Peer Beyond Graduate Research Symposium
Conference Program

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University of Calgary
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I would like to take this opportunity to acknowledge the traditional territories of the Blackfoot and the people of the Treaty 7 region in Southern Alberta, which includes the Siksika, the Piikuni, the Kainai, the Tsuut’ina and the Stoney Nakoda First Nations. The City of Calgary is also home to Metis Nation of Alberta, Region 3.

I want to congratulate the Graduate Students’ Association for taking the initiative to organize today’s conference. Graduate school is a time to immerse yourself deeply in a narrowly defined research project. It’s useful to take opportunities like today’s conference to step back from your project to remind yourself of the broad range of scholarship that is being pursued at the University.

A couple of months ago, I agreed to give this keynote address on the topic of “diversity.” At the time, I had no inkling of how salient a concept, and how pressing an issue, it would be today. My disciplinary background is Political Science, so you can imagine that I have been quite preoccupied with world events over the past month. I am shocked at the extent to which commitment to the principles of tolerance, diversity, and global mobility are being challenged, in favour of a retreat into protectionism and paranoia. In the face of this, I take comfort in the potential that Canada and its universities have in showing the way forward.

There are three main barriers to diversity:

The first is unconscious bias. The term ‘unconscious bias’ refers to the set of attitudes or stereotypes that affect our actions in an unconscious manner. Studies have found that we accumulate these biases early in life, and they are reinforced through our consumption of news and other information. These biases can be positive – a belief that women are kinder than men, for example – or devastatingly negative – such as an association between members of an ethnic group and criminality. None of us are immune to unconscious bias; the question is whether we make ourselves aware of them and then confront them. Combatting unconscious bias requires us to acknowledge and talk back to the stereotypes we hold. And it is the careful accumulation of scientific and social science evidence that allows us to do so effectively.

The second barrier to diversity is the challenge of cross-cultural communication and accommodation. Homogenous groups are comfortable places. Surrounding ourselves with others who share our worldview, our cultural assumptions, our language and our gender can create a reassuring sense of solidarity, community and comfort. But this comfort comes at a steep price. In diverse groups, assumptions are challenged; multiple perspectives find voice; problems are approached with different tools. There are numerous studies that have addressed this issue. Because it requires us to communicate across cultural, linguistic and other barriers, diversity demands more of a group or a society. Many of you work in research groups that include students, post-docs and faculty members from different cultures, with diverse educational backgrounds and of different genders. Creating a sense of community in a diverse group can be challenging: one action or statement can be interpreted in a number of ways through different cultural lenses; there can be perceptions of insiders and outsiders that map onto cultural or gendered characteristics. Nevertheless, many diverse research groups thrive. A sense of common identity and shared purpose, together with deliberate attempts to avoid unconscious bias, can make diverse research groups powerful forces for moving scholarship forward.
The third barrier to diversity – and one that we unfortunately see on the rise at the moment – is fear. The privileges that white Americans (and Britons, and Canadians) have enjoyed during the post-war era appear to be under threat. These privileged populations are seeing their prosperity eclipsed by highly motivated and well educated individuals from around the globe. For some, the reaction is to attempt to turn back the clock. Canada is not immune from the xenophobia and nativism that have caused the United States and Great Britain to pull away from international institutions and global mobility. Our notions of the country as bilingual and multicultural is helpful: it provides a kind of founding myth that makes notions of Canadian nationalism that are wrapped up in ethnic exclusion difficult to perpetrate (although it ignores our history with respect to indigenous people). But racism and resentment of new-comers fester in various pockets of Canadian society; it is essential that we address this and articulate a vision of a diverse future in which diversity fosters economic success and social stability.

Over the past month, we have been given the opportunity to reflect on Canadian universities, and the societies they serve, as liberal, tolerant, and open to the world. I believe that our universities are uniquely positioned to lead the way in demonstrating and fostering deep diversity. We can demonstrate the remarkable scientific and scholarly progress that diverse teams achieve. We can model the habits of mind, policies and practices that unleash the potential of deep diversity. This is the promise – and the mandate – of your generation of scholars and leaders. We are looking to you for that leadership.

Thank you
Peer Beyond Graduate Research Symposium

ORAL PRESENTATION ABSTRACTS
Brain Mechanisms of Associative Memory Deficits in Mild Cognitive Impairment Patients, With and Without Parkinson’s Disease

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PD dementia (PDD) severely affects quality of life, interpersonal relationships, independent activities of daily living; as well as is a huge economic burden to our society1-2. Mild cognitive impairment (MCI) defines patients with mild cognitive loss, but intact independent activities of daily living3-5. It is usually a transition phase from normal cognition to dementia, and is a major risk factor for the development of PDD2. MCI in PD (PD-MCI) is potentially important for early identification and intervention of PDD2. MCI patients show significant cognitive deficits in one or more cognitive domains, but are not demented6-7. Yet, the neural origins of memory, and particularly associative memory deficits in PD are not well known; nor is their impact on global cognition and decline; and their relationship with neuropsychiatric symptoms8-15. Relationship between the associative memory deficits observed in PD-MCI and MCI-non-PD (MCI without PD), is not well understood. Tazrina will follow a total number of 200 participants (=60 years), and compare PD-MCI with PD-non-MCI/MCI-non-PD, and healthy controls, who will undergo a BOLD (blood oxygen level dependent) fMRI (functional magnetic resonance imaging) session while performing an associative memory task (FAST=Face Associated Scene Task) that Tazrina has developed14-15; a comprehensive neuropsychological assessment; as well as various clinical questionnaires of neuropsychiatric symptoms. Finally, correlations of BOLD fMRI activity patterns, and performance on the clinical and neuropsychological tests will be done. FAST can be a MCI diagnostic tool (<20 minutes); and biomarkers found can be early predictors of PDD, considering MCI is the only “effective therapy stage”.

References:
Notch inhibition enhances the osteogenic differentiation of Embryonic and induced pluripotent stem cells.

Summer A Helmi, Leili Rohani, and Derrick E. Rancourt.

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Abstract:

Bone healing is a complex, yet well organized process. In some cases, where a bone defect might be caused by trauma, tumor excision, infection or osteoporosis, the defect will not heal properly on its own and interventions to enhance the healing process then become a necessity. Multiple factors regulate bone healing, including growth factors, hormones, cytokines, mechanical stimulation, and aging. One of the most important signalling pathways is Notch. Notch plays a major role in controlling the differentiation of bone mesenchymal stem cells and the formation of new bone. It also controls the formation of osteoclasts and the process of bone resorption.

Stem cell transplantation has been proposed for the treatment of bone defects. The cell types used for transplantation included adult stem cells, embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSCs). Understanding how cell signalling controls stem cell differentiation in the bone healing environment can greatly enhance osteogenic differentiation and improve the overall healing process. In the Rancourt lab, mouse embryonic stem cells have been successfully differentiated to the osteogenic cell lineage. This study aims to investigate the role of Notch signalling inhibition in the osteogenic differentiation of mouse embryonic and induced pluripotent stem cells. Our preliminary data suggests that Notch inhibition greatly enhances the differentiation of both mouse embryonic and induced pluripotent stem cells.
The frequency of blue-green algal blooms has been thought to be increasing over recent decades. Blue-green algae can produce toxins that can affect surface drinking water sources and limit recreational activities. Blue-green algal blooms can also lead to fish kills and alter aquatic food web structure, potentially altering energy cycling. Warming climate may cause salinity increases in endorheic basins, which in Alberta will increase sulfate concentrations. However, sulfate has been shown to compete with molybdenum for uptake sites, potentially altering molybdenum availability, the most common enzyme co-factor for nitrogen fixation.

We choose 25 shallow prairie lakes east of Calgary with a wide range in conductivity to sample four times throughout summer 2016 to determine if there were specific concentrations of nutrients that led to blue-green algal blooms, and whether there was suppression of blue-green algal growth at high sulfate concentrations. Our results show that many lakes had favourable conditions for blue-green algae growth. Chlorophyll concentrations ranging from 0 (below detectable limits) to 4725 μg/L suggest that the lakes we sampled may fall into distinct high and low chlorophyll categories. These results will be discussed relative to N:P and sulfate:molybdenum.

Keywords: blue-green algae, aquatic ecology, public health (water), micronutrients
Can you catch a behaviour like you catch a cold? Behavioural contagion increases with neighbour proximity, familiarity, and postural similarity.

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Abstract

Behavioural contagion, acting similarly to one’s social partner, is thought to be a core component of group cohesion and coordination. However, the mechanisms contributing to this phenomenon are poorly understood. Understanding why behaviour is contagious in some contexts but not others is an important step in developing hypotheses about how and why some behaviours spread between social partners. Here we examine the contagiousness of routine vigilance during grazing episodes in a population of free-ranging bighorn sheep (*Ovis canadensis*) rams. Results indicate that vigilance bouts are more likely to be contagious when neighbouring rams are in closer proximity, more familiar with one another, and posturally aligned. There is also a weak, but notable trend for the vigilance bouts of younger rams to be more contagious, and for contagion to be more likely when the initiating ram is lower ranking than the observing ram. We interpret these findings within the framework of biases in attentiveness to particular individuals as a possible mechanism leading to the occurrence of behavioural contagion.
Nanoscale singlet oxygen delivery systems: the good, the bad and the ugly.

Vladimir Kabanov, David Press, Belinda Heyne.

Department of Chemistry, University of Calgary.

