

**CULTURAL AND SOCIAL DETERMINANTS OF INDIGENOUS
PEOPLES OF CANADA'S PHYSICAL ACTIVITY AND SEDENTARY
BEHAVIOURS**

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By

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ABSTRACT

Introduction: Many Indigenous peoples take a wholistic approach to health and well-being which includes cultural, social, mental, and physical aspects of health. Improved physical activity (PA) and decreased sedentary behaviours (SB) have been shown to attenuate the risk of many chronic diseases. As Indigenous populations experience elevated risks for chronic diseases, PA and SB may be ideal targets for Indigenous health-related interventions. To date, little research is available on the sociocultural determinants of PA or SB in Indigenous peoples.

Objective: The objective of this study is to examine possible cultural and social determinants of PA and SB among Indigenous populations.

Methods: This research study followed the methodologies outlined in Chapter 9 of the Tri-Council Policy Statement 2, while also using a decolonizing lens, taking a strength-based approach, and overseen by an Indigenous community advisory group. Participants were self-identified, Indigenous students, staff, and faculty and were given the option of taking an online survey or interviewer administered survey. Factors evaluated were PA, SB, cultural connectedness, discriminatory experiences, social support, family influences, historic trauma, education, income, tobacco and alcohol use, home residence, sex, and gender.

Results: Indigenous students, staff, and faculty participated in this study for a total sample of 124 people. Cultural connectedness was positively associated with PA in First Nations and Cree participants but negatively associated in Métis participants. Social support was found to be positively associated with muscle strengthening activities. Physical activity of participants who experienced, or had a family member experience, residential school or foster care was influenced by this historic trauma. Overall Indigenous participant's PA was negatively associated with living in a northern community and being female. Métis peoples who were more physically active were

found to be less sedentary. Overall Indigenous participant's SB were negatively associated with discriminatory experiences, income, and living off-reserve. No associations between PA or SB were found when examining education, tobacco and alcohol use, and gender.

Conclusion: Cultural connectedness, discriminatory experiences, social support, family influences, historic trauma, income, home residence, and sex seem to be determinants of PA and/or SB; while education, tobacco and alcohol use, and gender do not.

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There are these two young fish swimming along and they happen to meet an older fish swimming the other way, who nods at them and says, "Morning, boys. How's the water?" And the two young fish swim on for a bit, and then eventually one of them looks over at the other and goes "What the hell is water?"

-David Foster Wallace

DEDICATION

To my family and lifelong friends: my water.

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CHAPTER 1

1.1 INTRODUCTION

Canada is a very beautiful and diverse country, which is inhabited by many distinct and diverse populations (Moodley, 1995). Indigenous peoples are one of these populations that make Canada such a great country. The term Indigenous peoples of Canada, is a broad term describing the original inhabitants of Canada, encompassing all First Nations, Inuit, and Métis people of Canada (Parrott & Filice, 2018). The Indigenous peoples of Canada came to this land over 14 000 years ago and have lived all across Canada, and continue to do so since the arrival of European peoples (Nair, 2017; Overy, 2008). In 2016 there were approximately 1 673 780 people who identified as Indigenous in Canada, this includes 977 235 First Nations, 587 545 Métis, and 65 025 Inuit (Statistics Canada, 2017). Since 2006, the Indigenous population has grown by 42.5%, which is growth four times larger than non-Indigenous populations (Statistics Canada, 2017). With over half of Indigenous peoples in Canada living in the Western provinces; Saskatchewan is home to 175 015 Indigenous peoples, which makes up over 16% of Saskatchewan's inhabitants (Statistics Canada, 2017). Indigenous peoples make up a large proportion of the population in Canada and Saskatchewan, and Indigenous people contribute to the diversity and strength of this country.

Indigenous peoples in Canada not only contribute to the ethnic diversity of Canada, but Indigenous cultures are also very diverse themselves (Government of Canada, 2018). Aboriginal

is a Western term that has been used to describe Indigenous peoples (Marks, 2018). Indigenous people's numerous communities have a variety of different cultures and ways of life; for example, there are 634 First Nations inhabiting in Canada with over 50 distinct languages being spoken amongst them (Gadacz & Parrott, 2015). Inuit is a term that refers to those who first inhabited the land, and whom inhabit the northern areas of Canada (Aodla Freeman, Pedersen, & Parrott, 2015). During the fur trade in Western Canada, a growing number of Indigenous women and European fur traders married and established distinct communities separate from other Indigenous or European communities (Gaudry & Agnes Welch, 2016; Métis National Council, n.d.). The Métis people were born out of these communities with their own unique culture, traditions, language, and way of life (Gaudry & Agnes Welch, 2016; Métis National Council, n.d.). Many Indigenous cultures also recognize five genders: male, female, two-spirited male, two-spirited female, and transgender (Jacobs, Thomas, & Lang, 1997). Indigenous peoples across Canada, including First Nations, Métis, and Inuit vary greatly in their ancestry, languages, and gender roles.

Overall, the majority of Indigenous lifestyles included hunting, fishing, gathering, and farming (Fredericks, 1999). Indigenous peoples were typically shown to have lived in hunter/gatherer societies, which were much more physically active lifestyles than those of present day (Dapice, 2006). Indigenous peoples were traditionally recognized as taller and stronger than the average European, with historical populations healthier than current populations (Dapice, 2006; J M Prince, 1995; Joseph M. Prince & Steckel, 2003; Steckel & Prince, 2001). When examining skeletal remains of populations in the Western Hemisphere, Indigenous peoples in North America experienced some of the highest health indexes (Steckel,

Rose, Larsen, & Walker, 2002). Indigenous peoples lived a variety of lifestyles and were recognized as a very strong and healthy population.

Contributing to the strength and health of Indigenous peoples was their wholistic approach to health and well-being, including the Medicine Wheel which is a common symbol for wholism in Indigenous culture (Dapice, 2006). The Medicine Wheel combines aspects of mental, emotional, physical and spiritual health to create a wholistic approach to health and well-being (Dapice, 2006). In many Indigenous cultures, these elements are believed to be interrelated and dependent of each other; thus a balance of all four aspects is needed to achieve personal health (K. Wilson, 2003). Within many First Nations cultures, a personal imbalance or disharmony of the spirit is believed to result in illness for that such person (Nauman, 2007). A lack of connection to tradition and culture is frequently recognized as a cause for many social problems experienced by Indigenous peoples (Health Canada, 2003; Walters & Simoni, 2002). This Indigenous, wholistic approach to health portrays all aspects of life (mental, emotional, physical and spiritual) interrelated and essential for health and well-being.

1.1.1 Self-Situating

Even though the focus of this reasearch is quantitative, I still wish to provide the reader a brief background on myself. I believe this would be beneficial for the reader to see my positionality and what has shaped my views on the various topics discussed. I will discuss how I came to studying physical activity and sedentary behaviours with Indigenous populations.

My name is Avery Ironside, I am a non-Indigenous, able bodied, male of European-descent. I grew up in the rural, farming community town of Elrose, Saskatchewan. I have a very supportive and loving family which includes two sisters and three brothers. I have always been

very physically active throughout my life; playing baseball, hockey, track and field, etc. Through this interest in sports and physical activity I came to the University of Saskatchewan to pursue a degree in the College of Kinesiology. After 4 years of undergraduate studies, I completed my Bachelor of Science in Kinesiology in the spring 2017. In pursuit of continuing my education, and with the hopes of entering a professional college, I began the Master's Program in the College of Kinesiology in the fall of 2017.

Growing up in rural Saskatchewan I had very minimal experiences with Indigenous culture. However, my family began fostering newborn babies when I was in highschool. We fostered two newborn babies, both of whom were from Indigenous families. Eventually after fostering the second Indigenous child for three years we adopted her into our family. Also, throughout my undergraduate degree, I began to learn more about Indigenous cultures and history. I was shown many of the unique aspects of Indigenous culture yet, the large inequities that exist between Indigenous and non-Indigenous peoples were also revealed to me. Thus, through discovering the need for Indigenous Allies and also having a First Nations sister I wanted to delve into Indigenous research within the College of Kinesiology. The goal of my Master's is to provide the Indigenous community with valuable information that can be used in a way which will benefit Indigenous families and individuals in Saskatchewan.

1.1.2 Significance of Study

Before European's came to Saskatchewan, Indigenous peoples had their own independent, diverse culture which varied from nation to nation (Overy, 2008). Yet, when European peoples began to colonize Canada, they also began to assimilate the Indigenous peoples to their own European culture (Macdonald & Steenbeek, 2015). This assimilation was

forced and carried out through a number of injustices (Macdonald & Steenbeek, 2015). This forced assimilation has led to increased traumatic life events, violent crimes, child abuse and neglect, unresolved grief and mourning, discrimination, and the loss of culture and way of life for many Indigenous groups (Walters, Simoni, & Evans-Campbell, 2002). The effects of this historic trauma can still be seen today. However, work is being done to reconcile the wrong doings of the past.

Nonetheless, large inequities still exist in Canada due to this historic trauma (Canadian Human Rights Commission, 2013). These inequities have led to disadvantages that Indigenous peoples must consistently face throughout their lives (Canadian Human Rights Commission, 2013). These disparities not only impact Indigenous peoples, but Canada as a whole.

Considerable research has been done focusing on these inequities, and the deficits they cause within Indigenous populations (Bartlett, Iwasaki, Gottlieb, Hall, & Mannell, 2007). However, this deficit, victim blaming approach is seen as regressive, and has potential to cause more harm than good within Indigenous communities (Bartlett et al., 2007; Pyett, Waples-Crowe, & Sterren, 2008). This paper will aim in taking a positive strength-based approach to research, yet certain inequities need to be highlighted to signify the importance of this research.

When looking at economic status of Indigenous peoples in Canada, the inequities caused by historic trauma are quite visible. The Canadian Human Rights Commission (2013) reported that Indigenous peoples have a lower household average income after tax compared to non-Indigenous peoples. Also, Indigenous peoples are more likely to collect employment insurance and social assistance than non-Indigenous peoples (Canadian Human Rights Commission, 2013). Indigenous men are 8% less likely to hold employment throughout the year compared to non-Indigenous men (Canadian Human Rights Commission, 2013). This historic trauma has also led

to inequities which affected the education many Indigenous people have been receiving; 29% of Indigenous peoples did not graduate high school and Indigenous adults are half as likely to go to University as non-Indigenous adults (Canadian Human Rights Commission, 2013). Also, when compared to non-Indigenous peoples, Indigenous peoples are more likely to experience racism while at an educational institution (Canadian Human Rights Commission, 2013). These inequities caused by historic trauma can be seen in the social and economic aspects of the Indigenous culture, but are increasingly evident in the health aspects as well (Adelson, 2005).

Contributing to the strength and health of Indigenous peoples was their wholistic approach to health and well-being, including the Medicine Wheel which is a common symbol for wholism in Indigenous culture (Dapice, 2006). The Medicine Wheel combines aspects of mental, emotional, physical and spiritual health to create a wholistic approach to health and well-being (Dapice, 2006). In many Indigenous cultures, these elements are believed to be interrelated and dependent of each other; thus a balance of all four aspects is needed to achieve personal health (K. Wilson, 2003). Within many First Nations cultures, a personal imbalance or disharmony of the spirit is believed to result in illness for that such person (Nauman, 2007). A lack of connection to tradition and culture is frequently recognized as a cause for many social problems experienced by Indigenous peoples (Health Canada, 2003; Walters & Simoni, 2002). This Indigenous, wholistic approach to health portrays all aspects of life (mental, emotional, physical and spiritual) interrelated and essential for health and well-being.

A variety of inequities can be found when looking at Indigenous health. The stress of historic trauma, which is the term used to describe the long-term impacts of colonization and cultural suppression (Hatala, Desjardins, & Bombay, 2016), has led to increased rates of HIV, morbidity, alcohol/drug use and dependence, and mental health issues such as anxiety and

depression (Walters et al., 2002). Obesity rates of Indigenous populations are higher, which also increases risks of other chronic diseases (Betancourt et al., 2017). Indigenous adults are less likely to have “excellent” mental health than their non-Indigenous counterparts (Canadian Human Rights Commission, 2013). When receiving health care, Indigenous peoples are more likely to experience racism and discrimination (Canadian Human Rights Commission, 2013). Indigenous peoples have a higher risk of developing chronic diseases including cardiovascular diseases, diabetes, and respiratory diseases (Reading, 2009). The effects of historic trauma can be seen throughout discrepancies in Indigenous health including the increased rates of chronic disease.

Chronic disease is a major issue in Canada. In 2016, the Canadian Government spent 228 billion dollars on health care (Krueger et al., 2017), of which 67% of these costs are typically attributed to the treatment of chronic diseases (Public Health Agency of Canada, 2011). Indigenous peoples face elevated risk for these chronic diseases (Reading, 2009). With the rates of chronic disease rising, Canada must start to look for solutions to decrease these rates and increase the health of its citizens (Elmslie, 2011).

Many Indigenous peoples approach health and well-being through a wholistic view, which is commonly represented by The Medicine Wheel (Dapice, 2006). The Medicine Wheel combines aspects of mental, emotional, physical and spiritual health; all of which are interrelated and dependent on each other and a healthy balance is needed to have good personal health (Dapice, 2006; L. F. Lavallée, 2007). It is believed in many First Nation cultures that an imbalance in these aspects may result in a physical illness (Nauman, 2007). Historic trauma leading to increased risk of illness is an example of how these imbalances in all four aspects of The Medicine Wheel are associated with health. Physical activity has been found to not only

combat the effects of chronic disease but it has also been found to interconnect and balance the four aspects of wholistic, Indigenous health (L. F. Lavallée, 2007; Warburton, Nicol, & Bredin, 2006b).

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (World Health Organization, 2010). Physical activity is known to counter the effects of chronic disease, sedentary behaviours, and obesity (Warburton, Nicol, & Bredin, 2006a). There is a linear relation of physical activity to health status; as physical activity increases so does overall health (Warburton et al., 2006a). However, there has been a decrease in physical activity (compared to the 1990s), along with an increase in chronic disease, obesity, and sedentary behaviours of Indigenous populations in Canada (H. J.A. Foulds, Warburton, & Bredin, 2013; Harris et al., 2002; Reading, 2009). Physical activity is a significant determinant of health that can be feasibly changed among Indigenous populations (Gracey & King, 2009a). Thus, effective Indigenous chronic disease/health interventions should address physical activity. An increase in physical activity among Indigenous populations would decrease risk of chronic disease as well as other health issues, and ultimately benefit Indigenous health across Canada (H. J.A. Foulds et al., 2013).

If an Indigenous community wished to effectively increase physical activity in their community long term, the intervention must address the upstream determinants of physical activity in that specific community (Williams, Costa, Odunlami, & Mohammed, 2008). Just as the balance of mental, physical, emotional, and spiritual factors influence Indigenous people's health, physical activity is also influenced by a multitude of factors throughout one's life. In the general population, physical activity is determined by many factors: income, education, personal health, social support, community, and family influences (Wendel-Vos, Droomers, Kremers,

Brug, & van Lenthe, 2007). Thus, a change in one of these factors could have an impact on physical activity. A determinant is something that identifies the nature of a specific factor (Merriam-Webster Dictionary, 2019b). Currently, there is very little understanding of the determinants of physical activity for Indigenous populations living in Canada, especially evaluating cultural and social determinants (Coble & Rhodes, 2006).

Some of the social and cultural factors that may be associated with physical activity are income, education, social support, cultural connectedness, sedentary behaviours, unhealthy behaviours, discriminatory experiences, gender, sex, and family influences (Bennie et al., 2015; Ferguson & Philipenko, 2016; Macniven et al., 2016; Mansoubi, Pearson, Biddle, & Clemes, 2014; Mesters, Wahl, & Van Keulen, 2014; Saewyc, Tsuruda, Homma, Smith, & Brunanski, 2013; Trost, Bauman, Sallis, & Brown, 2002; H. J. Wilson et al., 2014). Income and education are significant determinants of physical activity; low income and educational attainment can pose many barriers to physical activity (Parks, Housemann, & Brownson, 2003). Social support also plays a significant role in determining physical activity; a good base of social support is associated with more likelihood of being active (Carron, Hausenblas, & Mack, 1996; Sawyer, Ucci, Jones, Smith, & Fisher, 2017). Some social factors such as social support, income, and education have been extensively studied as determinants of physical activity for non-Indigenous population (Allender, Cowburn, & Foster, 2006; Bennie et al., 2015; Chrisman, Nothwehr, Yang, & Oleson, 2014; Macniven et al., 2016; McNeill, Kreuter, & Subramanian, 2006; Mesters et al., 2014; Parks et al., 2003; Plotnikoff, Mayhew, Birkett, Loucaides, & Fodor, 2004; Wendel-Vos et al., 2007; Wenthe, Janz, & Levy, 2009). More research on these well-known determinants of physical activity in general populations is needed to support them as determinants in Indigenous populations as well.

Since Indigenous and non-Indigenous cultures and lifestyles differ, it is possible that what determines each group to be physically active is different as well. Through consultation with the Indigenous community in Saskatoon and on the University of Saskatchewan campus, other social and cultural factors have been identified that may play a role in determining Indigenous people's physical activity; such as cultural connectedness. An association between cultural connectedness and physical activity has not been studied within Indigenous populations. Strong cultural identity and connectedness have been associated with increased health (Angela Snowshoe, Crooks, Tremblay, & Hinson, 2017; Walters et al., 2002). Cultural connectedness can act as a coping mechanism to combat historic trauma, thus increasing personal and community health (Walters et al., 2002). Cultural connectedness is associated with higher self-esteem (Saewyc et al., 2013) and increased positive mental health (A. Snowshoe, 2014; Angela Snowshoe et al., 2017). A higher degree of cultural connectedness is associated with lower binge drinking, and more exercise days per week within Indigenous youth populations (Saewyc et al., 2013). Stronger Indigenous cultural identity may also be associated with increased involvement in many physically active traditions such as hunting, trapping, dancing, and ceremonial proceedings. Cultural connectedness has the potential to be associated with physical activity and other possible determinants of physical activity, such as social support, unhealthy behaviours, discriminatory experiences, and family influences of physical activity. Other social and cultural factors have also been brought to our attention that may influence Indigenous people's physical activity and have thus been examined in this study.

Over the last several decades, due to colonization, Indigenous peoples have been forced to live a more sedentary lifestyle, restricting their mobility to living on reserves (S. Anderson, Currie, Copeland, & Metz, 2016). Sedentary behaviour is defined as any activity performed

while awake that involves little to no energy expenditure (< 1.5 METS) while in a sitting or reclined position (Sedentary Behaviour Research Network, 2012). The two most common sedentary behaviours among Indigenous adults are watching television and being on the computer (S. Anderson, Currie, Copeland, et al., 2016). Sedentary behaviours are a modifiable determinant of health, and is known to increase risks of cardiovascular disease, obesity, diabetes, cancer, depression, and overall mortality (Blodgett, Theou, Kirkland, Andreou, & Rockwood, 2015; Ekelund et al., 2016; Proper, Singh, Van Mechelen, & Chinapaw, 2011). Excessive sedentary behaviours can also have an effect on mental function. Sedentary behaviours are associated with poor well-being, depression, and weaker cognitive function (Iannotti et al., 2009; Y. D. Miller, 2010; Syväoja, Tammelin, Ahonen, Kankaanpää, & Kantomaa, 2014; Teychenne, Ball, & Salmon, 2010).

Physical activity has a negative correlation with sedentary behaviours, where increased physical activity may be associated with decreased sedentary behaviours (Mansoubi et al., 2014). Physical activity has been found to decrease the risk of chronic disease associated with sedentary behaviours, yet it does not remove the risk completely (Ekelund et al., 2016). An increase in physical activity leading to a decrease in sedentary behaviours may have a two-fold benefit on health. It has been theorized that reducing sedentary behaviours may be just as important as increasing physical activity (Sugiyama, Healy, Dunstan, Salmon, & Owen, 2008).

In summary, Indigenous peoples are an integral part of Canada. Yet, due to historic injustices, Indigenous peoples in Canada face many inequities throughout their lives (Philpott, 2018). These inequities have had many consequences including decreased Indigenous health (Philpott, 2018). Nonetheless, literature and Indigenous history has shown that being active has helped Indigenous peoples maintain physical strength, fitness, and health throughout all stages of

life from childhood to old age (National Collaborating Centre for Aboriginal Health, 2013). Yet, there is minimal research on the upstream determinants of physical activity or sedentary behaviours for Indigenous peoples living in Canada.

1.1.3 Overview

This cross-sectional, quantitative study aims to work with the Indigenous students, staff, and faculty on the campus of the University of Saskatchewan, in a culturally respectful, collaborative, and sensitive way to discover possible Indigenous specific determinants of physical activity and sedentary behaviours. There are three main objectives that this study aims to accomplish in collaboration with the Indigenous students, staff and faculty on campus. The first objective of this study is to evaluate the possible cultural determinants of physical activity for Indigenous people. Through collaboration with the Indigenous community in Saskatoon, various cultural factors were brought to our attention that may impact physical activity of Indigenous peoples. Cultural connectedness and experiences of discrimination have been shown to impact Indigenous health (A. Z. Dawson, Walker, Campbell, & Egede, 2015; Ferguson & Philipenko, 2016; Poon, Homma, Saewyc, & Smith, 2010; Saewyc et al., 2013; Siddiqi, Shahidi, Ramraj, & Williams, 2017; A. Snowshoe, 2014). As cultural connectedness and discriminatory experiences impact Indigenous health, these factors may also be determinants of physical activity of Indigenous peoples. There is some support for the idea that cultural connectedness and discriminatory experiences may be a determinant of physical activity for Indigenous people, but greater understanding is needed (Ferguson & Philipenko, 2016; Gates, Hanning, & Tsuji, 2015).

The second objective of this study is to examine the possible social determinants of physical activity among Indigenous people. Social support, education, income, sedentary

behaviours, gender, and sex have all been discovered as determinants of physical activity (S. Anderson, Currie, Copeland, et al., 2016; Bennie et al., 2015; Heather J.A. Foulds, Bredin, & Warburton, 2012; Macniven et al., 2016; Mansoubi et al., 2014; McNeill et al., 2006; Ryan, Cooke, Kirkpatrick, Leatherdale, & Wilk, 2017a; Trost, Bauman, et al., 2002; H. J. Wilson et al., 2014) yet, the relevance of these physical activity determinants to Indigenous populations remains unclear or unknown. Family influences and tobacco and alcohol behaviours have both been shown to impact physical activity of non-Indigenous populations (Bauman, Sallis, Dzewaltowski, & Owen, 2002; Bennie et al., 2015; Trost, Bauman, et al., 2002). Residential school attendance, foster care attendance, home residence, and tobacco and alcohol use have all been identified as determinants of Indigenous peoples health (S. Anderson, Currie, Copeland, et al., 2016; Czyzewski, 2011; Frohlich, Ross, & Richmond, 2006; Kelly-Scott & Smith, 2015; Sinclair, 2007a). There is a need for these social factors to be further evaluated as possible determinants of physical activity specific to Indigenous peoples.

The final objective of this study is to explore possible determinants of sedentary behaviours specific to Indigenous peoples. Physical activity, cultural connectedness (community belonging), and income are the few determinants of sedentary behaviours that have been identified among Indigenous populations (S. Anderson, Currie, Copeland, et al., 2016; Mansoubi et al., 2014; H. J. Wilson et al., 2014). This study evaluates a broader range of potential determinants of sedentary behaviours among Indigenous peoples including, discriminatory experiences, social support, education, tobacco and alcohol use, and home residence. This study accomplishes these objectives by collaborating with the Indigenous community and using culturally sensitive approaches.

Being a non-Indigenous person wishing to conduct research within Indigenous communities, I took a culturally sensitive, strengths-based, collaborative approach. I strove to be culturally sensitive by gaining knowledge on Indigenous topics and issues through the tutelage of my graduate supervisor, through my graduate courses and professors, as well as through meetings and encounters with those in the Indigenous community. Indigenous research in the past has commonly been from a deficit-based approach; focusing on the negative inequities when comparing Indigenous populations to other non-Indigenous populations, leading to a negative, problem focused portrayal of Indigenous communities (A. Dawson, Toombs, & Mushquash, 2017). Even though some inequities must be discussed to highlight the significance of this study, our goal is to take a strength-based approach. The strength-based approach for Indigenous research includes highlighting the positives and strengths of Indigenous peoples and cultures (Jardine, Genius, Lukasewich, & Tang, 2016). Taking a strengths-based approach has been shown to promote Indigenous culture, empowerment, identity, and leadership (Jardine et al., 2016). We have also focused on collaborating with the Indigenous community throughout this entire study. Many formal and informal meetings were had between myself, my supervisor, and members of the Indigenous community. At these meetings we listened to Indigenous community members' thoughts, concerns, and points of pride in relation to physical activity of Indigenous peoples. A Community Advisory Committee was also formed including Indigenous members from campus: an undergraduate student, graduate student, faculty member, staff member, and Indigenous Elder. This Community Advisory Committee aided in collaboration throughout the methods, data collection, and data interpretation of this study, and also aided in ensuring this study was culturally sensitive with authentic intentions. To further maintain this study as

culturally sensitive, utilizing a strength-based, collaborative approach, we ensured that there were multiple resources in place.

To achieve the objectives of this study, examining possible determinants of physical activity and sedentary behaviours among Indigenous peoples, we wished to ensure our methods were respectful and effective. Indigenous community members who formed the Community Advisory Committee and other Indigenous members of the community aided in forming the methods and procedures for this study. Online and in-person interviews were utilized. Recruitment and promotion of these surveys were done through University of Saskatchewan media channels, members of the Community Advisory Committee, Indigenous faculty and staff members, and by word of mouth. The Community Advisory Committee aided in interpreting the results and organizing the sample population into appropriate Indigenous groups to avoid pan-Indigenity. Through collaboration with the Community Advisory Committee and the Indigenous community we believe our methods were effective while still being culturally authentic and respectful.

In consequence of having sound, appropriate methods through collaboration with the Indigenous community we were able to meet our objectives and have significant, conclusive findings. These significant findings would not have been discovered without the aid and partnership between the Indigenous community on campus and the researchers of this study.

This research identified possible determinants of physical activity and sedentary behaviours for Indigenous peoples through a culturally sensitive, strength-based, collaborative approach. The findings from this study will be presented to the Indigenous community on the University of Saskatchewan campus and more broadly in Saskatoon, and the Indigenous community will be encouraged to use the results in any ways that they deem appropriate. It is

hoped that the results from this study could be used in positive ways to improve the lifestyles and health of the Indigenous communities of Saskatchewan.

1.2 REVIEW OF LITERATURE

1.2.1 Physical Activity among Indigenous Peoples

Indigenous populations living in Canada have higher physical activity compared to their non-Indigenous counterparts (H. J.A. Foulds et al., 2013). Yet Indigenous peoples have higher rates of diabetes, obesity, cardiovascular disease, and other chronic conditions than non-Indigenous peoples (Anand et al., 2000; Belanger-Ducharme & Tremblay, 2005; H. J. A. Foulds, Bredin, & Warburton, 2011; Hegele & Pollex, 2005; Liu, Hanley, Young, Harris, & Zinman, 2006). Over the last several decades, the introduction of western culture, and shift from Indigenous way of life, has led to a decrease in physical activity in Indigenous populations (H. J.A. Foulds et al., 2013). A decrease in physical activity has led to an even greater risk for developing chronic diseases (H. J.A. Foulds et al., 2013). Thus, even though Indigenous populations have higher physical activity, they also have higher rates of chronic disease when compared to non-Indigenous populations.

Chronic disease rates can be combated with physical activity (Warburton et al., 2006a). Physical inactivity is also associated with increased risk of chronic disease, and is defined as a lack of body movement caused by the contraction of skeletal muscles in which energy is expended (Booth, Roberts, Thyfault, Ruegsegger, & Toedebusch, 2017). However, recent studies have shown that few Indigenous peoples are active enough to achieve health benefits (H. J.A. Foulds et al., 2013). Objective measures have found that low proportions of Indigenous peoples in Canada and the United States are meeting physical activity recommendations (H. J.A. Foulds

et al., 2013). Few Indigenous adults met the physical activity recommendations in the United States or Canada: 27% when self-reporting and only 9% when using an accelerometer (H. J.A. Foulds et al., 2013). Also, 27% of Indigenous children met the physical activity guidelines when self-reporting, and 46% when using an accelerometer (H. J.A. Foulds et al., 2013). Only 7.4% of Saskatoon Tribal Council on reserve, Indigenous youth met the Canadian Society for Exercise and Physiology's physical activity standard (Lemstra, Rogers, Thompson, & Moraros, 2013). In summary, there is room for improvement in physical activity among Indigenous peoples in Canada (H. J.A. Foulds et al., 2013; Lemstra et al., 2013).

Current Indigenous peoples living in Canada may have higher rates of physical activity compared to non-Indigenous peoples, however these rates are still not adequate, and Indigenous health risks are still greater. Overall, physical activity is decreasing, especially in on-reserve, rural, and northern Indigenous communities (Heather J.A. Foulds et al., 2012; Kolahdooz, Sadeghirad, Corriveau, & Sharma, 2017). There is a clear benefit to increasing physical activity among Indigenous communities (H. J.A. Foulds et al., 2013). Increasing physical activity would decrease the risk of developing chronic diseases, and ultimately benefit Indigenous health. This can be done through well informed, effective, collaborative, physical activity and health interventions in Indigenous communities.

