



**4th Annual
Honours
Thesis
Presentations**



THE UNIVERSITY OF BRITISH COLUMBIA

School of Health and Exercise Sciences

Faculty of Health and Social Development

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Receptiveness to Workplace Exercise

Supervisor: Mary Jung



Introduction: The majority of Canadians are not currently active enough to meet physical activity guidelines. In addition to being inactive, most Canadian adults are spending long periods of time engaging in sedentary behaviours. A large proportion of this sedentary time is spent in the workplace - whether that work is conducted at home or on-site. The work environment may be one viable target for physical activity interventions. "Exercise snacks" - short bouts of high-intensity exercise with 1-4 hours of rest in-between - is one possible mode of delivering physical activity throughout a work shift as it does not require long breaks, change of attire, and could break

up long periods of sitting. Understanding perceived barriers and receptivity to workplace physical activity interventions is critical information needed to inform the design of future interventions. The purpose of this study was to 1) investigate determinants of workplace exercise participation, 2) assess whether motivating factors and receptivity to workplace exercise interventions differ based on workplace location, and 3) explore receptivity of exercise snacks as a modality of workplace physical activity.

Methods: Thirty-eight full time employees (23 women; $Age = 37.5 \pm 12.8$ years) who reported 6+ hours per workday of sitting and/or standing still participated in this study. Participants completed an online survey with questions related to determinants of participation in workplace exercise - using the Determinants of Physical Activity Questionnaire (DPAQ) - and receptivity to exercise snacks in the workplace (1-7 point scale). Participants were dichotomized into two groups dependent on where they spent a majority (i.e., 3+ days/week) of their weekdays working: at home or on-site.

Results: Scores of ≤ 5 on the DPAQ indicate likely barriers to physical activity participation. In this sample, motivation and goals ($M = 4.9$), action planning ($M = 4.6$), coping planning ($M = 3.5$), and goal conflict ($M = 4.4$) were lowest out of the 11 DPAQ areas. For the determinant of motivation and goals, on-site participants had significantly lower mean scores ($M = 4.2$; $n = 10$) than at-home participants ($M = 5.2$; $p = 0.04$; $n = 28$). No significant differences were found between at-home versus on-site participants for any other determinant areas. Anticipated enjoyment of engaging in exercise snacks was relatively high for exercise snacks ($M = 5.3$), and factors that may encourage participation included an exercise-friendly workplace ($M = 5.9$), performing exercise snacks with co-workers ($M = 5.1$), and having informational ($M = 5.0$) or instructional guidance ($M = 5.1$). Factors that may discourage participation in exercise snacks included perceived belief that a change of clothes was needed ($M = 3.4$) and that they would break a sweat ($M = 3.7$).

Conclusion: These preliminary findings suggest workplace physical activity interventions should target individuals' motivation and ability to plan exercise sessions, as well as teaching strategies to self-regulate and preplan for exercise sessions. Work location does not appear to impact which determinants of exercise should be targeted for workplace physical activity interventions. The findings also suggest exercise snacks may present a plausible workplace exercise modality.

Delaney Collins

Understanding the Delivery and Receipt of a Physical Activity Behavioural Intervention for People with Spinal Cord Injury Before and During the COVID-19 Pandemic

Supervisor: Kathleen Martin Ginis

Background: Tailored physical activity (PA) behavioural support may help people with spinal cord injury (SCI) to become and stay physically active. It is not known, however, whether the delivery and receipt of behaviour change techniques (BCTs) can support the individual to become and stay physically active during the COVID-19 pandemic. This study aimed to 1) to explore changes in PA behavioural outcomes (aerobic and strength-training) and intervention components (BCT delivery and receipt) over the course of a 6-month behavioural intervention for adults with SCI before and during COVID-19, 2) examine relationships between PA behavioural outcomes (aerobic and strength-training) and intervention components (BCT delivery and receipt) and, 3) explore participants' experiences and perceptions about the received PA behavioural support.