Today, photodynamic therapy is a commonly used method for treatment of various skin diseases and certain types of skin, mouth and lung cancers.\(^1\) This technique relies on production of an extremely reactive species, singlet oxygen, through a process of photosensitization by an organic dye. One of the remaining challenges of photodynamic therapy is the poor specificity of the photosensitizer towards tumor cells.\(^2\) A potential solution to this problem is to develop silica or lipid based photosensitizer delivery systems. Such nanocarriers could be modified with a variety of chemical or biological moieties to allow for active tumor targeting.\(^3\) Although there are several reports of successfully packing a variety of photosensitizers into the transporters and performing test photodynamic studies,\(^4,\,5\) one concern rarely addressed by researchers is the ability of produced singlet oxygen to escape the nano-carrier matrix. While this question has been answered for some lipid based delivery systems,\(^6,\,7\) no reports have indicated such studies for silica based carriers. Using common singlet oxygen detection methods, we set out to examine this reactive species’ ability to cross the nanoparticle barrier. Working with silica nanoparticles with encapsulated photosensitizers we have determined that singlet oxygen spends from 26% to 58% of its lifetime inside the nanoparticle matrix. Interestingly, our results suggest a trend between the hydrophobicity of the packed dyes and the singlet oxygen’s escape ability. Considering the structure of each dye could be a simple criterion to judge the fundamental usability of silica nanoparticles as photosensitizer delivery carriers.

References:

Investigating Novel Nanoparticle Arrays for Electrochemical Applications

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Nanoparticles are of great interest in electrochemistry, as they have applications ranging from energy conversion devices such as fuel cells, to analytical devices such as biosensors. In particular, nanoparticle arrays can be fabricated on biocompatible tantalum (Ta) surfaces, as they are chemically inert and stable over a wide pH range, due to the presence of a protective oxide layer on the outer surface. Furthermore, Ta can serve as a template for nanoparticle arrays due to its ability to form a patterned surface of shallow pores, called dimples, denoting the template as “dimpled tantalum” or “DT”. Although other methods currently exist for forming nanoparticle arrays, they are typically more-costly and time-consuming. This work demonstrates a low-cost method for the formation of a highly ordered nanoparticle array on a robust template, where a thin metal film (< 5 nm) is deposited onto the DT surface, followed by heat-treatment at a high temperature (450 °C), resulting in nanoparticles of the same size, shape, and separation, with only one nanoparticle per dimple. Currently, we have successfully fabricated gold and silver nanoparticle arrays using this method, where the nanoparticle size (< 40 nm) can be simply controlled by manipulating the initial thickness of the deposited metal film. The properties of these nanoparticle arrays are evaluated using electrochemical techniques (e.g. cyclic voltammetry), providing a “fingerprint” of the nanoparticle composition, and the total surface area can also be determined. These results will help prepare nanoparticle arrays with the best performance and stability in various electrochemical applications.

References

Evocations of Prairie Landscape in *The Land Quartet*

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In my proposed MFA-level thesis project, I intend to investigate evocations of prairie landscape in a contemporary Canadian interdisciplinary performance. The Alberta prairies is a landscape that has been historically studied through a regionalist lens. Within current critical discourse, the regional model emerges as an inadequate and impoverishing framework with which to view contemporary artistic works. The conflation of identity with geographical features of landscape perpetuates a view of the prairies that is regional in scope and undervalues the sensorial experiences of landscape. An embodied approach can enhance our ability to develop more fully integrated and dynamic understandings of the thematic, formal, and affective elements of prairie landscape.

Situating my research at the intersection of the performing arts disciplines, I will study *The Land Quartet* (2009-2011), a large-scale interdisciplinary project consisting of four multimedia dance works: *Mountain, Forest, Prairie,* and *Meridians.* Each quartet is oriented around a shared focus on landscape. The project was created by Calgary choreographer Davida Monk in collaboration with Canadian artists with shared interests in concepts of landscape and the complex human experiences of landscape. Employing a mixed methodology approach, I will devise a framework that supports more diverse, adaptive and sensorially engaged ways of conceptualizing landscape. My research will investigate the synergistic relationship between the thematic and formal elements of artistic works to further illuminate the affective qualities of landscape. An intended outcome of this project is to investigate the diverse experiences of Canadian artists, yielding more inclusive contributions to the study of landscape.
Experimental simulation of partitioning behavior of organics into the water following a deep submarine oil spill

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The traditional methods for determining partitioning behavior of organic species into water following petroleum spillage, fail to accurately model the conditions of high pressure, low temperature and dissolved gas found in submarine oil spill scenarios. To experimentally simulate the partition behavior of water-soluble oil components using live oils (methane-charged) with saline waters under subsurface oil spill conditions, a unique, customized oil-water partitioning device was developed. The partitioning behavior of low-molecular weight species was determined along the depth of the water column over a range of pressure (2–15MPa) and temperature (4–20°C) reflecting water depths between 200m and 1500m. Within these investigated ranges, the partitioning of BTEX compounds showed a ‘salting-out’ effect with the increase in pressure with ‘live oils’, resulting in lower BTEX partitioning into the water phase. In addition, BTEX compounds partitioning also showed an increase proportionally with the increase in temperature, and inversely with increase in alkylation.

This data will aid in near-field and far-field distribution modeling of the environmental fate of crude oil components of interest and assist in the prediction of component migration pathways from potential oil spills.
Connecting Early Horse Pregnancy and Cancer: an Opportunity for Comparative Medicine

Danielle Grant, Claudia Klein

Successful mammalian pregnancies are a precisely orchestrated cascade of events that are governed by communication between the embryo and maternal environment. However, in the case of the horse, the events leading to successful implantation remain a mystery. A previous investigation into the interactions between the conceptus (embryo and associated membranes) and maternal tissues revealed that the conceptus expresses fibrinogen [1]. Fibrinogen is typically only expressed by liver cells and has a classic role in blood clot formation, making its appearance in the uterine environment peculiar [2].

Our main hypothesis for fibrinogen’s role in this context is that fibrinogen acts upon the maternal tissues initiating physical attachment. It is noteworthy that the expression of fibrinogen by horse conceptus bears a striking resemblance to the expression of fibrinogen by cancer tumor cells. Fibrinogen expression has been documented for several cancers [3,4]. Although its expression is well known, a defined role of fibrinogen at the tumor-host cell interface has yet to be defined. Hence there appears to be a unique opportunity to explore the possibility of early equine pregnancy as a comparative medicine model for cancer cells expressing fibrinogen. The proposed research will aim to elucidate the physiological role of fibrinogen as well as the genetic regulations at play, thus developing our understanding of early equine pregnancy in addition to providing a foundation for a novel comparative medicine model. The technical aspects include a variety of bio-imaging techniques as well as the characterization of the epigenetic landscape of the equine fibrinogen gene cluster.

References:


Ionospheric STEC and VTEC constraints for fast PPP

Yan Xiang, Yang Gao, Yihe Li

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Abstract. Significant initialization or convergence time of PPP to reach sub-decimeter level is a limiting factor for many applications. Recent studies have indicated that external ionospheric information can help to shorten PPP long convergence time. As ionosphere and DCBs are coupled together, DCBs are one challenge to separate from the line-of-sight STEC. Receiver DCBs are often neglected that it can be absorbed by the receiver clock parameter. In this paper, we critiqued the ionospheric STEC and VTEC constrained PPP models separating receiver DCBs by taking advantage of the ionospheric information from a nearby station and GIM products. The results show that the improvements of positioning accuracy for ionospheric STEC and VTEC constrained PPP models are about 67% and 26% after a convergence time of 1 min. The convergence time is significantly reduced with the ionospheric constraints from a nearby station, while the performance of convergence time with GIM depends on the quality of GIM.
Wireless Sensor Networks for Industrial Refineries

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Abstract— In spite of the dominance of necessary wired networks, the economic incentive to migrate instrumentation and control networks to wireless is clear, particularly in the chemical and petroleum industry. Today, there are wired networks in petroleum refineries with over 20,000 sensors and actuators connected [1]. However, installing this wired infrastructure is extremely expensive since petroleum industry safety standards require metal shielding on all electrical cabling. This results in installation costs ranging between $200 and $2,000 per foot [2]. Despite this, wireless networking for the petroleum refinery environment has not been extensively studied.

This study makes two contributions. The first is to present field measurements which were conducted in an outdoor refinery. These measurements help characterize the performance of a wireless sensor network in this unique environment. The second contribution is to develop a computer model using the field measurements from which a variety of network simulations are produced. These simulations can help predict the performance and energy efficiency of a wireless sensor network deployed in this industrial setting.

This work builds on the relatively small amount of field measurement work that has been conducted for an industrial refinery [3], [4]. These new results show that the environment around scattered locations in the refinery can be well characterized by familiar models in wireless networks research. In addition, to the author’s knowledge, the network simulation presented is the first predicting the performance of a wireless network (ISA100.11a) specifically for a refinery application.

REFERENCES
Toward a Just City: Building Trust and Confidence within Public Engagement
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The recent rise of nationalism in many Western countries, public acrimony around oil pipelines in North America, and organized community resistance to various development projects within the city of Calgary are all spectacles, partially resulting from a trust deficit between the general public and governing institutions. A fair public engagement process that facilitates just outcomes would be part of a larger mitigating response. Using qualitative research methods, and a local north eastern community as a case study, this inductive investigation explores how public engagement processes toward community development in Calgary builds trust among stakeholder groups, and thus contributes toward the formation of a more just city.

