

Podium Session One:

0905 **Abstract 1**
Evaluating a Comprehensive Fatigue Assessment Battery for Spinal Cord Injury. Kyle Diab. MSc Student, Rehabilitation Sciences, UBC.

Objectives: Fatigue is among the most common and troubling complications for people with spinal cord injury (SCI). To develop effective fatigue management programs, it is important to assess underlying factors associated with fatigue. Currently there is no such assessment, and thus the self-report Comprehensive Fatigue Assessment Battery for SCI (CFAB-SCI) was designed to address this gap. The study objective is to test the internal consistency and convergent validity of the CFAB-SCI.

Design: Cross-sectional postal survey.

Setting/Participants: Community-dwelling adults with traumatic SCI were recruited from across Canada.

Interventions: None

Main Outcome Measures: Participants completed the CFAB-SCI, evaluating fatigue in SCI along with five possible contributing factors: pain, depression, sleep, stress, and environment. Participants also completed six convergent validity measures matching those six dimensions of the CFAB-SCI.

Results: 45 adults with SCI (62% men) with a mean age of 51±11 years and a mean time with injury of 22±13 years participated. Psychometric properties were assessed separately for each dimension. Spearman's correlation coefficient was used to evaluate convergent validity and Cronbach's alpha to evaluate internal consistency. Convergent validity ranged between $\rho=0.57-0.82$ ($p<.01$) and internal consistency between $\alpha=0.81-0.94$. Preliminary results suggest the CFAB-SCI achieves convergent validity and internal consistency above the pre-determined cut scores.

Conclusions: The CFAB-SCI will offer people with SCI an understanding of factors that may contribute to their fatigue experience and provide clinicians with a tool to measure underlying factors. Ultimately, we hope the CFAB-SCI will inform treatment decisions to mitigate the impact of fatigue among people with SCI.

0918 **Abstract 2**
Outcomes in Action: Quantified Patient Centered Care. Brittany Pousett. MSc, Certified Prosthetist. Barber Prosthetics Clinic.

There has been a recent increase in the use of outcome measures in rehab settings as evidence-based practice has become the standard of care. When incorporating outcome measures into practice, it becomes apparent that more information regarding the psychometric properties and interpretability of the measure is of utmost importance, although this information is often lacking. In response to this need, we have developed a protocol to begin filling this gap in the literature. However, as we have been implementing this protocol, we have found something previously unexplored - the benefit of the use of outcome measures on patient care. Join us as we explore the benefits of integrating research into clinical practice and how our patient's treatment have been transformed as a result of this.

0931 **Abstract 3**
Predictors for Arm Morbidity after Breast Cancer Surgery. Bolette Rafn. PT, MSc, PhD Student, Rehabilitation Sciences, UBC.

Objectives: To identify the prevalence and predictors for arm morbidity at 12 months after breast cancer surgery.

Design: 12 months prospective surveillance

Setting: Mount St. Joseph's Hospital in Vancouver

Participants: Women scheduled for breast cancer surgery

Intervention: Participants assessed for shoulder range of motion (ROM), arm strength, function, and volume pre-surgery and 12 months post-surgery.

Main Outcome Measure: Arm morbidity was defined as changes from pre-surgery: 1) Decrease in shoulder ROM $\geq 10\%$; 2) Decrease in strength $\geq 25\%$; 3) Increase in volume ≥ 200 mL; 4) Reduction in upper body function ≥ 10 points (Upper Extremity Functional Index).

Results: In 37 breast cancer survivors, 18 (49%) had arm morbidity at 12 months post-surgery. The most common impaired domains were decreased shoulder ROM ($n=12$, 32%), and reduced upper body function ($n=9$, 24%). Three predictive factors explained 51.2% of the variance in arm morbidity namely surgery type, lymph node dissection technique, and upper body function at pre-surgery. The only statically significant predictor was axillary lymph node dissection, which elevated the risk of arm morbidity 7.5 times (95%CI; 1.28 to 44.09, $p= 0.026$) compared to having a sentinel lymph node procedure.

Conclusion: Arm morbidity is common and persists 12 months after breast cancer surgery. In this small sample, women receiving axillary lymph node

dissection are at elevated risk of arm morbidity. More work is needed to determine what factors could be used to identify women who are at higher risk and could potentially benefit from a prospective surveillance program to identify the issues early and initiate relevant treatment.

0944 **Abstract 4**
Cerebrovascular Endothelial Function is Impaired after Experimental Spinal Cord Injury. Michelle (Mengyao) Jia. MSc Candidate, ICORD.

Spinal cord injury (SCI) results in a 3-4 fold increased risk-of-stroke and often diverse cognitive deficits. Endothelial dysfunction is considered one of the steps in the pernicious progression of cardiovascular disease capable of being measured *in vivo*, which is associated with vascular-cognitive decline in non-SCI populations.

Objective: To assess the *in vivo* endothelial health of the cerebrovasculature as well as after high-thoracic SCI and its association with cognitive function.

Design/Method: Sham-injured (SHAM; n=7) and T2 complete spinal cord transected (T2-SCI; n=5) animals were compared. Arterial spin labeling MRI was performed in a 7 Tesla scanner to measure regional cerebral blood flow before and throughout a carbogen challenge (5% carbon dioxide) for inducing hypercapnia. Recognition memory was also evaluated with the novel object recognition test.

Results: Cortical cerebrovascular reactivity to carbon dioxide was essentially absent in T2-SCI, and was 85% reduced compared to Sham ($p=0.010$).

Furthermore, resting (i.e., pre-carbogen) cerebral blood flow was reduced 44% in the brain stem ($p=0.006$) and 30% in the pretectal region in T2-SCI ($p=0.008$). Recognition memory was also impaired in T2-SCI indicated by 19% less time spent in the novel object zone ($p=0.007$).

Conclusion: This study demonstrates for the first time that *in vivo* cerebrovascular endothelial function (i.e., reactivity to hypercapnia) is impaired in experimental high-thoracic SCI, which corresponded to impaired cognitive function.

0957 **Abstract 5**
Benefits of Gait Training with Robotics for People with a Complete Spinal Cord Injury. Amanda Chisholm. Postdoctoral Research Fellow, Kinesiology, ICORD.

Objective: The purpose of this study is to examine changes in seated balance control in people with motor-complete spinal cord injury (SCI) after gait training with robotic exoskeletons.

Design: Cross-over (A-B-A or B-A-B).

Setting: Canadian research laboratory.

Participants: 3 individuals with motor-complete SCI.

Intervention: Subjects are randomly assigned to complete 3 training phases with robotic exoskeleton gait devices, either Ekso-Lokomat-Ekso or Lokomat-Ekso-Lokomat. Each phase involves 10 sessions completed over 3 weeks with up to 45 minutes of walking per session. During these sessions, we focus on increasing the comfortable walking speed.

Main Outcome Measure: We evaluate seated balance control before and after each training phase. The center of pressure (COP) variability during eyes open (EO) and eyes closed (EC) conditions, and total distance during a limit of stability (LOS) test is calculated from a forceplate.

Results: Subject 1 reduced COP sway after phase 1 Ekso-training (EO= 3.17 to 1.66mm, EC= 4.23 to 3.48 mm). COP sway increased to 2.48mm during EO and remained at 3.47mm for EC after phase 2 Lokomat-training. COP sway reduced to 1.78mm (EO) and 3.09mm (EC) after phase 3 Ekso-training. LOS total distance was 323 mm at baseline, 385mm after phase 1, 319mm after phase 2, and 340mm after phase 3. Subjects 2 and 3 are currently in phase 1.

Conclusions: Our preliminary findings show that gait training with robotics may improve seated balance control following SCI. This work will be important to understand how balance control mechanisms challenged during gait training with robotics.

