic syndrome, Obesity, Weight discrimination, Weight stigma

Exploring the effects of myositis in mice

Arshdeep K. Thuhan, Madison C. Garibotti, Ali A. Abdul-Sater, Christopher G.R. Perry

Introduction: A combination of mitochondrial dysfunction and autoimmunity are associated with myositis. Evaluating the mechanisms that contribute to muscle dysfunction can aid in developing therapeutic measures for patients.

Methods: Two pilot projects were performed using a model of EAM (experimental autoimmune myositis). In the first pilot, 12-week-old BALB/c mice received three sets of weekly injections, with each set distributed across four dorsal sites (61 $\frac{1}{4}$ L per site). The treatment group received one injection of rabbit myosin (Sigma) with complete Freund's adjuvant (CFA), followed by two injections of myosin with Freund's incomplete adjuvant (IFA) at days 7 and 14 to induce an enhanced immune response. The mice were sacrificed 21 days following the final injection. The second pilot project followed a similar protocol, but rabbit myosin was purified in lab and four sets of injections were done. The mice were sacrificed 28 days following the final injection. In both pilots, muscle weights were recorded, and muscle/organ tissues were collected for histological assessments, markers of inflammation and mitochondrial content.

Results: The first pilot showed a significant decrease in the average weight of the gastrocnemius and plantaris muscles in the EAM group ($p=0.09$, 0.07). The second pilot showed a trend toward a decrease in gastrocnemius weight ($p=0.08$), and a significant decrease in plantaris muscle weight ($p=0.01$). Increases in subcutaneous inguinal and ovarian adipose tissue were observed in the myosin treated group. Both pilots showed increases in spleen weight, and moderate lesions at injection sites which may suggest involvement of the immune system. Histological assessments of muscle tissue are expected to show immune cell infiltration and signs of muscle fibre damage.

Conclusion: Both pilots displayed different effects of myosin injections on muscle weights and adipose tissue deposition, suggesting there are many critical factors to consider when establishing a mouse model of myositis.

Keywords: Autoimmunity, metabolism, muscle physiology

The acute effects of post-exercise milk consumption on systemic inflammation following combined resistance and plyometric exercise in young females

Emily C. Fraschetti, Lauren E. Skelly, Ali A. Abdul-Sater, Andrea R. Josse

Background: Following an acute bout of high-intensity exercise, there is typically an increase in inflammatory cytokines. Attenuating this inflammatory response may speed post-exercise recovery. Consuming milk post-exercise, due to its anti-inflammatory properties and other bioactives, may be an effective nutritional strategy, however the influence of white milk consumption on post-exercise inflammation is largely unknown.

Methods: Using a crossover design, we compared the inflammatory response following the consumption of 555mL white milk (0%MF; MILK) vs. an isoenergetic, isovolumetric carbohydrate beverage (maltodextrin+water; CHO) after a single session of resistance and plyometric exercise in healthy females ($n=13$; age: 20 ± 2.3 y; BMI: 21.0 ± 1.1 kg/m²). Participants underwent the acute exercise protocol, followed by

consumption of two trial drinks (MILK or CHO) separated by 1h. Blood samples were collected at baseline, 15min, 75min, 24h, and 48h post-exercise. Serum concentrations of IL-6, TNF- $\hat{\pm}$, IL-1 $\hat{\pm}^2$, and IL-10 were assessed.

Results: Two-way repeated-measures ANOVAs on the absolute concentrations revealed a time-by-trial interaction for IL-10, whereby between 24h and 48h post-exercise the trials had opposing effects. In the MILK trial IL-10 decreased between these timepoints, whereas in the CHO trial, IL-10 increased. There was a main effect of time for IL-6, whereby concentrations increased at 15min post-exercise. There were no significant effects for TNF- $\hat{\pm}$ or IL-1 $\hat{\pm}^2$. At 48h, paired t-tests revealed that the relative concentrations of all cytokines were either significantly (IL-10 and IL-1 $\hat{\pm}^2$) or trending (TNF- $\hat{\pm}$ and IL-6) lower in the MILK vs. CHO trial.