As theoretical underpinnings, this investigation assumes that:

a) Building a just city is a fundamental objective for all urban planners
b) This partially entails planning to meet the needs of marginalized citizens
c) Community development initiatives within cities are best framed by public engagement processes based on collaboration between stakeholder groups
d) The desired outcome of such processes is cooperation, a combination of “trust” and “confidence” as laid out in the Trust + Confidence = Cooperation (TCC) Model
e) Trust revolves around individuals and social relations, while Confidence involves institutions and past performance.
f) A collaborative public engagement process better enables trust and confidence building

The key objective of this research is to construct and justify an inductive framework for public engagement, which intentionally facilitates trust building among community networks, and therefore enables the larger process of building a just city.

Keywords: Public engagement, city making, community development, trust, confidence, justice
Holistic Approach for Sustainability improvements: Life Cycle Sustainability Assessment of High Density Polyethylene Production in Alberta, Canada

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The growing environmental awareness and stringent environmental regulations is urging companies to look for sustainability opportunities in their production processes that reduce environmental impacts while achieving economic and social benefits. Life cycle thinking approaches offer a way of incorporating sustainable development along the whole life cycle of products’ processes while avoiding any transfer of negative impacts from a part of the life cycle to another [1]. Life cycle sustainability assessment (LCSA) is a triple-bottom line based life cycle approach that evaluates the environmental, economic and social impacts of direct and indirect operations of companies associated with products, and thus helps in improving their sustainability performance [2,3]. However, the LCSA approach is still an emerging field and needs a lot of case-study based contributions in advancing it further in practice [1, 4-6].

This case study presents an application of LCSA in its three tools: environmental life cycle assessment, life cycle costing and social life cycle assessment on High Density Polyethylene production in Alberta, Canada, covering environmental, economic and social impacts. The goal is to present the first attempt of a holistic analysis of LCSA results to propose sustainability improvements for the product system. Based on the preliminary results of this study, a holistic analysis approach developed was able to propose sustainability improvement proposals for the product system, however challenges still exist in understanding the interrelationships between the three dimensions’ results.

References


Converting Instant Cities to Smart Cities of Arab Gulf States
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Abstract:
The politically stable countries of the Gulf Cooperation Council (GCC) have accumulated vast financial growth of which have enabled them to expand their cities through grand urban and architectural developments. Most specifically, the United Arab Emirates (UAE) contains some of the world’s largest, tallest and bizarre structures and infrastructures of which gained popularity on a global scale. From the tallest tower in the world to the development of man-made islands shaped as palm trees and the map of the world, the UAE continues to develop their cities and expand along its coast and adjacent islands. The capital city, Abu Dhabi, the wealthiest of all the Emirates have advanced themselves through the initiation of sustainable construction and design through the guidelines of Estidama, the equivalent of the global LEED (Leadership in Energy and Environmental Design) system but adapted to the UAE’s unique environment.

Through this research, the city of Abu Dhabi is used as a case study for purposes of evaluating and readapting a typical city-block into a smarter community and how that, in turn, can serve the overall city grid. Currently the UAE and other countries of the GCC have already constructed newer developments that cater to environmental and smart-city initiatives such as Masdar City (Abu Dhabi), the Msheireb Development (Doha, Qatar), Lusail City (Doha, Qatar) and King Abdullah Economic City (Jeddah, Saudi Arabia) to name a few. By analyzing these developments and borrowing certain smart-technologies that can be readapted back into Abu Dhabi can therefore help transform the existing city into a smarter-city whilst considering the measures of environmental sustainability and cultural identity through their built form.
EXERCISE THERAPY IN JUVENILE IDIOPATHIC ARTHRITIS: A SYSTEMATIC REVIEW
Gregor Kuntze PhD 1, Colleen Nesbitt 1, Jackie L. Whittaker PhD BScPT2, Clodagh Toomey PhD BScPT2, Shane Esau 1, Patricia K. Doyle-Baker Dr PH 1, Jena Shank 1, Julia Brooks PT 3, Susanne Benseler MD 3, Carolyn A. Emery PT PhD 1

ABSTRACT
Objective: Juvenile idiopathic arthritis (JIA) affects functional, psychosocial and body composition outcomes in children and adolescents. Exercise therapy may be instrumental to return patients to healthy activity and promote wellbeing. This systematic review evaluated the efficacy of exercise interventions on improving clinical, functional, structural and psychosocial outcomes in children and adolescents with JIA.

Methods: Seven electronic databases were systematically searched up to August 2015. Study inclusion criteria included: original data, analytic prospective design, exercise intervention evaluation, JIA population, and inclusion of functional, psychosocial and/or body composition outcomes. Two independent authors assessed the quality [Downs and Black (DB)] and level of evidence (Oxford Centre of Evidence-Based Medicine).

Results: Of 4385 potentially relevant studies, nine were included and scored. The majority were moderate quality intervention studies [level 2b evidence; median DB score 20/32 (range 15–27)]. Interventions included aquatic, strengthening, proprioceptive, aerobic, and Pilates exercises. Due to substantial study heterogeneity (e.g., exercise protocol, population, study outcomes), meta-analyses were not performed. Consistent evidence indicates a beneficial effect of exercise on pediatric function (Child Health Assessment Questionnaire), health outcome (pain), quality of life (PedsQL), functional capacity, and lower and upper body strength in the JIA population.

Conclusion: Exercise therapy in JIA populations is well tolerated and beneficial across a range of clinically relevant outcomes. The paucity of high-quality evidence prohibits specific recommendations for clinical practice at this time. Future research evaluating exercise program implementation using validated outcomes and detailed adherence and safety assessment is needed to optimize clinical decision pathways in patients with JIA.
Title: The role of diet and gut microbiota in obsessive compulsive disorder in youth

Emily Macphail; Faculty of Kinesiology/Cumming School of Medicine, University of Calgary

Background: Obsessive compulsive disorder (OCD) affects ~5.2-10.4 million North Americans and can be disabling, with onset predominantly in youth1-3.

Zinc is integral for health; however, zinc deficiency is quite prevalent4. Youth have increased zinc deficiency risk factors, with deficiency being more problematic at this age, based on its importance developmentally4-11. Neural zinc levels affect neuroplasticity (subsequently affecting cognitive flexibility), and zinc supplementation has been demonstrated to improve mental health12-19. In animal models, zinc deficiency has been shown to alter gut microbiota20-23.

Objectives: This project will investigate associations between zinc; cognitive flexibility; anxiety, depression, and OCD symptoms; and the gut microbiota, in youth with and without OCD. It will also explore the effects of prebiotic supplementation on symptoms of OCD and gut microbial diversity.

Methodological Approach: Zinc intake, serum zinc and hair zinc will be analyzed. Berg's Card-Sorting Test and Trail Making Tests A & B will assess cognitive flexibility; self-report scales will measure anxiety, depression, and OCD symptoms; and gut microbiota will be quantified via stool sample analysis. Evaluation of differences in measures between youth with and without OCD will be carried out. Additionally, youth with OCD will be given either a prebiotic fibre supplement or placebo (double-blind design) for eight weeks, with baseline versus final measurement comparisons.

Significance: Nutritional status' impact on mental health is underexplored, and no literature to date combines analysis of zinc, cognitive flexibility, and gut microbiota, particularly in OCD. This research has the potential to aid development of alternative therapies for youth with OCD.
A test to measure neuromuscular fatigue during and immediately after cycling exercise

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Purpose: When assessing neuromuscular fatigue (NMF) from dynamic exercise using a large muscle mass (e.g. cycling), all studies have delayed measurement for 1-4 min after exercise cessation. This study aimed to determine the reliability of a new and innovative cycling ergometer that permits isometric measurement of fatigue within 1 s after cycling cessation, and compare these results to a traditional measurement of NMF. Methods: Twelve subjects participated in two data collection sessions. Electrical nerve and transcranial magnetic stimulation were used to assess knee-extensor NMF in both a traditional chair set-up (PRE and POST-Chair, 2 min after exercise) and the new experimental cycling ergometer (PRE, every 3 min during an incremental test and POST-Bike, at task failure). Results: The reduction in maximal voluntary contraction (MVC) force at POST-Bike (63 ± 16% of PRE; P < 0.0001) was not significantly different between sessions and there was excellent relative (ICC = 0.97) and absolute (CV = 3.2%) reliability, both at PRE and POST-Bike. Evoked twitch (Tw) and high-frequency paired-pulse (Db100) forces were reduced to 53 ± 14% and 61 ± 10% of PRE, respectively (P < 0.0001) and both showed excellent reliability at rest (ICC = 0.97; CV = 5.2% for Tw and ICC = 0.90; CV = 7.3% for Db100) and in fatigued conditions. M-wave and normalized motor-evoked potential areas recorded in the vastus lateralis and rectus femoris showed good to excellent relative reliability (ICC = 0.45 to 0.88). The reduction in MVC and Db100 with fatigue was greater on the cycling ergometer than on the chair ergometer. Conclusion: The innovative cycling ergometer is a reliable tool to assess NMF during and immediately after cycling exercise.
Maternal aspartame exposure and impact on offspring health: potential link to insulin resistance?

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Background: Recent research suggests that long-term consumption of sweeteners, found in ~6000 food products, may promote insulin resistance and obesity in lean and obese individuals. From a maternal health perspective, findings that sweeteners may affect insulin sensitivity have implications for gestational diabetes and health of the offspring. Our objective was to determine the effect of maternal aspartame consumption and the natural alternative stevia on maternal and offspring metabolic health.