1010 **Abstract 6**
Silent Lesions need to be Listened to: Lacunes and White Matter Hyperintensities. Angela Auriat. Postdoctoral Research Fellow, Physical Therapy, UBC.

Background: In addition to the overt stroke lesion, the co-occurrence of covert lesions, including white matter hyperintensities (WMH) and covert lacunar infarcts (CLI), may contribute to post-stroke outcome. The purpose of this study was to examine

the relationship between covert lesions and motor and cognitive outcomes in individuals with chronic stroke.

Methods: Volumetric quantification of the overt stroke, covert lesions (divided into periventricular and deep; pWMH, dWMH, pCLI, dCLI), ventricular and sulcal CSF (vCSF, sCSF), and normal appearing white and gray matter (NAWM, NAGM) were completed based on magnetic resonance imaging (MRI). We assessed motor impairment and function as well as global, memory, and non-memory cognition. When correlation analysis identified more than one MR parameter relating to a measure of stroke outcome, we used stepwise regressions to identify which factors had the strongest impact.

Results: Memory performance related to vCSF ($r=-0.515$, $p=0.004$). The strongest predictor of global and non-memory cognition is pCLI ($r=0.567$, $p=0.004$; $r=0.524$, $p=0.004$). Motor impairment and function related to the volume of stroke, NAWM and dWMH. Regression analysis for motor impairment and function identified stroke and NAWM ($r^2=0.358$; $p=0.001$), and dWMH ($r^2=0.387$; $p=0.001$) respectively, as the strongest predictors.

Conclusions: The type and location of covert lesions has important consequences for post-stroke cognitive and motor outcome and must be considered when evaluating stroke outcome. Targeting the progression of covert lesions in elderly populations will have significant impact on the degree of obtainable post-stroke recovery.

Podium Session Two:

1040 **Abstract 7**
Use of Datalogger Technology to Evaluate Sit-to-Stand Power Wheelchair Use in Children and Youth. Debbie Field. PhD Candidate, Rehabilitation Sciences, UBC.

Advances in power mobility (PM) technology with sit-to-stand (STS) wheelchairs are increasing options for individuals with motor impairments. In addition to providing a means for independent mobility, STS wheelchairs provide user-control over body position-in-space from sitting to standing, with the goal of enhancing functional abilities and independence. Little is known about how children and youth use this technology in daily life, despite its increasing availability. Data loggers provide a means of objectively measuring wheelchair performance parameters such as orientation in space, distance travelled, and bouts of mobility.

Objectives: To describe children's use of STS power wheelchairs in the first three months post wheelchair delivery using data logger technology.

Design: Case series with wheelchair use measured over three time-points: at one week, one month and three months post-wheelchair-delivery.

Participants: Convenience sample of children aged 5 to 18 years receiving a new STS power wheelchair.

Main Outcome Measure: Tilt, recline, and standing body positions, distance traveled and bouts of mobility, measured over an entire week at each time point.

Results: Six children (6 to 18 years old), four with a diagnosis of cerebral palsy and two with spina bifida participated, four were experienced PM users. Visual analyses of individual case data illustrated change in body orientation as well as distance, speed and bouts of mobility, though change varied across participants.

Conclusions: This is the first study to evaluate use of sit-to-stand power wheelchairs by children. This technology holds promise for increasing children's and youth's independence in mobility and control over body positioning.

1053 **Abstract 8**
Using Admission Berg Balance Scale Score to Predict Improvement in Walking Ability During Inpatient Stroke Rehabilitation. Dennis Riley Louie. PhD Student, Rehabilitation Sciences, UBC.

Objectives: To determine the discriminative value of using baseline Berg Balance Scale (BBS) score to predict walking ability after four weeks of inpatient stroke rehabilitation and to determine other predictors of walking.

Design: This was a retrospective cohort study.

Setting: Inpatient stroke rehabilitation in four hospitals within British Columbia.

Participants: 123 out of 140 enrolled participants were captured at four weeks. Participants were sub-acute stroke participants admitted to inpatient stroke rehabilitation (<4 weeks post-stroke) with lower extremity treatment goals.

Interventions: This cohort study did not administer an intervention. All participants received standard inpatient stroke rehabilitation.

Main outcome measure: The discriminative value of the BBS was assessed using receiver operating characteristic (ROC) curve analysis. Area under the curve and BBS cut-off score are reported. Multiple logistic regression was used to identify other

predictors, with odds ratio and confidence intervals reported.

Results: Baseline BBS was found to have good predictive value for distinguishing community ambulators (able to walk at 0.80 m/s or faster) (area under the curve = 0.88, 95% CI 0.81-0.95), using a cut-off score of 29. Both balance (odds ratio=1.063, 95% CI 1.004-1.125) and cognition (MMSE) (odds ratio=1.384, SE=95% CI 1.006-1.904) were found to be significant predictors of community ambulation.

Conclusions: A participant's baseline balance is predictive of their discharge walking ability, which may help to guide rehabilitation intervention and discharge expectations.

1106 **Abstract 9**

Powered Mobility Assessment and Training Practices: Preliminary Results from a North American Survey. Emma Smith. PhD Candidate, Rehabilitation Sciences, UBC.

Background: Powered wheelchair (PWC) provision is a complex process, which is reliant on a thorough assessment by a rehabilitation clinician who is familiar with the client's needs and capabilities. Ideally, individuals who receive a PWC will also be provided with training to ensure they are safe and competent operators in their environments of use. Unfortunately, we have limited understanding of current practice in this area. As a result, it is difficult to establish standard practices, or evaluate new training protocols.

Objective: To conduct a survey to understand current practices in PWC assessment and training in Canada and the United States.

Design/Setting: Online survey.

Participants: Rehabilitation clinicians and professionals who are involved in PWC provision for clients with disabilities in Canada and the United States of America.

Methods: Participants were recruited through professional organizations and clinical and research networks. The online survey which took approximately 30 minutes to complete, and included questions about PWC provision processes, including details of assessment and training procedures. Questions also explored factors contributing to decision making in powered wheelchair provision, and attitudes towards PWC use.

Results and Conclusions: We will present preliminary results from over 200 respondents from

all major geographical areas in Canada and the USA, and a variety of practice settings and client populations. Preliminary results indicate there is substantial variation in assessment and training across all populations and settings. A majority are not using standardized outcome measurements or training programs in their practice.

1119 **Abstract 10**

Developing an Online Knowledge Resource for People with Spinal Cord Injuries: Spinal Cord Injury Research Evidence (SCIRE) for Consumers. Christina Cassidy. Research Coordinator, G.F. Strong Research Lab.

Background: People with spinal cord injuries (SCI) and their families are increasingly seeking health information online. Despite the importance placed on evidence in healthcare, few evidence-based resources are available to consumers. The Spinal Cord Injury Research Evidence (SCIRE) Project is one current resource that provides synthesis of evidence for an audience of health professionals and researchers. We are developing a consumer module for the SCIRE Project website that will provide evidence-based information for people with SCI. We are using focus groups with potential end-users (people with SCI and stakeholders) to guide the development of this resource.

Methods: One focus group session was conducted with 15 potential end-users to explore their needs and priority topics for inclusion in the resource. Qualitative methodology was used to identify common themes from the data.

Results: The focus group participants identified several areas where knowledge was needed. Priority topics fell into several larger themes: essential information (such as bladder management); self-management and independent living topics; new and emerging treatments; and topics where gaps or conflicting evidence exists. Participants also identified the long term implications of treatments and topics in the acute phase after injury as areas where more information is needed.

Conclusions: The findings of the first focus group illustrate significant information needs for people with SCI. We will use these findings to inform development of the SCIRE for Consumers online web resource.