1.2.2 Possible Cultural Determinants of Physical Activity

1.2.2.1 Cultural Connectedness

Culture is defined as a set of customary beliefs, social forms, and material traits of racial, religious, or social group (Merriam-Webster Dictionary, 2019a). Cultural connectedness is a social factor that affects Indigenous peoples' health somewhat uniquely (Gates et al., 2015).

Cultural connectedness, a measure of attachment, sense of belonging, and group identification, is a fundamental concept of human life (Davis, 2012). In recent past, Indigenous peoples have struggled in a western society to maintain their own racial identity (group identification), leading to a multitude of imbalances in their lives (Sinclair, 2007b). Studies have recently identified a link between cultural connectedness and personal health (Davis, 2012; Gates et al., 2015; Macniven et al., 2016; Poon et al., 2010; Rae, Jones, Handal, Bluehorse-Anderson, & Frazier, 2016; Saewyc et al., 2013; Angela Snowshoe et al., 2017). An increase in cultural connectedness in Indigenous youth groups decreases the risk of partaking in unhealthy behaviours, and increases in the likelihood of partaking in healthy behaviours (Poon et al., 2010; Saewyc et al., 2013). Cultural connectedness is also positively associated with improved Indigenous youth mental health (A. Snowshoe, 2014). These studies affirm that cultural connectedness is an important determinant of Indigenous health (Poon et al., 2010; Saewyc et al., 2013; A. Snowshoe, 2014).

However, there have also been controversial findings on cultural connectedness within Indigenous populations. Spiritual balance, living in a community with strong First Nations language use, availability of traditional and cultural events predicted greater instances of depression in youth (Davis, 2012). On-reserve youth populations, despite having a high degree of cultural connectedness, reported poor health rates and increased prevalence of risk behaviours (Saewyc et al., 2013). Cultural connectedness alone may not attribute to a healthier lifestyle; poverty and historic trauma must be addressed as well (Saewyc et al., 2013). Overall, an association between cultural connectedness and Indigenous health has been found, yet the direction of the association is less definitive, and may be dependent on living on or off-reserve (Davis, 2012; Gates et al., 2015; Saewyc et al., 2013).

Cultural connectedness may also be a determinant of physical activity. Cultural connectedness has been associated with exercising more days per week in Indigenous youth populations (Saewyc et al., 2013). Greater cultural connection and community support was correlated with higher participation in physical activity with Indigenous youth on reserve (Gates et al., 2015). Also, when youth have more relatives who help them understand their culture, they are more likely to be physically active than youth who do not (Lévesque, Janssen, & Xu, 2015). A study done on a specific Indigenous population in the Yukon found that participants who were more enculturated (more involved in the process of learning about, identifying with, and practising traditional culture) were more likely to be highly physically active (Bersamin et al., 2014). In Métis communities, having attended a cultural event in the past year was associated with leisure time physical activity (Ryan, Cooke, Kirkpatrick, Leatherdale, & Wilk, 2017b). Studies suggest that physical activity interventions would be more effective if they incorporated a cultural component (Ryan et al., 2017b). These studies highlight a link between culture and physical activity, but no study has evaluated a direct association between cultural connectedness and physical activity among Indigenous peoples. Cultural connectedness is a complex topic, and more investigation is warranted between cultural connectedness and Indigenous health (Bennie et al., 2015; Davis, 2012; Ryan et al., 2017a).

1.2.2.2 Discriminatory Experiences

Discrimination in repetitive ways can become a chronic stressor which is adverse for health (R. Clark, Anderson, Clark, & Williams, 1999; Gee, Spencer, Chen, & Takeuchi, 2007). Discriminatory experiences have been related to unhealthy behaviours such as tobacco use, alcohol dependence, and prescription and illicit drug use (Gee, Delva, & Takeuchi, 2007;

Guthrie, Young, Williams, Boyd, & Kintner, 2002; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005; Landrine, Klonoff, Corral, Fernandez, & Roesch, 2006). Discriminatory experiences have also been linked to depressive symptoms (Wheaton, Thomas, Roman, & Abdou, 2018). Discrimination is associated with risk factors of chronic diseases (A. Z. Dawson et al., 2015; Siddiqi et al., 2017). Perceived discrimination is positively related to cardiovascular disease risk factors (Everson-Rose et al., 2015). Unhealthy behaviours such as, smoking and binge drinking, are also more abundant in populations with more perceived discrimination (Barr-Anderson et al., 2017; Borrell, Kiefe, Diez-Roux, Williams, & Gordon-Larsen, 2013; Chen & Yang, 2014; Rae et al., 2016). Members of minorities believe that racism contributes to high rates of morbidity and mortality in their communities (Cronin, Leary, & Russell, 2016). The effects of discrimination can be seen on various factors affecting health.

Discrimination also impacts physical activity. Perceived discrimination is viewed as a barrier to physical activity, and adversely associated to physical activity and sport, causing potential for more chronic disease risks (Barr-Anderson et al., 2017; Chen & Yang, 2014; Edwards & Cunningham, 2013a; McNeill et al., 2006). At the same time, the negative effects of community racism have been counteracted by increasing physical activity opportunities (Edwards & Cunningham, 2013a). One study in the United States found that African-Americans who experienced more discrimination were more physically active than those who did not experience discrimination (Borrell et al., 2013). Physical activity may act as a buffer to stresses caused by racism (Borrell et al., 2013); yet overall, discriminatory experiences have been negatively associated with rates of physical activity.

Discriminatory experiences may also be a determinant in Indigenous populations. Discriminatory experiences have been associated with racial differences in health within Black,

Hispanic, Asian, and Indigenous populations (A. Z. Dawson et al., 2015; Siddiqi et al., 2017). Indigenous youth experience more racism than non-Indigenous youth in a western physical activity setting (Bruner et al., 2016). As a result of physical activity in western settings, Indigenous youth are experiencing elevated discrimination (Bruner et al., 2016; McHugh, 2015; Robert J. Schinke, Amy T. Blodgett, Hope E. Yungblut, Mark A. Eys, Randy C. Battochio, Mary Jo Wabano, Duke Peltier, Stephen Ritchie & Recollet-Saikonnen, 2010). Indigenous university students have also identified racism and discrimination as barriers to physical activity (Ferguson & Philipenko, 2016). This racism and perceived discrimination can act as a limitation of physical activity for Indigenous peoples (Ferguson & Philipenko, 2016; McHugh, 2015). Physical activity interventions should focus on being accepting of all races and ethnicities, as physical activity is beneficial for all peoples, and discriminatory experiences are negatively associated with physical activity. There is limited quantitative research on the effects of discrimination on physical activity among Indigenous participants.

1.2.3 Possible Social Determinants of Physical Activity

1.2.3.1 Social Support

Social support is positively correlated with physical activity in many populations (Allender et al., 2006; Bennie et al., 2015; Chrisman et al., 2014; Parks et al., 2003; Plotnikoff et al., 2004; Wendel-Vos et al., 2007; Wenthe et al., 2009). Social support is a tool that many people use to overcome barriers to participating in physical activity (Allender et al., 2006). Social support is effective when provided from various sources such as a spouse, friends, and/or relatives (Chrisman et al., 2014; Macniven et al., 2016; Parks et al., 2003; Wenthe et al., 2009). Social support may be effective for increasing physical activity due to the increased motivation

and enjoyment the supporters provide (Allender et al., 2006). Opportunities for more social support can be incorporated into physical activity interventions to increase the potential effectiveness of these interventions (Kahn et al., 2002). For more information on social support as a determinant of physical activity see Appendix A: Systematic Review and Meta-Analysis on the Effects of Social Support on Physical activity; Authors: Avery Ironside, Caitlyn Kirkpatrick, and Dr. Heather J.A. Foulds.

Social support has also been positively correlated with physical activity in ethnic minorities (Macniven et al., 2016). Indigenous peoples place a lot of value in kinship, community, and family, thus potentially they could have increased social support when compared to non-Indigenous groups (National Collaborating Centre for Aboriginal Health, 2015). Indigenous athletes have identified social support networks as a key to their physical activity successes (L. Lavallée & Lévesque, 2013). Social support has also been associated with cultural connectedness which may also be a correlate of physical activity (Ryan et al., 2017b). Overall, social support is a well-established determinant of physical activity, however the relationship between social support and physical activity for Indigenous populations is less clear (Dishman, Sallis, & Orenstein, 1985; Taylor, Baranowski, & Sallis, 1994).

1.2.3.2 Family Influences

Family influences through support and encouragement of physical activity are positively associated with physical activity (Bauman et al., 2002; Dishman et al., 1985; Taylor et al., 1994; Trost, Bauman, et al., 2002). Yet it is unknown if this correlation is dictated by family history, family values, and/or parental role models of physical activity. There is very little understanding on family history, values, and role model influences on physical activity. One study has looked at

past family influences on physical activity, and found weak/mixed evidence of no association to physical activity (Bauman et al., 2002). Parents influence children's physical activity through being active role models, and offering support through organized physical activity (Edwardson & Gorely, 2010). A recent systematic review reported three articles that examined family influences on physical activity where one article determined family influences are a correlate, while one study was inconclusive, and the final study determined family influences was not a correlate (Bauman et al., 2012). Parental influence on adolescent's physical activity is inconclusive (Edwardson & Gorely, 2010). However, physical activity tracks well from youth to adulthood (Telama et al., 2014), thus if parental influences correlate in youth then this may affect physical activity into adulthood. There is minimal current literature on family influences on adult physical activity (Bauman et al., 2012).

There is no literature on Indigenous family history, family values, and/or parental role models of physical activity. As family support may be an important determinant of physical activity for non-Indigenous people (Bauman et al., 2012; Edwardson & Gorely, 2010), and family/kinship is a vital component of Indigenous culture (Absolon, 2010), family support for physical activity may also influence physical activity of Indigenous peoples. Thus, it may be possible that Indigenous family social support includes having family role models, instilling value of physical activity in youth, and a family history of being physically active. If family influences are found to be associated with physical activity for Indigenous participants, health interventions could incorporate family throughout the intervention to be more effective. More research is needed to determine if family has an impact on physical activity among Indigenous populations.

1.2.3.3 Residential School and Foster Care Experience

Beginning in the 1880s, Indigenous children were removed from their families and communities to residential schools which were characterised as systems of institutionalized education that lasted over 100 years until 1996 (Allan & Smylie, 2015). Indigenous children were forced to live at these schools, and faced various forms of abuse and neglect (Bombay, Matheson, & Anisman, 2014b). The goal of residential schools was to assimilate Indigenous children into European culture, and these motives have since been recognized as acts of cultural genocide (J. R. Miller, 2000; Neu, 2000). The “Sixties Scoop” refers to a period in Canadian history when thousands of Indigenous children were removed from their birth homes and placed in non-Indigenous environments (Sinclair, 2007b). The continued removal of Indigenous children from their homes led to an impedance of transmission of cultural values, beliefs and practices, and knowledge on parenting (Allan & Smylie, 2015). Historic trauma from residential schools and foster care experiences has created a collective wound among Indigenous peoples across Canada which has significantly impacted Indigenous health (Allan & Smylie, 2015; Brave Heart, 2003).

Those who attended residential school, were placed in foster care, or have a family member who experienced residential school or foster care have distinctively different health outcomes compared to those who do not have these experiences (Bombay et al., 2014b; First Nations Centre, 2005; Pearce et al., 2008; Sinclair, 2007a). Those who attended or had a family member attend residential school have increased rates of stress, depression, and risk of suicide (Bombay et al., 2014b). There is an increased risk of developing a learning disability, and participating in smoking behaviours if a family member or parent attended residential school (First Nations Centre, 2005). Those who are placed in foster care deal with stressors that lead to

increased risk of incarceration, substance abuse, and suicide (Sinclair, 2007a). Adoptees are most likely to experience poverty, alcoholism, and other negative stereotypes (Sinclair, 2007b). The trauma that residential schools and placement in foster care has caused throughout Indigenous history in Canada is still experienced by Indigenous peoples today, and the effects on their health can be seen.

The effects of residential school attendance and foster care experience are well known in Canada (Bombay et al., 2014b; First Nations Centre, 2005; Pearce et al., 2008; Sinclair, 2007a). However, the extent to which these experiences impact physical activity is unclear. There is no literature examining the extent residential schools or foster care experiences affect physical activity. One paper makes the extrapolation that due to historic trauma, Indigenous parents may be less likely to make optimal choices about physical activity for their children (Willows, Hanley, & Delormier, 2012). There is research highlighting how residential school and foster care experience may affect possible determinants of physical activity for Indigenous peoples (Bombay, Matheson, & Anisman, 2014a; Bombay et al., 2014b). Those who had a family member attend residential school are more likely to grow up in crowded homes with food and income insecurity (Bombay et al., 2014a). Income is a determinant of physical activity for non-Indigenous populations (Macniven et al., 2016; McNeill et al., 2006; Parks et al., 2003). As family residential school or foster care attendance affects income, this could affect physical activity as well (Sinclair, 2007a). Interestingly, minority groups which experience historic trauma are more likely to have an increased cultural identity (cultural connectedness) (Bombay et al., 2014b). Cultural connectedness could also be a determinant of physical activity that is influenced by family residential school attendance.

1.2.3.4 Education

Education has been associated with decreases in many unhealthy behaviours, and increases in many healthy behaviours such as physical activity (Bennie et al., 2015; McNeill et al., 2006; Mesters et al., 2014; Parks et al., 2003; Plotnikoff et al., 2004). Furthermore, lower education has also been associated with lower sedentary behaviours (Bennie et al., 2015). Education may be linked to physical activity through knowledge of personal wellness, or increased income associated with education may decrease barriers to participating in physical activity. In conclusion, education has been found to be one of the determinants of physical activity in general populations (Troost, Bauman, et al., 2002).

Education also plays a role in determining Indigenous person's health (Ryan et al., 2017b). Consequently, due to certain inequities, Indigenous peoples are more likely to have a lower degree of educational qualifications, when compared to non-Indigenous peoples (Gordon & White, 2014). Education is positively associated with physical activity among Indigenous peoples and non-Indigenous peoples, where a higher education is associated with participating in more physical activity (Findlay, 2011; T. K. Young & Katzmarzyk, 2007). Since education is a significant determinant of physical activity among Indigenous peoples, an intervention based on increasing Indigenous education could also benefit physical activity and thus Indigenous health (Ryan et al., 2017b). Recent research on education as a determinant of physical activity among Indigenous populations would be beneficial to support past findings.

1.2.3.5 Income

High income is known to enable healthy behaviours, decrease risk of chronic diseases, and increase overall health (McNeill et al., 2006). Income is also one of the largest factors

contributing to physical activity (Macniven et al., 2016; McNeill et al., 2006; Parks et al., 2003). Income allows people to overcome many economic and social barriers to participation in physical activity (McNeill et al., 2006; Parks et al., 2003). The environment in which physical activity is participated in is also dependent on income (Parks et al., 2003; J F Sallis, Bauman, & Pratt, 1998). Lower income groups are more likely to participate in physical activity on walking trails and/or parks, whereas high income groups have more access to malls and indoor gyms (Parks et al., 2003). Lower income groups are more likely to participate in occupational physical activity and walking, while higher income groups are more likely to participate in leisure time physical activity and sports (McNeill et al., 2006). Physical activity facilities are also more commonly located near neighbourhoods with more higher income families; furthering disparities in physical activity access by income (McNeill et al., 2006). Overall, income has a significant effect on how and how much a person is physically active.

Income is a correlate of physical activity in Indigenous populations (Ryan et al., 2017a). Household income was positively associated with leisure time physical activity in First Nations off-reserve, Métis, and Inuit populations (Findlay, 2011; Ryan et al., 2017a). First Nations peoples who had an annual household income of less than \$40 000 had lower odds of being active, i.e. having an energy expenditure of 3 or more kilocalories per kilogram of body weight per day (Findlay, 2011). Overall, removing economic barriers to physical activity could prove highly beneficial to increasing physical activity for Indigenous people (Ryan et al., 2017b). A benefit of increased income for Indigenous families could be an increase in physical activity and thus health.

1.2.3.6 Tobacco and Alcohol Behaviours

Tobacco and alcohol behaviours affect health and physical activity. Smoking and other health risk behaviours disrupt physical activity performance (Bennie et al., 2015; Katzmarzyk, 2008; Mesters et al., 2014). Physical activity has been negatively correlated with alcohol consumption (Elder, Leaver-Dunn, Wang, Nagy, & Green, 2000). Men who consume more alcohol than the national average are less active (Mesters et al., 2014). Tobacco use has been found to decrease in adolescents who are part of organized physical activity (Elder et al., 2000). Yet controversially, there is also evidence that alcohol consumption is positively associated with physical activity (Conroy et al., 2015; Leasure & Neighbors, 2014). Despite the contradictory evidence, overall physical activity has been associated with a decrease in unhealthy habits such as alcohol consumption and smoking (Elder et al., 2000). Tobacco and alcohol behaviours are overall negatively associated with physical activity.

Indigenous peoples' recreational uses of commercial tobacco and cultural use of sacred tobacco are very separate entities (Jetty et al., 2017). Tobacco use is a main risk factor for chronic disease for Indigenous populations (Gracey & King, 2009a). Also, Indigenous adolescents experience increased use of tobacco and alcohol which is associated with disease and social issues (Gracey & King, 2009a). There is no literature examining the correlation of tobacco and alcohol behaviours to physical activity of Indigenous adult populations. However, smoking and alcohol use are associated with sedentary behaviours among Indigenous peoples (S. Anderson, Currie, Copeland, et al., 2016). Increased alcohol consumption was associated with decreased sedentary behaviours (S. Anderson, Currie, Copeland, et al., 2016). Understanding any associations between tobacco and alcohol use with physical activity could support more wholistic health interventions incorporating tobacco and alcohol usage and physical activity.

1.2.3.7 Home Residence

It has been well documented that physical activity is affected by the built environment (Handy, Boarnet, Ewing, & Killingsworth, 2002). There are a multitude of factors that go into forming home communities i.e. built environment. For the purpose of this literature review we will focus on the location of home residences, and how this impacts physical activity. An urban community is a concentration of population at a high density (Statistics Canada, 2016a). While a rural community is a non-concentrated population dispersed at a low density (Statistics Canada, 2016a). In general populations it has been found that more rural communities have lower rates of physical activity compared to urban communities (Plotnikoff et al., 2004; Trost, Bauman, et al., 2002; Wilcox, Castro, King, Housemann, & Brownson, 2000). This decreased rate of physical activity in rural areas could be associated with the increased rates of chronic disease that many rural communities face (John & Gunter, 2018). Ethnic minorities who live in rural areas experience higher rates of poverty (John & Gunter, 2018). Physical inactivity rates are also elevated in more rural communities (Hartley, 2004). The mechanisms which show the differences between rural and urban communities' physical activity are very complex, yet an association is supported (J. X. Fan, Wen, & Kowaleski-Jones, 2014). The negative association between rural communities and physical activity has been well studied in the general population, and the mechanisms in which community locations affects physical activity may be similar in Indigenous populations. Northern areas which are less populated have also been shown to have different health outcomes when compared to more southern regions (Hartley, 2004). Yet, no research has examined differences between northern Saskatchewan communities and southern Saskatchewan communities.

Throughout the process of colonialism, Indigenous peoples have been continuously segregated from the rest of the population (S. Anderson, Currie, Copeland, et al., 2016). This segregation has led to many Indigenous communities being situated in rural, northern, and on-reserve areas (Barron, 1988). Indigenous peoples who live in on-reserve communities, which are typically in rural and northern areas (Mccue & Parrott, 2011), are more likely to experience decreased health compared to Indigenous peoples in non-remote communities (Czyzewski, 2011; Frohlich et al., 2006; Kelly-Scott & Smith, 2015). Those who live off-reserve are found to have higher education and increased life expectancy (Frohlich et al., 2006; Kelly-Scott & Smith, 2015). Women who live on-reserve have increased rates of coronary heart disease, cancer, cerebrovascular disease, and other chronic diseases (Czyzewski, 2011). Those who live on-reserve are more typically associated with crowded and damaged housing, higher unemployment rates, and elevated rates of obesity (Czyzewski, 2011; Katzmarzyk, 2008; Kelly-Scott & Smith, 2015). The impact that home community places on health may also be applicable to physical activity of Indigenous populations.

There are few studies examining physical activity of Indigenous populations in urban and rural locations. This is due to the fact that rural, reserve communities are typically surveyed less frequently (Statistics Canada, 2016a). Controversially, one study stated that Indigenous peoples who live in northern communities are more physically active and have lower rates of physical inactivity (Irvine, Quinn, & Stockdale, 2011). Yet peoples who live in northern communities typically face more barriers to being physically active (Heather J.A. Foulds, 2018; Kirby, Lévesque, Wabano, & Robertson-Wilson, 2007). Typically, Indigenous peoples who live off-reserve are more physically active compared to those on-reserve (Findlay, 2011; Heather J.A.

Foulds, 2018). More research is needed to determine the associations between Indigenous residences and physical activity.

1.2.3.8 Sex and Gender

Sex refers to biological attributes whereas gender refers to socially constructed roles in society (Canadian Institute of Health Research, 2014). Sex is recognized as a determinant of physical activity. Most studies report males have higher physical activity than females (Plotnikoff et al., 2004; Wenthe et al., 2009; H. J. Wilson et al., 2014). Even though physical activity tends to drop during adolescence, physical activity of males drops less throughout life compared to female physical activity (Telama et al., 2014; Wenthe et al., 2009). Extensive literature confirms that sex contributes to physical activity (Plotnikoff et al., 2004; Telama et al., 2014; Wenthe et al., 2009; H. J. Wilson et al., 2014).

The majority of observational studies that examine the correlates of physical activity evaluate sex but not gender. Furthermore, the terms male/female and man/woman have been used somewhat interchangeably which has caused misunderstandings on whether sex or gender is being reported (Clayton & Tannenbaum, 2016). Stating gender as man/woman based on sex is inconsiderate as the complexities of gender are broader, therefore may be different than sex, and need to be further evaluated (Clayton & Tannenbaum, 2016). Since gender is typically, but not always, dependent on sex, sex may have a similar impact on physical activity as gender (Rosenfeld, 2017; Trost, Pate, et al., 2002). There has been very little research done which evaluates the physical activity differences between Indigenous sexes. However, one study that was done in British Columbia with Indigenous peoples confirmed that Indigenous males are more physically active than Indigenous females which is consistent with non-Indigenous

populations (Heather J.A. Foulds et al., 2012). More research is necessary to determine if sex is a determinant of physical activity among Indigenous peoples.

Gender differences in physical activity have been well documented, and throughout recent literature there has been evidence of gender differences in physical activity (Mesters et al., 2014; Plotnikoff et al., 2004; Trost, Bauman, et al., 2002). Those who identify as men consistently report higher rates of physical activity when compared to other genders (Trost, Bauman, et al., 2002). Conversely, a study in Germany found that older age women are more physical active than older age men (Mesters et al., 2014), while a study in Finland found that there was no difference in physical activity between genders (Telama et al., 2014). Overall literature supports that gender is a determinant of physical activity, yet not as strong as other correlates such as social support, income, and education (Plotnikoff et al., 2004; Trost, Bauman, et al., 2002).

Gender has been identified as a correlate of physical activity of Indigenous adults (Findlay, 2011; Ryan et al., 2017b). Those who are Indigenous and identify as men are found to be more physically active in their leisure time, and overall, when compared to Indigenous women (Findlay, 2011; Heather J.A. Foulds et al., 2012; Ryan et al., 2017b). Commonly gender has been identified as a determinant of physical activity for Indigenous peoples yet is understudied compared to physical activity determinants of non-Indigenous peoples. There have also been no physical activity studies that included the genders of two-spirited male, two-spirited female, or transgender.

1.2.4 Sedentary Behaviours among Indigenous Peoples

Sedentary behaviour is defined as any activity performed while awake that involves little to no energy expenditure (< 1.5 METS) while in a sitting or reclined position (Sedentary Behaviour Research Network, 2012). Sedentary behaviour is not defined the same as physical inactivity. Sedentary behaviours are a modifiable determinant of health, and is known to increase risks of cardiovascular disease, obesity, diabetes, cancer, depression, and overall mortality (Blodgett et al., 2015; Ekelund et al., 2016; Proper, Singh, Van Mechelen, et al., 2011). Studies show that on average non-Indigenous people engage in as much as 8.5 hours of sedentary behaviours per day (Blodgett et al., 2015). Sedentary behaviours have also been shown to increase with age (Blodgett et al., 2015). Contritely, physical activity has a negative correlation with sedentary behaviours, where increased physical activity may be associated with decreased sedentary behaviours (Mansoubi et al., 2014). Physical activity has been found to decrease the risk of chronic disease associated with sedentary behaviours, yet it does not eliminate the risk completely (Ekelund et al., 2016). High rates of moderate intensity physical activity can also decrease the risk of death associated with high sitting time (Ekelund et al., 2016). Since sedentary behaviours have been associated with physical activity, there is potential for a physical activity intervention to impact sedentary behaviours. An increase in physical activity leading to a decrease in sedentary behaviours may have a two-fold benefit on health.

Since colonization, Indigenous peoples have been forced to live a more sedentary lifestyle, restricting their mobility to living on reserves (S. Anderson, Currie, Copeland, et al., 2016). On average, Indigenous adults are sedentary 25-29 hours a week during leisure time, which is above the Canadian National average of 20-24 hours a week (S. Anderson, Currie, Copeland, et al., 2016). Watching television and being on the computer were the two most

common sedentary behaviours reported among Indigenous adults (S. Anderson, Currie, Copeland, et al., 2016). Indigenous peoples who were more physically active were found to have lower rates of sedentary behaviours (S. Anderson, Currie, Copeland, et al., 2016). Decreasing sedentary behaviours through increasing physical activity is the one of the most effective ways to combat Indigenous health risks (Healy et al., 2008). Indigenous communities may wish for more knowledge on how sedentary behaviours affect physical activity. Adults in developed countries spend more than half of their waking hours sedentary, and their sedentary behaviours increase with age (Ding et al., 2012; N Owen, Bauman, & Brown, 2008). Extensive or prolonged sedentary behaviours are associated with type II diabetes, all-cause mortality, and cardiovascular disease (Proper, Singh, van Mechelen, & Chinapaw, 2011). Mortality due to cancer is also heavily associated with high rates of time spent sedentary with a link to colorectal-cancer mortality and all-cancer mortality (Lynch & Leitzmann, 2017). Excessive sedentary behaviours can have an effect on mental function as well. Sedentary behaviours are associated with poor well-being, depression, and weaker cognitive function (Iannotti et al., 2009; Y. D. Miller, 2010; Syväoja et al., 2014; Teychenne et al., 2010). Overall, the detrimental effects of high sedentary rates have been well studied in the general population.

Indigenous people's sedentary behaviours have also been well studied. Yet, Indigenous peoples experience elevated sedentary behaviours. Since colonization, Indigenous peoples have been forced to live a more sedentary lifestyle, restricting their mobility to living on reserves (S. Anderson, Currie, Copeland, et al., 2016). On average, Indigenous adults are sedentary 25-29 hours a week during leisure time, which is above the Canadian national average (S. Anderson, Currie, Copeland, et al., 2016). Screen time is classified as a sedentary behaviour which involves using a computer, television, video game, or smartphone/tablet (H. J. A. Foulds, Rodgers,

Duncan, & Ferguson, 2016). Watching television and being on the computer were the two most common sedentary behaviours among Indigenous adults (S. Anderson, Currie, Copeland, et al., 2016). Indigenous peoples have roughly 3.5 hours of screen time per day, with those who are male, younger, and overweight/obese having greater sedentary behaviours (H. J. A. Foulds et al., 2016). Indigenous children/youth report greater screen time compared to non-Indigenous youth (H. J. A. Foulds et al., 2016). Due to the plethora of negative outcomes associated with high sedentary behaviours, Indigenous communities may wish to focus their health interventions on decreasing sedentary behaviours. It has been theorized that reducing sedentary behaviours may be just as important as increasing physical activity (Sugiyama et al., 2008).

1.2.5 Possible Determinants of Sedentary Behaviours

1.2.5.1 Physical Activity

The association between physical activity and sedentary behaviours in the general population has been well researched, with generally negative associations identified. Total time spent in physical activity is inversely associated with total time spent in sedentary behaviour (Dunton, Berrigan, Ballard-Barbash, Graubard, & Atienza, 2009). A decrease in leisure time physical activity, moderate to vigorous physical activity, or light physical activity have all been associated with increases in sedentary behaviours (Healy et al., 2008; Helmerhorst, Wijndaele, Brage, Wareham, & Ekelund, 2009; Sugiyama et al., 2008). A negative association has been identified between overall energy expenditure and sedentary behaviours (Martínez-González, López-Fontana, Varo, Sánchez-Villegas, & Martinez, 2005). Each hour of television viewing is associated with 144 less steps per day (G. G. Bennett et al., 2006). Ultimately, participating in the recommended amount of physical activity is linked to decreased sedentary behaviours

(McCormack & Giles-Corti, 2004). A recent, published systematic review of the association between physical activity and sedentary behaviours concluded that there is a weak to moderate inverse association between physical activity and sedentary behaviours in the general population (Mansoubi et al., 2014).

