

**Kinesiology Research Day**  
**April 4<sup>th</sup>, 2019**  
**ABSTRACTS**

**1:10 pm**

**Title:** The impact of handle designs on muscle activity of the upper arm and low back during simulated Industrial pushing and pulling tasks

**Student:** Jackie Toner

**Supervisor(s):** Usha Kuruganti

**Background:** It is estimated that 50% of manual material handling tasks performed require pushing and/or pulling, and this number is only increasing as lifting, and lowering tasks are being replaced with pushing and pulling tasks. Nonetheless, minimal research has been done to explore the effect of pushing pulling tasks since the initiation of the Snook Tables in 1978.

**Purpose:** To examine the effects of handle orientation and handle height on muscle activity and force required when moving of a platform trucks during a pushing and pulling task.

**Methods:** A sample size of 40 participants (20 men and 20 women) will be involved in the proposed research. Participants will complete 12 trials, including various combinations of handle orientation (Vertical/ horizontal/semi-pronated), handle height (hip/shoulder), and task (push/pull), over a distance of 5 meters with the cart carrying 80kg of weight. Prior to the start of the 12 trials, participants will complete a handgrip dynamometer test to measure the strength capacity of each participant. During each trial. muscle activity will be measured involving both bipolar surface EMG of the participant's upper limb (posterior deltoid (PD), anterior deltoid (AD), triceps brachia (TB), biceps brachia (BB)) and High-density EMG of the low back (erector spinae (ES)). Force transducers in the handle will also be used simultaneously with the EMG, to capture handle force data that the participant will apply to the handle in each trial. Additional testing involving Borgs RPE scale and a personal handle survey will be completed in hopes to gather additional qualitative data about participant's personal preference and the comfortability of the handle variations being used when pushing and pulling. Multiple ANOVA's and basic descriptive statistics (Mean, standard deviation, median, mode) will be used to effectively analyze the relationships amount the multiple independent and defendant variables.

**Results:** TBD

**Discussion/Conclusion:** TBD

1:16 pm

**Title:** Kinematic variations of the lower extremity during a drop jump, drop jump counter movement jump, and single leg step down.

**Student:** Tamara Tompkins

**Supervisor(s):** Jeremy Noble

**Background:** There is limited research looking at a single leg step down combined with kinematic variations between a single leg step down and a drop jump, with a counter-movement jump. Furthermore, there is also limited research comparing these differences between competitive athletes and the general population.

**Purpose:** To provide further insights on the kinematic changes occurring at the knee and hip joints on two different dynamic movements related to increased risk of ACL injury, and to examine the differences between competitive athletes and the general population.

**Methods:** Participants will consist of 15-20 female adults, aged 19-30 years old, without a history of lower limb injury or balance issues (self-reported), and are currently competing in a competitive sport, and 15-20 female adults who have not competed in a sport for at least 5 years.

The Xsens Motion Capture System will be used to detect the motion of the body and provide no restrictions to participants' ability to move. Small sensors will be placed on participants forearms, upper arms, upper legs, lower legs, feet, pelvis, forehead, and shoulders. Body measurements will be taken including: foot size, arm span, ankle height, hip height, knee height, shoulder height, shoulder width, and hip width using a measuring tape. Weight, height, most dominant leg, and physical activity level will be recorded. All trials will be videotaped from the frontal view.

There will be three different tasks: stepping down from a step, performing a double leg drop jump from a step, and performing a double leg drop jump from a step followed by a countermovement jump in a random order.

1:22 pm

**Title:** The Relationship Between the Attentional Styles of Varsity Athletes Across a Variety of Varsity Sports

**Student:** Mike Danton

**Supervisor:** David Scott

**Background:** Nideffer (1976) developed the Test of Attentional and Interpersonal Style (TAIS), a personality profiling instrument that is well established in the world of sport and is based on a theory that seeks to predict behaviour based on the interaction between attentional processes. Nideffer has hypothesized that differences in attentional abilities, as a function of sport, would lead individuals to either gravitate towards certain sports based on their personality characteristics or develop those characteristics as a function of their involvement of that sport (1990).