Methods: Female diet-induced obese Sprague Dawley rats were randomized to one of three groups during pregnancy and lactation: 1) High fat/High sugar (HFS) diet + water (WTR); 2) HFS + Aspartame (APM); 3) HFS + Stevia (STV). A fourth lean reference group was maintained on a control diet and water (CTR). Dams underwent oral glucose tolerance tests (OGTT) and insulin tolerance tests (ITT) at baseline, gestation and lactation; pups underwent OGTT and ITT at 8, 12, and 18 weeks. DXA was used for body composition and brain regions isolated at euthanasia.

Results: HFS dams were significantly heavier than CTR (p<0.05). Compared to CTR and WTR, APM dams had higher glucose levels during the gestation ITT (p<0.025). At weaning, female APM and STV offspring were heavier than CTR and WTR, and male and female APM and STV offspring had greater body fat% compared to WTR and CTR (p<0.05). APM male and female offspring had reduced insulin sensitivity at 8 weeks of age compared to STV and WTR (p<0.05) and APM male offspring had worse glucose control (p<0.05). At weaning, HFS offspring had higher tyrosine hydroxylase mRNA expression in the nucleus accumbens region of the brain (p<0.05), and APM offspring had higher mu-opioid receptor mRNA expression (p<0.05) compared to CTR.

Conclusion: Maternal consumption of APM during gestation and lactation may compromise metabolic profile, body composition, and alter central pathways involved in appetite in offspring.
Understanding the pain experience of children visiting an emergency department for limb injury at the Alberta Children’s Hospital.

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Background: Limb injuries are one of the most common reasons for seeking emergency department (ED) care, accounting for 12\% of visits to the Alberta Children's Hospital ED. Limb injuries can be associated with significant pain, and untreated pain can result in significant short and long term adverse effects. Currently, there is limited information on how children experience pain during the various stages of the ED visit.

Objective: Our objective was to develop a pain “map” to understand how pain is reported at various stages of the ED visit. Secondary objectives were to identify points and predictors of where patients experienced the highest pain in the ED. This study is part of an ongoing quality improvement initiative.

Methods: Patients age 4-17 years with acute limb injury and a pain score of 4/10 or higher on the pain scale who consented to participate were asked to report pain scores and treatments offered and received at each of several stages of their ED visit. Descriptive methods were used to compare pain scores amongst various stages of the ED visit. Further steps will include use of linear regression to assess predictors for severe pain such as age, gender, triage time, and type of injury.

Results: A total of 905 patients with a mean age of 11.6± 0.21 years and an initial self-reported pain score of 5.5±0.11 on a 10-point pain scale were recruited between August 2014 and April 2015. The areas in the ED where patients self-reported their highest pain scores include IV insertion (5.56±0.69), initial assessment (5.55±0.11), in the waiting room (5.51±0.13), when being examined (5.38±0.16) and at X-ray (5.37±0.17). The areas in the ED where patients self-reported their lowest pain scores include reduction (4.66±0.71), casting (4.45±0.42) and discharge (4.34±0.16). There was a decrease of 1.21±0.17 reported in the pain scale between the points of the initial pain scores and the final pain scores taken (p<0.001).

Conclusion: We have identified the points of the ED visit where patients experience the most pain. This information will be valuable in planning further improvement efforts.
**Title:** Exploring “Learn-to” Sport Programs for Newcomers to Canada  
**Authors:** Simon Barrick, Dr. William Bridel, Joan Bard Miller

**Introduction:**  
Sport and leisure participation is commonly cited as integral to the integration of newcomers to Canada (ICC, 2014). Newcomers also espouse the benefits of sport and leisure participation (ICC, 2014), while identifying distinct participation barriers (Livingston & Tirone, 2012). These barriers include program costs, transportation, and navigating Canada’s bureaucratic sport system (Livingston et al., 2008; Livingston & Tirone, 2012). **Purpose:** In this study, program organizers and coaches, as well as parents of newcomer participants were interviewed about their experiences in the programs as well as overall strengths and weaknesses. These programs involved a range of sports (skating, hockey, soccer, and curling) hosted throughout Canada. **Methods:** Qualitative, semi-structured interviews were conducted with a total of 18 administrators, coaches, and parents representing six different sport programs. The interviews ranged in length from 15 minutes to 1.5 hours. Through subsequent self-reflexive note taking and memoing, various core themes were uncovered from the research data. These themes were then shared with study participants to ensure the interpretations were accurate. **Findings and Discussion:** The core emergent themes included: overcoming barriers to program participation, addressing language and cultural considerations, valuing community partnerships, and understanding skating as “Canadian”. These themes illustrate the diverse, intersecting considerations that program administrators and coaches of newcomer sport and leisure programs must be attentive to. These findings will also be put into conversation with existing literature on newcomer sport and leisure in Canada to address numerous service delivery barriers (Donnelly & Nakamura, 2006; Livingston & Tirone, 2012; Rich, Misener, & Dubeau, 2015). **Conclusion:** This study has revealed how well designed sport and leisure programs can successfully introduce newcomers to the Canadian sport system. I will conclude by outlining how the aforementioned themes can provide lessons to other programs about how best to meet the needs of newcomers by integrating them into inclusive and accessible sport programs.

**References**


PARENT AND PLAYER CONCUSSION KNOWLEDGE AND FACILITATORS OF APPROPRIATE MANAGEMENT IN YOUTH ICE HOCKEY
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Background Conussions are a significant burden in youth ice hockey that can have serious health consequences if not identified and managed appropriately. Parents’ role in facilitating identification and appropriate concussion management as well as child education is vital. This project aims to understand parent and player concussion knowledge and potential barriers to physician diagnosis and appropriate return to play after concussion.

Methods Using a mixed methods study design, 63 players (ages 11-14) and 82 parents from Vancouver and Calgary (Canada) completed a survey on concussion knowledge. Qualitative interviews of 6 mothers and 7 fathers explored the barriers and facilitators associated with physician follow-up after a concussion.

Results All parents and 93.6% players identified concussion as a brain injury. When asked to identify concussion symptoms from a list with 8 concussion and 8 distractor symptoms, parents and players had similar mean scores (12.7 and 12.3/16 respectively). Only 50.8% of parents and 14.3% of players were able to identify the correct course of action for all three scenario-based concussion management questions. Finally, only 59.8% of parents and 11.1% of players recognized the term “graduated return to play protocol”. A preliminary analysis of themes from the interviews highlighted barriers to physician follow-up: Parents’ belief that the concussion was not serious, concussion symptoms resolving prior to physician visit, and physician availability. Facilitators of appropriate behaviour: Team personnel explaining to the parents the importance of physician visits at time of injury and a team protocol that enforces physician-based management.

Conclusions Concussion awareness is improving but there are still gaps in hockey parents’ and players’ understanding of management. Understanding beliefs, barriers and facilitators of proper concussion management behaviour may assist with reducing the consequences that can arise due to mismanagement.

Keywords Sport-related concussion, ice hockey, knowledge, qualitative
Possible existence of optical communication channels in the brain

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The human brain is a dynamic physical system of unparalleled complexity. While neuroscience has made great strides, many fundamental questions are still unanswered, including the processes underlying memory formation, the working principle of anesthesia, and–most fundamentally–the generation of conscious experience. It therefore seems pertinent to explore whether the brain might generate, transmit and store information using other physical modalities than the ones that have been discovered so far. It is well established that neurons can emit photons, which prompts the question whether these biophotons could serve as signals between neurons, in addition to the well-known electro-chemical signals. For such communication to be targeted, the photons would need to travel in waveguides. Here we show, based on detailed theoretical modeling that myelinated axons could serve as photonic waveguides even in the presence of realistic optical imperfections [1]. We propose experiments, both in vivo and in vitro, to test our hypothesis. We discuss the implications of our results, including the question whether photons could mediate long-range quantum entanglement in the brain.

Re-storying Métis Spirit: honouring lived experiences

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Métis identity is an interesting phenomenon saturated with great complexities and conundrums as one begins to look at the diverse Métis population of Canada. These complexities are not only felt on a macro societal scale, but also on a micro individual scale. In order to explore the nuances of Métis identity and ways of knowing, my master’s research work specifically focused on the personal narratives of four Métis individuals in order to find connections to, and evidence of, Métis ways of knowing. Alongside the stories of the participants, I laced my own reflections and stories to create a research story that upholds and celebrates the Métis spirit. For the purposes of this oral presentation, I will be providing a brief overview of my Indigenous research framework and then illustrating the research evidence of Métis ways of knowing. Lastly, I will provide a short synopsis of my doctoral research and its relationship to my master’s research.
Digital Inequality in Transnational Social Space: 
A Critical Analysis on Intersectionality of Immigrants of Colour Experiences in Canada

Jingzhou Liu, Werklund School of Education

Transnational social space is composed of geographic virtual spaces that create multinational individual identities (Guo, 2015); social and power relations are analyzed in the online space as they relate to digital inequality (Purkayastha, 2012). Focusing on Canadian immigrant of colour’s digital social inequality, this critical literature review applies intersectionality theory to the transnational social space.

Intersectionality emphasizes gender, race, and class as distinct social categories of identity; it postulates that systems of social oppression are mutually constituted and produce inequality (Clarke, 2013). Analyzing power relations in the online social context, intersectionality highlights multiply-marginalized individuals and their challenges. Using online technologies in adapting to a new country, power relations produced by multiple institutional initiatives and social problems shape immigrants’ praxis.