Inverse associations between sedentary behaviours and physical activity have also been published with Indigenous populations. Increased physical activity has been associated with decreased sedentary behaviours (S. Anderson, Currie, Copeland, et al., 2016). An inverse relationship was discovered between an Indigenous persons step count and screen time behaviour (Troost, Marshall, Miller, Hurley, & Hunt, 2007). Elevated physical activity was also associated with less sedentary behaviours in Métis peoples (S. Anderson, Copeland, & Currie, 2017). Decreasing sedentary behaviours through increasing physical activity has been discussed as the most beneficial way to combat Indigenous health issues (Healy et al., 2008). In conclusion, the available literature on the associations between physical activity of Indigenous populations and sedentary behaviours does seem to be consistent with general population findings.

1.2.5.2 Cultural Connectedness

Community belonging and cultural/ethnic identity are measures that have been used to measure connection to a cultural group (S. Anderson, Currie, & Copeland, 2016). A sense of community belonging is associated with health behaviour change, exercise, weight loss, and improved diet (Hystad & Carpiano, 2012). Individual, interpersonal and environmental factors have also been shown to play a role in sedentary behaviours (Neville Owen et al., 2011). A strong sense of community belonging has been associated with decreased time spent in sedentary per week (S. Anderson, Currie, & Copeland, 2016). Women with a low sense of connection to

their neighborhood have elevated sedentary behaviours (A. F. Young, Russell, & Powers, 2004). Thus, it would seem that in the general population a sense of belonging, or a connection to community elicits a decrease in unhealthy behaviours such as being sedentary. African migrant children who retained their traditional cultural orientation are less sedentary compared to African migrant children who did not retain their culture (Renzaho, Swinburn, & Burns, 2008). Connection and sense of belonging to community has been understudied in relation to sedentary behaviours in the general population. Yet, available literature highlights stronger connections to a community are associated with lower sedentary behaviours.

Cultural connectedness is very similar to afore mentioned terms which measure connection to community/culture (Gates et al., 2015). The specific measure of cultural connectedness has not been associated with sedentary behaviours of Indigenous people, but connection to community has (S. Anderson, Currie, Copeland, et al., 2016). A strong sense of community belonging for Indigenous populations has been linked to decreased sedentary behaviours (S. Anderson, Currie, Copeland, et al., 2016). Métis men with a strong sense of community belonging spent 3.6 less sedentary hours per week compared to Métis men who had poor sense of community belonging (S. Anderson et al., 2017). In disagreement, Métis women with a strong sense of community belonging were found to have increased sedentary behaviours (S. Anderson et al., 2017). Overall, cultural connectedness is a determinant of health for Indigenous people, yet associations with sedentary behaviours have not been studied. Cultural connectedness and sense of belonging are very similar, however associations of cultural connectedness and sedentary behaviours for Indigenous people remain unclear.

1.2.5.3 Discriminatory Experiences

Despite the magnitude of evidence of associations between discriminatory experiences and health, very little research has evaluated associations between discriminatory experiences and sedentary behaviours. One study found a positive association between discriminatory experiences and screen time in Black men (Womack et al., 2014a). However, the same study identified no association between discriminatory experiences and overall sedentary behaviours. Perceived discrimination is viewed as a barrier to physical activity, and adversely associated to physical activity and sport, causing potential for more chronic disease risks (Barr-Anderson et al., 2017; Chen & Yang, 2014; Edwards & Cunningham, 2013a; McNeill et al., 2006). Yet there is very little evidence on discrimination's effects on sedentary behaviours in the general population.

Furthermore, there is no literature on the impact of discrimination on sedentary behaviours of Indigenous people. Racial discrimination is a major determinant of the overall well being of Indigenous communities (C. L. Currie, Wild, Schopflocher, Laing, & Veugelers, 2012). Also Indigenous peoples face elevated experiences of discrimination, with 80% of the Indigenous population in Canada experiencing racism in the past year (C. Currie, Wild, Schopflocher, & Laing, 2015). The negative effects of discrimination have been well documented. Racial discrimination is associated with increased risks of depression for First Nations peoples who live in Saskatchewan (Janzen et al., 2017). There is evidence suggesting a possible association of discrimination and increased sedentary behaviours for Indigenous peoples. Racism and perceived discrimination are barriers to physical activity among Indigenous participants (Ferguson & Philipenko, 2016; McHugh, 2015). Discriminatory experiences may be associated to with sedentary behaviours of Indigenous peoples.

1.2.5.4 Social Support

Various measures of social support influence sedentary behaviours. Overall the majority of evidence supports social support being negatively associated with sedentary behaviours, though not conclusively. High degrees of social support and being married were associated with decreased sedentary behaviours among Canadian adults (Huffman & Szafron, 2017). Individuals with poor social support were two times more likely to be sedentary than those who had appropriate degrees of social support (Ståhl et al., 2001). A negative association between social support and sedentary behaviours have been well documented in women and adolescent girls, including negative associations with screen time (Costigan, Barnett, Plotnikoff, & Lubans, 2013; Eyler et al., 1999; Wilcox et al., 2000). A qualitative study using focus groups also noted social support as a major influencer of sedentary time (Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015). Conversely, men who have high social support have increased sitting time (Huffman & Szafron, 2017). Also, no difference in sedentary behaviours were found between lonely and non-lonely groups (Lauder, Mummery, Jones, & Caperchione, 2006). Despite these contradictory findings the vast majority of evidence highlighted a negative relationship between social support and sedentary behaviours. One study even noted that social support may play an effective role in interventions which aim to reduce sedentary behaviours for adolescents (Draper, Grobler, Micklesfield, & Norris, 2015).

Indigenous peoples could have increased social support when compared to non-Indigenous groups as Indigenous peoples place tremendous value in kinship, community, and family (National Collaborating Centre for Aboriginal Health, 2015); however, the importance of social support for Indigenous peoples has been understudied. One study identified that Indigenous women who report high social support are more likely to report thriving health

(Richmond, Ross, & Egeland, 2007b). No literature has examined the association between social support and sedentary behaviours for Indigenous people.

1.2.5.5 Education

Education influences almost every aspect of life and potentially sedentary behaviours as well. Lower education attainments have been associated with increased sedentary behaviours (B. K. Clark et al., 2010; King et al., 2010; Wilcox et al., 2000). However, higher education attainments have also been associated with increased sedentary behaviours in other studies (Bennie et al., 2015; Rhodes, Mark, & Temmel, 2012; Stamatakis et al., 2013). A systematic review published in 2016 found that of the 9 studies examining the relationship between education and sedentary behaviours, 8 studies discovered an inverse relationship between education and television and screen entertainment time (O'Donoghue et al., 2016). Another study discovered decreased parental educational attainments were associated with increased screen time for their children (Salmon, Tremblay, Marshall, & Hume, 2011). In conclusion, there seems to be a lack of clarity over the association between education and sedentary behaviours in the general population. The association may be dependent on the measure of sedentary behaviour.

However, there is no literature on the relationship between Indigenous peoples' education and sedentary behaviours. One study has concluded that increased Indigenous peoples' educational attainment is associated with lower rates of physical inactivity (Katzmarzyk, 2008), yet more research is needed to determine if the same association exists with education and sedentary behaviours. Since education has a positive impact on Indigenous health, it is possible that education may also have a positive influence on decreasing sedentary behaviours. Increased

education could expand knowledge on the adverse effects of sedentary behaviours or increased education may lead to the overcoming of certain barriers which are associated with increased sedentary behaviours.

1.2.5.6 Income

Socioeconomic status is a social determinant of health and also seems to influence sedentary behaviours. A lower socioeconomic status has been associated with increased screen time (Hume et al., 2012; Tandon et al., 2012). One major factor of socioeconomic status is income, which also seems to influence sedentary behaviours. Similar to socioeconomic status, monthly family income and income in general are negatively associated with sedentary behaviours (S. Anderson, Currie, & Copeland, 2016; B. K. Clark et al., 2010; Shields & Tremblay, 2008; H. J. Wilson et al., 2014). Employment was also negatively correlated to sedentary behaviours, thus if a participant was unemployed they were typically found to be more sedentary than someone who was part-time or full-time employed (B. K. Clark et al., 2010). However, some studies have contradicted the general consensus. Two studies both found a positive association between household income and total time spent in sedentary behaviours (Kozo et al., 2012; Stamatakis, Coombs, Rowlands, Shelton, & Hillsdon, 2014). Overall the majority of studies agree that income and sedentary behaviours are inversely associated in the general population.

Income and time spent in sedentary behaviours seem to be inversely associated for Indigenous populations. Even though there is minimal literature on the topic, there seems to be a consensus that when Indigenous peoples incomes are high, their sedentary behaviours are low (S. Anderson, Currie, Copeland, et al., 2016; Katzmarzyk, 2008). For Indigenous populations, high

income is associated with low sedentary behaviours and low income is associated with high sedentary behaviours (S. Anderson, Currie, Copeland, et al., 2016). Also, Indigenous peoples with elevated income are less likely to be physically inactive (Katzmarzyk, 2008). Income may allow Indigenous peoples to overcome many barriers to physical activity and thus potentially decrease their time spent in sedentary behaviours (Findlay & Kohen, 2007). Indigenous communities may wish to further examine the association between income and sedentary behaviours.

1.2.5.7 Tobacco & Alcohol Use

The effects of tobacco and alcohol use on sedentary behaviours are also quite controversial. A large systematic review on the correlates of sedentary behaviours in the general population found mixed results for the associations between tobacco and alcohol use and sedentary behaviours (Rhodes et al., 2012). When evaluating the 16 studies that examined the association between tobacco use and sedentary behaviours Rhodes et al. (2012) found that 5 of the studies discovered a positive association and 5 other studies found no association. Rhodes et al (2012) also discovered that of the 8 studies that evaluated alcohol use and its association with sedentary behaviours, 6 found no association and 2 found a negative correlation. However, one study noted a positive correlation between alcohol use and sedentary behaviours (Lesjak & Stanojević-Jerković, 2015). Other studies have noted that sedentary adolescents are more likely to engage in high risk unhealthy behaviours such as smoking and alcohol abuse (Nelson & Gordon-Larsen, 2006). Overall, the evidence does not support a negative association between tobacco use and sedentary behaviours in the general population (Rhodes et al., 2012). The

evidence also does not support a relationship between alcohol consumption and sedentary behaviours in the general population (Rhodes et al., 2012).

Even though tobacco and alcohol use are determinants of health for Indigenous people, there is little understanding of their effects on sedentary behaviours. One study did examine the association between tobacco and alcohol use and Indigenous sedentary behaviours and found a negative association which is contrary to the extensive findings in the general population (S. Anderson et al., 2017). More understanding is needed to clarify the relationship between tobacco and alcohol use and sedentary behaviours in general and Indigenous populations.

1.2.5.8 Home Residence

It is well documented that the built environment impacts health, specifically location and characteristics of the community. The community residence not only affects health but also sedentary behaviours. A recent umbrella literature review identified conflicting evidence of an association between home residence and sedentary behaviours (O'Donoghue et al., 2016). Some studies have identified those who live in rural communities having increased screen time and general time spent in sedentary behaviours (Machado-Rodrigues et al., 2014; Tandon et al., 2012; Wilcox et al., 2000). Yet, other studies identified rural communities are actually less sedentary compared to urban communities (Hardy, Dobbins, Booth, Denney-Wilson, & D.kely, 2006; van Uffelen, Heesch, & Brown, 2012). These conflicting studies note that factors beyond rural or urban community location may impact sedentary behaviours. Studies have agreed that more remote communities are associated with more sedentary behaviours, where larger travel distances contribute to sedentary behaviours (Sugiyama et al., 2012; Zolnik, 2011). Overall, the

research seems to agree that remote, rural communities are more sedentary than non-remote urban or rural communities.

No evaluations of the extent to which the placement of Indigenous people's home residence affects sedentary behaviours have been performed. This substantial impact that residency of home community has on health of Indigenous peoples may also be applied to sedentary behaviours. Indigenous communities may wish for more research on how the location of a community affects sedentary behaviours.

1.2.6 Summary and Purpose

Physical activity is higher among Indigenous populations compared to non-Indigenous populations, yet many Indigenous peoples are still not meeting physical activity recommendations and are thus not receiving maximum health benefits (H. J.A. Foulds et al., 2013). There has been extensive research on what influences someone to be physically active (Bauman et al., 2012; Kaplan, Newsom, McFarland, & Lu, 2001; Plotnikoff et al., 2004; Sterdt, Liersch, & Walter, 2014; Trost, Bauman, et al., 2002), yet the research on determinants of physical activity specific to Indigenous people is less clear. Social support, family influences, education, income, tobacco and alcohol use, sedentary behavior, home residence, sex, and gender have all been identified as determinants of physical activity for non-Indigenous populations (Bauman et al., 2002; Bennie et al., 2015; Findlay, 2011; Mansoubi et al., 2014; McNeill et al., 2006; Mesters et al., 2014; Plotnikoff et al., 2004). The impact of social support, family influences, sedentary behaviours, and gender on physical activity for Indigenous populations have not been studied extensively and hold potential to be meaningful supports for physical activity among Indigenous populations (S. Anderson, Currie, Copeland, et al., 2016; Findlay,

2011; L. Lavallée & Lévesque, 2013). The effects of education, income, and sex on physical activity of Indigenous people have not been evaluated separately among Métis, First Nations, and Inuit peoples or among Indigenous populations in Saskatchewan specifically (Findlay, 2011; H. J.A. Foulds et al., 2013; Katzmarzyk, 2008; Ryan et al., 2017a). The associations of social support, family influences, education, income, tobacco and alcohol use, sedentary behaviours, home residence, sex and gender with physical activity for non-Indigenous populations have been identified. Yet understanding of associations of discriminatory experiences, social support, education, income, sedentary behaviours, sex, and gender with physical activity for Indigenous populations is lacking.

Some determinants of health have not been evaluated as potential determinants of physical activity. Cultural connectedness, residential school and foster care experiences, and tobacco and alcohol behaviours all impact Indigenous people's health (Bombay et al., 2014a; Gracey & King, 2009b; Poon et al., 2010; Sinclair, 2007b). Strong evidence supports that there may be a link between cultural connectedness and physical activity for Indigenous people, yet it has not been directly measured (Saewyc et al., 2013). Discrimination has been identified as a barrier to physical activity for Indigenous people in qualitative research (Ferguson & Philipenko, 2016). Residential school and foster care experiences have various impacts on Indigenous health, yet they have never been studied as a determinant of physical activity (Bombay et al., 2014b; First Nations Centre, 2005; Pearce et al., 2008; Sinclair, 2007a). Tobacco and alcohol behaviours have been found to have a negative impact on physical activity, yet they have not been evaluated as determinants of physical activity in Indigenous populations (Gracey & King, 2009b). Many factors show potential to be determinants of physical activity, yet evaluations of these potential determinants have yet to be undertaken.

The primary purpose of this study is to determine the associations of cultural factors with physical activity for Indigenous people. These cultural factors include cultural connectedness and discriminatory experiences. Studies highlight a link between culture and physical activity, but no study has evaluated a direct association between cultural connectedness and physical activity among Indigenous peoples (Gates et al., 2015; Lévesque et al., 2015; Ryan et al., 2017a; Saewyc et al., 2013). There is strong qualitative research that reports discriminatory experiences as a barrier to physical activity of First Nations peoples (Ferguson & Philipenko, 2016). However, evaluating the effects of discrimination on physical activity specific to Métis and Cree populations could be beneficial.

The secondary purpose of this study is to determine the associations of social factors and physical activity of Indigenous participants. These potential determinants include social support, family influences, residential school attendance, foster care experience, education, income, tobacco and alcohol use, sedentary behaviours, home residence, sex, and gender. Social support, education, income, sedentary behaviours, home residence, sex, and gender are correlates of physical activity in non-specific populations (S. Anderson, Currie, & Copeland, 2016; Findlay, 2011; Heather J.A. Foulds et al., 2012; L. Lavallée & Lévesque, 2013; Plotnikoff et al., 2004) and residential school attendance, foster care attendance, family influences, and tobacco and alcohol use show potential as determinants of physical activity for Indigenous populations (S. Anderson, Currie, & Copeland, 2016; Bombay et al., 2014b; Findlay, 2011; Sinclair, 2007b). No studies have examined the effects of family influences, historic trauma, or unhealthy behaviours on physical activity of Indigenous peoples.

The third purpose of this study is to determine the associations of social and cultural factors with sedentary behaviours for Indigenous participants. Sedentary behaviours are a

determinant of health, yet the underlying determinants of sedentary behaviours are relatively unknown (S. Anderson, Currie, Copeland, et al., 2016). Associations with sedentary behaviours examined include physical activity, cultural connectedness, discriminatory experiences, social support, education, income, tobacco and alcohol use, and home residence.

The overall objective of this study is to provide the community with knowledge on possible Indigenous specific determinants of physical activity and sedentary behaviours. These determinants could be used to aid physical activity interventions and health policies.

1.2.7 Objectives & Hypotheses

Primary Objective: To evaluate the possible cultural determinants of physical activity among Indigenous participants.

Primary Hypothesis: Cultural connectedness will be positively associated with physical activity among Indigenous people. Discriminatory experiences will be negatively associated with physical activity for Indigenous people.

Secondary Objective: To evaluate the possible social determinants of physical activity among Indigenous participants.

Secondary Hypothesis: Social support, family influences, residential school and foster care attendance, education, income, sedentary behaviours, home residence, sex, and gender will all be predictors of physical activity for Indigenous people. Tobacco and alcohol use will not be found as a possible determinant of physical activity for Indigenous people.

Tertiary Objective: To evaluate the possible determinants of sedentary behaviours for Indigenous populations.

Tertiary Hypothesis: All determinants of physical activity will be determinants of sedentary behaviours for Indigenous people.

CHAPTER 2

2.1 ETHICAL CONSIDERATIONS

Before the commencement of this study, ethical approval was obtained through the University of Saskatchewan Behavioural Ethics Board. Before any changes could be made to the study, further approval was sought and granted from the Behavioural Ethics Board. To ensure effective and respectful data collection, this research study followed the methodologies outlined in Chapter 9 of the Tri-Council Policy Statement 2 (2014). A decolonizing lens was used throughout this study which entails an effort by the researchers to move away from western research practices and move towards the position of creating knowledge from Indigenous cultural practices (Tuhiwai Smith, 1999). Lastly a strengths-based approach was implemented throughout this study with the goal of highlighting strengths of Indigenous peoples and minimal focus on deficits.

2.2 METHODOLOGY

2.2.1 Research Participants

In conjunction with the Indigenous Graduate Student Association, the Indigenous Student Achievement Program, staff at the Aboriginal Students' Centre, and other partnering Indigenous groups on the University of Saskatchewan campus, as well as a general advertisement within the University of Saskatchewan; Indigenous students, staff and faculty were invited to participate in this study. Out of the total student, staff, and faculty population at the University of

Saskatchewan, in the academic year of 2018/2019 there were 3 118 students and roughly 206 staff and faculty who self-identified as Indigenous, and from which participants were drawn (University of Saskatchewan Data Warehouse, 2017). Participants were at least 18 years old and self-identify as Indigenous. Classification of Indigenous identity included First Nation, Inuit, or Métis. Participation was open to Indigenous student, staff, and faculty including any sex, range of physical activity, and range of medical status. Participants could take part in the study either by completing an online survey or they were invited to come for an in-person interview at the Physical Activity Complex on the University of Saskatchewan campus. The in-person interview included the same questionnaires as the online survey but were administered by an interviewer. Participants and Indigenous students, staff and faculty at the University of Saskatchewan will be invited to attend a knowledge translation session where results and food will be shared, and attendees will have the opportunity to ask questions and discuss the study findings.

2.2.2 Recruitment

Participants were recruited through the partnering Indigenous groups and through the University of Saskatchewan student website (PAWS). The partnering Indigenous groups shared the study through their member lists, and I attended certain group meetings to highlight the importance of this study and recruit participants. Recruitment emails were sent out to all self-declared Indigenous staff and faculty once in the fall term of 2018 and once in the winter term of 2019. Advertisements for participants were posted on the PAWS website and on various bulletins across campus. Participants either completed the survey online on their own or contacted the study coordinator through email and were given the opportunity to attend a single, in-person interview session. For those who completed the online survey, they had the

opportunity to win one of six \$50 gift cards for their choice between two local, Indigenous clothing stores, and those who came in-person to complete the survey received the same opportunity for the \$50 gift cards and also received a \$5 gift card to their choice of one of two local Indigenous coffee shops. Consent forms were signed online or in-person at the start of the interview session (See Appendix B).

2.2.3 Sample Size

The effect size was calculated from the systematic review and meta-analysis previously reported (see section 1.2.3.1) which meta-analyzed a coefficient of determination (r^2) of 0.17 between social support and physical activity. The coefficient of determination led to an effect size calculated at 0.41. The effect size of 0.41, confidence level of 95%, a margin of error of 5%, and a power of 0.85 were inputted into an online sample size calculator (G*Power 3.1.9.4, Ute Clames, Germany). The afore mentioned parameters, once computed in the online sample size calculator, led to a calculated conclusion of 37 participants needed for this observational study (Faul, Erdfelder, Lang, & Buchner, 2007). Due to the unique history, culture, and traditions among Indigenous communities, it is unethical to research Indigenous peoples as an overarching group (Canadian Institutes of Health Research & Canada, 2014). Thus, we were examining significant differences within specific Indigenous groups such as Métis, First Nations, and Cree participants, and we needed 37 participants from each group. In 2016, First Nations peoples accounted for 65.5% of Saskatchewan Indigenous population while Métis peoples accounted for 33.1% (Statistics Canada, 2017). Thus, to collect enough Métis participants, a minimum of 112 participants was needed and a proposed sample size of 120 was determined as large enough to

account for non-responses. Thus, with a sample of 37 participants needed to detect significant differences, we had proposed a total sample size of 120 participants.

2.2.4 Testing Sessions

2.2.4.1 Online Testing

Participants could access the online survey either through weblinks or QR codes that were posted around campus on bulletin boards and on the university website. Participants were then directed to the survey that was powered by SurveyMonkey (SurveyMonkey Inc., San Mateo, California, USA, www.surveymonkey.com). The participants who filled out the questionnaire online were able to fill out the consent form online and then participate in the survey (which was identical to the in-person survey) at the time that was most convenient for them. At the conclusion of the survey, participants were offered the opportunity to be directed to another survey to be entered into the draw to win one of the six \$50 gift cards. This separate survey was implemented to ensure anonymity of participants completing the survey.

2.2.4.2 In-person Testing

Each participant who came to the Physical Activity Complex for in-person interviews registered for the study through email with the study coordinator, and an interview time was scheduled. Once arriving for the interview each participant filled out an informed consent form. Each questionnaire was administered by the researcher in an interview format. Interviewer administered questionnaires were conducted throughout the 2018-2019 academic year. Each interview only included two people: the participant and researcher. All survey material was conducted at the one interview sitting between the researcher and participant. Interviews took

roughly one hour to complete. Consent forms were signed before the interview began and before any data was collected.

2.2.5 Measurements

Measures were used to evaluate various demographic, physical activity, cultural, and social measures. Demographic measures were taken to further describe the sample population. Physical activity and sedentary behaviours, as the main variables, were measured through questionnaires. The cultural and social factors which were identified as possible determinants of physical activity and sedentary behaviours were measured. A compilation of measurements used in this study can be seen in Appendix C: Cultural and Social Determinants of Indigenous Peoples of Canada's Physical Activity and Sedentary Behaviours Survey.

2.2.5.1 Demographic Measures

Demographic information collected included age, sex, gender, marital status, employment situation, Indigenous group, and Indigenous Nation. Age was not categorized into subgroups, but instead age was reported as mean \pm standard deviation. Sex had the options of male/female/other, and gender had the options of man, woman, two-spirited male, two-spirited female, and transgender. Marital status was recorded as married/common-law, divorced/separated/widowed, or single/never married. Job situation was grouped as either student, temporarily unemployed, paid part-time employment, or paid full-time employment. Indigenous group was recorded as Métis, Inuit, First Nations-Status, or First Nations-Non-Status. Indigenous Nation was an open-ended question intending to allow the participants to further identify their Indigenous affiliation.

2.2.5.2 Physical Activity and Sedentary Measures

Physical activity was measured using the Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin & Shephard, 1985). The GLTEQ is a simple questionnaire used to measure physical activity. The GLTEQ assesses physical activity based on a 7 day recall period, measuring the amount of times in the past 7 days a person experienced light, moderate, and strenuous exercise (Godin & Shephard, 1997). The GLTEQ has been used to assess Indigenous peoples physical activity in past studies, and deemed to be reliable and valid (Godin & Shephard, 1997; Kirby et al., 2007). We used this measure to determine total physical activity minutes per week. This score was cumulated by multiplying the number of times they were active in a week by the amount of time they were active for to determine the total minutes per week they were physically active. To assess muscle strengthening activities, participants were asked how many times per week they engage in muscle strengthening activities such as resistance training. Participants were then assessed whether or not that they meet the Canadian Society of Exercise Physiology (CSEP) muscle strengthening recommendations of 2 or more muscle strengthening activities per week. Traditional activity participation was measured by asking participants to rate whether they frequently, infrequently, or never participated in traditional activities which involve being physical activity such as ceremonies, dance, hunting, trapping, etc.

Sedentary behaviours were calculated using a series of questions regarding time spent in sedentary behaviours from the Canadian Community Health survey (Statistics Canada, 2011). Six questions about sedentary behaviours were asked, each question asked about time spent on specific sedentary activities and these questions were used to calculate total time spent in sedentary behaviours and screen time. These six specific sedentary activities questions evaluated watching television, using a computer, laptop, or tablet, using your phone, doing paperwork,

reading, and passive traveling. Total hours spent in sedentary behaviours per week were calculated by summing together the hours a participant reported per week per sedentary activity. Total screen time per week was calculated by summing together the reported hours per week for watching television, using a computer, laptop, or tablet, and using your phone.

2.2.5.3 *Cultural Determinants*

For a measure of cultural connectedness, two measures were debated upon: the Cultural Connectedness Scale (CCS, Appendix C) and Multigroup Ethnic Identity Measure (MEIM, Appendix C). The Cultural Connectedness Scale was designed for measuring connection to culture among First Nation populations, while the Multigroup Ethnic Identity Measure was designed for general populations. Both measurement tools use different sub measures to evaluate one's cultural connectedness. The Cultural Connectedness Scale and the Multigroup Ethnic Identity Measure have both been deemed valid and reliable.

The Cultural Connectedness Scale was developed in 2015 to quantify cultural connectedness within First Nations populations (Angela Snowshoe, Crooks, Tremblay, Craig, & Hinson, 2015). Criterion validity has been determined through significant correlation between the Cultural Connectedness Scale and other well-being measures from other questionnaires (Angela Snowshoe et al., 2015). The Cultural Connectedness Scale is consistent with current theories, and consistent with findings from other studies (Angela Snowshoe et al., 2015). The Cultural Connectedness Scale has been used with Indigenous youth to assess mental wellness (Angela Snowshoe et al., 2017). Many of the questions on the Cultural Connectedness Scale only pertain to First Nations culture ex. *I know my culture/spirit name. The eagle feather or another similar item has a lot of meaning to me. How often do you use sage, sweetgrass, or cedar in any*

way or form? Etc. This questionnaire was current and offered promising opportunities to measure cultural connectedness specifically for First Nations peoples, yet it had been used with overarching Indigenous populations as well and is very inclusive (Angela Snowshoe et al., 2017). The Cultural Connectedness Scale includes 29 questions, 11 items ask for a dichotomous response (yes or no), 15 items use a Likert 5-point scale, and three items ask for either a never, once or twice in past year, every month, every week, or every day response (Angela Snowshoe et al., 2015). The Cultural Connectedness Scale measures connection to spirituality, traditions, cultural identity, and overall cultural connectedness. A spirituality score was accumulated by adding together a total of seven responses, a traditions score included a summed total of 11 responses, an identity score included the total score of 11 responses, and the overall cultural connectedness score was the summed total of all 29 responses.

The Multigroup Ethnic Identity Measure was developed in 1992 to measure ethnic identity as a general concept across all ethnicities (Phinney, 1992). The Multigroup Ethnic Identity Measure evaluates ethnic identity, commitment to ethnicity, exploration of ethnicity, ethnic identity search, affirmation and belonging, and overall ethnic identity measure. The Multigroup Ethnic Identity Measure has been deemed reliable through a study that compared the results of 12 studies that used the Multigroup Ethnic Identity Measure, and consistency was found (Ponterotto, Gretchen, Utsey, Stracuzzi, & Saya, 2003). Validity was determined through factor analysis and convergence of measures from parallel constructs (Ponterotto et al., 2003). The Multigroup Ethnic Identity Measure questionnaire was used in a study with an Indigenous population living in Canada to measure ethnic identity in a resiliency study, and the Multigroup Ethnic Identity Measure questionnaire was deemed valid (Heather J. A. Foulds, Bredin, & Warburton, 2018; Richardson, Song, Pumarino, & Hapsari, 2017). The Multigroup Ethnic

Identity Measure includes 14 questions which cover the various aspects of ethnicity (Phinney, 1992). Commitment section is calculated by averaging the responses of 3 questions, exploration is calculated by averaging the responses of 4 questions, identity search is calculated by averaging the responses of 5 questions, affirmation and belonging section score entails averaging the responses of 7 questions, and the total Multigroup Ethnic Identity Measure score is the average of all 14 responses (Ponterotto et al., 2003). Some questions are used to calculate multiple sections scores. Since these two questionnaires evaluate different sub-characteristics of cultural connectedness, both questionnaires were included.