**Purpose:** The purpose of this study is to examine the relationship between attentional style and playing position across a variety of sports. More specifically, the researchers wish to examine the relationship between scores on the attentional scales of Nideffer's TAIS across a variety of team and individual sports.

**Methods:** Participants consisted of 75 male and female varsity athletes aged 18-25 years that were enrolled at the University of New Brunswick during the 2018-19 school year. Participants completed a short demographic survey and paper questionnaire containing 74 questions geared towards personality and attentional characteristics. The survey and questionnaire were completed apart from other participants, teammates and coaches. The survey and questionnaire were sealed in an envelope and returned to the researchers where they were stored in a locked location. Analyses of the data will be completed using RStudio, a statistical program that can identify relationships and correlations of all variables and predictors.

**Results:** TBD

**Discussion:** TBD

1:28 pm

**Title:** Joint Kinematics and Kinetic During Barbell Squat Exercises: Dynamic Effort vs. Strength Loading Comparisons

**Student:** Steven MacPhail

**Supervisor:** Dr. Jeremy Noble

**Background:** Barbell back squats are one of the most popular resistance exercises in athletic training programs. Previous research has identified dynamic effort loading as a viable loading technique to optimize force-velocity relationships. Cumulative injury risk of dynamic effort loading has not yet been investigated, thus patterns of kinematics of the trunk and lower-limbs, as well as low-back kinetics will be compared between these two squat techniques.

**Purpose:** The purpose of this study is to examine joint kinematic and kinetic differences between traditional strength loading and dynamic effort loading during barbell back squats.

**Methods:** Fourteen university students (10 male, 4 female) aged 18-22 who had at least one year of barbell back squatting participated in the study. Each participant completed three sessions of squatting separated by 2-7 days. During the first session the participants' 1RM was assessed using the NSCA 1RM protocol. Two sets of four squats were completed under two conditions (TS = 85% 1RM, DE = 65% 1RM) for the second and third sessions and were randomized in order for each participant. The squats in either condition were recorded using an active motion capture system, force plates, and a linear force transducer.

**Results/conclusion:** Data collection is still in progress, results of the biomechanical analysis and conclusions will be presented at Kin research day.



1:41 pm – Erin Cunningham – not able to attend

**Title:** The Relationship Between Lumbar Multifidus Muscle Morphology, Physical Activity, and Low Back Pain in Young People: A Longitudinal Study

**Student:** Erin Cunningham

**Supervisor(s):** Dr. Jeffrey Hebert & Dr. Jeremy Noble

**Background:** Back pain is the leading cause of disability worldwide costing over \$6-12 billion to the Canadian medical system annually. Physical activity levels and muscle morphology of the lumbar multifidus muscle have been linked to development and prevalence of back pain.

**Purpose:** This study will investigate the univariate and multivariate associations of lumbar multifidus morphology and physical activity behavior with back pain in young people.

**Methods:** The prevalence of back pain relative to lumbar multifidus muscle morphology and physical activity is examined in a prospective cohort study of children from the European Youth Heart Study (EYHS). The primary outcome of low back pain at 2004 and 2009 is examined longitudinally relative to the exposure variables: physical activity data from 1997 and lumbar muscle morphology examined by magnetic resonance imaging (MRI) data from 2001 and 2004. A muscle morphology outcome from the two time points is examined relative to exposure variables of physical activity levels from 1997 and reports of low back pain at 1997 and 2001.

**Results:** TBD

**Discussion/Conclusion:** TBD



1:54 pm

**Title:** Effects of Sprint Interval Training on Metabolic Flexibility Response  
in Adults Living with Obesity

**Student:** Benjamin H. Colpitts

**Supervisor:** Martin Sénéchal

**Background:** Metabolic flexibility is the ability to respond or adapt to conditional changes in metabolic demand. Individuals living with obesity have an impaired metabolic flexibility compared to lean individuals; however, exercise interventions have been shown to improve metabolic flexibility in these populations. Although exercise enhances metabolic flexibility, it is unclear what is the optimal intensity of exercise training to enhance metabolic flexibility in individuals living with obesity.

**Purpose:** The primary objective of this study will be to compare chronic and acute changes in metabolic flexibility in individuals living with obesity compared to lean individuals following a 4-week sprint interval training intervention.