Conclusion: Post-exercise milk consumption may provide a benefit for lowering markers of inflammatory following acute exercise.

Keywords: Dairy products, inflammation, nutrition, exercise

Efficacy of Using Pulse Transducers as an Alternative Method to Evaluate Endothelial Function

Olivia Ramraj, Smriti Badhwar, Tania Pereira, Heather Edgell

Background- The EndoPATi f' is a convenient but expensive method of evaluating endothelial function, an indicator of vascular damage associated with cardiovascular disease. This limits its use by clinicians and researchers who cannot invest in this tool. We endeavored to find an affordable alternative method.

Methods - Endothelial function was assessed in twenty-five participants (15 female, 31.16 $\hat{\pm}$ 11.65yrs) using an EndoPATi f' with tonometry cuffs placed on both index fingers. Simultaneously, arterial pulse waves were recorded using pulse transducers (ADInstruments) wrapped around both middle fingers. Reactive hyperemia was induced for 5min by suprasystolic occlusion of the left forearm. Signals were acquired from both test (occluded) and control (non-occluded) arms for 5min at rest, during occlusion, and 5 minutes after release of occlusion. The integral of the pulse transducer waveform for each cardiac cycle was obtained. Area under the curve of the integral wave at baseline (3.5min prior to occlusion) and during peak response (10sec around the peak) after release, was calculated. The ratio of the post-occlusion to pre-occlusion amplitude in the test arm, normalized to the control arm (Tamp/Camp) was calculated to compare with the Reactive Hyperemia Index (RHI) calculated by the EndoPATi f' .

Results - A strong correlation was observed between Tamp/Camp and RHI using Spearman's Correlation ($\hat{\rho}$ = 0.67, p =0.0002). The coefficient of determination from regression analysis showed that 58% of the variation in RHI could be explained by the Tamp/Camp.

Conclusion - This method is a suitable alternative to the EndoPATi f' , and will make microvascular testing more accessible.

Keywords: Endothelial function, clinical assessment, cardiovascular disease, pressure transducer, EndoPAT, Reactive Hyperemia

Exploring the effects of experimental autoimmune myositis mouse model on skeletal muscle mass

Madison C. Garibotti, Arshdeep K. Thuan, Ali A. Abdul-Sater, Christopher G.R. Perry

Background: The degree to which myopathy in autoimmune myositis occurs in a muscle-specific and time-dependent manner remains unknown. Mapping these relationships could inform future study designs for developing novel therapies.

Methods: Two pilot projects were completed using a mouse model of EAM (experimental autoimmune myositis). In the first pilot, 12-week-old BALB/c mice received 3 injections (1x/week) of either myosin (commercial supplier; dissolved in glycerol) + complete/incomplete Freund's adjuvant (CFA/IFA) or CFA/IFA+glycerol alone (n=4/group). Mice were sacrificed 21 days following final injection.

In the second pilot, rabbit myosin was purified in-lab (dissolved in glycerol) and injected 4 times (1x/week). Separate groups received CFA/IFA+glycerol, glycerol alone or saline alone. Mice were sacrificed 28 days following the final injection.

Results: Pilot 1: Following three myosin injections (commercial), gastrocnemius ($p=0.097$) and plantaris weights ($p=0.075$) trended lower vs CFA/IFA+glycerol controls. There were no differences in soleus, EDL, tibialis anterior, and quadriceps. Pilot 2:

Following four injections with myosin purified in-lab, there was a surprising increase in soleus weight ($p=0.005$) vs CFA/IFA+glycerol. However, CFA/IFA+glycerol decreased soleus muscle weight ($p=0.024$) and trended lower for gastrocnemius ($p=0.094$) vs glycerol alone. Glycerol alone had no effect on muscle weights vs saline. Myosin purity: Coomassie stains revealed great purity from in-lab isolation.

Conclusion: Both pilots displayed different effects of myosin injections on body, muscle, and other organ weights, suggesting either injection number, duration or immune response or myosin purity may influence the model. However, the CFA/IFA control may effect certain muscles. With a larger sample size and using in-lab myosin isolations, the full investigation will determine whether locomotor muscle force production is also altered in relation to histological assessments of atrophy across muscle type throughout disease progression. The independent effect of CFA/IFA will also be resolved.