1132 **Abstract 11**
Perceived Benefits and Barriers to Yoga Participation after Stroke: A Focus Group Approach. Anne Harris. Physiotherapist, Acquired Brain Injury Unit, G.F. Strong Rehabilitation Centre.

Objective: The purpose of this study was to identify perceived benefits and barriers to yoga participation among adults with chronic stroke.

Design: Four focus groups were conducted with a total of 26 adults with chronic stroke. This study had a qualitative exploratory design.

Setting: Focus groups were held at local Stroke Recovery Groups.

Participants: A convenience sample of 26 community-based adults with stroke (14 female, 12 male) was recruited from local stroke support groups, the local rehabilitation centre, and select physiotherapy clinics. Inclusion criteria included: 1) 19 years of age or older, 2) at least 6 months post-stroke, 3) living in the community.

Intervention: Four focus groups were held with six or seven participants in each group. A discussion guide was developed through consensus among the authors and was based on open-ended questions relating to the study's purpose.

Main Outcome Measure: Audio recordings, transcripts and notes taken during the focus groups were included for analysis. Authors independently conducted initial data analysis, including identifying meaning units, labeling codes, grouping codes into categories, and identifying themes. The team mentor reviewed the codes, categories, and themes to improve validity.

Results: The major identified perceived benefits included: physical, wellbeing, and connection. Perceived barriers included: physical, cognitive, environmental, and financial limitations.

Conclusions: These results indicate the need for further research to better understand stroke survivors' perspectives. There is opportunity for education of clinicians, clients, and community groups about possible benefits of yoga after stroke and how to address barriers to participation.

Podium Session Three:

1445 **Abstract 12**
Towards Natural Control of a Bionic Hand Using Force MyoGraphy. Lukas-Karim Merhi. Lab Manager, MENRVA Research Group, SFU.

Force Myography (FMG) has demonstrated a promising alternative to conventional sensing techniques to naturally control a robotic upper extremity prostheses. It is based on pressure sensors and has the potential to provide the highest accuracy in prediction, stability over time, wearability, simplicity in socket embedding, and affordability of cost. Although, applicability of this technique to types of amputation and use in a clinical settings has not been widely investigated.

This paper presents an experimental case study aimed to control a bionic hand with FMG by a transradial amputated test subject. The prosthetic configuration simulates a real case scenario, where all the pressure sensors and processing capabilities are embedded inside a prosthetic socket. Both static position and dynamic motions' data analysis has been performed, showing that the former does not represent the best indicator of prosthesis performances even in a constrained laboratory environment. Different techniques to assess the effect of the limb position and improve dynamic classification accuracies are investigated: use of inertial measurement units, use of advanced dynamic protocols during the training phase, and socket weight compensation techniques.

1458 **Abstract 13**
A Tremor Suppression System: Simulations and a New Wearable Assistive Device. Gil Herrndstadt. PhD Candidate, MENRVA Research Group, SFU.

Background: Tremor is an involuntary rhythmic oscillation of a body part [1]. Despite not considered life threatening, pathological tremor can be a highly debilitating condition that significantly affects activities of daily living and social participation [2], [3]. The most common conditions associated to pathologic tremor are Essential Tremor (ET) and Parkinson's Disease (PD), affecting the arms as well as other body parts [4]. Conventional therapy, which includes but not limited to medication and surgery, is not always effective. Several devices have been developed by researchers in an attempt to offer an alternative treatment [5], [6]. Here we present a novel tremor suppression approach with simulation results.

Objectives: Test the proposed approach via a bench-top Tremor Simulation Device (TSD) shown in **Error! Reference source not found.**, and develop a novel wearable robotic system capable of implementing the proposed approach [7], as shown in **Error! Reference source not found.** **Methods:** The TSD simulates the voluntary and tremor motions of an individual with tremor. In addition, the TSD

implements the suppression approach, which is applied to the simulated motion. The suppression approach algorithm decomposed the voluntary and tremor motions and consequently activated the suppression motor such that it follows the voluntary motion only, while rejecting the tremor motion.

Results: A major challenge in robotic suppression of tremor is to remove the tremor component while leaving the intentional motion unobstructed. Our results demonstrate above 99% reduction of the tremorous motion with a minor effect to the voluntary motion (<1%) as shown in **Error!**

Reference source not found. and **Error! Reference source not found.** Follow up work is planned for testing the developed approach and new wearable device with participants having tremor.

1511 Abstract 14

The Role of Community-Based Rehabilitation in Poverty Reduction: A Case Study of Iran.
Tahmineh Mousavi. Postdoctoral Research Fellow, Cognitive Science and Technology Council of Iran.

Iran became one of the leading countries in the implementation of CBR programs in the Asia Pacific region at the national level. The government has recognized the need for the reduction of poverty amongst people with disabilities through CBR programs. CBR programs have been implemented in all thirty-one Iranian provinces. There were some challenges for the development and implementation of CBR programs in Iran. Human resources and funding for CBR activities were the major challenges. Due to lack of adequate trained personnel and limited governmental funding, CBR programs were assigned to NGOs in 2008 but the monitoring of CBR programs still is a task of Iranian Welfare Organization. By implementing CBR programs through NGOs, CBR programs became much more effective than before. The best practices of CBR programs in Iran aimed towards the reduction of poverty amongst people with disabilities include: raising public awareness, educating the families, creating income generation activities through the 'master-trainee' approach, creating self-help groups, establishing rural council Funds, and increasing accessibility and mobility.

1524 Abstract 15

Use of a Mobile Gait Analysis System to assess the Immediate and Long-term Effects of a Dropped Foot Stimulator on Walking in Stroke Patients.
Maura Whittaker. Physiotherapist, Private Practice.

Introduction: Measuring gait changes when fitting a dropped foot stimulator (DFS) is an essential but often difficult task for clinicians. Methods of assessing gait generally comprise qualitative kinematic analysis involving observation and rating of gait deviations, video analysis, gait speed assessment with a stop watch and more sophisticated three dimensional kinematic assessments using Vicon Motion and similar systems. Observational gait analysis such as the Wisconsin Gait Scale is simple and inexpensive to perform, but is subjective and influenced by the experience of the observer as low inter and intra test reliability with observational gait analysis has been reported. Measuring gait speed change provides useful evidence of progress with a DFS but does not provide detail on specific gait parameters. Kinematic assessments in a gait lab can be expensive, require patients to attend for lengthy appointments and are generally not available to clinicians in regular practice.

Mobility Lab (APDM Inc.) is a portable, instrumented gait and balance mobility assessment system designed for use in the clinic setting. It uses wireless, body worn inertial movement monitors to track each foot during gait. Both the positional trajectory through space and the orientation of each foot is measured 128 times per second. Mobility Lab can be set up in any location and offers fast collection of a range of gait data. A study was undertaken utilizing Mobility Lab to collect gait data on stroke patients with & without a dropped foot stimulator. **Study aims** included 1) quantification of the effects of a DFS in individuals previously fitted with and using a DFS on a daily basis; 2) assessment of the immediate orthotic effect of a DFS in individuals who had not previously used one 3) assessment of the effect of a DFS after two weeks of use in these individuals and 4) comparison of results from Mobility Lab to previously published kinematic studies on FES gait.

Methods: Initial assessment with a DFS to check for stimulation response and ability to walk with stimulation. At a second appointment, subjects were instrumented with Mobility Lab sensors and performed 5 consecutive walks as follows: 1st walk: no stimulation; 2nd, 3rd 4th walk with a DFS; 5th walk: no DFS. Subjects walked for a maximum of 1 minute per test, generally over a 10 metre course.