**Methods:** Adults (19 to 60 years) living with obesity ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ;  $n=15$ ) or without obesity ( $\text{BMI} \geq 18.5 \leq 24.9 \text{ kg/m}^2$ ;  $n=15$ ) who are physically inactive will be recruited.

Participants will take part in a 4-week sprint interval training intervention performed three times per week. The intervention progression is as followed: two cycles in week 1, three cycles in week 2, and four cycles in the final two weeks. The work period will consist of a 30-sec Wingate with a load of 7.5% of the participant's body weight and will be separated by four minutes of passive recovery. The primary outcome will be changes in chronic and acute metabolic flexibility measured during a resting state and an acute bout of cycling exercise (50% maximal capacity). These outcomes will be measured using  $\text{VCO}_2/\text{VO}_2$  and blood

2:00 pm

**Title:** Kinematic Variations by University Students during Stair and Level Walking while Carrying Various Backpack Loads.

**Student:** Kalpesh Hathi

**Supervisor:** Dr. Jeremy Noble

**Background:** The effects of backpack carriage have been studied in various settings specifically in children and military personnel. Less attention has been focused on a university student population specifically during stair walking.

**Purpose:** Analyze the kinematic and spatiotemporal step variations that may occur in university students carrying various backpack loads relative to a percentage of body weight during stair and level walking.

**Methods:** Participants consisted of 10 males and 10 females aged 20-25. Participants' motion was recorded using the Xsens motion capture system. Participants completed four blocks, each consisting of six trials: three stair walking (ascent followed by descent) and three level walking. Blocks varied in terms of backpack weight: 3.5 percent, 9.0 percent, 14.5 percent, and zero percent of body weight (baseline). These percentages were based on a preliminary study which assessed the average percentage of body weight carried in a backpack by a university student. Block orders, and trial orders within the blocks were both randomized. The backpack was standardized across participants. Backpack straps were adjusted by the participants to a comfortable length which remained consistent across all trials.

**Results:** Data is currently being analyzed. Findings regarding variations in trunk angles and lower limb kinematics in the sagittal plane along with spatiotemporal step parameters such as stride length, stance time, and swing time will be reported at Kin Research Day.

2:13 pm

**Title:** Height Estimation in Non-Ambulatory Individuals

**Student:** Alexander Jordan

**Supervisor:** Dr. Victoria Chester

**Background:** Physical growth is a fundamental aspect of paediatric health and wellbeing. Atypical growth may originate from numerous health conditions including developmental disorders or inadequate nutrition. Obtaining true height measurements in clinical populations, such as cerebral palsy, can be difficult due to spasticity, non-intentional movements, and lack of independent standing. As such, segment length measurements are often used to predict body height using published regression equations. These estimates of height vary in accuracy and reliability as a function of the specific segments and postures required for measurement, which can be difficult to achieve in patients with spasticity. Purpose: To evaluate the viability of a novel tibial tuberosity measurement in estimating height in children using a 3D body segment scanner.

**Methods:** Eighteen children ( $n=18$ ) between the ages of 6-18 years were recruited. Height and weight measurements were obtained using a stadiometer and scale. Arm span, demi span, tibial height, leg length, knee height, ulna length, and two tibial tuberosity measurements were determined using a fiberglass tape measure and large bone caliper to the nearest 0.1cm, and a small bone caliper to the nearest 0.001cm. A handheld 3D body segment scanner (TechMed3D, Quebec) was used to determine a seated tibial tuberosity to lateral malleolus distance. A subset of 10 participants completed the same protocol to establish the intra-rater variability. Regression analysis was used to determine a novel algorithm to estimate height. This study will provide initial data on the viability of using 3D body scanners and novel tibial tuberosity measurements in clinical populations.