Methods: This study used data from three participants enrolled in the intervention group of the Exercise guidelines Promotion and Implementation in Chronic Spinal Cord Injury (EPIC-SCI) trial. EPIC-SCI intervention involved a 30-minute intake session followed by 10 to 15-minute weekly counselling sessions, for 24 weeks, from a trained counsellor to support the participant to meeting and maintaining the SCI PA Guidelines. All sessions were audio-recorded, of which four were transcribed verbatim: intake, immediately before the COVID-19 pandemic, the first session during the COVID-19 pandemic, and the last session. Transcripts were coded for the number of BCTs delivered and received. Weekly PA was measured using the Leisure Time Physical Activity Questionnaire-SCI. A 30-minute exit interview was conducted with each participant to explore their experiences and perceptions of the PA behavioural support. Paired t-tests were conducted to explore differences in PA behaviour (aerobic and strength), BCT delivery and BCT receipt between intake and 6-month follow-up. Bivariate correlations were used to examine relationships between change in PA behavioural outcomes and intervention components. The audio-recordings of the interviews were transcribed and analysed using directed content analyses.

Results: Despite weekly variation in PA levels within and between participants, those three participants were able to stay physically active before ($M = 143$ min/week of aerobic PA) and during COVID-19 ($M = 210$ min/week of aerobic PA); no significant difference was found. Weekly counselling sessions before ($M = 51$ BCTs delivered; 39 BCTs received) and during COVID-19 ($M = 12$ BCTs delivered, and 6 BCTs received), show the implementation of intervention components to have a statistically significant difference ($p < 0.05$ for BCTs delivered and received). Interview data showed that all participants appreciated the received behavioural support; some participants found 6-months of behavioural counselling to be quite long. All participants mentioned COVID-19 related restrictions to be a barrier to becoming more physically active.

Discussion: All participants became and stayed physically active throughout the intervention, possibly due to the tailored behavioural support. While in general participants appreciated the received behavioural support, the findings should be interpreted with caution due to the small, varied sample size and unique circumstances of the COVID-19 pandemic. The promising findings on PA levels may suggest the feasibility and potential importance of providing tailored PA behavioural support to adults with SCI before and during COVID-19.

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Sydney Davis

Effectiveness of an ICU grade HVAC system on preventing aerosol spread in a dental setting

Supervisor: Jonathan Little



Objective: Patients visiting dental offices are at increased risk of potential exposure to airborne infectious agents capable of causing illness. With the high infectivity of the SARS-CoV-2 virus and the nature of aerosol-generating dental procedures, dental offices are taking extra precautions to reduce aerosol and droplet transmission risks for patients and staff. The purpose of this study was to evaluate if a heating, ventilation, and air-conditioning (HVAC) system built to hospital-grade negative pressure Airborne Infection and Isolation (AIs) standards could decrease the risk of self-reported cold and flu symptoms in dental office patients.

Methods: 107 participants (79% Female, 20% Male, 1% transgender) between the ages of 8-87 were recruited from two dental offices. 51 participants (82% female with mean age of 54) were recruited from an office with a regular air exchange system and 55 participants (74% Female with mean age of 38) were recruited from an office with an AIs HVAC system. A baseline, a demographics survey was administered prior to each participants' dental appointment. Daily illness symptom surveys were administered online for 3 weeks after the dental appointment followed by a final survey that asked about potential COVID-19 testing and results.

Results: There was no significant difference in cold and flu events reported in the dental office with the hospital-grade AIs HVAC system (total events = 6) compared to the regular HVAC system (total events = 4; $\chi^2(2, N = 98) \geq 0.36, p = 0.71$). There were no positive COVID-19 tests at either clinic. Patient age was significantly different ($p < 0.001$) between the dental offices and could serve as one potential confounding variable for illness prevalence.

Conclusion: A hospital-grade AIs HVAC system did not appear to influence patient self-reported cold and flu symptoms following a dental office visit. Public health orders around physical distancing, mask wearing, and reducing social contacts, along with pre-screening and other COVID-19-related safety precautions in dental settings, likely contributed to low overall incidence of infections and limited the ability to conclusively determine the impact of dental office HVAC systems in this natural experiment.