30 Subjects with hemiplegic gait were included in the study

Results Table I: Data on a 48 year old subject
Data on key walking parameters - speed, cadence, double support time, stance & swing phase, stride length, pitch of the foot at heel strike & toe off, lateral step & step variability was collected in both

the paretic & non paretic limb. Sample data is presented in Table 1. Aggregated results for individual parameters will be presented for slow, moderate & fast hemiplegic walkers.

Discussion/Conclusion

Use of a portable, quick set up gait analysis system that provides quantitative gait data can assist the clinician in identifying the effects of a DFS in hemiplegia. The ability to also track progress with use of a DFS assists in the management of the patient and facilitates documentation of progress. Mobility Lab provides a level of gait data not previously available to clinicians in daily practice. It makes it possible to fully and objectively assess the orthotic, total orthotic and carry over effect of a dropped foot stimulator in neurologic gait.

1537 Abstract 16

Electrophysiological Recovery Following Nerve Transfer for Upper Limb Peripheral Nerve Injury: A Retrospective Cohort Study. Michael Berger. Resident, Physical Medicine and Rehabilitation, UBC.

Purpose: Nerve transfer surgery for complete upper extremity nerve lesions is associated with improved strength and function post-operatively.

Electrodiagnostic (EDX) outcomes may be complimentary to measures of strength and function and may provide insight into the natural history of reinnervation following nerve transfer.

Methods: To characterize electrophysiological recovery in addition to Medical Research Council (MRC) strength recovery during routine follow-up in a cohort of post-operative nerve transfer patients. A secondary purpose was to determine the relationship between semi-quantitative electrophysiological reinnervation and MRC strength.

Methods: A retrospective cohort design was used to analyze MRC strength and semi-quantitative level of reinnervation (early, medium and late, based on assessment of spontaneous activity and motor unit potential characteristics during the needle electromyography examination), pre-operatively and at two time points post-operatively (EDX1 at 7.3±1.1 months; EDX2 at 17.2±4.0 months), following different nerve transfer surgeries (14 subjects, 19 transfers).

Results: Significant differences ($p < 0.0001$) were observed for MRC strength and level of reinnervation across time points. Early-to-medium reinnervation occurred in 87.5% of transfers at EDX1, prior to the attainment of functional strength ($MRC \geq 3$). A strong

association was observed between level of reinnervation and MRC strength ($r=0.88$, $p < 0.001$).

Conclusion: These data illustrate that electrophysiological assessment can be complimentary to functional measures post-nerve transfer, particularly early in the post-operative period, prior to observable improvements in strength. We recommend routine serial EDX examination for post-operative nerve transfer patients.

1550 Abstract 17

Prevalence and Pattern of Anti-spasticity Medication Use Following Traumatic Spinal Cord Injury: An Observational Canadian Cohort Study. Kaila Holtz. Resident, Physical Medicine and Rehabilitation, UBC.

Objective: To describe the prevalence of spasticity and anti-spasticity treatment following traumatic spinal cord injury (SCI) over time.

Design/Methods: Prospective cohort study using the Rick Hansen SCI Registry (RHSCIR) and retrospective medical chart review. Individuals with traumatic SCI between 2005 and 2014 admitted to Vancouver RHSCIR site hospitals were eligible for inclusion. Primary outcome measures were self-report spasticity and abstracted anti-spasticity medication use at discharge. Self-report spasticity treatment and functional limitation were primary outcomes in community follow-up.

Results: $N=465$. At discharge, the prevalence of reported spasticity was 65%. The prevalence of problematic spasticity (defined as being on an anti-spasticity medication) was 35%. Spasticity prevalence remained stable in community follow-up at 1, 2 and 5 years post-injury. Being discharged on anti-spasticity medication was significantly associated with patients reporting ongoing spasticity treatment in community follow-up ($p < 0.01$). Relative to all others, patients with severe motor incomplete (AIS C) injuries had the highest prevalence of ongoing spasticity treatment and functional limitation in community follow-up.

Conclusions: Spasticity is a significant medical consequence of SCI. It can be problematic up to 5 years post-injury, particularly in patients with incomplete cervicothoracic thoracic injuries. Ongoing spasticity results in 1 in 5 patients reporting functional limitation from it. Future research is needed to determine optimal clinical management

strategies to target and treat individuals at highest risk for problematic spasticity in the community.

Support: Dr. Patricia Mills received research salary support from the Vancouver Coastal Health Research Institute, TD Grants in Medical Excellence and VGH & UBC Hospital Foundation during conduction of this research. Dr. Kwon is the Canada Research Chair in Spinal Cord Injury.

1603 Abstract 18

Musculoskeletal Joint Pain Prevalence and Outcomes in Cardiac Rehabilitation at St. Paul's Hospital Healthy Heart Program: An Introduction and Review of the Literature. Sarah Courtice. Resident, Physical Medicine and Rehabilitation, UBC.

BACKGROUND: Exercise training in cardiac rehabilitation (CR) programs is effective secondary prevention against further cardiovascular events and all-cause mortality. Interestingly, musculoskeletal (MSK) pain may be more prevalent in patients with cardiac disease compared to age matched adults. Few studies have evaluated the prevalence of MSK pain and how its treatment influences CR program adherence and outcomes.

OBJECTIVES: To describe the prevalence and nature of MSK pain in CR patients referred to the Healthy Heart Program MSK clinic. We will also evaluate the impact of physiatrist referral on adherence and outcomes.

DESIGN: A retrospective chart review of the CR participants referred to the MSK clinic over a period of 5 years (2011 – 2015), n = 246 will be performed. Data on patient characteristics, type and location of pain, treatment (medication, bracing, corticosteroid), CR program adherence, and outcomes (BMI, estimated VO₂peak) will be abstracted from Healthy Heart Program charts. Patients participating in CR will be categorized into: 1) no joint pain, no MSK interventions, 2) joint pain, no MSK interventions, 3) joint pain, MSK interventions – good response (stay in program), and 4) joint pain, MSK interventions – poor response (drop out of program). Confidence intervals of 95% will be calculated using the Clopper-Pearson method. Multiple linear regression will be performed to determine whether MSK specialist referral and treatment type is related to program completion. Pearson coefficients will be determined between continuous variables.

SCOPING REVIEW: We performed a Medline search using terms “cardiac rehabilitation” AND “musculoskeletal pain” OR “joint pain” OR “arthralgia”. All human publications from 1946

onward were included in initial abstract screening. 6 relevant studies met population and primary outcome criteria. The prevalence of MSK pain in the CR population was found to range from 25-56%. MSK pain was more common amongst women in all studies (20.2-55.1%) and in older individuals (>65 years). Other predictors of MSK pain were a higher BMI and lower VO₂peak. Arthritis was the most common cause of pain in all studies that examined this (36.6 to 64.4% of cases), followed by strains/sprains (28.6%). The back (19-29%), knee (17-25%), and hip (8%) were the most common sites of pain. The one study to assess CR outcomes in those referred to an MSK clinic revealed that there was a significant improvement from initial to final mean Numerical Pain Rating Scale scores (P = .001) and peak oxygen uptake measures (P = .002). Another study that examined the effects of exercise modification found that 6 months of CR yielded significant (P= .001) and similar improvements in VO₂peak for patients with and without baseline MSK pain (16.3% and 18.8%, respectively). The improvement was less in those with arthritis compared with others (7.8% vs 20%, respectively). By 6 months, 31.1% and 29.8% of patients with and without baseline MSK pain discontinued CR (P = .81).

CONCLUSIONS: MSK symptoms (most frequently secondary to arthritis) are common in persons enrolled in CR. There are a number of patient characteristics, including sex, age, BMI, and VO₂peak that predict increased risk of MSK comorbidities amongst CR patients. Interventions to reduce the impact of MSK pain on CR participation (MSK clinic referral and exercise modification) allow for significant benefits without affecting compliance. Subsequently, we hypothesize that 1) MSK pain limits CR participation, 2) severity of pain and number of joints involved predict referral to a physiatrist, and 3) intervention by a physiatrist is associated with higher program completion rates and improved pain and functional outcomes.