2:26 pm

**Title:** Assistive Knee Brace Impact on Symmetric Loading in Bodyweight Squats for Unilateral Knee Injury Rehabilitation

**Student:** Harold Dylan Larter

**Supervisor(s):** Dr. Chris McGibbon

**Background:** Unilateral knee injuries impact many individuals over diverse populations leading to potential long-term disability. Previous literature has explored the inhibition of quadriceps muscle activation and impaired symmetric loading in this population post surgical intervention. Inhibited muscle activation paired with lack of bilateral symmetry reduces the chance of non-operative rehabilitation success. By assisting knee extension in the inhibited limb, symmetry and strength may be regained at an increased level reducing disability and enabling faster return to work and other life activities.

**Purpose:** To explore the role of adjustable knee extension assistance paired with visual symmetry feedback to reduce rehabilitation time in patients with unilateral knee injuries.

**Methods:** Potential participants for this study will include men and women who currently have a unilateral orthopaedic knee injury. Eligible participants will be assessed for leg dominance and right-left load distribution prior to the intervention. Each participant will be appropriately fitted with a Levitation™ knee brace with adjustable knee extension assist. EMG of the quadriceps and hamstrings will be collected in both limbs along with knee angles as they relate to the squat cycle. Each participant will be asked to complete repetitions of bodyweight squats with load symmetry visual feedback paired with the adjusted knee extension assist from the Levitation™ brace. The primary hypothesis of this experiment is that the novel rehabilitation intervention will increase affected limb quadriceps strength and bilateral

2:32 pm

**Title:** Testing the validity of a self-paced  $VO_{2max}$  protocol

**Student:** Joe Landine

**Supervisor(s):** Ken Seaman

**Background:** Mauger and Sculthorpe (2012) tested a new  $VO_{2max}$  protocol which allowed participants to self-pace their work rate basing the intensity of each stage on an increasing rating of perceived exertion (RPE). While the findings suggested that this form of testing brought about greater  $VO_{2max}$  values than the baseline values achieved during a traditional graded  $VO_{2max}$  test, the research design was criticized for comparing two tests of different lengths. It was suggested that the traditional  $VO_{2max}$  test may have led participants to premature exhaustion as it tends to last longer than the fixed ten minute RPE self-paced protocol.

**Purpose:** To test whether a RPE self-paced  $VO_{2max}$  protocol elicits a greater  $VO_{2max}$  value compared to a traditional  $VO_{2max}$  test of the same duration in an untrained population.

**Methods:** The study consisted of 15 participants (10 male, 5 female) between the ages of 20 and 27. The population of interest was an untrained population, defined as someone who is not currently participating in organized aerobic training. Participants completed three  $VO_{2max}$  tests at least one week apart. The first test was a traditional open-loop  $VO_{2max}$  test (TOL) to exhaustion with a verification stage. The second test was a traditional semi-open loop  $VO_{2max}$  test (TSOL) where the power increases were relative to each participant's ability with the intention of bringing every participant to exhaustion in ten minutes. The third test was a self-paced  $VO_{2max}$  test (SPV) which consisted of five, two minute stages at various RPE intensities subjectively determined by each participant (RPE 11, 13, 15, 17 and 20). The latter two tests were completed in a randomized counterbalanced order. A between groups repeated measures ANOVA was used to analyze the difference between  $VO_{2max}$ , maximum heart rate ( $HR_{max}$ ) and respiratory exchange ratio (RER) values.

**Results:** No significant differences were found between TSOL and SPV for  $VO_{2max}$  ( $p=0.955$ ), RER ( $p=0.088$ ), or  $HR_{max}$  ( $p=1.000$ ). TOL and SPV also showed no significant differences for  $VO_{2max}$  ( $p=0.069$ ), RER ( $p=0.496$ ), or  $HR_{max}$  ( $p=0.500$ ). A significant difference was observed in  $VO_{2max}$  ( $p=0.009$ ) between TSOL ( $42.0 \pm 6.3$  ml/kg/min) and TOL ( $39.9 \pm 7.2$  ml/kg/min). A significant difference was also observed in RER ( $p=0.008$ ) between TSOL ( $1.16 \pm 0.06$  AU) and the TOL ( $1.12 \pm 0.06$  AU). However,  $HR_{max}$  was not found to be significantly different between TSOL and TOL.