[Link to Thesis Presentation](#)

Alexa Durand

Digital Diabetes Prevention Programs: A Scoping Review

Supervisor: [Mary Jung](#)



Objective: Type 2 diabetes (T2D) is a major cause of heart failure, kidney disease and amputations that places a large economic burden on the Canadian health care system. Fortunately, in the majority of cases, incidence of T2D can be prevented or delayed through modifiable lifestyle factors such as diet and or exercise. The increasing reliance on technology in everyday lives can be leveraged to improve reach of DPPs. The goal of this review is to summarize results and what specific intervention characteristics are used in digital diet and exercise interventions targeting diabetes risk and provide a single location where future researchers can find a compilation of current digital diabetes prevention programs.

Methods: In this scoping review, multiple electronic databases were searched for general key terms related to prediabetes or diabetes prevention combined with interventions or programs. Specific eligibility criteria were created to ensure consistent screening guidelines between the reviewers. Each title and abstract, then full text were screened by 2 independent reviewers. All eligible studies were screened to identify digital diabetes prevention programs. The TIDieR checklist was used to extract the relevant information from each study.

Results: 18,795 titles and abstracts were screened resulting in 788 eligible full-text studies to be reviewed. After full-text screening there were 200 programs eligible for data extraction and of those, 31 programs were digital diabetes prevention programs. Data extraction using the TIDieR has been completed for 14 studies and is ongoing for the remaining 17. Mode of delivery included mobile phone applications (n=6), websites (n=7) and texting (n=1). Majority of these DPPs were conducted in America (n=7), with participants identifying most commonly as white (49%). The majority of the studies had contact with the participants about twice a week, however this ranged from daily messages to monthly phone calls. The majority of the studies had the participants working with a health coach or trainer to help guide and support the participants to reach their diet and/or exercise goals. Digital DPPs consistently underreport use of theory (only 1 discussed theory use) and demographic data (only 4 of the 14 analyzed thus far provided demographic information, and of those, none reported on both sex and gender). Majority of the completed studies showed positive results such as, improved weight loss (n = 6), decreased values of HbA1c (n = 3) and a general acceptance of the use of digital platforms for diabetes prevention programs (n = 3). Ongoing analysis for the remaining 17 studies will add to these findings.

Conclusion: While Digital DPPs are consistently shown to positively impact diabetes risk and are well accepted, future research is needed to know which mode of digital delivery is best and how these digital programs may differentially influence and can be tailored for different population groups. These components are important because the use of a digital format for diabetes prevention programs can help to provide resources to individuals who aren't able to or have trouble accessing in-person DPPs.

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Brendan Abrahamson-Durant

The Coronary Vascular Response to the Metaboreflex at Low Altitude and During Acute and Prolonged High Altitude Exposure