Poster Presentations: **1300-14:30**

Poster 1

Support Services and Health Care Utilisation After Stroke in Canada: A Population-Based Study. Adebimpe Obembe. Postdoctoral Research Fellow, Physical Therapy, UBC.

Background and purpose: Social support can help to deal with the consequences of stroke and promote functional independence and quality of life. The cost of health-care in Canada is rising, and its impact on people with neurological conditions is not known. The purpose of this study was to evaluate the impact of stroke on Canadians through support services and health-care utilization in a population-based sample of adults with neurological conditions.

Methods: Data were from the Survey of Living with Neurological Conditions in Canada, which was derived from a representative sample of household residents. Formal and informal support received and out-of-pocket expenses were assessed by personal interview. Logistic regression was used to explore the association between health-care utilization and six common neurological conditions (Stroke, Parkinson's disease, Alzheimer's disease or other dementias, traumatic brain injury, spinal cord injury and multiple sclerosis) using probability weights with stroke as reference category.

Results: The sample contained 2,410 respondents and equate to an estimated 459,770 when sample weights were used. Samples with the non-stroke conditions were more likely to receive formal assistance for personal (odds ratios 2.7 to 5.6; $P < 0.05$) and medical (odds ratios 2.4 to 4.4; $P < 0.05$) care than stroke survivors. Also, they were more likely to receive informal assistance (odds ratios 2.7 to 17.9; $P < 0.05$) and less likely to have out-of-pocket expenses for rehabilitation therapy (odds ratios 0.2 to 0.3; $P < 0.05$).

Conclusions: Stroke survivors received less support services and made more direct payments for rehabilitation than other neurological conditions. Further research is needed to elucidate factors that contribute to this variation.

Poster 2

Cardiovascular Symptoms are Prevalent During Routine Bowel Care in Individuals with Spinal Cord Injury. Vera-Ellen Lucci. MSc Student, Cardiovascular Physiology Lab, SFU.

Introduction: Constipation and bowel incontinence are common problems for individuals with spinal cord injury (SCI) and improving bowel function is a key target to enhance quality of life.

Bowel care is a potent trigger for autonomic dysreflexia -- sudden and extreme hypertension provoked by sensory stimuli below the injury. We aimed to gather information about bowel management practices and concurrent cardiovascular symptoms among individuals with SCI during routine bowel care.

Methods: An online survey combining the International Bowel Function Basic and Extended Data Sets and our Cardiovascular Symptoms Questionnaire was completed by participants recruited from SCI community organisations, online discussion forums, and social media. The study sample ($n=300$) included participants with a range of SCI levels (C1--sacral) and severities (A--D). Percentage responses were calculated.

Results: The most common bowel management technique was digital rectal stimulation (62%). The typical duration of bowel care was >30 mins in 53% and >60 min in 24% of respondents. Longer durations of bowel care and increased frequency of incontinence were associated with a more negative impact on quality of life. Dissatisfaction with bowel care was reported by 43% of respondents.

Respondents felt bowel care interfered with personal relationships (60%), prevented them staying away from home (63%), and stopped them working outside the home (41%). Bowel care had a more negative impact on quality of life than spasticity, using a wheelchair for mobility, and bladder and skin concerns. Most respondents (83%) reported at least one symptom of autonomic dysreflexia during their routine bowel care, including 32% who described palpitations;; 35% of respondents felt autonomic dysreflexia interfered with activities of daily living.

Conclusions: Many individuals with SCI are dissatisfied with their bowel care, and report concurrent symptoms of autonomic dysreflexia. Investigating strategies to effectively manage bowel care and minimise autonomic dysreflexia in people with SCI should be a priority.

Poster 3

The Wheelchair Outcome Measure for Young People: Ongoing Development And Clinical Usefulness. Debbie Field. PhD Candidate, Rehabilitation Sciences, UBC.

Independent mobility provides a foundation for overall development and participation in meaningful life situations, such as playing, learning, being part of

a family, developing friendships and contributing to one's community. Power and manual wheelchairs are often recommended to enhance children's independent mobility, with clinicians, children and families working collaboratively together to achieve individualized goals. Currently few participation measures are used in paediatric rehabilitation to evaluate wheeled mobility interventions.

The Wheelchair Outcome Measure for Young People (WhOM-YP) was developed specifically for children under 19 years of age who use wheeled mobility devices. The WhOM-YP, modified from the adult Wheelchair Outcome Measure, evaluates the importance of child-identified participation-related outcomes, and satisfaction with their performance. Initially known as the Wheelchair Outcome Measure for Adolescents (WhOM-A), to help identify therapeutic goals, measure progress, and evaluate success of wheeled mobility interventions, it has been revised to include younger children, and input from caregivers, depending on the child's age and abilities.

Objectives: To describe the WhOM-YP's development and clinical usefulness.

Design: Online survey.

Participants: Internationally recruited, 34 occupational therapists and 47 physical therapists working with children using wheeled mobility plus 47 Canadian final year OT and PT students.

Main Outcome Measure: WhOM-YP.

Results: Clarity of procedures, ease of use and applicability for clinical practice supported. Benefits and barriers to use identified and suggestions for improvement offered.

Conclusions: The WhOM-YP has potential to be a valuable addition to clinicians' measurement toolboxes when working with children and youth who use wheeled mobility. Results will inform further tool development.

Poster 4

Biomedical Evaluation of Challenges Associated with Turning in People Post-Stroke. Taha Qaiser. MSc Student, Kinesiology, UBC.

Basic household tasks or even walking outdoors require constant need to adjust gait to perform turns around obstacles. Most individuals with stroke have an asymmetric gait pattern due to one side of their body being affected more than the other. This asymmetric pattern causes a greater challenge in controlled turning during walking. Previous studies have indicated that up to 45% of all steps are turns. Therefore, it is essential that turning strategies used by people with stroke be investigated in order to design improved rehabilitation interventions.

However, it is surprising that limited research has been done on the turning capacity in individuals with stroke despite the fact that many falls occur while turning. This study aims to evaluate changes in motor control (muscular response to maintain balance) along different curved walking paths in people with stroke. Stroke participants in this study walked around large and small semi-circular curvature paths that were outlined on the floor, along with a straight path. During walking, weight bearing on support leg while turning, distribution of foot pressure, and muscle activity changes were measured. Data from both paretic and non-paretic sides were recorded, and compared to an age-matched able-bodied control subject. The degree of sensory and motor impairments in the lower limb and dynamic balance control were additionally evaluated. Our results demonstrated difficulty in muscle activity modulation and foot pressure distribution during curved walking. This study will build a foundation for future projects directed at improving the rehabilitation and recovery of mobility for stroke survivors.

Poster 5

The Prevalence and Natural History of Problematic Spasticity Following Traumatic Spinal Cord Injury. Kaila Holtz. Resident, Physical Medicine & Rehabilitation, UBC.

Objective: To describe the prevalence of spasticity and anti-spasticity treatment following traumatic spinal cord injury (SCI) over time.

Design/Methods: Prospective cohort study using the Rick Hansen SCI Registry (RHSCIR) and retrospective medical chart review. Individuals with traumatic SCI between 2005 and 2014 admitted to Vancouver RHSCIR site hospitals were eligible for inclusion. Primary outcome measures were self-report spasticity and abstracted anti-spasticity medication use at discharge. Self-report spasticity treatment and functional limitation were primary outcomes in community follow-up.