**Discussion/Conclusion:** It was found that an SPV protocol did not elicit a greater  $VO_{2max}$  than a traditional  $VO_{2max}$  test of the same duration, however, a significantly greater RER and  $VO_{2max}$  were observed in the TSOL test compared to the TOL tests. This statistical difference should be taken with caution as the typical error of measurement of a traditional  $VO_{2max}$  assessment (2.5 ml/kg/min) was greater than the mean difference between TSOL and TOL (2.1 ml/kg/min) indicating that these differences are likely due to standard measurement error during open circuit spirometry.

3:00 pm

**Title:** Motivations and rationales for coaches in USPORT women's hockey

**Student:** Sam Hilworth

**Supervisor:** Dr. Jonathon Edwards

**Background:** USPORT women's hockey (Canada highest level of University hockey) has become an increasingly enticing option for coaches looking to coach at an elite level. Commonly, USPORTS women's hockey is perceived as a "stepping stone" for coaches to move to higher levels, or in the case of male coaches move to a vacant position with a male team. While studies have been conducted around the topic of coaching, no studies have been conducted that look primarily at coaching motivations and rationales within women's hockey specifically.

**Purpose:** To explore the rationales and motivations to coach in a USPORT women's hockey program and attempt to compare the rationales and motivations of those coaches who are female versus those who are male.

**Methods:** Participants will consist of 4 female hockey coaches and 4 male hockey coaches. All coaches will be head coaches of a USPORT women's hockey team. USPORT consists of 4 conferences, CanWest, OUA, RSEQ, and AUS. One male and one female will be selected from each conference to participate in the study. Each participant will be administered a semi-structure interview, either by telephone or video conference. Each interview will contain approximately 20 questions. Interviews will be audio recorded and transcribed. Transcriptions will be coded, and NVivo will be used to manage and organize the themes that emerge through an open coding process. Codes will be identified through quotes found within the transcript and emerge naturally.

3:06 pm

**Title:** Variability in Physical Function Test Scores for Patients Living with Breast Cancer During a 12-Week Exercise Program

**Student:** Courtni Soucy

**Supervisor(s):** Danielle Bouchard

**Background:** Exercise is known to improve physical function for breast cancer patients. However, the improvement observed might be driven by bias due to the pre-post testing design. This study will examine the variability in performance in physical function tests in patients who have received a diagnosis of breast cancer in their lifetime.

**Purpose:** To describe the variability in the weekly performance on common physical function tests in breast cancer patients and determine if it will surpass the minimally clinically important difference and the variability observed pre-post.

**Methods:** Participants currently undergoing treatment will be recruited through Horizon Health and will join the established Stay Strong program. The program will include individual exercise sessions twice a week for twelve weeks at a local fitness facility.

Functional tests such as the 6-minute walk test, the one-leg stance test, and the chair stand test will be administered weekly. Secondary outcomes measured through valid questionnaires will include psychosocial social connectedness and mental well-being outcomes.

**Results:** N/A

**Discussion/Conclusion:** N/A



3:12 pm

**Title:** The Effectiveness of Personal Training Compared to Membership Fee Reduction in a Fitness Center Setting: Results from the Living Well with Diabetes Initiative

**Student:** Martine Girard

**Supervisor:** Martin Sénéchal

**Background:** Physical activity is well established as an effective strategy to enhance prevention and management of prediabetes and diabetes. However, few studies have been conducted to investigate the effectiveness of different exercise resources in a fitness center setting for individuals living with these conditions.

**Purpose:** The purpose of this study was to investigate whether personal training (PT) and discounted memberships (dMB) yielded different responses in a fitness center initiative.

**Methods:** Individuals living with prediabetes and diabetes ( $n=36$ ) participated in the "Living Well with Diabetes Initiative" and took part in PT or a dMB for a four-month duration. Outcome measures were body weight, body mass index, waist circumference (WC), cardiorespiratory fitness, blood pressure, and resting heart rate (RHR), and grip-strength, push-ups (PU), sit and reach, and one leg stance tests (OLS).

**Results:** No significant differences were observed at baseline between both groups ( $p > 0.05$ ) except for grip strength ( $p=0.049$ ). A significant improvement was observed for OLS in PT, while the dMB group displayed improvements in RHR and PU (all  $p < 0.05$ ). A significant difference was observed between groups for OLS only ( $p=0.031$ ). Percent change within PT was significantly improved for WC, while the dMB group showed improvements for RHR and PU ( $p < 0.05$ ). Percent change for OLS was different between groups ( $p=0.008$ ).