A critical scholarship focused on studies of digital inequality and transnational social spaces of immigrants’ online engagement is essential (Hedberg, 2014). Immigrant women of colour access digital space and find a racialized power dynamic (Collins & Bilge, 2016); refugees face challenges in bringing their voices to the online communities of Canada (Murray, 2015); returned Canadian immigrants of colour struggle to construct an interactive online space (Sherry, 2010). Two predominant challenges are revealed: multicultural societies are characterized by the existence of different social groups that hold different opinions in the stratification system, and digitally disadvantaged immigrants face difficulties in fully participating in due to economical, linguistical, and cultural barriers.

The unequal intersections of immigrants reveal the nature of social oppression within the digital space. It calls for equality of the social online learning space wherein individual, social, and institutional levels embrace identity differences. Within this space, digital inequality can be dynamically re-recognized and negotiated for helping immigrants achieve social transformation. I hope this concept will inform policymakers, researchers, and practitioners in developing related policies and initiatives in digital equality in Canada.

References
Ambiguous Loss in Trans Families

Elizabeth McNeilly

When parents are told by their son or daughter that they are transgender, many experience “ambiguous loss” (Boss, 1999); with the loss of gender, their child has “died.” Tension occurs at this stage when the social curriculum written for gender clashes with what a child is expressing (Clandinin, 2006). In the case of a gender non-conforming child, the past and present fail to align, future expectations rupture, and sociocultural “stories” of gender are challenged. Outside the home, hate crimes against transgender men and women attest that switching genders is a crime against societal norms (Butler, 2004). And yet why is there this fierce defence of and control over gender?

McNeilly will provide an overview of the theoretical frameworks that challenge the gender binary. She will share the significant work being done in psychology and the medical sciences that disrupt Western cultural conceptions of gender, finding instead a range of “genders,” complex variations of male and female. First Nation’s two-spirited people as well as the third gender fa’afafine of the Samoan Islands were respected within their communities until Western civilizations razed their cultures and patriarchal hegemony and misogyny replaced them (Sheppard & Mayo, 2013; Vasey & Bartlett, 2007). Today, studies show that gender variation is normal, that perhaps, as within these Indigenous societies, we ought to re-evaluate the definition of gender. McNeilly will situate this work in relation to her own doctoral studies exploring the experiences of gender variant children who live in the liminal space between boy and girl.

References


Formative feedback is defined as “information communicated to the learning that is intended to modify his or her thinking or behaviour to improve learning” (Shute, 2008, p. 153). When used effectively it can have a powerful effect on student learning and achievement (Hattie & Timperley, 2007). Drawing upon the literature on formative feedback, I will present the fundamentals of formative feedback, specifically what it is, why instructors should use it and when to apply it. The audience will leave with a greater understanding of the importance of formative feedback and how to begin implementing it into their own teaching practices as a method to improve student learning.


Peer Beyond Graduate Research Symposium

Poster PRESENTATION ABSTRACTS
Oxy-cracking technique as a new process for upgrading petroleum coke
Abdallah D. Manasrah, Nashaat N. Nassar

Abstract
The global production of heavy residues has reached 150 million metric tons per annum and is expected to increase in the future due to the progressively increasing heavier nature of the crudes. Petroleum coke, one of these heavy residues, is a solid rich in carbon produced during the coking process of bitumen and heavy oil upgrading. Finding an alternative technique to treat massive amounts of petcoke is need as commercial processes like gasification and combustion have drawbacks in terms of efficiency, energy and environment. In this study, an oxy-cracking process which is a combination of cracking and oxidation reactions is conducted as an alternative approach to petcoke utilization. The reaction is conducted in Parr reactor where petcoke particles are solubilized in aqueous alkaline medium and partially oxidized under mild operating temperature and pressure. Several operating conditions were investigated such as temperature, oxygen pressure, reaction time, petcoke particle size and mixing rate to optimize the solubility and selectivity of oxy-cracked petcoke. The results showed that temperature and residence time are the two major important parameters that affect respectively the reaction conversion and selectivity, where the optimum values 200–230 °C and 1–2 h were found. The experimental results enabled us to propose a reaction pathway based on the radical reaction mechanism to describe the kinetic behavior of petcoke. Reaction kinetics indicated that the petcoke oxidation undergoes a parallel- consecutive reaction in which an oxidative decomposition took place in the first step producing different aromatic intermediates. The oxy-cracked petcoke was characterized by FTIR, XPS and NMR analyses. The oxy-cracked petcoke was found to contain carboxylic, carbonyl, phenolic, and sulfonic functions. Further, a small amount of CO2 emission appears in the gas phase, as confirmed by Gas Chromatography and TOC analyses. Moreover, the elemental analysis showed that the liquid phase has less metals content compared with the residual petcoke remaining after oxy- cracking reaction.
Anti-oppressive practice is a social-justice oriented practice model, which embraces humanity in all its diversity and adversity. It offers a strong connection between social work practice, social justice and human rights and promotes equity, inclusion, transformation, and social justice as fundamental aspects of social work practice. The anti-oppressive framework of practice was primarily developed to address social divisions and structural inequalities. Social work practice underwent anti-oppressive transformation to ensure equality and justice for all social groups and to eradicate any manifestation of oppression in the social world or in the client-social worker relationship. This paper provides a synthesis and critical analysis of the use of anti-oppressive practice in serving recent skilled immigrant populations in the Canadian context. In doing so, it presents the distinct features, key concepts and main principles of anti-oppressive practice. The paper discusses the use of anti-oppressive practice in serving skilled immigrants in Canada and offers some suggestions for the social work profession in advancing these practices. The paper also acknowledges the limitations of anti-oppressive practice in serving skilled immigrants.
Intra- and Inter-Litter Variation in Parasite Intensity and Diversity in Columbian Ground Squirrels (*Urocitellus columbianus*)

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*Biological Sciences¹, Veterinary Medicine²*

The extent of parasite infection is affected by both host susceptibility and parasite traits. Parasite traits include colonizing ability, transmission mode and target tissue. Host susceptibility can vary with age, size, genetic resistance, hormones, behavior, and environmental factors. The effect of body size, body condition, and hormones, like testosterone, on parasite load has been explored in adult wild animals; however, offspring susceptibility to parasites has been little explored. Offspring can provide valuable information since they are naive to parasites, showing responses unmasked from the effects of previous infections. My study investigates multiple sources of host susceptibility in offspring, which I separate into two models: intra- and inter-litter variation in parasite load and diversity. Inter-litter sources of variation include litter size, mother's age and experience, mother's condition, nest burrow location, and nest hygiene. Intra-litter variation is expected to stem from offspring body size, sex, and genetic differences resulting from multiple paternity. Highly infested offspring are expected to have lower survival during their first hibernation. These mechanisms were tested on a wild population of Columbian ground squirrels located in Sheep River Provincial Park, Alberta. Multiple parasites were tested: two external parasites (fleas and mites) and three gastrointestinal parasites (eimeria, ascarid, and strongylid spp). This study benefits from a unique design (spatially and socially isolated nest burrows) which allows for the exploration of an unusually large number of explanatory variables and parasite types, making for one of the most comprehensive studies on the topic of host susceptibility to date.
Regan King, Trevor Seeger, Ephrem Zewdie, Omar Damji, Patrick Ciechanski, Adam Kirton, and Karen Barlow.

**Introduction:** Recovery from mild traumatic brain injury (mTBI) is variable, with symptoms persisting past 3 months in 10-15% of affected children. Mechanisms of neurotransmission in mTBI recovery are poorly understood, however prior evidence suggests neurotransmission mechanisms are altered after an mTBI. The role of altered neurotransmission in post-concussive symptom persistence is also unknown. Transcranial Magnetic Stimulation is a non-invasive brain stimulation technique that can be used to target cortical excitability in the superficial layers of the cortex, output can be measured by fine motor contractions in the first Dorsal Interroseous (FDI) muscle of the dominant hand. Further exploration is needed to develop effective treatment options and improve clinical outcomes.

**Objective:** To determine if cortical excitability is altered in children with mTBI, and compare its relation to symptomatology at one and two months post injury.

**Methods:** A cross-sectional controlled cohort study was used. Children aged 8-18 with mTBI were grouped based on their recovery status (symptomatic or asymptomatic) at one month post injury, with a healthy control group included for comparison. Cortical excitability was measured using single and paired pulse TMS paradigms at one and two months post injury. The control group was measured only once. The primary outcome was long interval cortical inhibition (LICI), a measure of GABA mediated cortical inhibition. Secondary outcomes included alternate TMS paradigms, and safety/ tolerability of the technique.

**Results:** Ninety-nine children diagnosed with mTBI (65 symptomatic, 34 asymptomatic) and twenty-nine healthy controls (stats) were enrolled. Long interval cortical inhibition (LICI) was reduced in the symptomatic group compared to the asymptomatic group ($F(1,59)= 5.70$, $p=0.020$). TMS was well tolerated in children.

**Conclusions:** TMS measures of cortical excitability are altered at two months post injury. Long interval cortical inhibition is reduced in children with persistent symptoms after two months.
NMR Evaluation of Gas Condensate Shale Reservoirs
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Objectives
The low porosity, very low permeability, and the existence of organic phase are the main challenges of characterizing shale reservoirs. These challenges fail traditional core analysis methods in evaluating the shale reservoirs. Low field NMR (Nuclear Magnetic Resonance) has been used to evaluate gas condensate in shale porous media.