Supervisor: Glen Foster



Since the myocardium lacks anaerobic capacity, rapid dynamic regulation of coronary blood flow is crucial to maintain oxygen (O₂) delivery to the myocardium. Both high altitude and muscle metaboreflex activation place conflicting stress on the heart and include increased cardiac workload, reduced oxygen availability, and increased sympathetic vasomotor outflow. The purpose of this study was to reconcile these effects by determining the coronary vascular response to muscle metaboreflex activation at low altitude and during acute and prolonged high-altitude exposure. Young, healthy participants (n = 13; 5F) first completed 5 minutes of baseline measurements before completing 2 minutes of isometric handgrip exercise (at 30% maximal voluntary contraction) followed by 5-6 minutes of post-exercise circulatory occlusion (PECO) to activate the muscle metaboreflex. An inflatable cuff placed on the upper right arm and inflated to supra systolic pressures (~200-220 mmHg) was used to isolate metabolites in the forearm during PECO. Testing occurred in ambient conditions at low altitude (Calgary, Alberta; 1,100m), after an acute ascent to high altitude (White Mountain, California; 3,800m, 1-2 Days), and again after 8-9 days of high-altitude exposure (White Mountain, California; 3,800m). End tidal partial pressures of oxygen (PETO₂ mmHg) and end tidal partial pressures of carbon dioxide (PETCO₂ mmHg) values were clamped at baseline levels throughout handgrip exercise and PECO to avoid blood gas changes which may impact the cardiovascular response to metaboreflex activation. Cardiovascular, respiratory, and left anterior descending coronary artery blood velocity (LADv; transthoracic Doppler echocardiography) were recorded during baseline and PECO while blood gas measurements were obtained by radial artery puncture at baseline. Heart rate (HR, bpm), and rate pressure product (RPP, mmHg • beats/min) were significantly increased (p<0.05) from low altitude to acute and prolonged high altitude suggesting increased myocardial workload. Arterial O₂ content was significantly reduced with acute but not prolonged high altitude suggesting O₂ delivery was challenged to a greater extent during acute high altitude. Despite increased myocardial workload and reduced PaO₂ at high altitude, the LADv was similar at baseline across conditions (P = 0.19). Metaboreflex activation led to similar changes in HR, MAP, and RPP across all conditions despite significant reductions in PaO₂ and PaCO₂ at both high-altitude time points compared with low altitude (P<0.05). At low altitude, the change in LADv induced by metaboreflex activation was 1.7 ± 30.9 mm/s and did not differ (P = 0.15) from acute high altitude (-13.8 ± 49.9 mm/s) or prolonged altitude ($+10.8 \pm 36.8$ mm/s). In summary, acute and prolonged high altitude stressed the coronary vasculature by increasing cardiac workload but arterial oxygen content was only reduced during acute high altitude. The metaboreflex stress was similar across all conditions and the coronary blood velocity response was unchanged. Interpretation of results from our study may be hindered by low statistical power, high variability of the LADv measurement, relatively low sample size, and the possibility of differential coronary vascular control mechanisms between the sexes.

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Effects of contraction duration on frequency and amplitude-based components of submaximal force steadiness analysis

Supervisor: Jennifer Jakobi

Introduction: Accurate representation of output measures of force steadiness (FS) is essential for understanding physiological contributions to force control. FS refers to the ability to modulate force production, and is typically measured by the standard deviation of force (SD), or S normalized to mean force, expressed as the coefficient of variation of force (CV). Duration of analysis was suggested as an influential factor in the measurement of frequency and amplitude-based output measures of FS due to physiological and processing time-based effects. However, the direct comparison of short and long-duration contractions has not been systematically investigated. The purpose of this study was to investigate the effect of contraction duration on frequency



and amplitude-based measurement components during FS tasks. It was hypothesized that contraction duration would impact analysis of frequency, but not amplitude-based components of submaximal FS tasks.

Methods: Eleven subjects (10 males, 1 female, 23 ± 5 yrs) performed submaximal isometric elbow-flexion tracking tasks with plateaus of 5-seconds and 10-seconds at force levels of 5, 10, 25, 50 and 75% of maximal force. FS and muscular activation were measured by amplitude based components of CV, SD, and normalized root mean square (RMS) electromyography (EMG) of the short (SH) and long head (LH) of the biceps brachii, brachioradialis (BR), and triceps brachii (TB). Frequency-based variables of FS included power spectrum density (PSD: 0-0.5Hz, 0.5-1Hz, 1-1.5Hz, 1.5-2Hz) and intermuscular coherence (IMC) ($\alpha = 8-12$ Hz, $\beta = 13-30$ Hz, $\gamma = 31-60$ Hz) of agonist-agonist (SH-BR, LH-BR, SH-LH) and agonist-antagonist (SH-TB, LH-TB, BR-TB) muscle pairs. Both frequency and amplitude-based variables were analyzed for the plateau phase of the 5-second, 10-second, and last 5-second of the 10-second contractions. Repeated measures ANOVA's were used to analyze the effects of contraction duration.