**Conclusions:** Some health and fitness benefits were observed within PT and dMB groups. More rigorous studies are needed to delineate the impact of utilizing PT or a dMB in a fitness center setting for people living with prediabetes and diabetes.

3:25 pm

**Title:** Factors affecting early diagnosis of Autism Spectrum Disorder (ASD) amongst immigrant population in New Brunswick (NB)

**Student:** Kanza A Hashmat

**Supervisor:** Dr Shelley Doucet

**Background:** Autism now affects 1 in 68 children. This new estimate is roughly 30% higher than the estimate for 2008 (1 in 88), roughly 60% higher than the estimate for 2006 (1 in 110), and 120% higher than the estimates for 2002 and 2000 (1 in 150). About 1 in 42 boys and 1 in 189 girls were identified with ASD. Most children identified with ASD were not diagnosed until after age 4, even though children can be diagnosed as early as age two.

**Purpose:** Barriers for early detection of ASD amongst immigrant population in NB

**Methods:** Qualitative study will be conducted. Data will be collected from an immigrant population (first generation) with kids on ASD within age range of three and thirteen years. The data collection process involves interviews, and questionnaires of the mothers with children on ASD, studies will record the age when diagnosis was given, maternal education level, family socio-economic and marital status, ethnicity and access to health care system. This will enable us to look at the barriers leading to early diagnosis of ASD.

**Results:** With the results, we will form a means of action based on the conclusion. The qualitative methodology will be used to find barriers in the research. We will then organize and rationalize the need for increased awareness of ASD and interventions for the barriers.

**Conclusions:** My aim is to develop a cost-effective intervention at community level for early detection of ASD, better accommodate needs of immigrant families and support health equity.



3:31 pm

**Title:** Tactical Formation Matchups Associated with the Outcome of Soccer Matches

**Student:** Alex Dodgshon

**Supervisor(s):** Tim McGarry

**Background:** Formation matchups may play a role in the outcome of a match. While many studies have looked at the performance indicator value of many statistics, little attention has been given to the interactions of formations and the extent to which these influence the result.

**Purpose:** To identify particular formation matchups that lead to an effect on the outcome of a match.

**Methods:** Data will consist of all 490 teams that participated in one of Europe's top 5 league's between 2014/2015 - 2018/2019. The same teams will be differentiated based on the season they took part in one of the competitions. Each teams quality will be measured using goals, and expected goals, differentials per 90 minutes. The teams playing styles will be measured by the number of passes made and allowed per defensive action in the opposition half. Each match will include a formation matchup and associated outcome in goals and expected goals, as well as measurements for both teams quality and playing style. This will allow for ANCOVA tests to check for significant differences in outcome based on formation matchups whilst using team quality and/or playing style as covariates. Analyses will be performed in the entire sample and within season and league subgroups.



3:37 pm

**Title:** Physical Activity and Sedentary Activity Patterns as a Predictor of Diabetes alone or in Combination of Metabolic Syndrome: A Cross-sectional Analysis

**Student:** Spencer Smith

**Supervisor(s):** Martin Sénéchal

**Introduction:** Physical activity (PA) and sedentary activity is well established to prevent metabolic syndrome (MetS) and diabetes; two conditions associated with premature mortality risk. Although both conditions are manageable with more PA and less sedentary activity it is unclear what the patterns of these activities are amongst individuals with MetS, diabetes or both simultaneously.

**Objective:** To investigate patterns of sedentary activity and PA, among individuals with diabetes, MetS, or both compared with controls (no MetS nor diabetes) once adjusted for potential confounders.

**Methods:** Cross-sectional analysis from National Health and Nutrition Examination Survey 2003-2004 and 2005-2006 cycles included 2456 adults aged 18 and above. The primary exposure variables were PA and sedentary and patterns (1, 5, 10, 30, 60 minute-bouts) measured by accelerometer. The primary outcome measure was group categorization: Control (no MetS nor diabetes), MetS, diabetes, and Mets & diabetes.