Methodology
In this experimental study, special core analysis experiments have been done on a core plug taken from Montney reservoir. Then the specific NMR based analysis methodologies have been complemented. To achieve this, custom-built NMR compatible core holder suitable for shale reservoir conditions has been used. The high pressure, high temperature NMR environment designed to capture multiphase spectrums. The NMR apparatus responses have been investigated for identifying and measuring the condensation of methane, ethane, propane, butane, and pentane as a function of pressure and temperature. For this purpose, cleaned dried samples saturated with the mentioned gasses at increasing pressure. At ambient conditions, these gasses are not detectable by NMR. As pressure increases, ethane, propane, butane, and pentane started to condense. This liquid phase has distinguishable NMR characteristics with respect to the vapor phase of the same hydrocarbon. Then the pressure reduced and the cores depleted, the NMR spectra of the depleting core recorded.

Results
NMR spectra have been collected and used to quantify and verify free, clay bound, and capillary bound fluids relaxation times. Porosity and permeability of shale sample are going to be measured. The deliverable result will be a data bank with NMR response of gas and gas condensate reservoirs. The recorded relaxation characteristics are sufficiently different, which makes NMR a tool for the quantitative determination of the hydrocarbon volumes that are associated with condensation phenomenon of gas condensate shale reservoirs. Obtained NMR spectra investigated in detail, as it is critical for production planning of gas condensate.
Cortical Thickness and Treatment Response to Repetitive Transcranial Magnetic Stimulation in Youth with Treatment Resistant Major Depressive Disorder

**Background:** Current treatment options for major depressive disorder (MDD) in youth are limited in effectiveness and positive results are often short-lived [1]. Repetitive transcranial magnetic stimulation (rTMS) is an emerging intervention for treatment resistant major depressive disorder (MDD) in youth [2-4]. Biomarkers are objectively measured characteristics that act as an indicator of response to treatment [5]. Identification of biomarkers will allow clinicians to move from the current trial-and-error method of prescription [6] to personalized, precision medicine. Here, we investigate cortical thickness as a biomarker of response to rTMS treatment. We hypothesize that the target site for rTMS, the dorsolateral prefrontal cortex (DLPFC), will differ in cortical thickness between responders and non-responders to treatment.

**Methods:** Anatomical data was collected on a 3.0T GE MR750w. A 15-weekday rTMS treatment was applied targeting the left DLPFC (120% RMT, 75 Trains/3000 pulses per session) in 22 youth with treatment resistant MDD (13 – 21 years). FreeSurfer was used for cortical reconstruction.

**Results:** No significant adverse events were reported. Half of participants (n=11) responded to rTMS treatment with a greater than 50% reduction in Hamilton Depression Rating Score (range -17.65 to 78.95%, mean 45.21%, SD ± 25.43). At baseline, responders had thinner left rostral middle frontal (p=0.0001) and right superior frontal (p=0.006) regions compared to non-responders. Change in Hamilton depression rating score negatively correlated with right lateral orbitofrontal cortical thickness in responders (p=0.003).

**Conclusions:** rTMS is an effective treatment method for youth with treatment resistant MDD. Our data demonstrates a relationship between decreased regional cortical thickness and response to rTMS in youth with MDD. Identification of a morphological biomarker of response in adolescent major depression has considerable clinical implications and lends insight to the pathophysiology of depression.

**References**
The Effect of Biologic and Targeted Synthetic Drugs on Work and Productivity-Related Outcomes for Patients with Psoriatic Arthritis: A systematic review.
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2 Departments of Medicine and Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Canada.

Background: The efficacy of biologic and synthetic targeted agents for the treatment of psoriatic arthritis is well established. However, there has been no systematic review of how these agents affect work productivity in this patient population. Objectives: To systematically review the effects of biologic therapies (Secukinumab, Ustekinumab, Adalimumab, Etanercept, Certolizumab Pegol, Apremilast, Golimumab, or Infliximab) used to treat psoriatic arthritis on work productivity. Methods: A systematic review of Medline, EMBASE, CENTRAL, and clinicaltrials.gov was conducted to identify randomized controlled trials reporting on work productivity outcomes at the end of the placebo-controlled double-blind period. Results: A total of 7,959 records were identified. 394 were further assessed for eligibility, of which 5 trials were finally included. All included trials were judged to be of high quality and low risk of bias in nearly all categories of the Cochrane Risk of Bias Tool. However, work productivity was not well reported: 3 studies (60%) did not include the percentage of employed patients, 2 (40%) failed to provide an outcome measure for biologic naïve patients, and 4 (80%) failed to report a measure of variability. Infliximab, Golimumab, Certolizumab Pegol, Ustekinumab, and Apremilast resulted in improvements to work productivity compared to placebo. It was measured with a self-reported visual analog scale from 0 to 10. Improvement in work productivity was greater for higher doses, except for Certolizumab Pegol. No studies were found for Etanercept, Secukinumab, or Adalimumab. Conclusions: Evidence for the available biologic therapies show consistent improvement in work productivity. This is useful for informing reimbursement decisions and to include socio-economic considerations of health into treatment decisions. However, reporting of work productivity outcomes is inconsistent across trials. The implementation of the Work Productivity and Activity Impairment (WPAI) questionnaire is recommended.
Assessing the protective role of the smoothelin-like 1 protein in mouse models of heart failure
Megha Murali and Justin MacDonald
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Background: Cardiovascular disease is the leading cause of death and disability in the world (WHO Fact sheet, 2017)\(^1\). Though extensive research has led to advanced treatments, most increase the survival rate without improving the quality of life. Thus further research on novel molecular pathways in cardiac physiology is imperative to understand its etiology and tackle the progression of chronic heart failure (HF).

Smoothelin-like 1 (SMTNL-1) protein is a novel regulator of vascular homeostasis and belongs to smoothelin family of muscle proteins\(^2\). The deletion of SMTNL1 provides an exercise-adapted phenotype in muscle cells and improves cardiovascular performance in the absence of any exercise activity\(^3\). Robust compensatory mechanisms involving SMTNL1 may efficiently counterbalance pressure-overload induced impairment in cardiac function.

Aim and Methods: The project aims to examine pathological cardiac remodeling and disease progression in response to pressure-overload-induced biomechanical stress (i.e., hypertension) in two well defined models of HF: (1) the transverse aortic constriction (TAC) model induced hypertension, left ventricular hypertrophy and HF with an acutely reduced left ventricular ejection fraction and (2) angiotensin (Ang)-II infusion model induced HF with diastolic dysfunction and preserved left ventricular ejection fraction.

Ten-week old male KO and WT (n=10/group) mice will undergo TAC or Ang II infusion (1.5mg/kg/day). Sham-operated mice and vehicle administered mice will serve as the control groups, respectively. At week 0 and after 4 weeks of pressure-overload, mice will undergo echocardiography. Mice will be terminated and tissues harvested for further molecular analysis.

Results and Significance: Echocardiographic analysis of naïve KO mice before undergoing pressure-overload induction shows improved ejection fraction and cardiac output when compared to the WT counterparts. The proposed study will help us to elucidate the pathophysiological role of SMTNL-1 protein in the regulation of cardiac hemodynamics in preclinical models of heart failure, which aids in the development of SMTNL-1 based therapeutics or diagnostic markers in the field of cardiovascular diseases.

References:
Using 9.4T MRI and atlas-based volumetrics to quantitatively measure atrophy in the experimental autoimmune encephalomyelitis mouse model of multiple sclerosis

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Purpose: Grey matter (GM) atrophy plays an important role in multiple sclerosis (MS) and has become a clinically relevant marker of damage and disability1,2. To better study and treat atrophy in MS, there is a need for animal models that feature both neuroinflammation and atrophy. One potential model is experimental autoimmune encephalomyelitis (EAE), which is commonly used to study neuroinflammation. Previous work showed EAE mice experience atrophy in the cerebral cortex and cerebellum at long-term disease duration3 similar to MS patients4,5. We do not know how widespread the atrophy is in EAE and if white matter (WM) structures are affected. We used high-resolution magnetic resonance imaging (MRI), a Bruker cryoprobe, and atlas-based regional morphometrics to determine the extent of atrophy in the brains of EAE mice at long-term disease.

Methods: Female C57BL/6 mice were induced with EAE as described.6 Disease severity was assessed using a 15 point scoring system.7 Mice were imaged at 66 days post induction (n= 27 EAE, 8 Naïve, 13 CFA (receive immune stimulant but no self targeting myelin antibodies)). Imaging was done using a 9.4T MRI with a helium cooled Bruker cryoprobe using a FLASH sequence (TR/TE/α=2000ms/6.5ms/60° voxel=37.5 x 37.5 x 250µm³) (Figure 1a). The N3 algorithm was used to correct for signal drop-off from using a surface coil.8 Niftyreg was used to register an average brain atlas with 62 segmented brain regions9 to each dataset to calculate regional volumes (Figure 1b). Statistics were performed using an ANCOVA test with body weight as a covariate with a Bonferroni post-hoc. The false discovery rate method (FDR=5%) was used to correct for running multiple ANCOVA tests.10

Results: By combining a cryoprobe with 9.4T MRI, we obtained a nominal resolution of 37.5 x 37.5 x 250µm³ in 38 min. in vivo. Cumulative long-term disease scores were averaged and EAE mice were divided into two groups based on whether their scores were above (high score) or below average (low score) (n=13 high score EAE, n=14 low score EAE). After correcting for weight, high score mice displayed smaller volumes for 19 out of the 62 measured structures compared to Naive, CFA, and low score EAE mice. Atrophied structures include both GM and WM regions such as cerebral cortex (Figure 2a), corpus callosum (Figure 2b), cerebellum, hippocampus, thalamus, and striatum.