Results: No difference was observed for CV of force ($1.7 \pm 0.6\%$), SD of force (1.3 ± 1.2 N), or EMG ($28.5 \pm 37.9\%$) between contraction durations ($p > 0.05$). 10-second PSD was ~49% greater than 5-second from 0-0.5Hz, and ~28% lower than 5-second from 1-1.5Hz. 5-second of 10-second PSD was ~42% lower than 10-second for 0-0.5Hz, ~16% greater than 10-second from 0.5-1Hz, and ~36% greater than 10-second from 1.5-2Hz. IMC was significantly lower in the 10-second compared to 5-second and 5-second of 10-second analysis across alpha (~44% lower), beta (~43% lower), and gamma (~35% lower) frequency bands for agonist-agonist and agonist-antagonist muscle pairings.

Conclusions: The lack of differences in CV, SD, and RMS EMG suggest that shorter contraction durations are suitable for analyzing amplitude-based variables, while shorter contraction duration consistently overestimates IMC, and produces variable effects on PSD. Differences between 10-second and 5-second of 10-second analysis in PSD also suggest that physiological mechanisms may change throughout the contraction, irrespective of analytical effects of contraction duration observed in IMC. Caution should be utilized when interpreting results of frequency-based variables over contractions of shorter durations.

Amanda Holyk

The Impact of COVID-19 on the Delivery of Pulmonary Rehabilitation

Supervisor: Neil Eves



Objective: Online pulmonary rehabilitation (PR), consisting of real-time interactive web-based exercise, education and self-management training, is an alternative delivery for PR during the COVID-19 pandemic. Online PR was implemented during the COVID-19 pandemic to reduce transmission of the SARS-CoV-2 virus and protect those with chronic respiratory conditions. Due to the rapid appearance of online PR, there is limited evidence regarding the benefits and barriers of online PR compared to in-person PR, or client preferences on the delivery of PR during COVID-19. Thus, the aim of the study was to determine whether the COVID-19 pandemic has altered patient preference on the delivery of PR and to assess the benefits and barriers of an online PR format.

Methods: Thirty-three participants (15 females; 18 males; mean (SD) age 70(8) years) with an established chronic respiratory condition (COPD (n=25), asthma (n=6), and other (n=2) who were enrolled in, or previously completed, one or more of the following PR programs: a) in-person PR before the COVID-19 pandemic, b) online PR during the COVID-19 pandemic and/or c) in-person PR during the COVID-19 pandemic, participated in the study. Participants completed a novel questionnaire via the secure, online UBC Survey Tool Qualtrics. The questionnaire included validated questions that identified client preferences on PR modality in a number of different areas of interest (i.e., accessibility, motivation, exercise confidence, self-efficacy, social interaction, enjoyment, and safety). Cronbach's alpha index was calculated for each area of interest to determine internal consistency of questions and appropriate aggregation. One-way ANOVA was used to determine differences between groups and dependent t-tests were performed to compare responses in a subset of patients who performed in-person PR before and online PR during COVID-19.

Results: The internal consistency detected by the Cronbach's alpha was $>.70$ for each area of interest. Online PR during COVID-19 was reported as more accessible compared to in-person PR before ($p=0.026$) and during COVID-19 ($p=0.036$). Individuals in the online PR group also reported greater social interaction versus in-person PR during COVID-19 ($p=0.03$). Additionally, participants felt less safe exercising in-person during COVID-19 compared to the alternate PR groups ($p<0.003$ for both). No statistical difference was observed between groups in the other areas of interest (motivation, exercise confidence, self-efficacy, and enjoyment). Overall, 50% of participants preferred online PR, 40% preferred in-person PR and 10% did not have a preference.

Conclusion: During the COVID-19 pandemic, online PR is preferred to in-person PR for accessibility, social interaction and safety. However, there was considerably less responses for the in-person PR during COVID-19 group due to the short timeline of the study. Future research is needed to address this limitation. These results provide important initial evidence to help optimize in-person and online PR programs.