**Results:** There was a significant difference among groups for every sedentary activity pattern ( $p < 0.001$ ) with the MetS and control presenting less sedentary time. PA performed in 1, 5 and 10-minute bouts were significantly different among groups ( $p < 0.001$ ). Multinomial logistic regressions showed a worse sedentary activity pattern in the Mets & diabetes compared to the control group ( $p < 0.05$ ), but not compared to the diabetes group ( $P > 0.05$ ). MVPA patterns was significantly different in the Mets & diabetes compared to the control group and the MetS ( $p < 0.05$ ) but not compared to the diabetes group ( $p > 0.05$ ).

**Conclusion:** Even if people living with MetS are presenting a different pattern of PA and sedentary patterns, people living with diabetes have no difference compared with people living with both MetS & diabetes. Exercise programs should not only focus on the total time but also to break up sedentary bouts with exercise.

3:50 pm

**Title:** The Cognitive and Physical Demands of Using Human Factor Designed in-Vehicle Hand Controls for Secondary Functions

**Student:** Bharat Kant

**Supervisor(s):** Wayne Albert and Michelle Cardoso

**Background:** Secondary hand control units enable individuals who have physical limitations in one of their arms (due to structural, traumatic or pathological reasons) who want to maintain their independence by driving their vehicles. The most predominant users of existing hand grip controls include post-stroke victims.

**Purpose:** To identify a secondary hand control design that reduces cognitive and physical demand while driving.

**Methods:** This laboratory-based study will investigate the cognitive and physical demands of using three different secondary hand controls, of which one is a new ergonomic prototype. A driving simulator (STISIM Drive® Model 100) will be used to investigate all three secondary hand controls and is based on the internal dimensions and configuration of a standard sedan car. Thirty healthy participants will be recruited, each required to drive the same route 4 times: the first driving trial will include no hand controls to ensure the participants understand the task at hand, whereas the other 3 randomized driving trials will include a secondary hand control mounted on the steering wheel. A standardized narration will indicate which tasks the participants must to perform (turning, high beams, use of windshield wipers with and without fluid, and horn). The following instruments will be included in the study: electromyography (EMG), pressure pads, questionnaires, Empatica E4 wristband and near-infrared spectroscopy (NIRS).



3:56 pm

**Title:** Cognitive Load Assessment During Myoelectric Prosthesis Use

**Student:** Oscar Ortiz

**Supervisor(s):** Usha Kuruganti & Daniel Bluestein

**Background:** The lack of kinesthetic and proprioceptive feedback while utilizing a myoelectric controlled upper limb prosthesis can place a high level of cognitive load (CL) on users. To address this, researchers have attempted to supplement the sense of touch through various vibrotactile technologies. However, studies assessing the addition of feedback have focused in performance outcomes, while overlooking the user's cognitive experiences.

**Purpose:** To quantify the effect of vibrotactile feedback patterns on CL during object manipulation tasks using a myoelectric prosthesis.

**Methods:** 40 naïve healthy participants will be randomly assigned to train and test a variety of object manipulation tasks using an upper-limb myoelectric by-pass prosthesis with or without vibrotactile feedback while electroencephalographic (EEG) activity is recorded. To analyze CL during the tasks, novel auditory probes will be presented at random intervals. The magnitude of the auditory evoked EEG responses have been shown to be a reliable measure of CL in human-machine control tasks. Results will be corroborated with a questionnaire focusing on task difficulty and perceived utility of the feedback. Performance differences between conditions will be quantified by the time-to-completion of the task and number of failed attempts.

**Significance:** This study aims to shed a new perspective on vibrotactile feedback research as it places importance on the user's cognitive experience. In the long term, this may help to identify control and feedback features for a truly intuitive prosthesis that can replace the user's missing sense of touch.



4:02 pm

**Title:** The Associations of Back Muscle Endurance and Lumbar Multifidus Intramuscular Adipose Tissue with Back Pain in Young People

**Student:** Cara Hazelton

**Supervisors:** Dr. Jeff Hebert, Dr. Martin Senechal

**Background:** Back pain costs the Canadian Medical system an estimated 6-12 billion dollars annually. Some research has suggested a positive correlation between multifidus muscle morphology and back pain in adults. Back pain in youth is a growing concern and there is minimal research looking at above variables.