Discriminatory experiences were evaluated in four ways: perceived community racism, lifetime discrimination, everyday discrimination, and discrimination as a barrier to physical activity. Perceived community racism was measured by one question asking “Is racism and discrimination a problem in your community?” (Edwards & Cunningham, 2013b). Lifetime discrimination was measured using one question adapted from Lifetime Discrimination Scale from the Detroit Area Study which asks, “Has racism and discrimination had an impact on you at one point in your lifetime?” (Williams, 1999). Everyday discrimination was measured using one question from the Everyday Discrimination Scale adapted from the Detroit Area Study which asked, “Is racism a problem in your town, city, or rural area where you currently live?” (Williams, Yan Yu, Jackson, & Anderson, 1997). Racism as a barrier to physical activity was assessed by one question, “Has racism and discrimination had an impact on your physical activity levels”. All responses were scored as Yes (2), Unsure (1), or No (0), and responses were summed to give a total discriminatory experiences score.

2.2.5.4 Social Measures

Income, and education were both measured as possible determinants of physical activity and sedentary behaviours. Household income was recorded in four classes \$10 000-\$20 000, \$20 001-\$40 000, \$40 001-\$75 000, and more than \$75 000. Education was recorded as some high school, high school diploma, vocational school or some college, college/university degree, or professional/graduate degree. Home residence was also measured as a possible determinant of physical activity and sedentary behaviours. It was advised to the researchers that residence of community could impact physical activity and sedentary behaviours. Participants were asked if they grew up in rural or urban, northern or southern, and on-reserve or off-reserve communities. Participants were also asked if they have ever moved away from their home community for an extended period of time.

Social support was measured using an enhanced form of the Social Support Index (Plumb, 2011) which uses a multi-dimensional approach to quantifying social support. The Social Support Index: Multi-Dimensional Approach measures four facets of social support: community support, family support, friendship support, and positive perception of support (Distelberg, Martin, & Borieux, 2014). This measure has been deemed reliable and valid (Distelberg et al., 2014). Questions in this questionnaire included: people can depend on each other in this community, the members of my family make an effort to show their love and affection for me, I have friends who let me know they value who I am and what I can do. Responses are scored on a 5-point Likert scale with 1-Strongly Disagree and 5-Strongly Agree. Five responses are reverse scored. Community support was calculated by summing the responses of four questions, family and friend support included the summed responses of three questions

each, positive perception of support score is calculated by summing the responses of five questions, and overall social support score is the sum of all 17 responses.

Family influences on physical activity were assessed by the adaptation of the Family Support Questionnaire from the Family Influences on Physical Activity study (Xin Wang, Liu, Ren, Lv, & Li, 2015). Family support of physical activity was assessed by the following three questions (1) how many days per week on average do your families encourage you to engage in physical activity; (2) how many days per week on average do your families watch you engaging in physical activity; and (3) how many days per week on average do your families involve themselves in your activities, that is, having physical activity together with you. Response options included: (1) never or less than weekly; (2) 1-2 days/week; (3) 3-4 days/week; (4) more than 5 days per week (Xin Wang et al., 2015). Family history of physical activity was mentioned by stakeholders as a potential determinant of physical activity. Participants were asked to respond to this statement, “My family/friends are very physically active”. Participants’ had the option to respond on a 5-point Likert scale with 1-Strongly Disagree and 5-Strongly Agree.

When analyzing the possible effects of historic trauma on physical activity, participants responded to two questions. One question regarded residential school attendance and asked if the participant or one of their family members ever attended residential school. The second question regarded foster care experience and asked if the participant was ever placed in foster care or if a family member was ever placed. Participants’ physical activity was compared between those who had specific historic trauma experience, and those who did not.

Tobacco and alcohol behaviours were measured using five adapted survey questions from the Canadian Community Health Survey (Statistics Canada, 2011). The five questions asked

about tobacco and alcohol related behaviours ex) What is your smoking status? (with an additional option of “for ceremonial purposes only”) and How often in a week do you drink?.

2.2.6 Data Analysis

The methodologies of this study were influenced by the balancing of the respect and requests of the community with the standard scientific procedures commonly used in research. All analysis was discussed with the CAC to ensure respectful, useful, and ethical knowledge was presented. Since there are such diverse and unique Indigenous cultures that fall under the umbrella term ‘Indigenous’, pan-Indigenization in research can be unethical and less useful than analysis specific to individual Indigenous groups (Canadian Institutes of Health Research & Canada, 2014). However, data on the Indigenous population as a whole may also be provided as this could be useful for Indigenous programs/supports on campus as they serve a variety of different Indigenous groups, and these results are likely representative of the overall University Indigenous demographics. Thus, for data analysis we examined Métis, First Nations, and Cree groups separately, and also analyzed the Indigenous population as a whole. Participants were divided into groups based on their responses to the Indigenous group and Indigenous Nation questions. Analysis was conducted by overall Indigenous, Métis, First Nations, and Cree for each comparison. All outlying data was included in the final analysis, as was decided in conjunction with the CAC. It was believed that all of the data generously provided for this study, by the Indigenous community, should be included in the analysis. If a participant had any data missing in a certain section, then their data for that specific section was removed from analysis. For example, if a participant did not respond to one question in the MEIM, then their score for that sub measure and overall MEIM score was removed, yet the scores for the other complete

subsections were included. Mean differences were examined within the Indigenous groups and significance was set at p -value <0.05 . Data analysis was performed SPSS Version 23.0.

Statistical analysis included independent t-tests and simple ANOVAs.

Independent t-tests were used to compare cultural and social factors means between physical activity and sedentary behaviour groups. For examining the associations of physical activity with social and cultural factors, each Indigenous group was divided into high physical activity and low physical activity groupings. The reported total physical activity means were lower than past research has suggested (H. J.A. Foulds et al., 2013), and there was a variance of means between the Indigenous groups. Subsequently, to keep the analysis consistent, it was decided to create the physical activity groups by dividing at the mean into high and low physical activity groups. Due to small sample size only males and females were compared for sexes and men vs. women were compared for genders. Participants' physical activity means were compared between those who had attended, or had a family member attended, residential school and those who did not. Also, participants' physical activity means were compared between those who were placed, or who had a family member placed, in foster care and those who did not. Independent t-tests were used to evaluate differences between residential school experience vs. non experience groups and foster care placement vs. no placement groups. Independent t-tests were also used to evaluate means of total physical activity minutes per week between genders, sexes, and northern or southern home residency. Also, t-tests were used to compare physical activity of those who had left their home community for an extended period of time and those who had not. Bonferroni corrections were not applied to the multiple independent t-tests. When examining sedentary behaviours, each Indigenous group was divided into high and low sedentary behaviours groups and also into high and low screen time groups. All high/low groups were

divided at the specific group means and compared with independent t-tests. Independent t-tests were also used to compare sedentary time per week of northern vs. southern home residence home residence groups.

All assumptions for independent t-tests were examined. The data used with the independent t-tests were examined to be normally distributed by plotting histograms and visually approximating that the data follows the curve of normality. Our sample was random as each participant had an equal opportunity to participate in this study. All dependent variables included in independent t-test analysis were parametric in nature, as all data was either on interval or ratio scales. Homogeneity of variance was measured throughout the statistical analysis through the use of Levene's test. If Levene's test of homogeneity was significant, then equal variances were not assumed.

Simple one-way ANOVAs were used when multiple group means were compared. When examining the physical activity minutes per week of each Indigenous groups rural/urban/both groupings, on-reserve/off-reserve/both groupings, tobacco use, alcohol use, income, and education groups, simple one-way ANOVAs were used to determine if significant differences existed within the possible determinants. When comparing total sedentary time per week between the rural/urban/both, on-reserve/off-reserve/both, tobacco use, alcohol use, income, and education groups, simple one-way ANOVAs were used as well. Tukey's B post hoc tests were used to determine specific differences if simple ANOVA was significant. Bivariate correlations were also used when examining the relationship between the Cultural Connectedness Scale and the Multigroup Ethnic Identity Measure.

All assumptions for simple one-way ANOVAs were examined. Each one-way ANOVA had one continuous variable which was either total minutes of physical activity per week or time

spent sedentary per week. Each test also included three or more independent groups, and no repeated measures which allowed for independence of observations. The data used with the one-way ANOVAs were examined to be normally distributed by plotting histograms and visually approximating that the data follows the curve of normality. Homogeneity of variance was measured throughout the one-way ANOVA test with the use of Levene's test. If Levene's test of homogeneity was significant, then equal variances were not assumed. The existence of outliers was measured by examining box plots of the data and visually noting any data points that lay outside two standard deviations from the mean.

CHAPTER 3

3.1 RESULTS

Of the 3 118 self-declared Indigenous students in the fall and winter terms of 2018/2019, and the roughly 206 staff and faculty on the University of Saskatchewan campus this study received 124 respondents, for a response rate of 3.7%. There were a total of 140 people who opened the survey but only 120 participants who completed the survey online for a completion rate of 89%. Of the 120 people who completed the online survey there was a total answer completion rate of 79%, and there were four participants who completed the survey in-person. Data collection was open from September 13th, 2018 to March 11th, 2019. Overall, there was a moderate majority of women and females to men and males (Table 3-1). The respondents were predominately either Métis or First Nations with a small portion of Inuit respondents. Of the First Nation respondents 67.5% identified as Cree/Nehiyaw. Student and paid full-time employment made up the majority of respondent's job situations, over half made more than \$40 000 a year, and about three quarters of respondents had some post-secondary education. Regarding the marital status of the respondents there was almost an even split between those who were single and those in a relationship, with less than 10% separated or divorced. When examining the social setting of the respondents one quarter grew up in a northern community, about one third lived in a rural community, and the majority grew up off reserve. Seventy-five percent of respondents moved away from home for an extended period of time. Examining potential causes of historic

trauma: 8% of respondents attended residential school, 72% had a family member who attended, 16% of respondents were placed in foster care of which 68% were placed outside their family, and 49% had a family member placed in foster care.

Table: 3-1 Sample Demographic Characteristics Table, N(%), Mean \pm SD

| Characteristic | Overall Indigenous N=124 | Métis N=41 | First Nations N=80 | Cree N=54 |
|------------------------------|--------------------------------|-----------------|-----------------------|-----------------|
| Assigned Sex at Birth | | | | |
| Female | 93(75.6) | 31(75.6) | 62(77.5) | 42(77.8) |
| Male | 30(24.4) | 10(24.4) | 18(22.5) | 12(22.2) |
| Gender Identity | | | | |
| Women | 87(70.7) | 30(73.2) | 56(74.7) | 39(75.0) |
| Men | 31(25.2) | 11(26.8) | 18(24.0) | 12(23.1) |
| Trans Man | 1(0.8) | 0(0) | 1(1.3) | 0(0) |
| Trans Woman | 0(0) | 0(0) | 0(0) | 0(0) |
| Genderqueer/non-conforming | 1(0.8) | 0(0) | 1(1.3) | 0(0) |
| Other | 3(2.4) | 0(0) | 3(3.8) | 2(4.5) |
| Age | 29.9 \pm 11.3 | 28.4 \pm 11.8 | 30.8 \pm 11.1 | 30.3 \pm 11.8 |
| Indigenous Group | | | | |
| Métis | 41(33.3) | | | |
| Inuit | 2(1.6) | | | |
| First Nations – Status | 75(61.0) | | | |
| First Nations – Non-Status | 5(4.0) | | | |
| First Nations † | 71 | | | |
| Cree | 54(76.1) | | | |
| Salteaux | 6(8.5) | | | |
| Dene | 3(4.2) | | | |
| Other ‡ | 8(11.3) | | | |
| Job Situation | | | | |
| Student | 73(60.8) | 23(57.5) | 48(62.3) | 36(79.2) |
| Temporarily Unemployed | 2(1.7) | 1(2.5) | 1(1.3) | 1(1.9) |
| Paid part-time employment | 11(9.2) | 4(10.0) | 7(9.1) | 3(5.8) |
| Paid full-time employment | 34(27.4) | 12(30.0) | 21(27.3) | 12(23.1) |
| Income | | | | |
| \$10 001 to \$20 000 | 33(26.8) | 6(14.6) | 26(32.9) | 20(37.0) |
| \$20 001 to \$40 000 | 17(13.8) | 5(12.2) | 12(15.2) | 7(13.0) |
| \$40 001 to \$75 000 | 60(48.8) | 25(61.0) | 33(41.8) | 22(40.7) |
| More than \$75 000 | 13(10.6) | 5(12.2) | 8(10.1) | 5(9.3) |

| Characteristic | Overall Indigenous N=124 | Métis N=41 | First Nations N=80 | Cree N=54 |
|--|--------------------------------|---------------|-----------------------|--------------|
| Education | | | | |
| Some high school | 1(0.8) | 1(2.4) | 0(0) | 0(0) |
| High school diploma | 28(23.0) | 11(26.8) | 17(21.8) | 13(24.1) |
| Vocational school or some college | 40(32.8) | 12(29.3) | 27(34.6) | 20(37.0) |
| College/university degree | 32(26.2) | 9(22.0) | 21(26.9) | 14(25.9) |
| Professional/graduate degree | 21(17.2) | 8(19.5) | 13(16.7) | 7(13.0) |
| Marital Status | | | | |
| Single, never married | 51(41.5) | 13(34.1) | 35(44.3) | 24(44.4) |
| In Relationship | 59(48.0) | 22(53.7) | 37(46.8) | 24(44.4) |
| Separated/Divorced | 11(8.9) | 4(9.8) | 6(7.6) | 5(9.3) |
| Other | 2(1.6) | 1(2.4) | 1(1.3) | 1(1.9) |
| Home Residence | | | | |
| Rural | 48(39.7) | 17(41.5) | 31(40.3) | 19(35.8) |
| Urban | 35(28.9) | 15(36.6) | 17(22.1) | 13(24.5) |
| Both | 38(31.4) | 9(22.0) | 29(37.7) | 21(39.6) |
| Northern Community | 31(25.4) | 11(26.8) | 20(25.6) | 16(30.2) |
| On Reserve | 25(20.8) | 0(0) | 25(32.5) | 16(30.8) |
| Off Reserve | 74(61.7) | 37(90.2) | 36(46.8) | 26(50.0) |
| Both | 21(17.5) | 4(9.8) | 16(20.8) | 10(19.2) |
| Move away from home for extended period of time | | | | |
| Yes | 92(75.4) | 27(65.9) | 64(82.1) | 42(77.8) |
| No | 30(24.6) | 14(34.1) | 14(17.9) | 12(22.2) |

N, Number of Participants; SD, Standard Deviation; †, Not all First Nation participants declared a Nation affiliation; ‡, Other Nations are not specifically identified due to small sample sizes;

All assumptions for independent t-test data analysis were met. The majority of assumptions were also met for the use of simple one-way ANOVAs. However, the assumption of no outliers was not met, as data points outside two standard deviations were not removed due to the wishes of the community.

3.1.1 Cultural Determinants of Physical Activity

Table 3-2 highlights the findings of this study in reference to possible cultural determinants of physical activity within Indigenous populations. Possible cultural determinants examined include cultural connectedness and discriminatory experience.

Table: 3-2 Cultural Determinants of Physical Activity Findings Summary

| Possible Determinants | Association Found | Brief Description of Finding |
|----------------------------|-------------------|---|
| Cultural Connectedness | +/- | First Nations and Cree participants who were more physically active had higher cultural connectedness scores than those who were less physically active, yet the reverse was found in Métis participants. |
| Discriminatory Experiences | ~ | No significant associations were found between discriminatory experiences and physical activity. |

+, positive association; -, negative association; ~, no association;

Métis participants who were more physically active were found to be less cultural connected. This can be seen in Figure 3-1, in which the means for cultural traditions ($p=0.01$; Figure 3-1B), spirituality ($p=0.01$; Figure 3-1), and overall cultural connectedness ($p=0.01$; Figure 3-1D) were significantly lower in the high physical activity group than the low physical activity group. However, First Nation and Cree participants who were more physically active were found to be more connected with their culture compared to First Nations and Cree participants who are less physically active. This can be seen in Figure 3-1, in which the means for First Nations cultural identity ($p=0.02$; Figure 3-1A), Cree cultural identity ($p=0.02$; Figure 3-1A), First Nations overall cultural connectedness ($p=0.04$; Figure 3-1D), and Cree overall cultural connectedness ($p=0.046$; Figure 3-1D) were significantly higher in the high physical

activity group than the low physical activity group. No differences in cultural connectedness was observed between physical activity groups of overall Indigenous participants.

Figure 3-1A

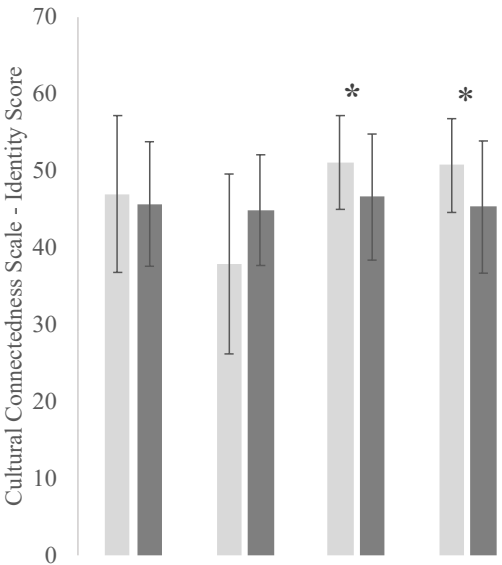


Figure 3-1B

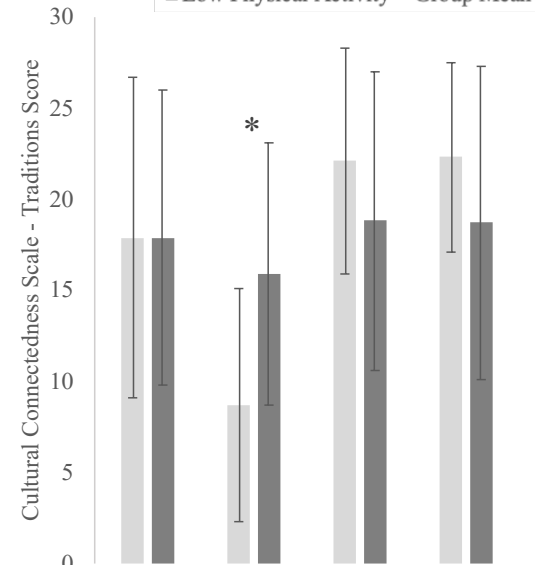


Figure 3-1C

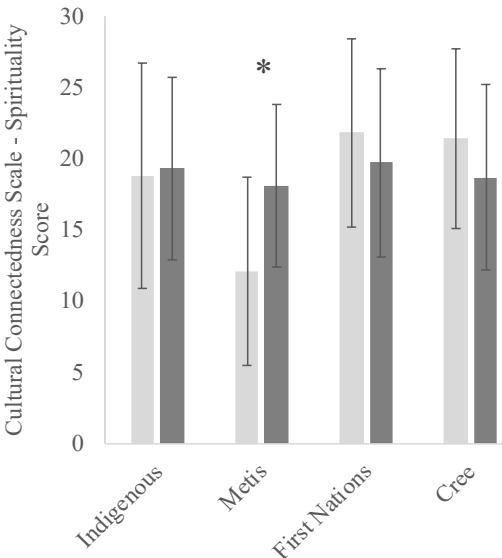


Figure 3-1D

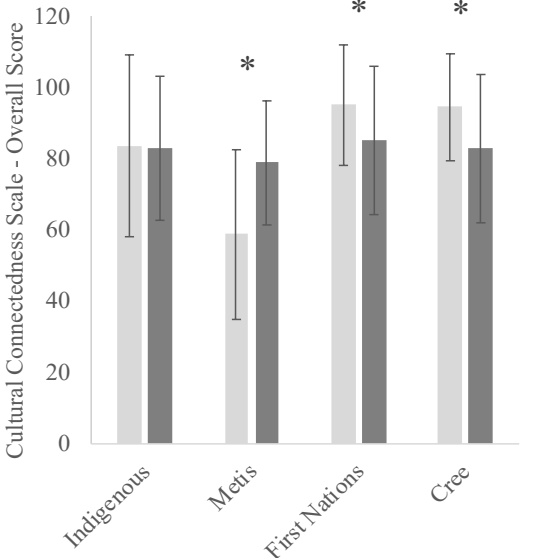


Figure: 3-1 Overall Indigenous, Métis, First Nations, and Cree Cultural Connectedness Scale (CCS) score comparisons by high physical activity and low physical activity groups. Figure 3-1A illustrates the comparison of CCS-Identity scores by physical activity group. Figure 3-1B illustrates the comparison of CCS-Tradition scores by physical activity group. Figure 3-1C illustrates the comparison of CCS-Spirituality scores by physical activity group. Figure 3-1D illustrates the comparison of CCS-Overall scores by physical activity group. *p-value<0.05

Métis participants who were more physically active were found to be less cultural connected. This can be seen in Figure 3-2, in which the means for ethnic exploration ($p=0.01$; Figure 3-2B) and ethnic identity search ($p=0.01$; Figure 3-2C) were significantly lower in the high physical activity group than the low physical activity group. However, First Nations and Cree participants who were more physically active were found to be more connected with their culture compared to First Nations and Cree participants who were less physically active. First Nations commitment to ethnicity ($p=0.02$; Figure 3-2A), ethnic exploration ($p=0.001$; Figure 3-2B), ethnic identity search ($p=0.02$; Figure 3-2C), affirmation and belonging ($p=0.03$; Figure 3-2D), and overall identity scores ($p=0.02$; Figure 3-2E) were significantly higher in the high physical activity group than the low physical activity group. Cree participants means for ethnic exploration ($p=0.001$; Figure 3-2B) and ethnic identity search ($p=0.01$; Figure 3-2C) were significantly higher in the high physical activity group than the low physical activity group. No differences were observed between the Multigroup Ethnic Identity Measure scores of high and low physical activity groups of overall Indigenous participants.

Figure 3-2A

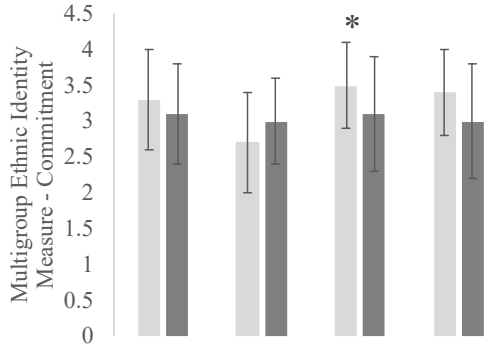


Figure 3-2B

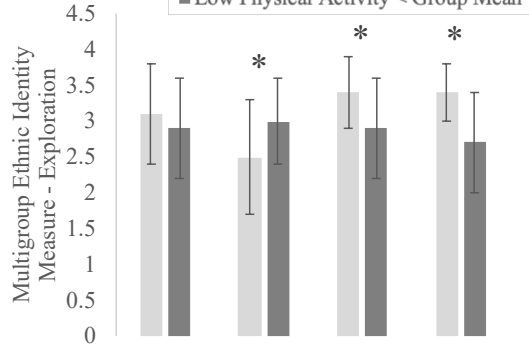


Figure 3-2C

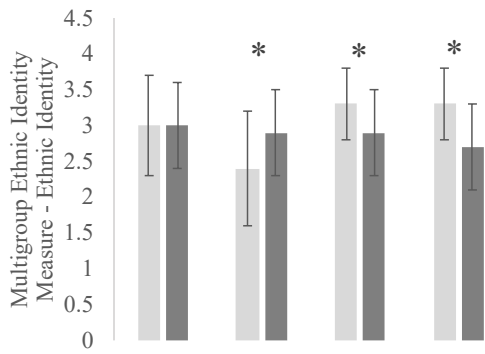


Figure 3-2D

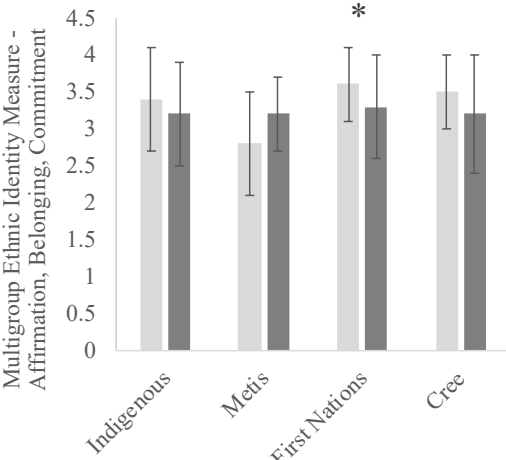


Figure 3-2E

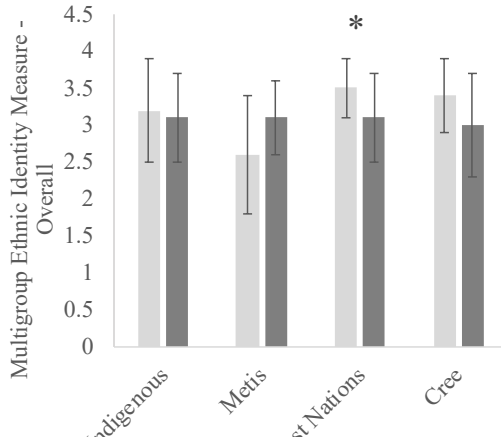


Figure: 3-2 Overall Indigenous, Métis, First Nations, and Cree Multigroup Ethnic Identity Measure (MEIM) score comparisons by high physical activity and low physical activity groups. Figure 3-2A illustrates the comparison of MEIM-Commitment scores by physical activity group. Figure 3-2B illustrates the comparison of MEIM-Exploration scores by physical activity group. Figure 3-2C illustrates the comparison of MEIM-Ethnic Identity scores by physical activity group. Figure 3-2D illustrates the comparison of MEIM-Affirmation, Belonging, and Commitment scores by physical activity group. Figure 3-2E illustrates the comparison of MEIM-Overall scores by physical activity group, *p-value<0.05

Table 3-3 describes correlations identified between the Cultural Connectedness Scale scores (N=105) and Multigroup Ethnic Identity Measure scores (N=108) as large, positive, and highly significant. There are similarities between the measurements, but they are also both unique tools. It was decided that both measures would be used to highlight different aspects of cultural connectedness and to support each other's findings.

Table: 3-3 Correlations between Cultural Connectedness Scale and Multigroup Ethnic Identity Measure

| Cultural Connectedness Scale | Multigroup Ethnic Identity Measure | | | | |
|------------------------------|------------------------------------|-------------|------------------------|--|---------|
| | Commitment | Exploration | Ethnic Identity Search | Affirmation, Belonging, and Commitment | Overall |
| Overall Indigenous | | | | | |
| Identity | 0.678** | 0.740** | 0.785** | 0.687** | 0.786** |
| Traditions | 0.656** | 0.599** | 0.669** | 0.619** | 0.698** |
| Spirituality | 0.660** | 0.629** | 0.697** | 0.645** | 0.728** |
| Overall | 0.723** | 0.716** | 0.782** | 0.708** | 0.802** |
| Métis | | | | | |
| Identity | 0.758** | 0.853** | 0.879** | 0.797** | 0.871** |
| Traditions | 0.593** | 0.662** | 0.692** | 0.609** | 0.675** |
| Spirituality | 0.741** | 0.711** | 0.744** | 0.749** | 0.779** |
| Overall | 0.751** | 0.807** | 0.838** | 0.776** | 0.839** |
| First Nations | | | | | |
| Identity | 0.585** | 0.680** | 0.711** | 0.571** | 0.693** |
| Traditions | 0.634** | 0.511** | 0.588** | 0.560** | 0.642** |
| Spirituality | 0.612** | 0.540** | 0.623** | 0.576** | 0.671** |
| Overall | 0.673** | 0.637** | 0.707** | 0.627** | 0.737** |
| Cree | | | | | |
| Identity | 0.505** | 0.580** | 0.612** | 0.452** | 0.567** |
| Traditions | 0.631** | 0.421** | 0.512** | 0.505** | 0.567** |
| Spirituality | 0.632** | 0.391** | 0.471** | 0.539** | 0.569** |
| Overall | 0.653** | 0.515** | 0.590** | 0.551** | 0.628** |

CCS, Cultural Connectedness Scale; MEIM, Multi Ethnic Identity Measure; **p<0.001

There were also no significant difference between those who participated in traditional activities frequently, infrequently, or never in overall Indigenous, Métis, First Nations, and Cree participants (Figure 3-3).