Results: N=465. At discharge, the prevalence of reported spasticity was 65%. The prevalence of problematic spasticity (defined as being on an anti-spasticity medication) was 35%. Spasticity prevalence remained stable in community follow-up at 1, 2 and 5 years post-injury. Being discharged on anti-spasticity medication was significantly associated with patients reporting ongoing spasticity treatment in community follow-up ($p < 0.01$). Relative to all others, patients with severe motor incomplete

(AIS C) injuries had the highest prevalence of ongoing spasticity treatment and functional limitation in community follow-up.

Conclusions: Spasticity is a significant medical consequence of SCI. It can be problematic up to 5 years post-injury, particularly in patients with incomplete cervicothoracic thoracic injuries. Ongoing spasticity results in 1 in 5 patients reporting functional limitation from it. Future research is needed to determine optimal clinical management strategies to target and treat individuals at highest risk for problematic spasticity in the community.

Support: Dr. Patricia Mills received research salary support from the Vancouver Coastal Health Research Institute, TD Grants in Medical Excellence and VGH & UBC Hospital Foundation during conduction of this research. Dr. Kwon is the Canada Research Chair in Spinal Cord Injury.

Poster 6

Using Mobile-Health to Connect Women with Cardiovascular Disease and Improve Self-Management. Brodie Sakakibara. Postdoctoral Research Fellow, Health Sciences, SFU, and Physical Therapy, UBC.

Background: In this single group pre-post study we investigated the feasibility of a mobile-health program, called Healing Circles, at improving self-management in women with cardiovascular disease (CVD). The Healing Circles program uses mobile-health technologies to facilitate peer-support and self-management by connecting women with CVD in groups of 5 to 8 people.

Hypothesis: We hypothesized that the program would improve self-management after 10-weeks of use. Attitudes and perceptions towards the Healing Circles program were also explored.

Methods: Participants were recruited through The Heart and Stroke Foundation's website and social media channels. To be included, potential participants had to be women with ischemic heart disease who owned an iPhone and/or iPad. The 42-item Health Education Impact Questionnaire was used to measure self-management. A composite score (0 to 252) is derived, in addition to eight subscale scores (0 to 6): active life engagement; health behaviours; skill acquisition; constructive attitude; self-monitoring; health service navigation; social support; and emotional well-being. Attitudes and perceptions were obtained during exit interviews.

Results: Preliminary t-test results from 13 participants (mean age 56 years) show statistically significant improvements to overall self-management [(Mean change = 15.77, SD = 15.51, 95% CI = 6.39 to 25.14)], $t(12) = 3.67$, $p=0.003$, as well as in the skill acquisition, self-monitoring; social support; and emotional well-being domains. Exit interviews revealed women enjoyed using the program, and desired and benefited from peer-support.

Conclusion: Foundational evidence supports the study's hypothesis, and demonstrates a high satisfaction with using mobile-health to improve peer-supported self-management in women with CVD.

Poster 7

Development of an Intervention to Increase Affected Upper Limb Use Post Stroke. Lisa Simpson. PhD Student, Rehabilitation Sciences, UBC.

Objectives: Despite gains made during rehabilitation, many people do not go on to use their affected upper limb after stroke. Use of the affected arm in natural settings is being recognized as an important primary outcome for rehabilitation and clinical trials. The purpose of this project is to describe the development of an intervention which focuses on increasing affected upper limb use post stroke.

Methods: The intervention was developed using theories and evidence from the behavioural change and self-management literature, principals of experience-driven neuroplasticity and evidence from clinical trials that aimed to increase use of the upper limb post stroke.

Results: The intervention incorporates a capacity building exercise program in combination with a behavioural change protocol that includes goal setting, self-monitoring, feedback on performance and a new wearable sensor that provides objective feedback about participants' arm and hand activity.

Conclusions: This theoretically-derived intervention has the potential to increase affected upper limb use following stroke. We plan on assessing the feasibility and efficacy of the intervention in an upcoming clinical trial.

Poster 8

Measurement Properties of the Wheelchair Skills Test for Scooters among Experienced Users. Sharon Jang. MSc Student, Occupational Science and Occupational Therapy, UBC.

Background: Scooter use can promote mobility and community participation; however, accidents are a concern. Scooter training may improve safety, but a validated measure of scooter skills is required to ascertain this.

Objectives: To investigate the reliability, score distribution, and validity of Wheelchair Skills Test (WST) for Scooters

Design: Test-retest, with 4 weeks between testing.

Setting: GF Strong/ICORD

Participants: 20 participants who owned a scooter for ≥ 3 months, and had mobility limitations that prevented them from ambulating for more than one block without a mobility aid.

Main outcome measures: 1) the WST objectively measured participants' scooter skills, 2) the Wheelchair Skills Test – Questionnaire (WST-Q) subjectively evaluated skill capacity, 3) an adapted version of the Wheelchair Use Confidence Scale measured scooter confidence level, 4) the Hospital Anxiety and Depression Scale assessed participants' mood, 5) independent functioning was evaluated using the physical functioning subscale of the Functional Independence Measure, 6) the Trail Making B was used to measure visual attention and task switching, and 7) visual acuity was measured with the Snellen Eye Chart.

Results: The WST for scooters had a high test-retest reliability ($ICC_{1,2}=0.889$), and was significantly associated with scooter confidence ($r=0.466$, $p=0.038$), WST-Q scores ($r=0.547$, $p=0.013$), and gender ($p = 0.005$). A moderate, non-significant correlation ($r=0.347$, $p=0.134$) was found between WST and functional independence. Negative, non-significant correlations were found between WST and anxiety ($r=-0.252$, $p=0.284$), depression ($r=-0.22$, $p=0.347$), and age ($r=-0.294$, $p=0.209$).

Conclusion: The WST for scooters demonstrates good measurement properties, which supports its use in practice.

Poster 9

EEG controlled Exoskeleton for Upper Extremity Rehabilitation: Feasibility Research on both Healthy and Stroke Participants. Xin Zhang. PhD Student, MENRVA Research Group, SFU.

Objective: Stroke affects motor abilities and impairs the performance of daily activities [1]. Rehabilitation is the key to early motor recovery. However, conventional therapy is labour and cost intense, which limited the outcomes of the rehabilitation [2]. Robotic devices provide solutions for the high cost of conventional rehabilitation therapy[3]. Literature

suggests that stroke survivors should actively engage in exercises and practice daily tasks repetitively for the recovery of the function[4][5][6]. In this study, we explored the usability of an exoskeleton (robotic device) to actively engage chronic stroke survivors in repetitive daily tasks.

Methods: We developed an elbow exoskeleton (fig.1) controlled by electroencephalography (EEG) to perform preprogrammed simple daily activities, for example, reaching out for drinking, picking up and placing etc. While performing these activities, participants engage in kinaesthetic imagination of the activity, the EEG system assesses the participant's intentions (move vs. rest motor command) and the load cell judges the movement direction. The data collection and analysis for this study is ongoing. Till date, four healthy individuals (average age 28.75 ± 6.30) and one individual with stroke (68 years old, 5 years post-stroke) have participated in the study.

Results and Conclusion: The results of this study are promising. Both healthy and stroke participants were able to control the exoskeleton via EEG and load cell. Healthy participants were able to finish at least 9 trials of the training tasks in one hour whereas stroke participant was able to complete 15 trials in an hour. Fig. 2 shows the overall system response of the stroke participant. Results suggest that the proposed exoskeleton can be used by chronic stroke survivors, with potential for active rehabilitation in clinics and hospitals.

Poster 10

Towards the Development of a Novel Smart Compression System for Overcoming Lower Leg Disorders. Mahan Rahimi. MASC Student, MENRVA Research Group, SFU.