**Purpose:** To investigate for associations between back muscle endurance and back muscle morphology as future predictors of back pain in youth.

**Methods:** We are using data from approximately 400 young people collected for the European Youth Heart Study and the subsequent Backs on Funen study. We are looking for a longitudinal link between the biological determinants of back muscle endurance and Multifidus morphology with future back pain. 2001 back muscle endurance and multifidus morphology will be examined relative to self-reported back pain in 2004. Also, 2004 back muscle endurance and multifidus morphology will be examined relative to reported back pain in 2009. Multilevel mixed regression models will be constructed to investigate these relationships

**Results:** TBD

**Discussion/Conclusion:** TBD



4:08 pm

**Title:** *Comparison of 3D Kinematics to the modified Wisconsin Gait Scale for children with hemiplegic cerebral palsy*

**Student:** *Dylan Sembinelli*

**Supervisor(s):** *Dr. Victoria Chester*

**Background:** Gait among children with hemiplegic cerebral palsy (CP) is comparable to gait in post-stroke adults, both showing slower walking speed, less time on the affected side, and shorter stride length. The Wisconsin Gait Scale (WGS) is an observational gait analysis tool for assessing the effectiveness of treatments in post-stroke adults. This low-cost, clinical scale evaluates 3D joint angles and temporal-spatial data. The modified WGS (mWGS) is an extension of the WGS and is the first comprehensive scale designed specifically for children with hemiplegia.

**Purpose:** To validate the mWGS using 3D motion analysis in children with hemiplegia.

**Methods:** Four children from the Fredericton area (n=4; 2F, 2M) with hemiplegia between the ages of 9-16 years were recruited for this study. Kinematic data was collected using 12 Vicon cameras (Oxford Metrics, Oxford, UK), and high-speed videos (Basler AG, Ger.) were captured in the sagittal and frontal plane for the mWGS assessment. Participants were asked to perform at least ten gait trials at a self-selected speed. A single 'best' trial for analysis was selected based on mean temporal-spatial data and marker visibility. Joint angles and temporal-spatial data was computed using a custom biomechanical model of the lower extremity in Visual3D (C-Motion, Maryland, USA). Kinematic data will be compared to existing age-matched controls, and deviations from typical gait will be counted in reference to relevant sections of the mWGS using a case-by-case approach.

**Significance:** Validation of this scale could provide clinicians a comprehensive, inexpensive tool for evaluating treatment effectiveness in children with hemiplegia.

4:27 pm

**Title:** Motor Unit Recruitment Patterns in Traditional Strength Loading and Peak Average Power Loading Protocols

**Name:** Brandon Richards

**Supervisor:** Dr. Ken Seaman

**Background:** Motor unit recruitment strategies during peak average power loading and traditional strength loading strategies is an untapped area of research, yet extremely important when considering loading protocols used to induce favorable adaptations.

**Purpose:** The purpose of this research is measure muscle activity using high density surface electromyography (EMG) to better understand how muscle fibres are recruited during the loading strategies listed above.

**Methods:** 30 (15 males and 15 females) healthy participants between the ages of 19-35 years old will be recruited to participate in the following study. Three testing days will take place; baseline testing session then two experimental data collection sessions (isokinetic and isotonic contraction conditions, performed on different days). During each experimental data collection sessions, two sets will take place, one peak average power loading and the other is traditional strength loading. All sets on each day will include 6 repetitions. On the isokinetic contraction day, peak average power loading will be performed at 120 degrees per second on the isokinetic dynamometer, while during the isotonic condition, this loading style is performed using 67% of the participants estimated one repetition maximum (1-RM) on the back squat. The traditional strength loading protocol will involve one set being performed at 30 degrees per second (isokinetic condition), while during the isotonic condition, it is performed using the participants 85% 1-RM. EMG data will be recorded from the vastus lateralis. The information obtained will lead to conclusions about the motor unit recruitment strategies during various loading styles, as well as the reductions in performance across the loading set.