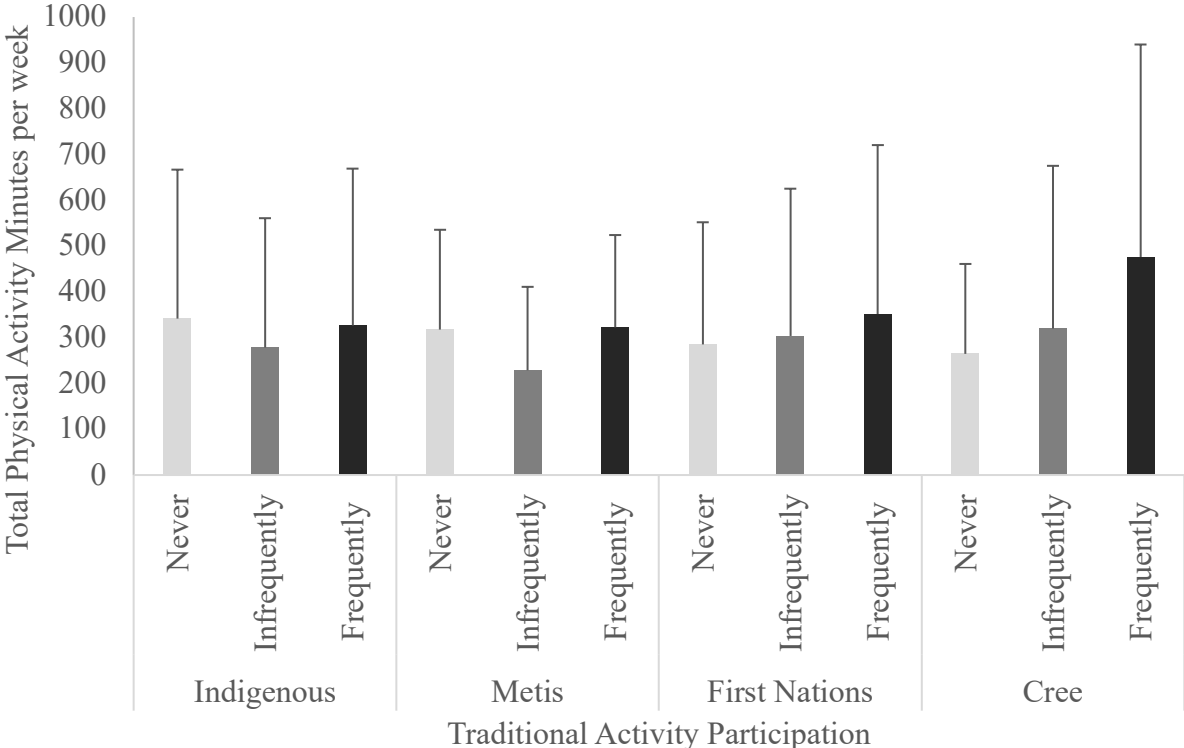


Figure: 3-3 Overall Indigenous, Métis, First Nations, and Cree physical activity levels by traditional activity participation.

Overall Indigenous, Métis, First Nations, and Cree participants who were more physically active were found to have no significant difference in discriminatory experiences compared to those who were less physically active (Figure 3-4).

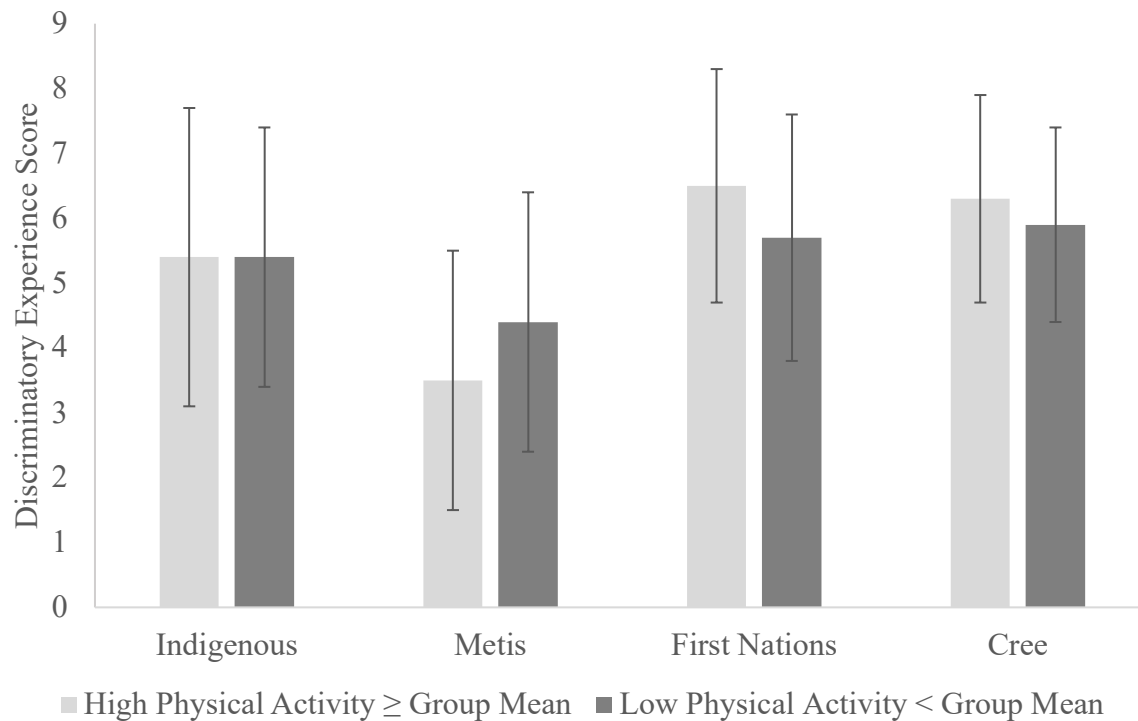


Figure: 3-4 Overall Indigenous, Métis, First Nations, and Cree discriminatory experiences comparison between high and low physical activity groups

3.1.2 Social Determinants of Physical Activity

Table 3-4 highlights the findings of this study in reference to possible social determinants of physical activity within Indigenous populations. Possible social determinants examined include social support, family influences, historic trauma, education, income, tobacco and alcohol use, sedentary behaviours, home residence, sex, and gender.

Table: 3-4 Social Determinants of Physical Activity Findings Summary

| Possible Determinants | Association Found | Brief Description of Finding |
|-------------------------|-------------------|---|
| Social Support | (+) | Métis participants who met muscle strengthening recommendations had higher levels of social support than those who did not. |
| Family Influences | (+) | Participants who met muscle strengthening recommendations had higher scores of family influences on physical activity than those who did not. |
| Historic Trauma | (+/-) | Métis who attended residential school were more physically active than those who did not. Métis who experienced foster care were less physically active than those who did. |
| Education | ~ | No significant associations. |
| Income | ~ | No significant associations. |
| Tobacco and Alcohol Use | ~ | No significant associations. |
| Sedentary Behaviours | (-) | Métis participants who were more physically active were less sedentary than those who were less physically active. |
| Home Residence | (-) | Participants who grew up in northern communities were less physically active than those who did not. |
| Sex and Gender | (+) | Males were more physically active than females. |

+, positive association; -, negative association; ~, no association;

Overall Indigenous participants, Métis, First Nations, and Cree participants who had higher rates of physical activity were found to have no differences in social support from community (Figure 3-5A), family (Figure 3-5B), friends (Figure 3-5C), a positive perception on support (Figure 3-5D), and overall social support (Figure 3-5E) compared to Indigenous participants who had lower rates of physical activity.

Figure 3-5A

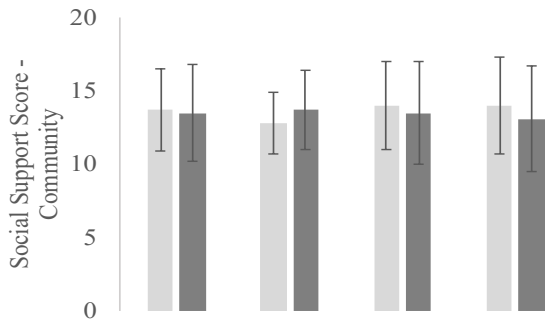


Figure 3-5B

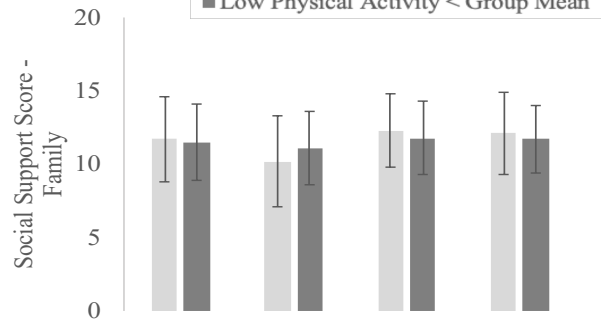


Figure 3-5C

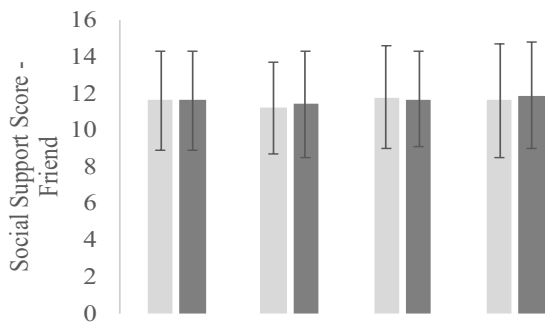


Figure 3-5D

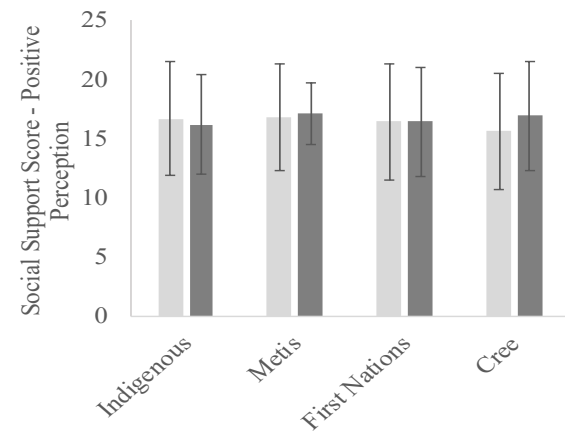


Figure 3-5E

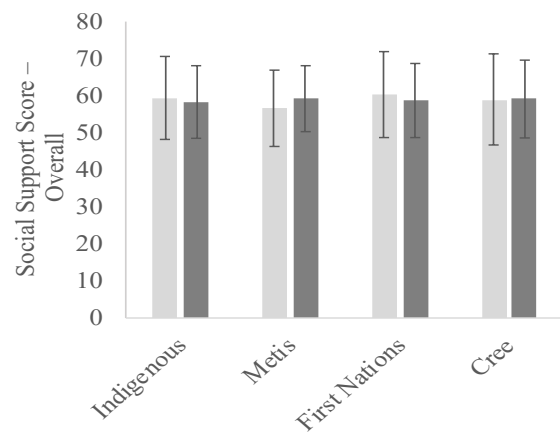


Figure: 3-5 Overall Indigenous, Métis, First Nations, and Cree social support scores comparison between high and low physical activity groups.

Overall Indigenous, Métis, First Nations, and Cree participants who were more physically active were found to have similar encouragement/support for physical activity from their friends and family compared to those who were less physically active (Figure 3-6).

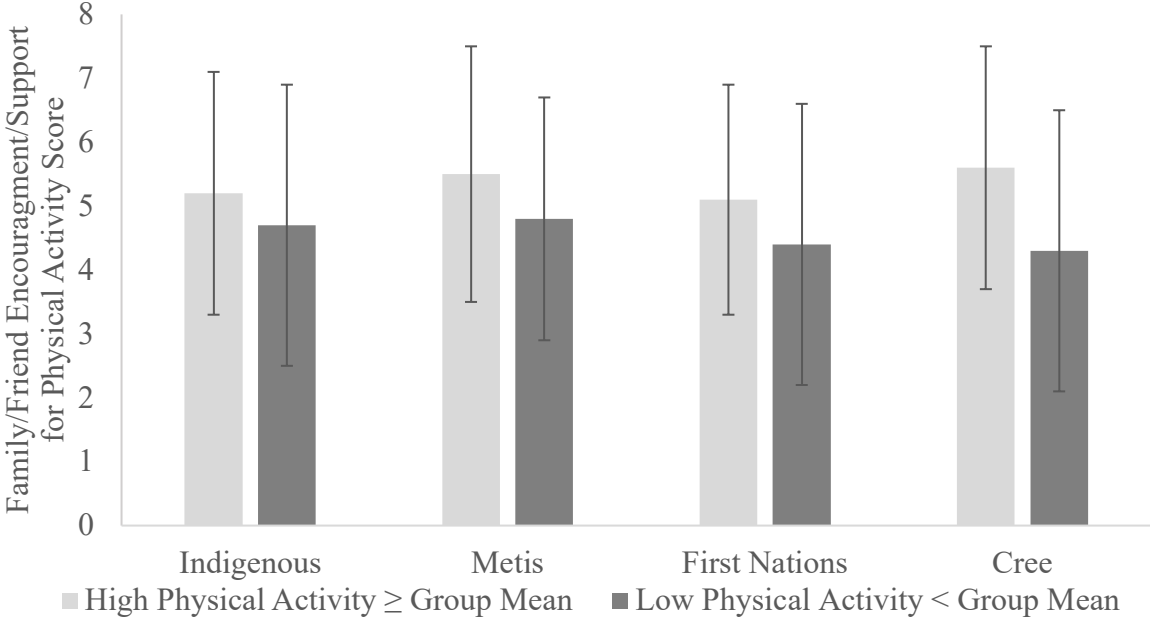


Figure: 3-6 Overall Indigenous, Métis, First Nations, and Cree family/friend support/encouragement for physical activity score comparison between high and low physical activity groups

Métis people who had higher degrees of family support ($p=0.03$; Figure 3-7A) and overall social support ($p=0.02$; Figure 3-7E) were found to participate in more muscle strengthening activities. Overall Indigenous, First Nations, and Cree participants who meet the CSEP physical activity muscle strengthening activity recommendations were found to have no significant differences between means of social support from community, family, friends, a positive perception on support, and overall social support compared to Indigenous participants who did not meet the muscle strengthening activity recommendations (Figure 3-7).

Figure 3-7A

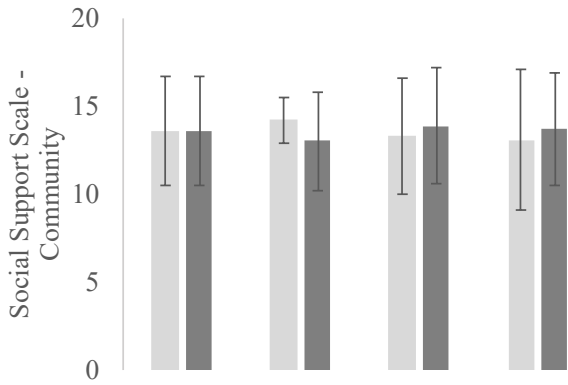


Figure 3-7B

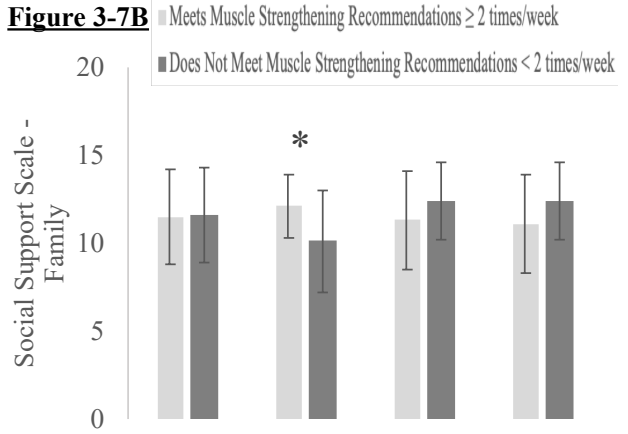


Figure 3-7C

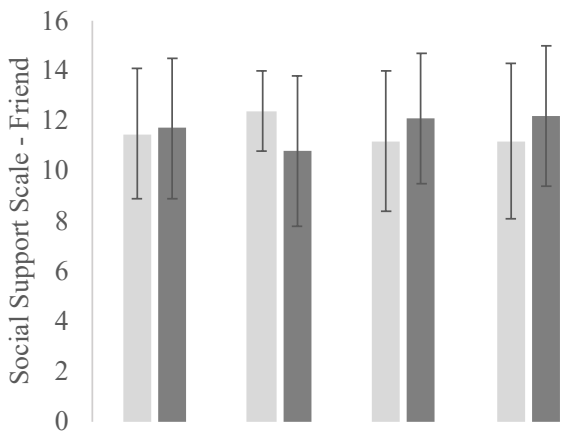


Figure 3-7D

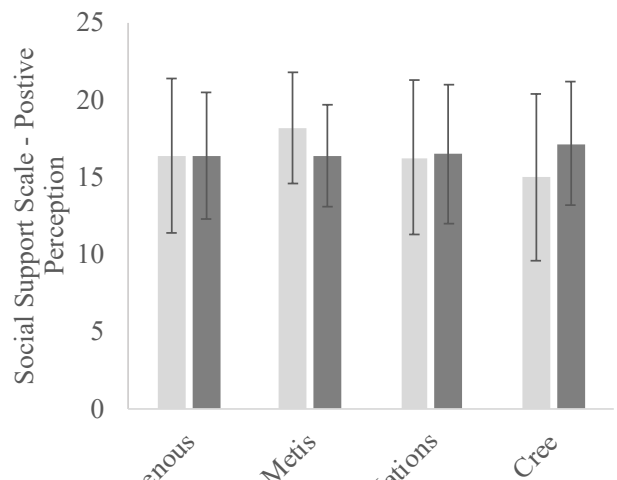


Figure 3-7E

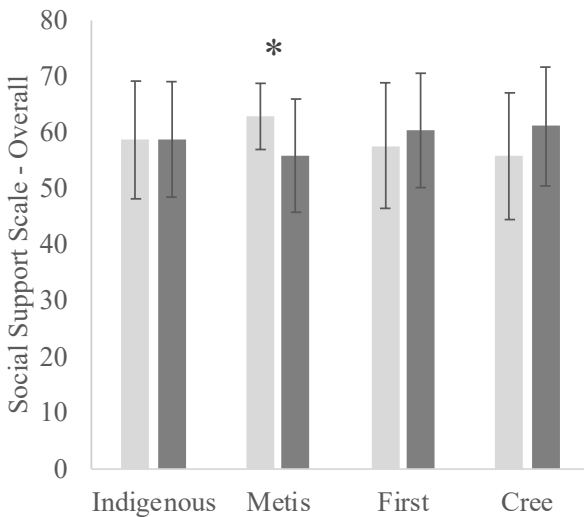


Figure: 3-7 Overall Indigenous, Métis, First Nations, and Cree social support levels categorized by those who meet the CSEP muscle strengthening activity recommendations per week (≥ 2 times) and those who do not, *p-value<0.05.

Overall Indigenous, First Nations, and Cree participants who meet the CSEP physical activity muscle strengthening activity recommendations were found to have higher encouragement/support for physical activity from their friends and family compared to Indigenous participants who did not meet the muscle strengthening activity recommendations. Figure 3-8 demonstrates friend/family encouragement/support for physical activity was significantly higher in the meets muscle strengthening recommendations groups than the does not meet muscle strengthening recommendation groups for overall Indigenous (p=0.002), First Nations (p=0.01), and Cree participants (p=0.003). However, no significant differences were found between the Métis groups.

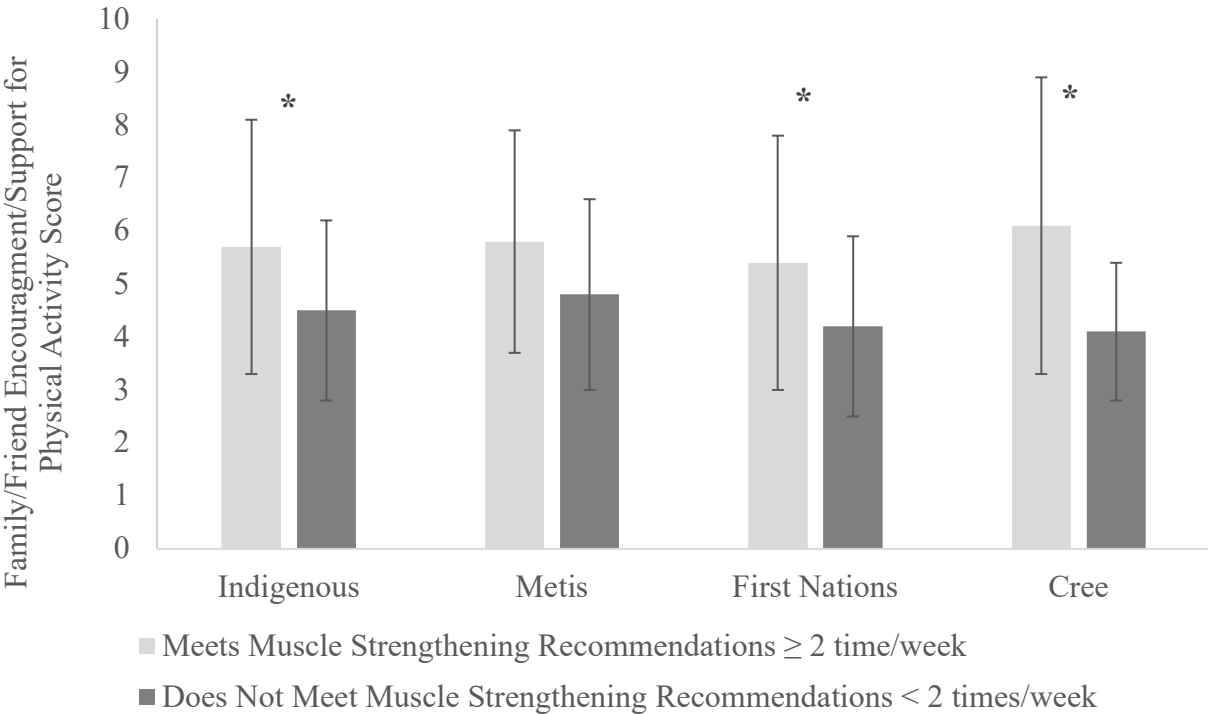


Figure: 3-8 Overall Indigenous, Métis, First Nations, and Cree family/friend support/encouragement for physical activity score categorized by those who meet CSEP muscle strengthening activity recommendations per week (≥ 2 times) and those who do not, *p-value <0.05 .

Overall Indigenous, Métis, First Nations, and Cree participant groups who experienced historic trauma had increased cultural connectedness (Table 3-5). Indigenous participants who did attend residential school, or have a family member attend, were found to participate in more traditional activities per week. Similarly, Indigenous participants who were placed, or did have a family member placed, in foster care, were found to participate in more traditional activities per week. There were no significant differences between Indigenous participants who have residential school or foster care experiences and muscle strengthening activities per week.

Métis participants who were not placed, or did not have a family member placed, in foster care were found to identify less with their culture and have higher rates of physical activity per week (Table 3-5). There were also no significant differences between Métis participants who have residential school or foster care experiences and those who do not in muscle strengthening activities per week, and traditional activities per week.

First Nations participants who did attend residential school, or have a family member attend, were found to have more cultural connectedness (Table 3-5). First Nations participants who were placed, or did have a family member placed, in foster care were found to participate in more traditional activities per week. However, there were no significant differences between First Nations participants who had attended or had a family member attend residential school in total physical activity minutes per week, muscle strengthening activities per week, or traditional activities per week. There were also no significant differences between First Nations participants who have foster care experiences and those who do not in cultural connectedness, total physical activity minutes per week, and muscle strengthening activities per week.

Cree participants who did attend residential school, or have a family member attend, were found to have more cultural connectedness and total physical activity minutes per week (Table 3-

5). However, there were no significant differences between Cree participants who had attended or had a family member attend residential school in muscle strengthening activities per week or traditional activities per week. There were also no significant differences between Cree participants who have foster care experiences and those who do not in cultural connectedness, total physical activity minutes per week, muscle strengthening activities per week, and traditional activities per week.

Table: 3-5 Overall Indigenous, Métis, First Nations, and Cree participants cultural connectedness and physical activity scores. Grouped by self or family residential school/foster care experiences, Mean \pm SD.

| | Self/Family Residential School Attendance | No Self/Family Residential School Attendance | p-value | Self/Family Foster Care Experience | No Self/Family Foster Care Experience | p-value |
|--------------------------|---|--|--------------|------------------------------------|---------------------------------------|--------------|
| Indigenous | N=71 | N=28 | | N=52 | N=47 | |
| CCS | 90.4 \pm 19.0 | 65.7 \pm 21.2 | 0.000 | 91.2 \pm 18.8 | 74.9 \pm 23.2 | 0.000 |
| MEIM | 3.3 \pm 0.6 | 2.7 \pm 0.6 | 0.000 | 3.3 \pm 0.6 | 2.9 \pm 0.6 | 0.000 |
| Total PA (mins/week) | 290.4 \pm 303.6 | 298.2 \pm 211.0 | 0.90 | 249.2 \pm 287.6 | 340.6 \pm 267.8 | 0.11 |
| MS activities (per week) | 1.7 \pm 2.2 | 1.3 \pm 2.0 | 0.45 | 1.6 \pm 2.3 | 1.7 \pm 2.1 | 0.90 |
| TA activities (per week) | 1.0 \pm 0.7 | 0.5 \pm 0.6 | 0.001 | 1.1 \pm 0.7 | 0.6 \pm 0.6 | 0.000 |
| Métis | N=11 | N=21 | | N=10 | N=22 | |
| CCS | 80.7 \pm 18.7 | 64.4 \pm 21.7 | 0.04 | 84.8 \pm 17.1 | 63.2 \pm 20.7 | 0.01 |
| MEIM | 1.9 \pm 0.5 | 2.3 \pm 0.7 | 0.09 | 1.8 \pm 0.5 | 2.3 \pm 0.6 | 0.02 |
| Total PA (mins/week) | 185.9 \pm 148.7 | 327.2 \pm 224.0 | 0.07 | 153.5 \pm 162.1 | 335.9 \pm 206.6 | 0.02 |
| MS activities (per week) | 1.4 \pm 1.5 | 1.0 \pm 1.6 | 0.52 | 1.2 \pm 1.6 | 1.2 \pm 1.6 | 0.98 |
| TA activities (per week) | 0.8 \pm 0.6 | 0.5 \pm 0.6 | 0.14 | 0.9 \pm 0.7 | 0.5 \pm 0.5 | 0.06 |

| | Self/Family Residential School Attendance | No Self/Family Residential School Attendance | p-value | Self/Family Foster Care Experience | No Self/Family Foster Care Experience | p-value |
|--------------------------|---|--|--------------|------------------------------------|---------------------------------------|-------------|
| First Nations | N=58 | N=7 | | N=40 | N=25 | |
| CCS | 92.2±18.2 | 69.3±21.1 | 0.003 | 93.0±18.5 | 84.7±20.9 | 0.10 |
| MEIM | 3.3±0.6 | 2.8±0.5 | 0.02 | 3.3±0.6 | 3.2±0.5 | 0.22 |
| Total PA (mins/week) | 316.6±324.5 | 201.7±131.7 | 0.40 | 281.0±313.2 | 344.5±314.4 | 0.43 |
| MS activities (per week) | 1.6±2.1 | 2.4±2.8 | 0.39 | 1.5±2.0 | 2.0±2.3 | 0.28 |
| TA activities (per week) | 1.1±0.7 | 0.7±0.8 | 0.21 | 1.2±0.7 | 0.8±0.6 | 0.04 |
| Cree | N=31 | N=5 | | N=19 | N=17 | |
| CCS | 89.3±16.6 | 67.8±3.0 | 0.02 | 89.6±16.6 | 82.5±21.5 | 0.28 |
| MEIM | 3.2±0.6 | 2.9±0.5 | 0.23 | 3.2±0.7 | 3.1±0.5 | 0.58 |
| Total PA (mins/week) | 362.9±358.8 | 137.5±100.1 | 0.01 | 294.0±342.7 | 382.8±354.0 | 0.46 |
| MS activities (per week) | 1.9±2.5 | 1.3±1.5 | 0.64 | 1.8±2.6 | 1.8±2.2 | 0.96 |
| TA activities (per week) | 1.1±0.6 | 0.6±0.5 | 0.09 | 1.2±0.5 | 0.6±0.6 | 0.56 |

CCS, Cultural Connectedness Scale; MEIM, Multi-Ethnic Identity Measure; MS per week, Muscle strengthening activities per week; N, number of participants; TA per week, Traditional activities per week; Total PA, Total physical activity minutes per week

Overall Indigenous, Métis, First Nations, and Cree participants who grew up in a rural, urban, or both communities were found to have similar physical activity (Table 3-6). Overall Indigenous, First Nations, and Cree participants who grew up in a northern community were found to have significantly less physical activity. However, there were no significant differences in physical activity for Métis participants who grew up in northern communities or participants who left their home community for an extended period of time. There were also no significant differences in physical activity between overall Indigenous, Métis, First Nations, and Cree participants who grew up on-reserve, off-reserve, or both.

Overall Indigenous, Métis, First Nations, and Cree physical activity did not seem to be influenced by tobacco or alcohol use (Table 3-6). Also, overall Indigenous, Métis, First Nations, and Cree physical activity did not seem to be influenced by income or education as their means for physical activity were not significantly different.

Indigenous males were found to be significantly more active than Indigenous females (Table 3-6). However, there were no significant differences between Métis, First Nation, or Cree physical activity by sex. There were also no significant differences in physical activity between genders among overall Indigenous, Métis, First Nations, or Cree participants.