Nicholas Reitsma

The Relationship Between Breath Acetone Biofeedback During a Ketogenic Diet and Weight Loss in Men and Women with Overweight and Obesity

Supervisor: Jonathan Little

Objective: Obesity is associated with a number of serious chronic health conditions including cardiovascular disease and type 2 diabetes. A ketogenic diet is an intervention that has been growing in popularity; still, the overall efficacy of the diet in a real-world setting remains to be thoroughly explored. Breath acetone, which is produced when the body is in a state of ketosis, has been suggested as a non-invasive proxy for rate of fat loss; however, this has not been evaluated in a clinical trial. Therefore, we aimed to evaluate the correlation between average breath acetone values and weight loss over a 12-week ketogenic diet intervention.



Methods: As part of a larger randomized trial, 77 participants (71% female; 42 ± 11 years; BMI = 33.5 ± 4.7 kg/m²) were randomized to follow an app-based ketogenic diet program where they collected breath acetone measurements three times daily for 12 weeks. Baseline and follow-up weights were measured on an at-home wireless scale and mean breath acetone values were calculated.

Results: Participants lost an average of 5.6 kg (95% CI: 4.5 kg to 6.7 kg) over 12 weeks. There was a significant correlation between average breath acetone value and weight loss ($R^2=0.42$, $p<0.001$), suggesting greater weight loss with higher breath acetone levels across the 12-week intervention.

Conclusion: Among men and women with overweight/obesity, a ketogenic diet app with breath acetone biofeedback was effective at promoting weight loss in a real-world setting. Rate of weight loss was associated with higher breath acetone values.

[Link to Thesis Presentation](#)

Jenna Sim

Saying goodbye to biases: Examining whether a 20-minute online module can reduce Human Kinetic students' explicit biases on weight and race

Supervisor: [Mary Jung](#)



Objective: Many healthcare practitioners hold explicit biases. Two common types of explicit bias seen in healthcare are weight and racial bias. The bias a practitioner holds can have negative effects on the quality of care provided to their patients. Small Steps for Big Changes (SSBC) is a diabetes prevention program designed to empower individuals at risk of developing type 2 diabetes to make diet and exercise changes in their life. It is important to train SSBC coaches on cultural safety and inclusivity (CSI) to try to reduce the explicit biases they may hold towards future SSBC clients. The goal of this study was to examine whether existing weight and racial bias in undergraduate Human Kinetics students (a population representative of SSBC coaches) could be feasibly reduced. A brief cultural safety training module was developed for SSBC coaches. It was hypothesized that, compared to students who did not read the CSI module, students who read the CSI module would report less explicit weight and racial bias.

Methods: 22 UBC Okanagan Human Kinetics undergraduate students (82% women) were recruited through classroom visits and online postings. Participants were randomly divided into four groups: CSI Indigenous vignette, non-CSI Indigenous vignette, CSI overweight vignette, and non-CSI overweight vignette. The two CSI groups read the module, and the non-CSI groups watched an irrelevant neutral video matched for length of time to the CSI material. Participants then read a written vignette describing a mock SSBC client who was identified as either Indigenous or overweight. Explicit bias was measured by asking participants to rate the mock SSBC client on their competence, compliance, reliability and motivation.

Results: There was no significant difference ($p=0.41$) in explicit bias between the CSI Indigenous group (mean=4.50;SD=1.19) and the non-CSI Indigenous group (mean=5.03;SD=0.91). Similarly, there was no significant difference ($p=0.31$) in explicit bias between the CSI overweight group (mean=5.04;SD=0.76) and the non-CSI overweight group (mean=4.25;SD=1.55).

Conclusion: These findings suggest that there was no difference in weight or racial explicit bias between those who read the brief CSI module and those who did not read it. On average, both the students who read the module and those who were in the non-CSI groups rated the mock clients as competent, compliant, reliable and motivated. Human Kinetics students may not hold negative explicit biases about potential behaviour change clients based on weight and ethnicity, although caution should be made with interpretations as this analysis is being conducted on a portion of the full sample size anticipated. Further research needs to be conducted to examine the effectiveness of watching this module on SSBC coaches' explicit biases, as well as to examine whether these coaches have implicit racial and weight biases that may lead to negative client healthcare experiences.

[Link to Thesis Presentation](#)