Objectives: Leg swelling is prevalent in the elderly, spinal cord injury patients, and pregnant women. This condition can be associated with hypotension and may lead to stroke volume (SV) decline and syncope. The efficacious role of compression therapy in management of such disorders has been the subject of numerous studies. The shortcomings of the existing compression therapy products motivated us to develop an adaptive compression system (ACS) for prevention of lower leg oedema during stasis or ambulation. The proposed device is a motorized compression gadget capable of delivering different pressure modes, and adapts to physiological changes based on the interface pressure feedback from flexible Force Sensing Resistors® (FSRs).

Methods: Previous studies have proven a positive correlation between left ventricular ejection time (LVET) and SV. We used this concept to conduct a study on 12 healthy participants and investigate the performance of the ACS in pumping blood back to the heart by monitoring its capability of preventing LVET decline, hence SV fall. We created the shift in blood volume by graded lower body negative pressure and throughout testing continuously monitored beat-to-beat blood pressures, electrocardiogram, and seismocardiogram. Each subject completed two sets of experiments with and without ACS application.

Results: A two-way repeated-measures analysis of variance revealed a significant difference in the mean values of LVET drop ($\% \Delta \text{LVET} \pm \text{SEM}$: no ACS = -20.25 ± 4.28 , with ACS = -16.99 ± 2.08 ; $p < 0.05$).

Conclusion: This study showed that our device is capable of hindering LVET fall by facilitating blood circulation through the compression of lower extremities.

Poster 11

Effects of Injury Severity on Micro RNA Expression Profile In A Porcine Model of Spinal Cord Injury. Seth Tigchelaar, PhD Student, ICORD.

With no treatment options currently available to clinicians, there is an urgent need for non-invasive biomarkers to aid in the scientific development and clinical validation of novel therapies for acute spinal cord injury (SCI). Micro RNAs (miRNAs) are small regulatory noncoding RNA molecules that mediate post-transcriptional silencing of gene expression. Many miRNAs are highly expressed in the adult nervous system and are directly implicated in the pathogenesis of various neurodegenerative diseases.

In this study, we compared the miRNA expression profile in serum between injury severities in a porcine model of SCI and performed a parallel analysis in the Serum and CSF of human patients with SCI. Female Yucatan minipigs received a T10 SCI using a weight drop impactor followed by compression for 5 minutes. Animals were grouped into three injury severities, which were induced by altering the height of the weight drop (10, 20, and 40 cm). Samples of CSF and Serum were collected from patients with SCI with either AIS A, B, or C. Next-generation sequencing technology was used to compare effects of injury severity on miRNA levels obtained daily over a period of 5 days post-injury.

We demonstrate miRNA profiles in serum samples from a porcine model of SCI, during acute and sub-

acute stages after SCI as well as in the Serum and CSF of human patients with SCI. This characterization is important to establish whether biomarkers of SCI found in pigs can be transferred to humans and visa-versa.

Poster 12

Post-Meditative Stupor in Mahasi-Style Vipassana Meditation: A Case Study. Sean Pritchard. PhD Candidate, Clinical Psychology, Fielding Graduate University.

“Mindfulness-based interventions”, now accepted psychological treatment protocols, have been adapted from a Burmese meditation tradition known as Mahasi-style *vipassana*. Advanced Mahasi meditators move sequentially through a series of insights known as *nanas*. Some of these stages are pleasant, while others can be extremely challenging. Three intermediary stages known as the *dukkha nanas*, - informally the “dark night stages” (Britton, 2012), can be particularly difficult and, under adverse conditions (Lustyk, Chawla, Nolan, & Marlatt, 2009), may produce extended psychiatric-like symptoms, such as psychosis or dissociation (Kuijpers, van der Heijden, Tuinier, & Verhoeven, 2007; Nakaya & Ohmori, 2010; Waelde, 2004). In a recent case, Deidre (pseudonym), a 40 year old German schoolteacher, returned home from a 7 week Vipassana retreat at a well known monastery in Yangon, Burma. Soon after her return, she lapsed into what was diagnosed as a depressive stupor (ICD-10) and was admitted to a State psychiatric facility. She was immobile, non-verbal and in need of intravenous feeding and hydration. The author was invited to visit Deidre in the hospital in an effort to ameliorate her condition. Drawing on the context provided by the *dukkha nanas*, the working hypothesis was that Deidre was experiencing a “dark night” episode. In dialogue using nonverbal yes/no responses, her meditative experiences were contextualized and reframed as normal to the practice (Bronn & McIlwain, 2015; Kornfield, 1979; VanderKooi, 1997). She was able to resume lucid speech and mobility during the first face-to-face session. Over the next few weeks, Deidre intermittently relapsed. Weekly Skype dialogues further supported the reframing of her meditative experiences and the successful resumption of her previous teaching vocation. This case-study will describe and examine the implications of such dark-night episodes.

Poster 13

Feasibility of Current Exercise Prescription During Anthracycline Chemotherapy for Breast Cancer. Sarah Sayyari. MSc Student, RA, Clinical Exercise Physiology Lab.

Background: Exercise during chemotherapy is both safe and effective for cancer patients. Given the benefits of exercise, there is justification for determining which exercise prescription is most appropriate for cancer patients. The ACSM exercise prescription recommends that cancer patients participate in 150 minutes of moderate activity per week. However, Jones, Eves, and Peppercorn suggest that this prescription may be unreasonable for many patients undergoing chemotherapy, and instead recommend 90 minutes of moderate activity per week, making progressions when appropriate.

PURPOSE: To assess the feasibility of the modified exercise prescription for cancer patients in women undergoing adjuvant anthracycline and cyclophosphamide chemotherapy (AC) for early stage breast cancer.

METHODS: Participants enrolled in a supervised exercise program within the first half of their chemotherapy treatment. The progressive prescription included 3 weekly aerobic training sessions (20-30 min at 50-70% of heart rate reserve). Criteria for determining feasibility included: attendance; adherence to prescribed intensity and duration; and participant retention. Staff collected reasons for failure to achieve the prescribed workout.

RESULTS: Sixty-four participants (age, 49±9 years, BMI, 26.3±5.9 kg/m²) enrolled. The intervention was a mean of 8.5±2.5 weeks. The retention rate was 78%. Mean attendance for all participants was 59±30%, and 72±19% with withdrawals excluded. Fifty five percent of participants adhered to the prescribed intensity at least 80% of the time, and 73% of participants adhered to the prescribed duration at least 80% of the time. The total adherence to prescribed frequency, intensity, and duration combined was 44±27%. The most common reason for failing to meet the prescribed frequency, intensity, or duration was due to treatment symptoms.

CONCLUSIONS: The current exercise prescription for cancer patients appear not to be feasible for most women undergoing AC chemotherapy for early stage breast cancer. The dose of exercise that was performed may not be adequate to achieve cardio-protection and the current guidelines may need to be altered for those undergoing chemotherapy treatment.

Poster 14

Above and Below: Impaired Endothelial Function in Rat Femoral Artery after Spinal Cord Injury is Reversed with Passive Exercise. Annie (Mei Mu Zi) Zheng. MSc Candidate, Faculty of Medicine, ICORD.

Objective: Examine the endothelial function of conduit arteries above and below the level of spinal cord lesion using a method independent of arterial dimensions. Endothelial dysfunction is considered a highly sensitive marker of cardiovascular disease progression. Reports on endothelial function (using flow mediated dilation) after spinal cord injury (SCI) has been contentious, due to a lack of appropriate adjustment for differences in resting arterial dimensions as well as shear rate between SCI and able-bodied controls. Moreover, exercise has been linked with improved vascular function through increases in blood flow and shear stress. This study also aims to assess the effect of passive exercise on the endothelial function of conduit arteries of SCI animals.

Design: Experimental cross-sectional study.