Table: 3-6 Overall Indigenous, Métis, First Nations, and Cree social determinants of physical activity. Total minutes of physical activity per week by sex, gender, home residence, tobacco and alcohol use, income, and education, Mean ± SD.

| | Indigenous N=123 | Métis N=41 | First Nations N=80 | Cree N=54 |
|-----------------------|---------------------|---------------|-----------------------|--------------|
| Sex | | | | |
| Female | 273.0±285.8 | 250.0±190.2 | 285.9±328.2 | 340.8±369.4 |
| Male | 422.9±350.0 | 361.3±222.7 | 400.3±283.1 | 362.8±350.8 |
| <i>p-value</i> | 0.03 | 0.16 | 0.21 | 0.88 |
| Gender | | | | |
| Women | 286.1±289.1 | 256.9±189.7 | 303.1±334.2 | 365.2±370.7 |
| Men | 409.2±350.5 | 326.7±232.7 | 400.3±283.1 | 362.8±350.8 |
| <i>p-value</i> | 0.07 | 0.37 | 0.30 | 0.99 |
| Home Residence | | | | |
| Rural | 289.1±245.3 | 316.3±212.8 | 274.0±264.3 | 319.6±396.2 |
| Urban | 289.6±355.2 | 240.6±169.7 | 273.6±351.5 | 283.5±387.5 |
| Both | 352.6±326.9 | 252.8±228.9 | 387.1±351.8 | 415.7±403.1 |
| <i>p-value</i> | 0.61 | 0.57 | 0.37 | 0.64 |
| Northern Community | 164.9±229.0 | 274.4±257.2 | 103.3±193.2 | 134.9±216.0 |
| Southern Community | 337.0±292.0 | 265.0±188.2 | 381.9±328.5 | 461.9±380.8 |
| <i>p-value</i> | 0.01 | 0.91 | 0.000 | 0.002 |
| On-Reserve | 217.1±314.1 | - | 217.1±314.1 | 259.0±400.3 |
| Off-Reserve | 312.4±244.2 | 292.0±201.4 | 343.4±288.7 | 387.3±350.3 |
| Both | 349.8±345.7 | 115.0±87.4 | 423.6±365.2 | 420.3±367.0 |
| <i>p-value</i> | 0.25 | 0.09 | 0.12 | 0.58 |

| | Indigenous N=123 | Métis N=41 | First Nations N=80 | Cree N=54 |
|-----------------------------------|---------------------|---------------|-----------------------|--------------|
| Home Residence | | | | |
| Left Home Community | 306.1±298.3 | 271.2±200.3 | 324.6±333.3 | 358.1±387.5 |
| Did Not Leave Home Community | 308.4±336.4 | 277.6±206.2 | 251.5±249.6 | 305.3±267.5 |
| <i>p-value</i> | 0.97 | 0.93 | 0.48 | 0.71 |
| Tobacco Use | | | | |
| Never Use | 349.0±344.3 | 304.1±214.8 | 338.8±360.4 | 400.0±418.3 |
| Regularly Use | 335.6±373.9 | 250.0±170.7 | 385.5±422.2 | 392.3±453.3 |
| Quit | 281.9±229.1 | 289.1±176.5 | 278.5±255.6 | 290.4±257.7 |
| Ceremonial Purposes | 236.2±211.1 | 120.0±127.3 | 257.4±220.6 | 278.8±311.0 |
| <i>p-value</i> | 0.65 | 0.65 | 0.73 | 0.90 |
| Alcohol Use | | | | |
| Never | 369.5±392.2 | 346.7±183.7 | 297.2±290.7 | 465.0±384.8 |
| < Once a Week | 277.2±289.8 | 262.8±206.1 | 291.1±338.6 | 292.1±354.4 |
| ≥ Once a Week | 346.9±2806 | 279.4±201.7 | 390.3±321.0 | 409.8±375.0 |
| Every Day | 189.0±114.6 | - | 270.0±0 | - |
| <i>p-value</i> | 0.55 | 0.79 | 0.80 | 0.49 |
| Income | | | | |
| \$10 001 to \$20 000 | 320.2±361.3 | 185.8±190.2 | 364.6±393.4 | 388.3±415.0 |
| \$20 001 to \$40 000 | 348.0±239.2 | 345.0±201.7 | 349.1±260.5 | 417.5±315.1 |
| \$40 001 to \$75 000 | 307.3±313.0 | 293.9±198.0 | 279.4±304.8 | 333.3±350.6 |
| More than \$75 000 | 225.2±210.1 | 227.0±199.6 | 224.1±210.0 | 123.1±246.3 |
| <i>p-value</i> | 0.75 | 0.55 | 0.65 | 0.59 |
| Education | | | | |
| Some high school | 50.0±0 | 50.0±0 | - | - |
| High school diploma | 393.4±352.2 | 310.5±157.3 | 458.6±446.7 | 497.6±452.7 |
| Vocational school or some college | 255.0±258.0 | 286.9±278.8 | 248.0±257.9 | 244.2±253.1 |
| College/university degree | 380.6±361.7 | 314.4±209.8 | 358.9±312.9 | 449.5±371.3 |
| Professional/graduate degree | 199.5±184.1 | 192.5±111.0 | 203.8±221.9 | 37.5±75.0 |
| <i>p-value</i> | 0.09 | 0.52 | 0.12 | 0.08 |

N, number of participants

3.1.3 Determinants of Sedentary Behaviours

Table 3-7 highlights the findings of this study in reference to possible determinants of sedentary behaviours within Indigenous populations. Possible determinants examined include cultural connectedness, discriminatory experience, social support, education, income, tobacco and alcohol use, physical activity, and home residence.

Table: 3-7 Determinants of Sedentary Behaviours Findings Summary

| Possible Determinants | Association Found | Brief Description of Finding |
|----------------------------|-------------------|---|
| Cultural Connectedness | (+) | Cree participants who were more sedentary had higher levels of cultural connectedness than those who were less sedentary. |
| Discriminatory Experiences | (+) | Overall Indigenous participants who were more sedentary had higher scores of discriminatory experiences than those who were less sedentary. |
| Social Support | (+/-) | Participants who were more sedentary had higher levels of family and community support but lower levels of positive perception of support than those who were less sedentary. |
| Education | ~ | No significant association. |
| Income | (-) | Overall Indigenous participants who had higher levels of income were less sedentary than those who had lower levels of income. |
| Tobacco and Alcohol Use | ~ | No significant association. |
| Physical Activity | (-) | Métis participants who were more sedentary had lower levels of physical activity than those who were less sedentary. |
| Home Residence | (-) | Overall Indigenous participants who grew up off-reserve were less sedentary than those who grew up on-reserve |

+, positive association; -, negative association; ~, no association;

Overall Indigenous participants who spent less time in sedentary behaviours were found to have fewer discriminatory experiences (Table 3-8). Also, overall Indigenous participants who had less screen time were found to have less family social support. However, there were no significant differences in physical activity, muscle strengthening activities per week, traditional activities per week, or social support scores between overall Indigenous participants with high and low sedentary behaviours. There were also no significant differences in physical activity, muscle strengthening activities per week, traditional activities per week, community social support, friend social support, positive perception of social support, overall social support, and discriminatory experiences between overall Indigenous participants with high and low screen time (Table 3-8).

Métis participants who spent less time in sedentary behaviours were found to have higher physical activity (Table 3-8). However, there were no significant differences in cultural connectedness, muscle strengthening activities per week, traditional activities per week, social support scores, or discriminatory experiences between Métis participants with high and low sedentary behaviours. Métis participants who had high rates of screen time were found to report more community support. There were no significant differences in cultural connectedness, physical activity, muscle strengthening activities per week, traditional activities per week, social support scores, or discriminatory experiences between Métis participants with high and low screen time.

First Nations participants who spent less time in sedentary behaviours were found to have a more of a positive perception of social support (Table 3-8). There were no significant differences in cultural connectedness, physical activity, muscle strengthening activities per week, traditional activities per week, community social support, family social support, friend social

support, overall social support, or discriminatory experiences between First Nations participants with high and low sedentary behaviours. There were also no significant differences in cultural connectedness, physical activity, muscle strengthening activities per week, traditional activities per week, social support scores, or discriminatory experiences between First Nations participants high and low screen time.

Cree participants who spent less time in sedentary behaviours were found to have less cultural connectedness (Table 3-8). Cree participants who had less screen time were also found to have less community support. There were no significant differences in physical activity, muscle strengthening activities per week, traditional activities per week, social support scores, or discriminatory experiences between Cree participants with high and low sedentary behaviours. There were also no significant differences in cultural connectedness, physical activity, muscle strengthening activities per week, traditional activities per week, social support scores, or discriminatory experiences between Cree participants high and low screen time.

Table: 3-8 Overall Indigenous, Métis, First Nations, and Cree participants physical activity, social support scores, and discriminatory experiences. Grouped by group means of sedentary behaviour hours per week (overall Indigenous=119.4, Métis=88.9, First Nations=137.8, and Cree=148.0) and screen time hours per day (overall Indigenous=11.1, Métis=9.2, First Nations=12.4, and Cree=14.3), Mean \pm SD.

| | High Sedentary | Low Sedentary | p-value | High Screen Time | Low Screen Time | p-value |
|--------------------------|-------------------|-------------------|-------------|-------------------|-------------------|-------------|
| Indigenous | N=42 | N=68 | | N=41 | N=69 | |
| CCS | 86.9 \pm 20.6 | 80.8 \pm 23.3 | 0.18 | 88.4 \pm 19.8 | 80.2 \pm 23.4 | 0.08 |
| MEIM | 3.2 \pm 0.6 | 3.1 \pm 0.6 | 0.74 | 3.3 \pm 0.6 | 3.1 \pm 0.7 | 0.09 |
| Total PA (mins/week) | 310.6 \pm 314.4 | 305.8 \pm 308.2 | 0.94 | 284.0 \pm 314.9 | 321.4 \pm 307.2 | 0.55 |
| MS activities (per week) | 1.8 \pm 2.4 | 1.4 \pm 1.9 | 0.40 | 1.5 \pm 2.3 | 1.6 \pm 2.1 | 0.70 |
| TA activities (per week) | 0.9 \pm 0.7 | 0.9 \pm 0.7 | 0.87 | 0.9 \pm 0.7 | 0.9 \pm 0.7 | 0.68 |
| Community-SS | 13.9 \pm 3.2 | 13.4 \pm 3.0 | 0.49 | 14.4 \pm 2.8 | 13.1 \pm 3.2 | 0.05 |
| Family-SS | 11.8 \pm 2.6 | 11.4 \pm 2.7 | 0.50 | 12.5 \pm 2.1 | 11.1 \pm 2.9 | 0.01 |
| Friend-SS | 11.8 \pm 2.5 | 11.5 \pm 2.8 | 0.55 | 12.1 \pm 2.6 | 11.3 \pm 2.7 | 0.19 |
| Positive-SS | 15.6 \pm 4.5 | 17.0 \pm 4.4 | 0.14 | 16.6 \pm 4.2 | 16.3 \pm 4.6 | 0.72 |
| Overall-SS | 58.6 \pm 9.1 | 58.8 \pm 11.1 | 0.90 | 61.5 \pm 9.0 | 57.3 \pm 10.7 | 0.05 |
| DE Score | 6.1 \pm 1.8 | 4.9 \pm 2.2 | 0.01 | 5.6 \pm 1.8 | 5.2 \pm 2.3 | 0.34 |
| Métis | N=16 | N=22 | | N=16 | N=22 | |
| CCS | 71.8 \pm 21.0 | 70.2 \pm 23.4 | 0.84 | 72.6 \pm 22.7 | 69.7 \pm 22.3 | 0.72 |
| MEIM | 2.1 \pm 0.6 | 2.1 \pm 0.7 | 0.78 | 2.1 \pm 0.6 | 2.1 \pm 0.7 | 0.75 |
| Total PA (mins/week) | 186.6 \pm 157.4 | 332.0 \pm 211.4 | 0.03 | 234.3 \pm 233.2 | 299.5 \pm 179.3 | 0.34 |
| MS activities (per week) | 0.9 \pm 1.5 | 1.2 \pm 1.5 | 0.56 | 1.1 \pm 1.5 | 1.1 \pm 1.5 | 0.96 |
| TA activities (per week) | 0.5 \pm 0.6 | 0.7 \pm 0.6 | 0.36 | 0.4 \pm 0.5 | 0.7 \pm 0.6 | 0.14 |
| Community-SS | 14.1 \pm 1.7 | 13.0 \pm 2.8 | 0.17 | 14.4 \pm 1.4 | 12.8 \pm 2.8 | 0.05 |
| Family-SS | 10.6 \pm 2.6 | 10.8 \pm 2.9 | 0.88 | 11.2 \pm 2.7 | 10.5 \pm 2.8 | 0.52 |
| Friend-SS | 11.4 \pm 2.4 | 11.3 \pm 2.9 | 0.95 | 11.4 \pm 2.3 | 11.3 \pm 2.9 | 0.95 |
| Positive-SS | 17.4 \pm 2.7 | 16.8 \pm 3.9 | 0.64 | 17.7 \pm 2.8 | 16.6 \pm 3.8 | 0.37 |
| Overall-SS | 59.5 \pm 8.0 | 57.4 \pm 10.3 | 0.57 | 61.5 \pm 7.6 | 56.3 \pm 10.0 | 0.15 |
| DE Score | 4.2 \pm 2.1 | 3.8 \pm 2.0 | 0.55 | 3.8 \pm 2.3 | 4.1 \pm 1.9 | 0.78 |
| First Nations | N=23 | N=46 | | N=25 | N=44 | |
| CCS | 95.6 \pm 17.1 | 85.7 \pm 20.4 | 0.05 | 92.9 \pm 20.1 | 86.8 \pm 19.5 | 0.23 |
| MEIM | 3.3 \pm 0.7 | 3.2 \pm 0.5 | 0.45 | 3.4 \pm 0.6 | 3.2 \pm 0.6 | 0.17 |
| Total PA (mins/week) | 334.2 \pm 392.3 | 302.9 \pm 285.2 | 0.71 | 328.3 \pm 377.1 | 304.9 \pm 291.0 | 0.78 |
| MS activities (per week) | 2.0 \pm 2.7 | 1.6 \pm 1.9 | 0.53 | 1.5 \pm 2.4 | 1.8 \pm 2.1 | 0.68 |

| | High Sedentary | Low Sedentary | p-value | High Screen Time | Low Screen Time | p-value |
|--------------------------|----------------|---------------|-------------|------------------|-----------------|---------|
| First Nations | N=23 | N=46 | | N=25 | N=44 | |
| TA activities (per week) | 1.2±0.7 | 1.0±0.7 | 0.22 | 1.1±0.7 | 1.0±0.7 | 0.41 |
| Community-SS | 14.4±3.6 | 13.3±3.1 | 0.19 | 14.4±3.2 | 13.2±3.3 | 0.18 |
| Family-SS | 12.4±2.4 | 11.8±2.5 | 0.31 | 12.7±2.1 | 11.6±2.7 | 0.09 |
| Friend-SS | 12.1±2.9 | 11.5±2.6 | 0.42 | 12.0±2.9 | 11.6±2.6 | 0.51 |
| Positive-SS | 14.8±5.1 | 17.3±4.2 | 0.04 | 16.1±4.6 | 16.6±4.8 | 0.68 |
| Overall-SS | 59.1±9.9 | 59.4±11.1 | 0.92 | 60.8±10.0 | 58.4±11.0 | 0.37 |
| DE Score | 6.4±1.6 | 5.8±2.0 | 0.19 | 5.9±1.6 | 6.1±2.0 | 0.75 |
| Cree | N=15 | N=24 | | N=13 | N=26 | |
| CCS | 93.8±17.8 | 79.5±18.7 | 0.03 | 92.8±18.9 | 81.3±18.8 | 0.09 |
| MEIM | 3.2±0.8 | 3.1±0.5 | 0.80 | 3.3±0.6 | 3.1±0.6 | 0.30 |
| Total PA (mins/week) | 427.3±430.5 | 295.0±308.5 | 0.27 | 484.3±435.36 | 276.7±303.0 | 0.09 |
| MS activities (per week) | 2.4±2.8 | 1.2±1.9 | 0.17 | 2.6±3.0 | 1.2±1.8 | 0.08 |
| TA activities (per week) | 1.3±0.7 | 0.9±0.6 | 0.10 | 1.2±0.7 | 1.0±0.6 | 0.23 |
| Community-SS | 14.2±3.4 | 13.0±3.5 | 0.29 | 14.8±3.0 | 12.7±3.5 | 0.14 |
| Family-SS | 12.4±2.5 | 11.5±2.4 | 0.30 | 12.8±2.4 | 11.4±2.4 | 0.11 |
| Friend-SS | 12.0±3.0 | 11.7±2.9 | 0.74 | 11.9±3.3 | 11.7±2.8 | 0.86 |
| Positive-SS | 15.2±4.7 | 17.2±4.6 | 0.21 | 14.9±5.0 | 17.2±4.4 | 0.17 |
| Overall-SS | 59.5±9.5 | 58.8±12.3 | 0.85 | 60.3±9.6 | 58.3±11.9 | 0.62 |
| DE Score | 6.3±1.6 | 5.9±1.5 | 0.45 | 6.0±1.6 | 6.0±1.6 | 0.94 |

CCS, Cultural Connectedness Scale; DE per week, Discriminatory Experience Score; MEIM, Multi-Ethnic Identity Measure; MS per week, Muscle strengthening activities per week; TA per week, Traditional activities per week; Total PA, Total physical activity minutes per week

As shown in Table 3-9, overall Indigenous, Métis, First Nations, and Cree participants who grew up in a rural, urban, or both communities and northern or southern communities were found to have similar sedentary behaviours. However, overall Indigenous participants who grew up off-reserve had significantly lower sedentary behaviours. Yet there were no significant differences in Métis, First Nations, and Cree participants' sedentary behaviours between those who grew up on-reserve, off-reserve, or both. Overall Indigenous, Métis, First Nations, and Cree

participants' sedentary behaviours was not influenced by tobacco or alcohol use as their hours spent sedentary per week were not significantly different.

Overall Indigenous participants who had more income were significantly less sedentary, as seen in Table 3-9. However, Métis, First Nations, and Cree participants did not have any significant differences between sedentary behaviours in the income groups. Also, overall Indigenous, Métis, First Nations, and Cree sedentary behaviours was not associated with education as their means for hours spent sedentary per week were not significantly different.

Table: 3-9 Overall Indigenous, Métis, First Nation, and Cree participants social determinants of sedentary behaviours. Total time spent sedentary (hours) per week by home residence, tobacco and alcohol use, income and education, Mean \pm SD.

| | Indigenous N=123 | Métis N=41 | First Nations N=80 | Cree N=54 |
|--------------------------------------|---------------------|-----------------|-----------------------|-------------------|
| Home Residence | | | | |
| Rural | 125.5 \pm 62.6 | 93.8 \pm 30.0 | 144.2 \pm 69.5 | 150.8 \pm 82.5 |
| Urban | 102.3 \pm 32.5 | 86.5 \pm 20.2 | 121.3 \pm 32.5 | 130.6 \pm 38.9 |
| Both | 127.9 \pm 75.6 | 83.5 \pm 31.2 | 141.6 \pm 80.3 | 156.2 \pm 92.7 |
| <i>p-value</i> | 0.16 | 0.62 | 0.55 | 0.76 |
| Northern Community | 120.9 \pm 70.8 | 90.3 \pm 27.4 | 140.0 \pm 83.1 | 135.3 \pm 86.8 |
| Southern Community | 120.0 \pm 58.2 | 91.0 \pm 27.3 | 136.1 \pm 63.6 | 152.8 \pm 78.7 |
| <i>p-value</i> | 0.95 | 0.95 | 0.84 | 0.81 |
| On-Reserve | 139.7 \pm 58.6 | - | 139.7 \pm 58.6 | 146.4 \pm 70.7 |
| Off-Reserve | 105.1 \pm 43.0 | 87.7 \pm 26.4 | 126.3 \pm 50.5 | 130.9 \pm 53.0 |
| Both | 133.3 \pm 91.7 | 99.4 \pm 31.0 | 147.4 \pm 99.7 | 168.5 \pm 119.6 |
| <i>p-value</i> | 0.03 | 0.42 | 0.58 | 0.51 |
| Tobacco Use | | | | |
| Never Use | 107.3 \pm 48.5 | 88.1 \pm 27.2 | 128.6 \pm 58.9 | 133.7 \pm 70.6 |
| Regularly Use | 133.7 \pm 75.6 | 93.1 \pm 29.7 | 151.8 \pm 80.0 | 152.2 \pm 91.4 |
| Quit | 111.3 \pm 49.2 | 86.4 \pm 35.1 | 123.0 \pm 51.5 | 135.4 \pm 66.4 |
| Ceremonial Purposes | 140.2 \pm 79.7 | 83.8 \pm 14.5 | 150.5 \pm 82.7 | 192.6 \pm 108.9 |
| <i>p-value</i> | 0.18 | 0.98 | 0.55 | 0.62 |
| Alcohol Use | | | | |
| Never | 139.4 \pm 85.2 | 64.4 \pm 12.3 | 155.8 \pm 87.6 | 187.8 \pm 111.2 |
| < Once a Week | 117.2 \pm 49.5 | 94.4 \pm 28.1 | 133.2 \pm 73.3 | 143.8 \pm 63.3 |
| \geq Once a Week | 113.0 \pm 63.2 | 81.5 \pm 20.2 | 133.3 \pm 73.3 | 132.7 \pm 92.6 |
| Every Day | 63.5 \pm 60.4 | - | 85.0 \pm 0 | - |
| <i>p-value</i> | 0.24 | 0.12 | 0.58 | 0.39 |
| Income | | | | |
| \$10 001 to \$20 000 | 140.0 \pm 75.0 | 90.2 \pm 28.9 | 155.4 \pm 79.1 | 170.1 \pm 90.0 |
| \$20 001 to \$40 000 | 138.0 \pm 85.2 | 80.1 \pm 17.2 | 164.2 \pm 91.3 | 164.6 \pm 102.6 |
| \$40 001 to \$75 000 | 108.4 \pm 40.8 | 93.1 \pm 27.4 | 123.1 \pm 44.5 | 133.3 \pm 56.0 |
| More than \$75 000 | 94.1 \pm 36.0 | 78.0 \pm 30.9 | 104.2 \pm 37.1 | 91.6 \pm 31.8 |
| <i>p-value</i> | 0.03 | 0.60 | 0.09 | 0.27 |
| Education | | | | |
| Some high school | 76.0 \pm 0 | 76.0 \pm 0 | - | - |
| High school diploma | 125.4 \pm 73.2 | 76.9 \pm 16.9 | 160.0 \pm 78.7 | 184.7 \pm 79.9 |
| Vocational school or some college | 115.7 \pm 52.5 | 95.3 \pm 29.5 | 125.7 \pm 59.2 | 130.5 \pm 72.4 |
| College/university | 124.9 \pm 62.2 | 97.4 \pm 32.9 | 142.0 \pm 67.3 | 145.5 \pm 80.7 |
| Professional/graduate | 112.9 \pm 59.1 | 88.3 \pm 26.5 | 129.3 \pm 69.6 | 124.1 \pm 89.2 |
| <i>p-value</i> | 0.86 | 0.47 | 0.47 | 0.37 |

N=number of participants

CHAPTER 4

4.1 DISCUSSION

The main purpose of this study was to provide the Indigenous community of the University of Saskatchewan and Saskatoon with valuable information on what cultural and social factors may be associated with Indigenous people's physical activity and sedentary behaviours. Numerous cultural and social factors were measured as potential determinants of physical activity and sedentary behaviours, and multiple possible determinants were identified.

The primary hypothesis was that cultural factors would be associated with physical activity in Indigenous populations. The findings show that physical activity of Métis, First Nation, and Cree participants is associated with their connectedness to their culture. The secondary hypothesis was that social factors would be associated with physical activity for Indigenous populations. The findings show that social support and family/friend influences are positively associated with Indigenous muscle strengthening activities. In addition, historic trauma was also shown to be associated with physical activity. Self or family placement in foster care was associated with lower physical activity and lower participation in traditional activities, yet Cree participants who attended residential school, or had a family member attend, had more physical activity. Indigenous peoples who grew up in northern communities were found to be less physically active, and Indigenous males were found to be more physically active compared to females. Lastly, the final hypothesis stated that many cultural and social factors that are

involved in Indigenous people's lives will also affect sedentary behaviours. The findings show that cultural connectedness, discriminatory experiences, social support, home residence, income, and physical activity are all associated with sedentary behaviours among Indigenous peoples. Overall, the participants in our sample reported below average physical activity compared to other Indigenous groups. This sample population averaged 308 minutes of mild to moderate to vigorous physical activity per week compared to a recent systematic review and meta-analysis which found Indigenous peoples in Canada to have an average of 517 minutes of physical activity per week (H. J.A. Foulds et al., 2013; Ho et al., 2008). Also, participants were less physically active when compared to the general population of Canada who accumulates 1 911 mild to moderate to vigorous minutes of physical activity per week (Colley et al., 2011). This finding is contrary to past research which shows that Indigenous peoples who live in Canada are more physically active than non-Indigenous peoples (Katzmarzyk, 2008). This finding could be due to university students being more sedentary throughout the day while at lectures and studying compared to other careers which may be more active throughout the day.

4.1.1 Cultural influences on Physical Activity

Table 3-2 highlights the findings of this study in reference to possible cultural determinants of physical activity within Indigenous populations. Group identification is a fundamental concept of human life (Ruble et al., 2004). Thus, cultural connectedness and the degree an Indigenous person identifies with their culture was found to be associated with physical activity. Métis and First Nations peoples are both unique and distinct Indigenous groups. For example, during colonization Métis peoples' culture was heavily influenced by the catholic and protestant churches (Logan, 2015). Thus, catholic and protestant religions may still

be prominent in today's Métis communities. Since catholic and protestant religions may still be followed in many Métis communities, the questions in the Cultural Connectedness Scale that pertain to Indigenous spirituality may not be as applicable (Angela Snowshoe et al., 2015). Also, many of the questions in the Multigroup Ethnic Identity Measure pertain to the participant's cultural connectedness by the degree to which they have actively searched, or looked into, their cultural history (Phinney, 1992).

The affirmation, belonging, and commitment measure in the Multigroup Ethnic Identity Measure is very similar to the identity measure of the Cultural Connectedness Scale. The affirmation, belonging, and commitment measure asks questions pertaining to the degree of happiness of being a part of the Indigenous group, being proud of the Indigenous group, and feeling strongly attached to the Indigenous group. Whereas the identity measure of the Cultural Connectedness Scale asks questions pertaining to having a strong sense of belonging, attachment, and connection to the Indigenous group. Ethnic identity search in the Multigroup Ethnic Identity Measure is also very similar to the identity measure of the Cultural Connectedness Scale. The ethnic identity search questions ask about talking to others and developing an understanding of what group membership means to the participant. The identity measure on the Cultural Connectedness Scale frames questions around spending time finding more information about their culture and talking and listening to others about the culture's history, traditions, and customs. Both questionnaires also question the participant on whether or not they attend traditional activities with their group such as feasts, dances, or other special customs. The Cultural Connectedness Scale is longer and more Indigenous orientated thus has some more specific questions when compared to the Multigroup Ethnic Identity Measure. The Cultural Connectedness Scale touches on topics such as culture/spirit name, using materials for

prayer and guidance, attending or helping with specific cultural ceremonies, specific cultural items such as the eagle feather holding greater meaning to the participant, and looking for guidance or help from their culture. However, the Multigroup Ethnic Identity Measure asks a question on if the participant thinks about how their group membership affects their life where the Cultural Connectedness Scale does not approach this topic. Both questionnaires measure participant's attachment to their group; some questions/topics are very similar, yet others are different as well. Both questionnaires were useful in measuring cultural connectedness in all Indigenous groups. However, the Cultural Connectedness Scale was more tailored for Indigenous populations, specifically First Nations. Future research may wish to use the Cultural Connectedness Scale when evaluating cultural connectedness in Indigenous populations. When working with Métis or Inuit populations, Researchers may wish to revise certain questions that specifically pertain to First Nations cultures and make the questions more inclusive.

When compared to Indigenous youth, this study's sample population was less culturally connected overall. The mean overall cultural connectedness score for this studies sample population was 83.5 ± 22.3 compared to Indigenous youth in another study 100.9 ± 22.1 (Angela Snowshoe et al., 2017). However, the sample population for this study scored higher in the Cultural Connectedness Scale – Identity section (46.3 ± 8.9 vs. 42.8 ± 7.2). Yet, this sample population scored lower in the Cultural Connectedness Scale – Spirituality (18.0 ± 8.3 vs. 35.5 ± 8.9) and Traditions (19.3 ± 7.1 vs. 22.5 ± 6.0) section compared to the Indigenous youth. When comparing this sample population's Multigroup Ethnic Identity Measure cultural connectedness scores to traditional First Nations youth, this sample population was more culturally connected (Gfellner & Armstrong, 2013). The overall Multigroup Ethnic Identity Measure score for this population was 3.1 ± 0.6 compared to traditional First Nation Youth,

2.24±0.38. Yet, when comparing Multigroup Ethnic Identity Measure affirmation, belonging, and commitment scores, our sample population 3.3±0.7 was lower than the traditional First Nation youth, 3.4±0.8. This comparison may highlight that as Indigenous peoples grow older, they may become less culturally connected overall yet more connected to their cultural identity. These differences could be from Indigenous peoples moving away from their home community as they get older, and thus farther away from their cultural roots. However, as Indigenous participants mature, they may also develop a greater understanding for the meaning of their cultural identity and thus increase their cultural connectedness identity.