Discussion/Conclusions: EAE mice with high disease scores exhibit significant reductions in brain volume in the long-term phase of the disease. Atrophy in MS is seen as a marker of damage and disability this appears to be the case in EAE. We detected atrophy in 19 of the 62 structures and verified previous reports of atrophy in the cortex and cerebellum. The atrophic structures bear similarity to those that feature atrophy in MS.4,5 This suggests that the EAE model may be a good model to study the mechanism behind atrophy as a result of neuroinflammation and demyelination. The EAE model, with this imaging protocol, has the potential to be a model for studying atrophy in MS and for testing future neuroprotective therapeutic treatments.


Figure 1. Atlas-based regional morphometrics. A) Gradient echo MRI image of an EAE mouse brain 66 days post induction. The N3 algorithm was used to correct for signal drop-off from using a surface coil. B) EAE mouse brain segmented into the 62 measured structures.

Figure 2. Regional volume. A) cerebral cortex, B) corpus callosum. EAE were grouped as above average (High Score EAE n =13) and below average (Low Score EAE n=14) disease scores. Animals sacrificed at 66 days post induction. p < 0.05*; <0.01**, <0.001***
Incidence of Clostridium difficile Infection in Alberta (2013-15)
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Background. Clostridium difficile is a major healthcare associated infection responsible for most cases of hospital associated diarrhea. The overall CDI (Clostridium difficile infection) rate in Canada peaked in 2008 but remained stable since then. CDI can be broken down into two types: hospital-acquired CDI (HA-CDI) and community-acquired CDI (CA-CDI). Traditionally, HA-CDI was the dominant form but CA-CDI is on the rise and now makes up a significant proportion of identified CDI in the acute inpatient settings. Our primary objective is to identify the distribution of HA-CDI and CA-CDI in acute inpatient settings. Our secondary objective is to assess whether differences exist between HA-CDI and CA-CDI in selected few variables from the surveillance data.

Methods. We obtained 3,524 acute inpatients data between years 2013-2015 from Infection Prevention and Control of Alberta Health Services (AHS). The surveillance population consisted of all hospitalized patients of AHS/COV(Covenant Health) healthcare facilities in Alberta who were > 1 year of age. We utilized AHS Case definitions for HA-CDI and CA-CDI. We applied appropriate statistical techniques to assess differences between HA-CDI and CA-CDI.

Results. CA-CDI had more females than males. This finding is consistent with CDI surveillance conducted in Scotland between 2013 and 2014. CA-CDI affects younger people more than HA-CDI. The number of days between diagnosis to mortality did not differ between HA-CDI and CA-CDI. HA-CDI had higher overall mortality compared to CA-CDI. Among females with HA-CDI, mortality was higher than CA-CDI and this was statistically significant. Among males, mortality did not differ between HA-CDI and CA-CDI.

Conclusion. CA-CDI epidemiology is changing, and it is affecting younger people more than HA-CDI. Mortality occurs more among hospitalized females than males. Further investigation is necessary to identify the underlying risk factor that is driving these observed patterns.
Advancing Professional Status of Social Workers on Interdisciplinary Health Care Teams: Perspectives of Hospital Social Workers in Ontario, Canada

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Hospital social workers are increasingly part of interdisciplinary health care teams; however their roles within these teams are often poorly articulated, underfunded, and their skills are underutilized (Golden, 2011). Research highlights the unique and critical skills that social workers bring to interdisciplinary teams and suggest that social workers are uniquely positioned to excel in positions of leadership within health care (Jackson, 1999; Jones et al., 2014). Social workers provide health care in a holistic way by recognizing an individual’s environment and considering the social determinants that may influence health. Social workers are trained to understand and articulate the ways in which social injustice disadvantages many who interact with the health care system. Research that advocates for and addresses barriers to social workers' advancement in positions of leadership promotes social justice by ensuring that those with the knowledge and passion for promoting it have their voices heard. The current research draws on qualitative interviews with 23 hospital social workers to better understand social workers' roles within interdisciplinary teams, where social workers have had success as leaders within these teams, and what barriers prevent them from advancing their professional status. Our findings show that poorly defined roles decrease social workers' feelings of efficacy and can lead to conflict and confusion within teams. Further, social workers often do not have access to professional development to advance their skills; however in the cases where interdisciplinary teams are clear on roles, provide professional development for their employees, and recognize members' contributions the experience is overall positive.

References

**In this Together: What it means to be an “Ally” for Graduate Students Exploring Indigenous Social Work**

Kimberly Van Patten

**Purpose:** As graduate students in social work, we are invited to engage in reflexive practices to assist us in the construction of our future social work identities. Within this process, we are encouraged to examine our social identities and positionalities so that we may be grounded in this awareness during our practice. Inspired by the shared reflections of my self-identified, non-Indigenous classmates in the Master of Social Work (MSW) program at the University of Calgary, this paper examines an Indigenous approach to what it means to be an “ally” to Indigenous people and communities within the field of social work. **Methodology:** The Four Directions of the Medicine Wheel are used as a guide to discuss this process. Key themes from the literature in the areas of Indigenous social work and social work education, practice, and theory are presented.

**Practice Outcomes:** I present a framework for MSW students on what it means to be an ally from an Indigenous approach, including expectations for social workers who self-identify as Indigenous allies.

**Discussion:** This work is intended to build on ally models of social justice through the deliberate use of an Indigenous perspective.

**References**


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Subversion of dendritic cell phagosomal maturation by disruption of actin remodeling is an important virulence factor of Cryptococcus gattii

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Cryptococcus gattii is an emerging hypervirulent fungal pathogen in the Pacific west coast of Canada and the United States. Investigations of the pathogenesis of this fungus have suggested that C. gattii infected hosts are challenged with a dysfunctional cell-mediated adaptive immunity. Recent studies have shown that C. gattii subverts dendritic cell antigen processing function, which results in a failed activation of T cells. Here we investigate the processing of C. gattii when phagocytized by dendritic cells leading to antigen presentation. Confocal microscopy images revealed that phagosomes containing the capsulated R265 and R272 strains of C. gattii are surrounded by a layer of bundled actin compared to the acapsular strain, R265ΔCap59. Phagosomes surrounded by actin failed to display lysosomal markers, suggesting a failure of lysosome fusion and thus, phagosomal maturation, which is critical in the antigen processing and presentation pathway. Disruption of the actin around the phagosomes containing the capsulated strains of C. gattii with cytochalasin D restored lysosomal fusion. Furthermore, the addition of purified bacterial lipopolysaccharide (LPS) to dendritic cell media after phagocytosis of C. gattii increased lysosomal fusion, indicating the importance of pattern recognition receptor (PRR) mediated signal transduction in the restoration of phagosomal maturation. Actin cytoskeleton remodeling is an important mechanism for dendritic cell function and survival. Disrupting this crucial host cell function is a novel strategy that C. gattii uses to prevent maturation of phagosomes, which may support intracellular fungal survival. We speculate that the formation of a persistent bundled actin layer around the phagosomes is a critical mechanism of virulence employed by C. gattii that blocks T cell-mediated adaptive immunity and aids in the survival of fungus in immunocompetent individuals.

Relevant references:

Indigenous Education: A Call to Action
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This paper is an exploratory study presenting current literature about incarcerated Indigenous offenders in Canadian correctional facilities, who are thought to be suffering from Fetal Alcohol Syndrome Disorder (FASD). FASD is a permanent and often debilitating disease that may lead to secondary conditions, increasing the likelihood of Indigenous peoples coming into contact with both provincial and federal justice systems. Actual numbers of Indigenous FASD offenders remain unknown, therefore, I present estimates of FASD sufferers among Indigenous people who are currently incarcerated.

Included in this paper is Canada’s Truth and Reconciliation Commission’s Call to Action #34 – which calls upon governments to undertake reforms to the criminal justice system to better address the needs of Indigenous offenders inflicted with FASD.

I discuss how FASD, first identified in the 1970s, has become politicized and stereotyped by ascribing its prevalence to the moral failure of Indigenous women who are said to drink to excess, more than other women, during pregnancy. I explore the literature that relates to the social and environmental realities that many Indigenous communities face – the inter-generational links between residential schools, mass adoption in the 1960s and 1970s – as reasons for the prevalence of FASD, which ultimately, may lead to increased contact with justice systems. I present literature that shows that while Indigenous people are increasingly over-represented in the criminal justice system, there is scant literature that shows them being incarcerated because of behaviors stemming from FASD, thereby we fail to seek appropriate solutions or mitigation at a social, cultural or community level.

The paper concludes by presenting current practices of Indigenous communities and organizations that seek to counter the deleterious effects of FASD through culturally appropriate means. I also present recommendations for future research.
Towards an Evaluation of Community-Based Physical Activity Programs for Childhood Cancer Survivors
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Purpose: Childhood cancer survival rates have increased to > 80%, but there are many negative physical and psychosocial implications of cancer treatment (Baumann, Bloch & Beulertz, 2013). Fortunately, preliminary research supports physical activity (PA) in childhood cancer survivors as both safe and feasible, and aids in reducing many of the adverse side effects of treatment. The next step is to determine how this research translates into community-based programs. One such evidence-based program is the PEER program, which is one of only a few existing community-based programs for pediatric cancer patients (Chamorro-Viña et al., 2013). As one step in this translation, a battery of assessment tools must be compiled to assess the PEER program effectiveness.

Research Question: What are feasible assessment tools that can be used to evaluate PEER, a community-based PA program for childhood cancer survivors?