Keywords: Metabolism, Muscle physiology, autoimmune myositis

Associates of Seeking Social Contacts Among Older Adults in the COVID-19 Pandemic

Matthew Le, Alexander Michelberger, Brad A. Meisner

BACKGROUND: The COVID-19 virus and pandemic response resulted in increased stress for many older adults, where social engagement served as a protective factor. However, with lockdown restrictions, community-dwelling older adults were limited in their ability to seek outside social contacts. Thus, older adults were faced with a problem: continue to self-isolate at the cost of their mental health or seek social contacts with the potential risk of contracting the virus. Previous research focuses on

the former, outlining the psychological implications of COVID-19; however, less research examines factors associated with seeking social contact outside the household during the COVID-19 pandemic. Therefore, the objective of this study was to examine the potential associations between a range of psychosocial and demographic factors with seeking social contacts during the COVID-19 lockdown among older adults (age 65+ years).

METHODS: Using data from the Canadian Perspectives Survey collected in May 2020 (Series 2; n=4,600), backwards-step logistic regression was used to estimate the independent associates of social contact. Social contact was measured by whether participants came in close contact with someone during the last seven days, excluding members of their household (yes/no).

RESULTS: Five factors were significantly associated with social contact: higher levels of anxiety (OR=1.35, 95%CI [1.13-1.61]), identifying as male (OR=1.19, 95%CI [1.03-1.36]), living alone (OR=1.22, 95%CI [1.04-1.42]), experiencing little to no financial hardship (OR=1.23, 95%CI [1.03-1.46]), and being a non-immigrant (OR=1.48, 95%CI [1.24-1.76]).

CONCLUSION: These findings may help explain some reasons for social engagement sought by older adults despite the socially-restricted environment.

Keywords: Gerontology, Behavioural, Population, Socio-demographic, Cross-sectional, Quantitative

Muscle weakness precedes atrophy in the C26 mouse model of cancer cachexia and is linked to muscle-specific mitochondrial stress

Luca J. Delfinis, Catherine A. Bellissimo, Shivam Gandhi, Sara N. DiBenedetto, Madison C. Garibotti, Arshdeep K. Thuhan, Megan E. Rosa-Caldwell, Fasih A. Rahman, Arthur J. Cheng, Michael P. Wiggs, Uwe Schlattner, Joe Quadrilatero, Nicholas P. Greene, Christopher G.R. Perry

Introduction: Muscle weakness and wasting are defining features of cancer-induced cachexia. Mitochondrial stress occurs before muscle atrophy in certain muscles, but the heterogeneity between different muscles and across time remains unclear. This investigation compared the effects of cancer on quadriceps and diaphragm muscle force, atrophy, and mitochondrial function at 2 and 4 weeks of tumour growth.

Methods: Colon-26 (C26) carcinoma cells or phosphate-buffered saline (PBS) were injected in the hind flank of 8-week-old male CD2F1 mice. Tumours developed for 2 or 4 weeks where a battery of assessments on muscle were completed.

Results: At 2 weeks, small tumours had no effect on body or muscle mass, while force production was lower in both quadriceps and diaphragm vs control. Mitochondrial oxidative phosphorylation (energy production) was lower in quadriceps, while mitochondrial H₂O₂ emission (waste production) was elevated in diaphragm. At 4 weeks, the presence of large tumours corresponded to lower tumour-free body mass, muscle mass, and cross-sectional area of quadriceps and diaphragm fibres. Quadriceps force production was the same as control but remained lower in diaphragm while mitochondrial energy production was increased in both muscles vs control.

Discussion: These findings indicate muscle weakness precedes atrophy in quadriceps and diaphragm in the C26 model of cancer cachexia. Early weakness is associated with heterogeneous mitochondrial responses whereby energy production is reduced in quadriceps and waste production is elevated in diaphragm. Muscle-specific compensations in force production and mitochondria occur thereafter which suggests the effect of cancer on muscle is heterogenous.

Keywords: Muscle, Mitochondria, Cancer Cachexia