First Nation and Cree participants who identify more with their culture and have more overall cultural connectedness were found to be more physically active. These findings are consistent with current themes in literature on cultural connectedness and Indigenous health. An increase in cultural connectedness has been linked to an increase in healthy behaviours and a decrease in unhealthy behaviours in Indigenous populations (Poon et al., 2010; Saewyc et al., 2013). A higher degree of cultural connectedness has also been linked to improved mental health in Indigenous populations (A. Snowshoe, 2014). Contritely, Métis participants who were found to be more culturally connected also had lower physical activity. This finding may be correlated to some articles claiming that higher cultural connectedness was associated with increased rates of depression and poorer general health (Davis, 2012; Saewyc et al., 2013). As Métis and First Nations cultures are distinct from each other, each group may be affected differently by certain cultural determinants of physical activity. Indigenous communities may wish for more research to determine the exact mechanism in which cultural connectedness affects physical activity. Our findings also highlighted how those who participated in more traditional activities were not more physically active. This finding disagrees with current literature that states that Indigenous

peoples who live a more traditional lifestyle and have less stress are more physically active than their peers (Bersamin et al., 2014).

One possible mechanism in which cultural connectedness could impact physical activity could be through the Indigenous paradigm on wholistic health (Dapice, 2006; K. Wilson, 2003). Being more connected to culture could lead to improved spiritual, mental, and emotional health which in turn would also lead to improved physical health and thus healthy physical activity. Also, higher levels of cultural connectedness could potentially lead to more participation in traditional activities (or vice versa). Even though there was no association between physical activity and traditional activities; traditional activities are also physical activities, and thus higher cultural connectedness and participation in traditional activities may be associated with higher physical activity as our findings suggest. Since cultural connectedness has been associated with mental health (A. Snowshoe, 2014) and mental health is also associated to physical activity (Asztalos, De Bourdeaudhuij, & Cardon, 2010), it is possible that cultural connectedness is linked to physical activity through the mechanism of wholistic mental health. Cultural connectedness could also be associated with a stable base of cultural and/or community support which has also been linked to physical activity (P. J. Anderson, Bovard, Wang, Beebe, & Murad, 2016). The majority of literature agrees that cultural connectedness has a positive impact on overall Indigenous health, and our findings highlight that cultural connectedness is linked to increased physical activity in First Nation and Cree participants.

The finding of a negative association between Métis cultural connectedness and physical activity does contradict our above finding, however there may be certain factors that explain this relationship. Potentially Métis people who are more culturally connected are engaged in more identity exploration activities which are sedentary behaviours. Métis peoples who are more

culturally connected may spend more time with genealogy searching online, learning the language, speaking with others, or reading/listening to Métis histories, culture, and customs all of which are predominately sedentary activities. With a negative association between sedentary behaviours and physical activity, Métis peoples may be less active due to more exploration of their cultural identity. Whereas First Nations and Cree people's exploration of their culture may be less sedentary. If Indigenous communities wish to determine the mechanisms behind these relationships more research may be needed.

Many Indigenous peoples report experiencing racism in their daily lives (C. L. Currie et al., 2012). Our findings suggest that there is no association between discriminatory experiences and physical activity among Indigenous peoples. This finding disagrees with current literature in that discriminatory experiences are seen as a barrier to being physically active, and that discriminatory experiences and physical activity are negatively associated (Barr-Anderson et al., 2017; Chen & Yang, 2014; Edwards & Cunningham, 2013a; McNeill et al., 2006). Indigenous youth experience more racism in physical activity settings than non-Indigenous youth (Bruner et al., 2016). Both Ferguson (2016) and McHugh (2015) agree that racism and discrimination can act as barriers to Indigenous peoples and limit their physical activity opportunities. Our findings also disagree with the literature that states discrimination is positively associated with physical activity. A study with a population of African American peoples found that those who experience discrimination were more physically active than those who experienced less discrimination (Borrell et al., 2013). A possible explanation for this behaviour was proposed; discrimination may act as a stressor and one of the possible ways these groups deal with this stressor would be to participate in physical activity (J. S. Jackson & Knight, 2006; Williams &

Mohammed, 2009). Thus, with the contradictory literature, no association between discriminatory experiences and physical activity among Indigenous peoples may be correct.

4.1.2 Social influences on Physical Activity

Table 3-4 highlights the findings of this study in reference to possible social determinants of physical activity within Indigenous populations. The social support scores for this sample population are very similar to a general populations' social support scores (Distelberg et al., 2014). Community social support score for the Indigenous population was 13.61 compared to the general population of 13.1. The family social support score for the Indigenous population was 11.6 which is slightly lower than the general population of 12.1. Friend social support scores were almost identical with the Indigenous population of 11.6 and the general population of 11.7. The general population had a higher positive perception of social support 17.4 compared to the Indigenous population of 16.4. Overall the social support of this studies sample population is very similar to a study done with the general population (Distelberg et al., 2014).

Social support from family, friends, and community have been repeatedly shown to positively influence physical activity (Allender et al., 2006; Bennie et al., 2015; Chrisman et al., 2014; Parks et al., 2003; Plotnikoff et al., 2004; Wendel-Vos et al., 2007; Wenthe et al., 2009). Our findings on associations of community, family, friend, positive perception, and overall social support with physical activity were inconclusive. There were no differences in community, family, friend, positive perception, and overall social support scores between those who had more physical activity and those who had less physical activity. However, Métis peoples who had more family support and overall social support were found to participate in more muscle strengthening activities which is an aspect of physical activity. Thus, even though there were no

significant findings associating social support and physical activity, there were significant findings supporting a positive association between social support and muscle strengthening activities. However, given the importance of kinship, community, and family in Indigenous culture and the findings of previous research with non-Indigenous populations, social support may be a possible determinant of physical activity among Indigenous participants. Social support gives people the opportunities to overcome many barriers to physical activity (Allender et al., 2006), and social support increases physical activity by providing motivation and increased enjoyment (Kahn et al., 2002). Social support has also been suggested to possibly be associated with increased cultural connectedness (Ryan et al., 2017a), which we found is positively associated to physical activity. However, our findings did not support past research with non-Indigenous populations, instead there was no relationship between physical activity and general social support among Indigenous participants, but there was a positive association between social support and muscle strengthening activities. Yet, more research is needed if Indigenous communities wish to further evaluate if social support is a determinant of physical activity.

Friend and family support/encouragement for physical activity has been shown to positively influence physical activity (Bauman et al., 2002; Dishman et al., 1985; Taylor et al., 1994; Trost, Bauman, et al., 2002). Our findings did not support past research (in non-Indigenous populations) in this regard where Indigenous participants who had more physical activity did not have more support/encouragement for physical activity from their friends and family. It is hypothesized that the same mechanisms in which social support influences physical activity, social support may also influence muscle strengthening activity habits. Our findings did show that overall Indigenous, First Nations, and Cree participants who receive more support and encouragement for physical activity perform more muscle strengthening activities. Our findings

did not show positive associations between family encouragement and physical activity. Many people who are going to school at the University of Saskatchewan may be away from their families and thus receiving overall less support/encouragement for physical activity from their families. Potentially with a more polarizing sample of participants receiving or not receiving support/encouragement for physical activity from their family, more significant differences would be found.

Historic Trauma inflicted upon Indigenous peoples from forced residential school attendance and foster care policies have created a cultural wound that has affected all Indigenous peoples across generations (Brave Heart, 2003). Several studies in Canada have found evidence that historic trauma negatively affects Indigenous health (Mohatt, Thompson, Thai, & Tebes, 2014), and our study evaluated associations between historic trauma and physical activity. It is estimated that 150 000 Indigenous children attended residential schools and 80 000 survivors are estimated to be alive today (The Truth and Reconciliation Commission of Canada, 2015). The sixties scoop is an infamous period in which an estimated 20 000 Indigenous children across Canada were placed in foster care (Fournier & Crey, 1998). Literature has shown that up to 70% of Indigenous children were placed in non-Indigenous homes, and there was a 85-95% breakdown rate of the placements (Sinclair, 2007b). This study's sample population had 8% of respondents who attended residential school which is above the national population's average of an estimated 5% of Indigenous peoples alive today having attended residential school (The Truth and Reconciliation Commission of Canada, 2015). Today 1% of the total Indigenous population is in foster care, 16% of our sample population reported being placed in foster care which is well above the national average (Statistics Canada, 2016b). These elevated rates of Indigenous

peoples at a post-secondary institution who have experience with historic trauma highlights the resiliency and success of Indigenous peoples.

Our study found that that Métis people who were placed in foster care, or had a family member placed, were less physically active. This finding suggest that self or family foster care experiences have a negative impact on physical activity. There is no current research on the effects of historic trauma on physical activity, yet our findings do concur with current research on the effects of historic trauma on Indigenous health. Forced residential school attendance and removal from family and community has led to cross-generational effects for Indigenous peoples such as increased exposure to sexual violence (Pearce et al., 2008), increased risk of incarceration and intravenous drug use (Lemstra, Rogers, Thompson, Moraros, & Buckingham, 2012; Sinclair, 2007a), increased rates of stress and suicide (Bombay et al., 2014a), and higher rates of depression (Bombay, Matheson, & Anisman, 2011; Bombay et al., 2014a). Historic trauma affects psychological health through experience and exposure to loss (Whitbeck, Adams, Hoyt, & Chen, 2004).

Historic trauma has been shown to be a significant source of distress, greater than any other stressors Indigenous peoples face including negative life events and childhood adversity (Walls & Whitbeck, 2011). This study discovered that overall Indigenous peoples who attended residential school, or had a family member attend, or who was placed in foster care, or had a family member placed, were more likely to participate in traditional activities. We also discovered that Cree participants who attended residential school, or had a parent attend, were more physically active and more likely to participate in traditional activities. This could be connected to our finding that Indigenous participants, including Métis and Cree participants, who experience more historic traumas are more connected to their culture. We discovered that

cultural connectedness is negatively associated with physical activity in Métis participants and positively associated with physical activity in Cree participants. Métis and Cree participants who are in a university setting and have experienced historic trauma may have different relations with cultural connectedness. Also, many residential schools implemented mandatory physical activity programs which could be the mechanism which supports this finding (Forsyth, 2007). However, more research may be needed if Indigenous communities wish to further examine the effects of historic trauma on physical activity among Indigenous populations. Qualitative research may be a beneficial tool for researchers and communities wishing to further explore this relationship between historic trauma and physical activity.

No differences in physical activity were found between urban and rural groups. However, differences in physical activity were seen between those who grew up in northern communities and those who did not. Indigenous peoples who grew up in northern communities were found to have lower physical activity than those who did not grow up in northern communities. This is contradictory to one report that noted Indigenous peoples who grew up in Northern Saskatchewan communities were more active than their respective counterparts, yet it should be noted on-reserve peoples were excluded from their analysis (Irvine et al., 2011). Similar to on-reserve communities, northern communities face barriers to physical activity due to the lack of resources caused by the distance of the community to more urban centers. Northern communities are more remote and can have difficulties acquiring resources such as sufficient food, water, and health care services. Northern communities also face barriers to physical activity such as the weather which may prohibit outdoor activities for portions of the year (Heather J.A. Foulds, 2018). This finding in northern communities may be similar to past research's findings that have shown Indigenous peoples who live off reserve have more physical activity compared to those

who live on reserve (Findlay, 2011; Heather J.A. Foulds, 2018). Even though reserves are not always situated in rural areas, as there are urban reserves in Saskatchewan, many Indigenous reserves are typically in rural and northern regions of the province (Mccue & Parrott, 2011). Indigenous peoples who live off-reserve are typically found to have more education and greater life expectancy (Frohlich et al., 2006; Kelly-Scott & Smith, 2015). Also, those who live on-reserve are stereotyped as having less access to resources, and it has been determined that those who live on-reserve are more likely to live in crowded homes in need of repair (Kelly-Scott & Smith, 2015). It is highly likely that these health disparities and resource inequities between on-reserve and off-reserve Indigenous peoples are what is causing the physical activity differences between the two cohorts. Many of the same mechanisms could potentially be true for comparing Indigenous people's physical activity between northern and southern communities. These differences in physical activity may be related to the inequities between remote and non-remote Indigenous communities.

Tobacco and alcohol use have been found to affect health, yet whether they affect physical activity is still debatable. Our research found no association between Indigenous people's tobacco and alcohol use and physical activity. There is no research currently that examines the associations between tobacco and alcohol use and physical activity among Indigenous peoples. However, the majority of research in non-Indigenous populations agrees that tobacco and alcohol use are negatively correlated to physical activity. Tobacco use has been known to cause disruptions in physical activity (Bennie et al., 2015; Katzmarzyk, 2008; Mesters et al., 2014). Alcohol use has also been found to be negatively correlated with physical activity (Elder et al., 2000; Mesters et al., 2014). Yet, there is also evidence that alcohol consumption and physical activity are positively correlated (Conroy et al., 2015; Leasure & Neighbors, 2014).

Since there is no previous research on physical activity and tobacco and alcohol use in Indigenous communities it is difficult to compare our findings. Yet with conflicting research even in non-Indigenous populations, tobacco and alcohol use may not affect physical activity. If tobacco and alcohol use are determinants of physical activity, they may only have a minute impact.

Indigenous males were found to be more physically active than Indigenous females. This is consistent with past literature regarding differences in physical activity between sexes in general populations and in Indigenous specific populations as well (Heather J.A. Foulds et al., 2012; Plotnikoff et al., 2004; Wenthe et al., 2009; H. J. Wilson et al., 2014). However, no difference in physical activity was found between Indigenous genders. This is contrary to past research which has shown that Indigenous peoples who identify as men are typically more physically active (Findlay, 2011; Heather J.A. Foulds et al., 2012; Ryan et al., 2017b). These findings highlight the importance of differentiating between sex and gender when examining possible determinants of physical activity. Larger sample sizes may be able to detect differences between other sexes and genders (transgender, genderqueer, two-spirited) as well. It is important to note that Indigenous males are more physically active than Indigenous females. In collaboration with Indigenous communities, potential physical activity interventions or health policy may wish to focus on Indigenous females if they tend to be less physically active.

4.1.3 Determinants of Sedentary Behaviours

Table 3-7 highlights the findings of this study in reference to possible social determinants of sedentary behaviours within Indigenous populations. Studies show that on average people engage in as much as 8.5 hours of sedentary behaviours per day (Blodgett et al., 2015) and these

sedentary behaviours contribute to an increased risk of cardiovascular disease, obesity, diabetes, cancer, depression, and overall mortality (Blodgett et al., 2015; Ekelund et al., 2016; Proper, Singh, Van Mechelen, et al., 2011). This study's sample population reported an average of 17.5 hours per day spent sedentary. Even though this population is made of primarily students and those working at the university who may be more likely to be engaged in sedentary behaviours, this rate of sedentary behaviour is excessive. One possible explanation may be that multiple sedentary activities overlap durations, and thus separating specific sedentary activities and then summing their times may not have been accurate. For example, time spent watching TV, on laptop, and on phone were all measured separately and yet could be done at the same time.

Our findings show that Métis people who are more physically active engage in less sedentary behaviours. This is consistent with findings in general populations that show negative correlations between sedentary behaviours and physical activity (Mansoubi et al., 2014; O'Brien, Issartel, & Belton, 2018; Sisson, Broyles, Baker, & Katzmarzyk, 2010; Tremblay et al., 2011). There is relatively little research on the determinants of sedentary behaviours of Indigenous peoples, however one article does highlight that Indigenous adult physical activity and sedentary behaviours are inversely associated (S. Anderson, Currie, Copeland, et al., 2016). Thus, our conclusions on the negative relationship between sedentary behaviours among Indigenous peoples and physical activity are consistent with findings in general and Indigenous populations. The mechanism between these associations could be that those who devote more time to being physically active, simply have less time to be sedentary. Another possibility is that those who spend less time sedentary have less health issues that attribute to the sedentary behaviours and thus also do not hinder physical activity (Blodgett et al., 2015). Physical inactivity is a major

correlate of obesity and its comorbidities in Indigenous adults who reside in Canada (Katzmarzyk, 2008).

In Cree participants, high sedentary behaviours was associated with high cultural connectedness. Cultural connectedness has not specifically been studied as a correlate of sedentary behaviours; however, sense of belonging to community has been negatively associated with sedentary behaviours in First Nations populations (S. Anderson, Currie, Copeland, et al., 2016). Thus, our finding on the positive association between cultural connectedness and sedentary behaviours disagrees with the available literature. Potentially, Cree participants with high cultural connectedness are engaged in more sedentary cultural practices such as talking with Elders, sedentary traditional activities, or learning their cultural language. If Cree communities wish to further explore this association, more research would be needed.

Our study also showed a link between discriminatory experiences and sedentary behaviours among Indigenous participants. Indigenous peoples who experienced less discrimination were found to spend less time sedentary per week. With less time spent sedentary per week there is a decreased risk of developing chronic disease (Ekelund et al., 2016). Our findings support conclusions in other recent studies in non-Indigenous populations (Barr-Anderson et al., 2017; Chen & Yang, 2014; Edwards & Cunningham, 2013a; McNeill et al., 2006). Furthermore, there are no other studies which looked to identify a link between discrimination and sedentary behaviours. In non-Indigenous populations with less experiences of discrimination are more inclined to spend less time sedentary per week (Womack et al., 2014b). Discrimination can become a stressor which may lead to unhealthy behaviours to escape from negative emotions brought on by the discriminatory experiences (Pascoe & Richman, 2009). These unhealthy behaviours could include sedentary behaviours.

Social support has been found to be a determinant of physical activity (Allender et al., 2006; Bennie et al., 2015; Chrisman et al., 2014; Parks et al., 2003; Plotnikoff et al., 2004; Wendel-Vos et al., 2007; Wenthe et al., 2009), yet its associations with sedentary behaviours are unclear. Our study showed that screen time among overall Indigenous and Métis participants was positively associated with family and community social support. This finding disagrees with the current research from general populations (Huffman & Szafron, 2017). However, we also discovered that First Nations participants who were less sedentary had a more positive perception of their social support network. Sedentary behaviours are seen as being influenced by social support networks (Deliens et al., 2015), and many sedentary behaviour interventions include a social support component (Biddle, Lorencatto, Hamer, Gardner, & Smith, 2015). Since our study was involving university students, staff, and faculty, our study population may have already elevated social support from the university and elevated time spent sedentary due to class room and desk work time. These potential differences between our population and the general population could lead to the different results. Also, components of Indigenous culture may lead to a link between high social support and increased sedentary behaviours. However, our study found time spent sedentary per week among First Nations participants was negatively associated with a positive perception of their social support network. This concurs with previous research in non-Indigenous populations where those who have more social support were also found to have less sedentary behaviours (Costigan et al., 2013; Eyster et al., 1999; Huffman & Szafron, 2017; Ståhl et al., 2001; Wilcox et al., 2000).

Education has been shown to be a contributor to Indigenous health (Ryan et al., 2017b). Education has been associated with a decrease in unhealthy behaviours and increase in healthy behaviours (McNeill et al., 2006). However, our study showed no association between education

and physical activity. This is contradictory to past research with non-Indigenous populations where higher education corresponded with more time spent in sedentary behaviours (Bennie et al., 2015; Rhodes et al., 2012; Stamatakis et al., 2013). It is hypothesized that those who have more education spend more time sedentary per week at work due to the nature of employment that higher education offers. More research may be needed if Indigenous communities wish to further examine the association between education and sedentary behaviours. Our research may have been skewed since our population was university students, staff, and faculty whom the majority had a high degree of education.

Income can be a determinant of health, increasing participation in healthy behaviours, decreasing risk of chronic disease, and increasing overall health (McNeill et al., 2006). Our study did find a significant negative association between degree of income and sedentary behaviours among Indigenous participants. In the general population, household income is negatively associated with sedentary behaviours (S. Anderson, Currie, & Copeland, 2016; B. K. Clark et al., 2010; Shields & Tremblay, 2008). Our findings support past literature with Indigenous populations, those who were high income earners spent less time sedentary per week (S. Anderson, Currie, Copeland, et al., 2016). Income allows many people to overcome certain barriers in life, including barriers to being physically active (McNeill et al., 2006; Parks et al., 2003). Thus, those who have more income may be more likely to be active and less likely to be sedentary compared to those who have less income.

Tobacco and alcohol use have been associated with poor health among Indigenous populations (Gracey & King, 2009a). Our findings showed no association between tobacco and alcohol usage and sedentary behaviours. There is no literature that examines tobacco and alcohol usage with sedentary behaviours among Indigenous peoples. However, there has been research

within the general population, especially with youth. Overall, high tobacco and alcohol use have been associated with high sedentary behaviours (Lesjak & Stanojević-Jerković, 2015; Rhodes et al., 2012). However, this study did not see any differences between different degrees of tobacco or alcohol usage and sedentary behaviours. Many Indigenous cultures use tobacco in a ceremonial way, which could play a role in its lack of association to sedentary behaviours. The sample population reported only 57% of participants use alcohol less than once per week. The total Indigenous population in Canada has a daily smoking rate of 18.4% whereas this sample population was similar with 19% using tobacco for recreational purposes daily (Government of Canada, 2018).

We hypothesized that home residence would have an impact on sedentary behaviours. Our findings showed no relation between growing up in a rural vs. urban community and an Indigenous person's time spent sedentary. Research is conflicting on the subject (O'Donoghue et al., 2018) with some research showing rural populations are less sedentary (Hardy et al., 2006; van Uffelen et al., 2012) and others showing urban populations are less sedentary (Machado-Rodrigues et al., 2014; Wilcox et al., 2000). However, none of these studies were done in Canada or with Indigenous populations. Also, we were unable to find any associations between sedentary behaviours among Indigenous participants and whether or not they grew up in a northern community. There is minimal literature comparing northern Indigenous communities to southern Indigenous communities in regard to their sedentary behaviours. However, one report highlighted that Indigenous peoples in northern Saskatchewan have lower rates of physical inactivity, compared to southern Saskatchewan Indigenous residents (Irvine et al., 2011), it should be noted this study was measuring physical inactivity and not sedentary behaviours. However, our study did discover that overall Indigenous participants who grew up off-reserve

were less sedentary. Moreover, there is no research that examines sedentary behaviours between off-reserve and on-reserve Indigenous communities. However, there has been research that has shown people who grow up in more remote communities spent more time sedentary per week during travel (Sugiyama et al., 2012; Zolnik, 2011), which in turn could lead to more sedentary lifestyle in general. Overall, we did not find any association between Indigenous people's sedentary behaviours and growing up in a rural or urban setting, or northern community, but we did discover an association between growing up off-reserve and being less sedentary. More research may be needed if Indigenous communities wish to determine the association of these environmental setting factors and sedentary behaviours.

CHAPTER 5

5.1 CONCLUSION

5.1.1 Determinants of Physical Activity Conclusion

Overall, possible Indigenous specific determinants of physical activity have been identified. Culture seems to be a determinant of physical activity as First Nations and Cree participants who are more culturally connected and identify more with their culture are more physically active than those who do not. However, Métis peoples who are more connected to their culture were found to be less physically active. Historic trauma also seems to be associated with physical activity. Participants who attended residential school or had a family member attend, were found to have less physical activity. However, participants who were placed in foster care, or had a family member attend, were more physical active. Finally, living in a remote community also seemed to be a determinant of physical activity as those who lived in remote communities were less physically active. Social support and family influences were also positively associated with increased muscle strengthening activities. Being less sedentary and male were also positively associated with physical activity. These social and cultural factors may directly influence physical activity in Indigenous communities.

5.1.2 Determinants of Sedentary Behaviours Conclusion

Overall, possible Indigenous specific determinants of sedentary behaviours have been identified. Physical activity may be directly associated with sedentary behaviours. Those who

have higher physical activity are associated with spending less time sedentary per week. Discriminatory experiences seem to have an influence on sedentary behaviours. Those who experience less discrimination were found to also spend less time sedentary. When examining social support as a determinant of sedentary behaviours positive and negative associations were found. Income was found to have a negative association with sedentary behaviours. Tobacco and alcohol use, and education were not found to be associated with sedentary behaviours among Indigenous participants. Those who grew up off-reserve were found to spend less time sedentary per week, but no differences were found when examining rural/urban or northern/southern communities. These social and cultural factors may directly influence sedentary behaviours among Indigenous peoples.

5.2 LIMITATIONS AND STRENGTHS

This study was not without its limitations. A limitation could have been that the data collection for this study was open over a period of winter months when participants may be less active. A response rate of only 3.7% is also a limitation as it leaves a large percentage of the population not sampled. Perhaps offering more incentives to participate would increase the response rate with this population. Self-reporting of variables throughout the survey is also a limitation. Self-reporting leaves the study susceptible to recall bias of exaggeration or general false statements (X. Fan et al., 2006; James F Sallis & Saelens, 2000). Participants were also given the opportunity to not answer various questions in which they preferred not to divulge certain information. This practice is culturally appropriate and minimally invasive yet leads to non-reporting.

This study was also potentially limited by its generalizability. The population for this study was comprised of University of Saskatchewan students, staff, and faculty. Thus, some may argue that our findings are not applicable to other Indigenous populations. However, the sample population for this study was very diverse. A university campus includes many peoples from all throughout Saskatchewan and across North America. The sample population for this study included a wide variety of Indigenous cultures making this study's findings more applicable to other Indigenous populations. The diversity of this population may also be seen as a strength when comparing cultural measures. Some participants may have had very little exposure to their culture while others may have grown up directly immersed in their culture. Similarly, in regard to social support, some participants may be from Saskatoon and thus close to their social support network while others may have had to move a long way from home to come to post-secondary school. However, the University of Saskatchewan does offer many supports to students which could influence social support. This specific population may also be a strength. The Indigenous community at the University of Saskatchewan may see our results as extremely valuable since our study population focuses only on Indigenous students, staff, and faculty at the University of Saskatchewan.

Not comparing within the Indigenous groups using physical activity and sedentary recommendations as cut-offs for the groups may also be a limitation of this study. Due to the variance between groups, below average physical activity levels, and elevated sedentary levels it was decided in conjunction with the CAC to divide the Indigenous groups by each specific group mean. This created high and low physical activity/sedentary behaviour groups for each Indigenous group allowing for comparison. However, this limits the study's comparability to

other studies where the majority compare factors between those who are classified as active and inactive based on physical activity and sedentary behaviour recommendations.

The use of quantitative measures to evaluate abstract factors also decreases the internal validity of this study. Cultural connectedness, discriminatory experiences, and historic trauma are factors that exist abstractly and do not have any physical properties that are easily measured. Even though the quantitative measures used in this study have been proved reliable and valid, they may not be as effective as other measures. Qualitative measures may be more effective for evaluating these specific abstract factors. Another limitation of this study is the use of multiple independent t-tests without any Bonferroni corrections which increases the chance of type I error. Furthermore, data points outside two standard deviations of the mean were not removed from the data analysis. Not removing outliers may affect the scientific rigour of the study as one-way ANOVA tests assume outliers are removed. In collaborating with the CAC, it was decided that all data, regardless of outliers, would be included in the final analysis. It was concluded that all of the data generously provided for this study, by the Indigenous community, should be included in the analysis. However, the inclusion of outliers does affect the assumptions for the statistical analyses and widens the confidence intervals considerably.

This study does not control for extraneous variables while measuring the specific independent and dependent variables. Thus, the cross-sectional design of this study does not enable the researchers to make causal statements. However, the goal of this study was not to provide the Indigenous community with data that highlights causal relationships. Instead the goal of this study was to provide the Indigenous community with knowledge on possible determinants of physical activity and sedentary behaviours. If researchers wish to be able to make causal

statements in regards to Indigenous specific determinants of physical activity and sedentary behaviours, longitudinal study designs and randomized control trials would be more appropriate.

Lastly, this study was limited by its scope of determinants. We chose to examine only the social and cultural determinants of physical activity and sedentary behaviours. Physical activity and sedentary behaviours of Indigenous peoples may also be impacted and determined by policy and other environmental factors not examined in this study (Heather J.A. Foulds, 2018). When examining discriminatory experiences only interpersonal factors were examined, and institutionalized discrimination was not. In conjunction with the CAC it was decided that an exhausting list of questions examining discriminatory experiences may not be appropriate. Thus, we limited our discriminatory experiences measures to only examine interpersonal factors. Our findings will more than likely not be a complete list of possible determinants of physical activity and sedentary behaviours among Indigenous communities.

Despite limitations, this study is grounded in strong methods and has findings that may be beneficial to the community. This study was a quantitative, cross-sectional study informed by community with the intent of providing the community with beneficial information. The use of a cross-sectional design was planned to accommodate the research questions. Since this research primarily focuses on the possible determinants of physical activity and sedentary behaviours, a cross-sectional study design fits well. A longitudinal, intervention study could be used in future research to examine how physical activity and sedentary behaviour changes when cultural and social factors are changed. However, many determinants of physical activity and sedentary behaviours cannot be manipulated due to ethical reasons (social support, discrimination experiences, etc.). Future longitudinal, intervention studies depend on an understanding of

cultural and social factors associated with physical activity and sedentary behaviours. Thus, a cross-sectional design was chosen.

The research questions that determined the study design were influenced and informed by the Indigenous community in Saskatoon. Before the study was proposed to the College of Kinesiology, researchers met with various members of the Indigenous community both within and outside of the University of Saskatchewan campus. Following the statements of Chapter 9 in the TCPS, the research design was influenced through the direction, advice, and counsel provided to the researchers through these meetings with the community. Many Indigenous members that contributed to the development of this study were involved in the physical activity community in some way. The Indigenous community emphasized the need for this research, the methodology, and main outcomes to be evaluated. Eventually a Community Advisory Committee was formed to provide continuous input to the study throughout its duration. The Community Advisory Committee aided the researchers in shaping the research questions and methods to be culturally appropriate, culturally sensitive, and ensured the answers we were looking for would be important to the surrounding Indigenous community. Data analysis and discussions were also developed in collaboration with the Community Advisory Committee. Every major decision included input from the Indigenous community and makes this study even more significant. The Community Advisory Committee and other Indigenous peoples in the community truly made this study strong and allowed for important findings to come forth.