Methods: The knowledge-to-action framework will be used as a framework to aid in determining feasible and sustainable assessment tools. An initial literature review will be conducted to determine evaluation tools used to date in pediatric oncology and community-based programs. Following the initial review, interviews will be conducted with key stakeholders to understand what they find valuable to achieve in PEER. Feedback from stakeholders may provide a wider range of measures that were not found in the literature review that may be important to the evaluation. The evaluation tools will be selected based on the literature review and feedback from key informants about the acceptability of the measures, the tools will then be tested for feasibility in the PEER program.

Conclusion: Preliminary research supports that PA is safe and feasible for childhood cancer survivors, thus it is important to understand how this research translates into community-based programs. Evaluation of the PEER program will provide additional evidence and support its sustainability as an important wellness resource for children with cancer.
Investigation of Depolarization as the Trigger for Lubricin and Hyaluronan Secretion from Non-Excitable Human Synovial Fibroblasts
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Osteoarthritis (OA) and Rheumatoid Arthritis (RA) are major global concerns and their treatment/preventative options are limited. A decrease in the amount of Hyaluronan (HA) and Lubricin, the two major components of the lubricating synovial fluid produced by synovial fibroblast cells, have been associated with an increased risk of OA and RA. Their secretion pathways remain unclear, however, calcium has been shown to play a major role. Depolarization has shown to increase intracellular calcium. Therefore, this study investigates the effect of using potassium to depolarize human synovial fibroblasts (HSF) and measure the changes in HA and Lubricin concentrations. HSF were cultured in 10% Fetal Bovine Serum (FBS) from two donors with either no potassium, 50mM potassium or 100mM potassium. TGFβ and PGE2, known stimulators of Lubricin and HA, respectively, were used as internal controls. After 12 hours their media was retrieved and the concentration of Lubricin was measured using the AlphaLISA assay, whereas HA was measured using the HA Elisa assay. The study was conducted in a single blind fashion and a Generalized Estimating Equation (GEE) analysis will be used to determine the significance of the differences between the groups. So far descriptive analysis of the data has shown an increase in both HA and Lubricin concentrations. Identifying a relationship between depolarization of HSF leading to the production of Lubricin and Hyaluronan could pave the way for the exploration new treatments and preventative options for OA and RA. Additionally, it would shed more light on their biochemical production pathway.

Relevant References
Exploring Canada’s Cybersecurity Policy Options through Scenario Planning

Erik Henningsmoen

Cybersecurity is an emerging issue in Canadian public policy discourse. Modern information and communications technologies (ICT) are essential for Canadian prosperity and economic growth, but such ICT systems are also vulnerable to cyberattacks by criminal organizations, activist groups, terrorists, and the intelligence agencies and military forces of rival states.

The World Economic Forum’s *Global Risks Report 2016* reports that cyberattacks were the top perceived geopolitical risk in North America in 2016. Cyberattacks have recently been used by state actors to augment conventional military operations, carry out industrial espionage, attack critical infrastructure and defence programs, and interfere with elections and democratic institutions.

This research proposal will establish a framework to explore Canada’s cybersecurity options in the face of a cyberattack through the use of scenario planning. Scenario planning exercises are widely used in business and in policy planning to help to provide foresight and clarity in complex, strategic environments. These scenarios are intended to help create narratives to crystalize strategic options and possible courses of action.
Consistent with Canada’s International Education Strategy, the proportion of international students at Canadian educational institutions is rising. Unfortunately, the challenges of adjusting to postsecondary education may be exacerbated for international students given that international students are highly susceptible to social isolation and prejudice. Fostering relationships between international and Canadian students that involve academic mentoring can facilitate adjustment to a new university, reduced psychological distress and reduced prejudice among Canadian students. Research examining the effectiveness of mentoring programs in Canadian universities, however, is sorely lacking. This study will examine the conditions under which mentorship relationships between international students and Canadian students last, and yield positive outcomes. A study of a mentorship program (in collaboration with a university international student services association) involving the formation of friendships between international and Canadian students will be conducted. International student mentees (N = 100) and a control group of international students (N = 100) will complete pre- and post- program questionnaires including measures of academic achievement, university adjustment, psychological distress, attitudes toward mentors and Canadian students generally, and perceived discrimination. Canadian student mentors’ (N = 100) attitudes toward mentees and international students generally will also be assessed. The findings of this study may provide recommendations to strengthen mentorship programs to both support international student success and positive relations between Canadian and international students, benefitting the university community as a whole.
Pilot study of supplementary motor area rTMS for Tourette’s syndrome in children
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Introduction: Tourette’s Syndrome (TS) is a disorder that affects more than 80,000 children in Canada. Treatment options for TS are limited and can carry significant risk of side effects. New interventions are needed. The goal of this study is to determine the effect of fMRI-guided, low frequency repetitive transcranial magnetic stimulation (rTMS) on the severity of tics and underlying neurobiology in children with TS. Using low frequency rTMS, we inhibit activity in an overactive region of the brain—the supplementary motor area (SMA). We hypothesize that (1) the severity of tics will decrease with treatment and (2) SMA GABA will increase while SMA glutamate will decrease in association with rTMS and clinical response.

Methods: Children aged 7-12 with moderate to severe tics are recruited from a pediatric TS clinic. Motor task fMRI generates personalized maps of the SMA that are uploaded to a TMS neuronavigation system. The participants, MRI, and TMS robotic system are co-registered for precise targeting of SMA. Treatment consists of 1800 low frequency (1 Hz) rTMS stimulations to the SMA at 100% resting motor threshold; 900 per hemisphere. Additional outcomes include mental health and symptom scales, SMA spectroscopy, safety and tolerability, and robotic TMS motor mapping. All measures are completed at baseline and post-treatment.

Results: The first three male participants are presented. All three show a significant decrease in tic severity (A:30%; B:23%; C:72%) and impairment (A:25%; B:50%; C:67%) after treatment; assessed using the Yale Global Tic Severity Scale. Multidimensional Anxiety Scale for Children scores decreased as well (A:2.4%; B:3.1%; C:5.9%). SMA glutamate levels also decreased (A:16.9%; B:2.2%; C:0.9%). Procedures were well-tolerated.

Discussion: Robot-driven, personalized, neuronavigated rTMS interventions appear feasible and well-tolerated in children with severe TS. Treatment combined with TMS and neuroimaging may inform mechanisms of action and predictors of responsiveness. This study is ongoing.
Integrating Social Studies Curriculum for the Practice of School Psychology
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Background: Integrating social skills intervention programming into classroom educational time can be challenging for school psychologists due to time constraints and limited resources. In order to optimize school psychologist exposure in classrooms, a potential solution is to incorporate social skills training and diversity education into the existing social studies curriculum.

Purpose: This research project will explore and combine research-based strategies and approaches to increase the efficacy of school psychology practice in the classroom. The expected outcome is a concise manual for school psychologists to use for understanding how to effectively collaborate with teachers using Alberta Education curriculum and evidence-based universal social skills interventions.

Objectives:
1. Apply a transdisciplinary approach to increase collaboration between school psychologists and teachers to promote diversity education in Canadian schools.
2. Provide students the opportunity to engage in meaningful interactions with fellow peers and their teachers that will consequently support the development of social skills.
3. Explore how the context of the social studies classroom is highly conducive for school observations required for psychological assessment.

Implications of Proposed Research: Increasing collaboration between teachers and school psychologists can efficiently integrate social skills training without consuming time needed to learn academic material. Universal classroom-based interventions such as diversity education, multiculturalism, and anti-bullying programs, naturally align with the Alberta social studies curriculum and support the goals of psychological development in the classroom. Additionally, school psychologists are able to conduct classroom observations for psychological assessment in a natural environment for the student that is more socially oriented than traditional academic courses that have less focus on social development.
Identification of validated case definitions for chronic disease using electronic medical records (EMRs): A systematic review

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Objective: Secondary data, derived from primary care electronic medical records (EMRs) are being used for research and surveillance. To broaden their usability, we must specify case definitions to identify important chronic conditions. The purpose of this study is to identify case definitions that have been validated in primary care EMR data.

Methods: We performed a systematic search of Embase and MEDLINE to identify studies that describe case definitions for clinical conditions in EMR data and reported the performance of these definitions using validity metrics (specificity, sensitivity, positive and negative predictive values). We compared the performance of different case definitions for the same conditions and explored the influence of data sources, jurisdiction, and patient population. Two independent reviewers screened abstracts and full-text articles. The quality the studies were evaluated using the QUADAS tool.

Results: The initial search produced 6664 articles after removing duplicates and 40 were selected for inclusion in the review. The majority were published between 2010-2016 (82.5%) and most took place in Europe (62.5%). Case definitions were identified for 47 acute and chronic conditions. There were multiple definitions for diabetes (n=8), colorectal cancer (n=2), depression (n=3), hypertension (n=6), chronic obstructive pulmonary disease (n=6), asthma (n=3), arthritis (n=3), and skin and soft tissue infections (n=2). The studies used International Classification of Disease version 9 (ICD-9) criteria and read codes along with laboratory values and medications for the algorithms. The most frequently used validity measure was positive predictive value (PPV). Most studies (70%) were found to have good quality (score > 3/6) using the QUADAS tool.

Conclusion: Our review of the literature found a significant number of validated case definitions with good accuracy for use in EMR data. Existing case definitions will serve as a starting point for the development of new case definitions and will enable better surveillance based on detailed clinical EMR data.