Participants/methods: We examined endothelial function in Wistar rats with complete T3 spinal cord transection (SCI), T3 transection and passive exercise (PE), and uninjured controls. *In vitro* wire myography was used to examine endothelial-mediated vasodilation (acetylcholine, ACh) in the BA and FA of each rat.

Results: Femoral arteries from SCI animals exhibited impaired reactivity to ACh (i.e., requiring 5x greater ACh to reach 50% of maximal dilation; $p < .01$) compared to those of the controls. Passive exercise after SCI improved the sensitivity of FA ($p < .01$) to be similar to that of uninjured animals. However, brachial arteries from all groups showed similar responses to ACh ($p = 0.789$).

Conclusion: We have shown, for the first time, the expected endothelial dysfunction in the inactive/supraspinally disconnected femoral artery after SCI. Furthermore, passive exercise of the hind legs was effective in preventing endothelial dysfunction. Together, this study provides mechanistic insight into cardiovascular disease progression after SCI, as well as a potential therapeutic intervention.

Poster 15

Importance of Determining Individual Physical Activity Cut-Points for Wrist-Accelerometry in Individuals with Spinal Cord Injury. Laura McCracken. MSc Student, Kinesiology, ICORD.

Objectives: To determine metabolic cut-points for wrist-worn accelerometry to objectively classify

accelerometry-based moderate-to-vigorous physical activity (MVPA) in individuals with spinal cord injury (SCI). To explore the generalizability of group mean cut-points by assessing the agreement of MVPA by individual- and group cut-points.

Design: Cross sectional.

Setting: ICORD

Participants: 15 manual wheelchair users (30-64yrs, C5-L1) with chronic (>1 year) SCI.

Interventions: Graded treadmill-wheeling test and a 7 day PA monitoring period.

Main outcome measures: Oxygen consumption and wrist-acceleration vector magnitude were averaged across the penultimate 30s of each stage. Oxygen consumption was converted to SCI metabolic equivalents (METS) and linear regression was applied to determine a vector magnitude cut-point corresponding with an energy expenditure of ≥ 3 METS, used to define MVPA. Individual and group cut-points were established. Participants completed a 7 day PA monitoring period. Mean daily MVPA was calculated using established cut-points. Agreement in measures of mins/day of MVPA obtained via each cut-point method was compared using Bland-Altman analysis.

Results: The individual MVPA cut points ranged from 6040 to 21540 CPM, with a group cut-point of 11662 (CI = 8028-15081). Bland-Altman analysis revealed 3.85 ± 39.8 minutes (95% limits of agreement = 74.16 to 81.86), suggesting a large discrepancy between the two methods.

Conclusions: This discrepancy is clinically significant since SCI activity guidelines recommend 20 minutes of MVPA twice weekly. Individuals with SCI display a wide range of wrist-based acceleration profiles that correspond to 3 METs. Individual calibration of cut-points is recommended for effective ambulatory PA monitoring in this population.

Poster 16

Exploring Patient-Reported Barriers To Exercise Over The Trajectory of Adjuvant Treatment For Breast Cancer. Kelcey Bland. MSc Candidate, Rehabilitation Sciences, UBC.

Women undergoing treatment for breast cancer may experience unique barriers to exercise resulting in reduced exercise adherence. Further information on how exercise programming can effectively address these patient-reported barriers is needed. **Objective:** To describe patient-reported exercise barriers during and post-adjuvant treatment among women with

breast cancer enrolled in a supervised exercise program. **Design:** A prospective single arm intervention program. **Setting:** Breast Cancer Training Centre near the BC Cancer Agency, Vancouver Centre. **Participants:** Women ≥ 19 yrs, who had received $\leq 50\%$ of adjuvant chemotherapy for early-stage breast cancer enrolled in the Nutrition and Exercise During Adjuvant Treatment Study. **Intervention:** A supervised aerobic and resistance exercise program: 3x/week during treatment and 1-2x/week for 20-weeks post-treatment. **Main Outcome Measure:** Perceived exercise barriers collected at T1) baseline, T2) end of treatment and T3) end of exercise program, using a standard exercise barriers questionnaire. Barriers are summarized as % of participants who experienced barriers 'often' or 'very often.' The top 3 barriers at each time point are reported. **Results:** 68 participants (age=51 \pm 11 yrs) enrolled in the program. At all time points, fatigue was a top patient-reported barrier (T1 29.4%; T2 36.2%; T3 18.0%). Procrastination was also a common barrier (T1 27.5%; T2 15.7%) and exercise not being part of the routine (T1 31.4%; T3 19.6%). Other prevalent barriers included family responsibilities (T2 15.7%) and lack of self-discipline (T3 21.7%). **Conclusion:** Fatigue may be an important barrier to target when designing exercise programs for women undergoing breast cancer treatment. Identifying and targeting patient-reported barriers might increase exercise program adherence and efficacy.

Poster 17

Can Galvanic Vestibular Stimulation (GVS) Improve Gait of People with Parkinson Disease? Bubblepreet Randhawa. Postdoctoral Research Fellow, MENRVA Research Group, SFU and Physical Therapist, Fraser health Authority.

Purpose: Typically, people with PD present with asymmetrical leg swing, increased cadence and decreased step length along with freezing of gait (1). The purpose of this pilot study is to investigate the effect of Galvanic Vestibular Stimulation (GVS) on the gait pattern in individuals with Parkinson Disease (PD).

METHOD: This study employs randomize, cross-over design. We are recruiting 20 individuals with PD (35-80 years), with festination and freezing of gait. All participants will receive GVS (Good Vibrations Engineering Ltd., Canada) via 2 cm² self-adhesive disk electrodes positioned over the mastoid process, controlled by software programming. Stimulation will be given at the same time in participant's regular medication schedule (2). After determining cutaneous sensation threshold under

electrodes, all participants will receive 3 sessions of the bilateral bipolar GVS (up to 2.56 mA) or no current (sham) for 20-minute duration in sitting (3). Participants will wear foot sensors (Physilog®4) to record spatial and temporal parameters of gait during timed up and go test and dynamic gait test.

RESULTS AND DISCUSSION: The data collection and analysis of this study is underway. To date, Lee et al (2015) (4) and Kim et al (2013) (5) have reported improvement in arm motor performance after single session of GVS by altering beta oscillations. Pal et al (2009) (1) showed reduction in body sway after GVS in PD by influencing vestibulo-spinal route. In this study, we hypothesize that 3 sessions of GVS will improve stride length and velocity, foot clearance and cadence in individuals with PD.

Poster 18

Impact of Data Processing On Physical Interpretations Of Medical Actigraphy Data For Upper Extremity Stroke Rehabilitation. Mona Lisa Delva. MASc Candidate, MENRVA Research Group, SFU.

Accelerometric based activity counting has demonstrated strong correlations to recovery before and after stroke rehabilitation. However, there is room to improve the only moderate to poor correlations with movement specific features (such as timing and repetition). This project explores the inertial characteristics of upper extremity movement patterns to develop a model of activity for rehabilitation. The impact of processing algorithms and sensor choice were also considered. Nine healthy participants performed a series of free-world upper extremity movement tasks modelled after activities of daily living (ADLs) and stroke diagnostic tests, as well as upper extremity movement tasks constrained by speed and direction. Raw gyroscope and accelerometer data were collected from a state-of-the-art device and linearly regressed with medically graded actigraphy bands for analysis. The results demonstrated that wrist motion during upper extremity tasks had similar distributions of data across all planes and axes of motion. The results also highlighted that processing algorithms based on mean and median epoched data were more sensitive ($p < 0.05$) to differences in planes and axes of motion, but that variance based methods presented lower root-mean-square-errors (RMSE) errors when linearly regressed with medically graded technology. The findings from this study help to better understand inertial patterns of upper extremity rehabilitation tasks, implications of sensor placement, and physical interpretations of activity count measures.