The purpose of having extensive input and collaboration with the Indigenous community of Saskatoon and University of Saskatchewan was to undertake authentic, meaningful and respectful research. The input and collaboration also allowed various Indigenous stakeholders and advisors to propose specific factors/potential determinants to be evaluated. The research

design of this study was created and upheld through collaboration and input with the Indigenous community. To complete the mutual undertaking of this research project, the results will be presented to the Indigenous community on campus and we will provide a summary of results to interested stakeholders.

Evaluating each Indigenous group separately is a large strength of this study. Since each Indigenous culture is unique and has different histories, it may be assumed that each Indigenous group has non-identical determinants of physical activity and sedentary behaviours. Due to the sample size researchers were able to examine the possible determinants for physical activity and sedentary behaviours for Métis, First Nations, and Cree participants. This avoidance of pan-Indigenization aids in strengthening this study's findings, and makes the knowledge more valuable to the previously mentioned Indigenous groups. Yet the inclusion of an overall Indigenous group also provides valuable knowledge to the Indigenous community at the University of Saskatchewan.

Measuring not only sex as a possible determinant of physical activity but gender as well, is furthermore a strength of this study. Even though there may be a large correlation between the two factors, distinguishing the difference is very important in research. The terms male/female and man/woman have been used somewhat interchangeably throughout past research and has caused misunderstandings on whether sex or gender is being reported (Clayton & Tannenbaum, 2016). Stating gender based on sex is inconsiderate as the complexities of gender are broader, therefore may be different than sex (Clayton & Tannenbaum, 2016). This study uses appropriate language when discussing sex and gender aiding in the clarity of the findings. The methodologies of examining sex separate from gender and vice versa is a considerable strength of this study.

Another strength of this study was the breadth of the determinants examined. Not only were various social determinants studied but cultural determinants as well. Importantly, significant associations were made between the possible determinants and physical activity. Many factors were studied to see not only their association with physical activity but with sedentary behaviours as well, both of which play roles in Indigenous health. The number of factors that were studied adds strength to these findings, offering a more wholistic picture of what impacts physical activity in Indigenous communities. There is no previous literature that examines the associations of physical activity among Indigenous adults and cultural connectedness, family influences, historic trauma, or tobacco and alcohol use. There is also no previous literature that examines the associations of sedentary behaviours among Indigenous adults and cultural connectedness, discriminatory experiences, education, and home residence. The number of novel findings that this study presents is also a strength.

5.3 KNOWLEDGE TRANSLATION & APPLICATION OF FINDINGS

All participants will be encouraged and invited to attend a knowledge translation session in the fall of 2019, after school has resumed in September. This session will occur at Gordon Oakes Red Bear Center, and food and refreshments will be offered to encourage attendance. This session gives the researchers the opportunity to share the results with the broader community and provides the community with the opportunity to offer input and discuss the results. A summary of the thesis manuscript, along with a PowerPoint presentation will be brought to the knowledge translation session, and participants will have the opportunity to read, watch, and discuss the study and findings. Discussion of results and conclusions with participants will be important for drawing greater input and interpretations from the broader community. This discussion will also

allow the participants to share any other experiences they deem relevant to the study. The knowledge translation session will give participants the opportunity to discuss the significance of the results, and opportunities for these results to change existing physical activity programs or implement new physical activity programs to better support Indigenous peoples on campus. Once the final thesis manuscript is approved by the Thesis Committee, a summary of the results will be sent to each participant if they elected to have the results shared with them. The complete thesis will also be made available if they wish to read it.

The Indigenous community will then be able to use the findings in a way that the community views as most beneficial. The findings have the potential to be used to design or improve physical activity programs and interventions. Since cultural connectedness was found to be positively associated with physical activity in First Nations and Cree participants this may be an important factor to focus on for physical activity interventions. Also, Métis peoples who were placed in foster care were found to have lower rates of physical activity. This finding may be valuable to note when making health care policy and developing physical activity interventions. Indigenous females and those who grew up in northern communities were found to have less physical activity, this may also be important to note for physical activity interventions. Important possible determinants of physical activity and sedentary behaviours that were identified could be used to inform health policy and future evaluation of these determinants of health. This presentation of these findings may also inform Indigenous leaders and offer them more knowledge and insight into what may influence Indigenous peoples to be physically active. This study may also simply inform communities that various factors are involved in determining physical activity. Increasing knowledge in the area of physical activity of Indigenous peoples has

the potential to impact physical activity, decreasing the risk of chronic diseases, and benefiting Indigenous health overall.

5.4 IMPLICATIONS FOR FUTURE RESEARCH

The results from this study will inform the participants, the community, and researchers on potential determinants of physical activity and sedentary behaviours among Indigenous populations. The methods used in this study may also be used as a reference for future researchers looking to collaborate with Indigenous communities. Communicating and co-operating with the Indigenous community helps to ensure respectful and appropriate methodologies are undertaken. Collaborating with the Indigenous community influences the research question to be formed in a way that the findings may be more beneficial to the community, and thus generating greater impact from the research.

Future research could use the findings from this study to focus on specific determinants of physical activity and sedentary behaviours among Indigenous populations. For example, this study found associations between cultural connectedness, historic trauma, home residence, and physical activity among Indigenous populations. Future research collaborations with an Indigenous community may wish to complete an in-depth study on the mechanisms in which cultural connectedness, historic trauma, or home residence affects physical activity. More in-depth research on what influences physical activity among Indigenous populations may enable health policy designers to make more informed decisions impacting Indigenous health.

Longitudinal and controlled trial studies would allow future research to make causal statements and further delve into the mechanism of physical activity and sedentary behaviours determinants. A longitudinal study that measures physical activity and sedentary behaviours

among Indigenous peoples could also measure a potential determinant such as cultural connectedness. Indigenous communities and researchers in collaboration, would then be able to measure a participant's fluctuations in cultural connectedness and identify if these fluctuations were correlated to the participant's physical activity or sedentary behaviours. Indigenous communities and researchers may also be able to design randomized controlled trials to determine the influence of various potential determinants on physical activity and sedentary behaviours among Indigenous peoples. Researchers and Indigenous communities could create interventions, with a control group, which aim to build participants cultural connectedness over a period of time. Then physical activity and sedentary behaviours could be compared pre and post intervention to see if there were significant changes due to a change in cultural connectedness. The information from a randomized control trial may be extremely valuable to an Indigenous community as it allows for definitive, causal statements to be made on the determinants of physical activity and sedentary behaviours.

Similar to this study, future research may wish to combine Indigenous research methodologies and Western research methodologies as both have potential benefits for this research. Indigenous methodologies which are derived from tribal knowledge could provide valuable findings (Kovach, 2009). Indigenous methodologies include different ways of knowing, decolonizing theory, using story as method, self-location, Indigenous research methods, cultural protocol, meaning making, and ethical responsibility (Kovach, 2009). Using story as method to describe how home residence affects physical activity may be beneficial to Indigenous communities and researchers as well. Potentially instead of written, online, survey questions, audio questions could be used to integrate Indigenous and Western methods. Western research methodologies may also aid in providing valuable findings to Indigenous communities. Using

western technology such as smartphones and smartwatches to accurately measure and record physical activity and sedentary behaviours could be used to define specific determinants. Measuring physical activity through accelerometers, taking anthropometric measures, and fitness testing may be beneficial to future implications if deemed culturally appropriate by the Indigenous community. Accelerometers may be a more objective measure for examining the associations of various Indigenous specific determinants of physical activity and sedentary behaviours. Anthropometric and fitness measures which future research may wish to examine could be waist circumference, body mass index (BMI), grip strength, and/or maximum aerobic capacity. Anthropometric and fitness measures may provide Indigenous communities with more knowledge on the associations between cultural factors, social factors, physical activity, physical fitness, and Indigenous health. A combination of Indigenous and Western research methodologies may be beneficial for future research.

Qualitative research may also be a method for future research that Indigenous communities may wish to explore. Examining Indigenous specific determinants of physical activity from a qualitative lens could provide invaluable insight on this topic. For example, the associations between historic trauma and physical activity may be more clearly explained when examined qualitatively. In focus groups or semi-structured, in-person interviews, Indigenous survivors of residential schools and foster care would be able to explain how their experiences influence their physical activity. Photovoice and journals may also be qualitative methods that would be useful in explaining the impacts of various cultural and social factors on physical activity and sedentary behaviours. Future research, in collaboration with Indigenous communities, may wish to examine the uses of qualitative research to further explore the mechanisms of physical activity and sedentary behaviour determinants.

Lastly, Indigenous communities may also wish to collect more information with a larger Indigenous population outside of a university campus or to collect more information with one specific Indigenous community. In all instances mentioned, this study will provide a basis to advise which determinants to consider for future studies and physical activity programs.

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APPENDICES

Appendix A:

**Systematic Review and Meta-Analysis on the Effects of Social Support on
Physical Activity**

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Introduction

Physical inactivity is a major contributor to the development of many chronic conditions including obesity, type II diabetes, coronary heart disease, peripheral artery disease, hypertension, stroke, congestive heart failure, depression and anxiety, osteoporosis, colon cancer, breast cancer, endometrial cancer, gestational diabetes, and premature death (Booth, Roberts, & Laye, 2012; Booth et al., 2017; González, Fuentes, & Márquez, 2017; Lynch & Leitzmann, 2017). Furthermore, only 2 in 10 adults are meeting physical activity guidelines in Canada (Chief Public Health Officer, 2016). Physical activity has been shown to decrease risks of developing chronic disease including cardiovascular disease, diabetes, some forms of cancer and osteoporosis (Durstine, Gordon, Wang, & Luo, 2013; Warburton et al., 2006a). Physical activity is any bodily movement that is produced by skeletal muscles and results in energy expenditure (Caspersen, Powell, & Christenson, 1985). Routine physical activity is also associated with improved psychological well-being, including reduced stress, anxiety, and depression (Paluska & Schwenk, 2000; Warburton et al., 2006a).

Social support can be broadly defined as positive, supportive behaviour or actions received from others (Richmond, Ross, & Egeland, 2007a). Social support includes positive

interactions with others in a social setting, emotional support such as guidance or feedback, tangible support referring to material aid, and the reception of affection and/or intimacy (Richmond et al., 2007a). Social support has been found to be a strong determinant of health (Harandi, Taghinasab, & Nayeri, 2017; Ohrnberger, Fichera, & Sutton, 2017; Ozbay et al., 2007; Reblin & Uchino, 2008; Richmond et al., 2007a). Low social support has been associated with elevated heart rate, increase blood pressure, and atherosclerosis (Ozbay et al., 2007). Social support appears to effect life expectancy in a similar magnitude as obesity, cigarette smoking, hypertension, and physical activity (Ozbay et al., 2007). Social support may have an impact on mental health, including decreasing risks of depression and anxiety (Harandi et al., 2017; Ohrnberger et al., 2017; Ozbay et al., 2007; Scheid & Brown, 2010; Xingmin Wang, Cai, Qian, & Peng, 2014). Overall, social support encourages the use of coping mechanisms, reduces stress, and predicts positive mental and physical health (Hakulinen et al., 2016; Harandi et al., 2017; Pflum, Testa, Balsam, Goldblum, & Bongar, 2015)

Qualitative research shows that social support and social interaction are common reasons for people being physically active (Allender et al., 2006). Participation in sport has been found to be heavily influenced through friend encouragement (Chrisman et al., 2014). Yet overall research has been inconsistent in the strength and direction of the association between social support and physical activity (Scarapicchia, Amireault, Faulkner, & Sabiston, 2017).

This review included examinations of social support and physical activity in all populations. The main objective of this study was to systematically review and perform a meta-analysis to determine if social support influences adults' physical activity. It was hypothesised that social support would have a significant positive influence on adults' physical activity. The

secondary objective of this study is to evaluate the effects multiple domains of social support (friend support, family support, co-worker support, etc.) have on physical activity.

Methods

Search Strategy & Selection Criteria

In accordance with Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines, a systematic approach was completed in order to identify original, peer-reviewed research articles. The goal was to find articles with reports on social support measures and physical activity. In collaboration with a librarian, the Medline search strategy was employed (Table A.1). The searches of all databases were conducted on May 31st, 2018. The following electronic databases were searched: Cumulative Index to Nursing and Allied Health Literature, CINAHL, (1937-May Week 4 2018), Excerpta Medica Database, EMBASE, (1947-May Week 4 2018), Medical Literature Analysis and Retrieval System Online, MEDLINE, (1946-May Week 4 2018), Scopus (1966-May Week 4 2018), and SPORTDiscus (1973-May Week 4 2018). Keywords included: exercise, social support, community support, family support, peer support, and community networks. All results were downloaded to Endnote 7.0 (Thompson Reuters, Philadelphia, USA). Any reference lists believed to be relevant were perused to select additional studies.

Table A.1: The Medline search strategy employed for systematic review of social support and physical activity among adults. Run May 31, 2018, search to May Week 4 2018

| Search Terms | Citation |
|---|----------|
| 1. exp EXERCISE/ | 166 367 |
| 2. Social Support/ | 63 750 |
| 3. community support.mp. | 1536 |
| 4. family support.mp. | 3819 |
| 5. peer support.mp. | 2560 |
| 6. Community Networks/ | 6466 |
| 7. friendship.mp. | 2715 |
| 8. FAMILY/ | 70 556 |
| 9. support groups.mp. | 3420 |
| 10. Self-Help Groups/ | 8626 |
| 11. 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 | 147 997 |
| 12. 1 and 11 | 2162 |
| 13. limit 12 to (English language and humans) | 2086 |
| 14. limit 13 to “review articles” | 178 |
| 15. 13 not 14 | 1908 |
| 16. limit 15 to (government publications or journal articles) | 1874 |
| 17. limit 16 to (case reports or comment or editorial or guideline or letter or practice guideline) | 15 |
| 18. 16 not 17 | 1859 |
| 19. limit 18 to “all adult (19 plus years)” | 1324 |

Studies of any year, any design, published in English, and reporting social support and physical activity among only adult populations, were included. Any population could be either the sole participating group or reported as a subset of multiple populations. We excluded any studies reporting social support and physical activity pertaining to youth populations (17 years or younger) and also studies that were qualitative in nature. Key outcomes of social support included: family social support, friend/peer social support, social support for exercise, and total social support. Additional social support outcomes included: co-worker social support, social network size and volume, and perceived organizational support. Key outcomes of physical activity included: total moderate to vigorous physical activity, total leisure time physical activity, and categorization of fulfilling recommended physical activity guidelines. Additional physical

activity outcomes included: steps/day, physically active days per month, and kilocalories of energy used per week. Characteristics of the included articles, including study name and location, year of study, sample size, sample population, social support measure, and physical activity measure were reported. The meta-analysis was completed using comparable social support and physical activity variables, and correlation values. Comparable variables were chosen to include the largest number of articles and sample size for more efficient and reliable meta-analysis. Correlation values between identical social support and physical activity measures were weighted based on sample size and combined to determine the meta-analyzed correlation value (Neyeloff, Fuchs, & Moreira, 2012). Risk ratios (RR) were converted to odds ratios (OR) via the Zhang conversion formula $RR=OR/[(1- P_0) + (P_0 \times OR)]$ (Zhang & Yu, 1998). Where P_0 = Incidence of the outcome of interest in the non-exposed group (Zhang & Yu, 1998).

Study Selection & Data Extraction

A thorough, multi-stage screening process was used. Two independent reviewers conducted the screening process with discrepancies addressed by a third reviewer. A list of compiled results from five databases, after removing duplications, were screened first by reviewing titles, followed by abstracts, and finally by full-text. At no point were the reviewers of the articles blinded to the author or journal names. In the case of multiple companion studies, the individual articles of the companion set were examined to obtain the greatest range of measures, the largest sample size, while ensuring no duplicates of a single measure from an investigation were counted. A spreadsheet was used for the data extraction process, done by two independent reviewers, to extract all measures of interest. Extracted data included social support measure, physical activity measure, correlation value, social support outcome, and physical activity outcome.

Quality of Methodology & Risk of Bias

In order to assess the quality of methodology of all included articles, the Downs & Black scoring system was used (Downs & Black, 1998). Following the Downs & Black scoring system, each article was separately evaluated for its individual quality and given a score out of 26. The assessments were completed independently by two reviewers, and consensus was achieved with thorough discussion. No articles were excluded by reviewers based on the articles' quality scores.

Risk of bias was assessed according to PRISMA guidelines. PRISMA guidelines are appropriate for this systematic review as it is largely observational studies. Risk of bias was labeled: yes, no, or unable to determine if there is a risk of bias. Selection bias was evaluated through recruitment bias and allocation bias. Recruitment bias was said to exist if differences existed between the target group recruited and participants included in the investigation i.e. participants were not representative of the population they were recruited from. For example, recruitment bias was noted if characteristics of participants such as age and body composition did not appear to represent the population, in comparison to available publications or the authors' expert opinion. Recruitment bias was also recognized if different recruitment strategies were used for different groups. Allocation bias was noted if differences in confounding variables (age, body composition and blood pressure) between intervention groups existed before initiation of the study. For example, allocation bias was reported if a study was comparing two groups, yet one group had a significantly higher mean age than the other group. Performance bias was reported if different interventions, treatments, or care were provided to different groups. For example, performance bias was considered if one comparison group was tested significantly more than another group. Detection bias was labeled present if measurement techniques were

different within a study between groups or within individual groups. Attrition bias was observed if participants were different from those who decided not to participate, or participants lost to follow-up. For example, if there were large variable differences between those dropping out of the study compared to those who remained in the study, attrition bias would be reported. Reporting bias was detected if procedures and measures outlined in the methods were not described in the results or if the methods were referred to a companion publication. We did not consider the blinding of participants and personnel or randomization of participants in regard to the presence of selection bias as most studies were not reporting an intervention.

Data Synthesis

All main outcome measures included means and standard deviations, or proportions and standard deviations of social support measures and physical activity measures. Relationships between social support and physical activity were identified and reported for the systematic review. Correlations and significance between the social support measure and the physical activity measure used were highlighted and reported. Odds ratios reporting the effect of social support on physical activity in specific studies were also highlighted. Finally, the effects of family-social support domain and friend-social support domain on physical activity were compared. Meta-analysis was performed when multiple articles using comparable social support measures and physical activity measures and correlation values were identified. The researchers meticulously analyzed the methods used by each article to ensure only comparable methods and measures were included in the meta-analysis. Comparisons of compiled averages were conducted using meta-analysis comparison of means via Microsoft Excel 2010 (Neyeloff et al., 2012). Measures obtained from different studies were combined appropriately and units were converted as necessary. Correlations values were weighted based on sample size and combined (Neyeloff et

al., 2012). Forest plots were created using Microsoft Excel 2010 with a modified forest plot template (Neyeloff et al., 2012). All results are presented as means with standard deviations, and as odd ratios with confidence intervals where available.

Results

Literature Search and Findings

In total, 3552 citations were screened with 39 articles included in the final assessment of the systematic review (Figure A.1). These 39 articles were the result of 38 studies (in only one instance there were two articles made from a single study): 3 from Canada, 23 from the United States of America, 4 from Brazil, 2 from Australia, 2 from European countries, 1 from Japan, 1 from Nigeria, and 1 International study. This systematic review participant sample was made of 2 320 college students (5 articles, 5 studies), 20 162 older (60+ years) adults (6 articles, 6 studies), 331 multiple sclerosis survivors (2 articles, 2 studies), 1566 breast cancer survivors (2 articles, 2 studies), 7 999 minority/disadvantaged group members (7 articles, 7 studies), and 9740 participants in Women only studies (9 articles, 8 studies). Of the 39 articles there were included in the final assessment, there were a total of 57 361 adult participants. Overall, the systematic review sample population seems to generally represent a community population; older adults, younger adults, disadvantaged populations, healthy populations, and unhealthy populations. Characteristics of the included studies can be seen in Table A.2 In general, many of the studies were examining the determinants of health. Some studies specifically measured the effect of social support on health, and thus physical activity.

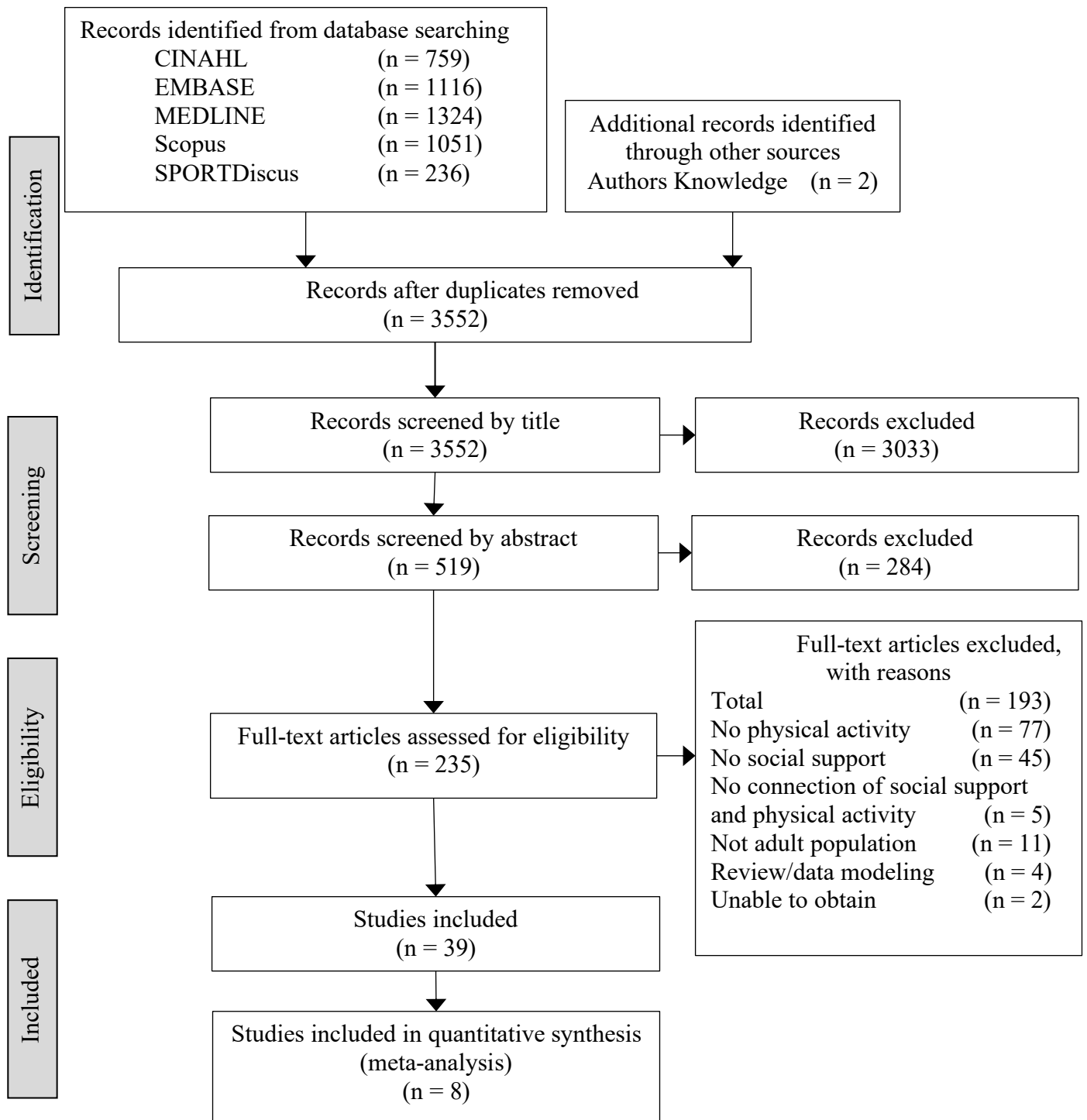


Figure A.1: Systematic review and meta-analysis citation screening process. Five databases were searched including CINAHL, EMBASE, MEDLINE, Scopus, and SPORTDiscus. n = number of studies.

Table A.2: Characteristics of included studies

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|--|---|---|--------------------|--|--|-------------------------------|
| Anderson, Bovard, Wang, Beebe, & Murad, 2016 | USA | Nordic Skiers 47.9 yrs | 5433 | Sallis Social Support for Exercise Scale | Exercise (min/week) CSEP Guidelines | 18 of 26 |
| Aparicio-Ting, Friedenreich, Kopciuk, Plotnikoff, & Bryant, 2014 | <i>Tomorrow Project</i> Canada | Canadian Adults 53 yrs | 2771 | Sallis Social Support for Exercise Scale | CSEP Guidelines | 16 of 26 |
| Belanger & Patrick, 2018 | Mid-Atlantic University - USA | USA College Students 19.28 yrs | 733 | Positive Social Influence Scale | Health Promoting Lifestyle Profile II | 13 of 26 |
| Böhm, Mielke, da Cruz, Ramires, & Wehrmeister, 2016 | Brazil | Brazilian Elderly 69.5 yrs | 1285 | Physical Activity Social Support Scale | CSEP Guidelines Walking min/week MVPA min/week | 17 of 26 |
| Bourdeaudhuij, Teixeira, Cardon, & Deforche, 2005 | Portugal & Belgium | Portuguese and Belgium Adults 36.2 yrs | 526 | Sallis Social Support for Exercise Scale | MVPA min/week | 18 of 26 |
| Carlson et al., 2012 | <i>Senior Neighbourhood Quality of Life Survey</i> USA | USA Older Adults 74.4 yrs | 719 | Sallis Social Support for Exercise Scale | MVPA min/week | 16 of 26 |

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|--|---|---|--------------------|--|---|-------------------------------|
| Cleland et al., 2010 | <i>Resilience for Eating and Activity Despite Inequality (READI) Study</i> Australia | Australian Woman living in disadvantaged neighbourhoods 34.5 yrs | 4108 | Sallis Social Support for Exercise Scale | CSEP Guidelines | 19 of 26 |
| Coulon, Wilson, & Egan, 2013 | <i>Positive Action for Today's Health (PATH) Trial</i> USA | African American Adults 51 yrs | 434 | Social Support for Exercise Habits Scale (SSEHS) | MVPA min/day | 19 of 26 |
| Eyler et al., 1999 | <i>US Women's Determinants Study</i> USA | USA Minority Women 40+ yrs | 2912 | Physical Activity Social Support Scale | CSEP Guidelines | 19 of 26 |
| Haye, Heer, Wilkinson, & Koehly, 2014 | <i>Risk Assessment For Mexican-Americans (RAMA) Study</i> USA | USA Parent-Child Dyads | 224 | Parent-Child Encouragement Classifications | Weekly Physical Activity Frequency and Quantity | 15 of 26 |
| Idowu, Adeniyi, Atijosan, & Ogwumike, 2013 | Nigeria | Nigerian Adults with Hypertension 31+ yrs | 212 | Medical Outcome Survey – Social Support | International Physical Activity Questionnaire | 15 of 26 |
| Jackson et al., 2016 | USA | African American Women 49 yrs | 47 | Sallis Social Support for Exercise Scale | International Physical Activity Questionnaire | 16 of 26 |

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|---|---|--|--------------------|--|---|-------------------------------|
| Janisse, Nedd, Escamilla, & Nies, 2004 | USA | American Women 44.9 yrs | 259 | Sallis Social Support for Exercise Scale | Current PA Status | 16 of 26 |
| Kaplan, Newsom, McFarland, & Lu, 2001 | <i>Canadian National Population Health Survey</i> Canada | Canadian Older Adults 65+ yrs | 12169 | Kaplan Social Support Scale | Monthly moderate intensity physical activity lasting 15 minutes | 17 of 26 |
| Leslie et al., 1999 | Australia | College Students | 2148 | Sallis Social Support for Exercise Scale | Kcal/month | 18 of 26 |
| Loprinzi & Joyner, 2016 | <i>National Health and Nutrition Examination Survey (NHANES)</i> USA | USA Older Adults 71.4 yrs | 5616 | Any Support Identified | Mets/month | 14 of 26 |
| Marquez & McAuley, 2006 | USA | Latino Adults 29.4 yrs | 266 | Sallis Social Support for Exercise Scale | LTPA | 18 of 26 |
| Motl, McAuley, Snook, & Gliottoni, 2009 | USA | Adults with Multiple Sclerosis 48.0 yrs | 292 | Social Provisions Scale (SPS) | Godin Leisure Time Exercise Questionnaire | 16 of 26 |
| Moy, Sallis, Ice, & Thompson, 2010 | <i>Native Hawaiians and Pacific Islanders Study</i> USA | Native Hawaiians and Pacific Islanders 46.9 yrs | 100 | Sallis Social Support for Exercise Scale | New Zealand Physical Activity Questionnaire | 16 of 26 |

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|-------------------------------------|---|---|--------------------|--|---|-------------------------------|
| Muchicko, Lepp, & Barkley, 2014 | <i>American University</i> USA | Trans-Cis Gender Adults 32 yrs | 80 | Sallis Social Support for Exercise Scale | Godin Leisure Time Exercise Questionnaire | 15 of 26 |
| Mudrak, Slepicka, & Elavsky, 2017 | Prague | Czech Older Adults 68 yrs | 46 | Sallis Social Support for Exercise Scale | Godin Leisure Time Exercise Questionnaire | 16 of 26 |
| Murano et al., 2014 | Tsuchiura Kyodo, Japan | Adults with type II diabetes 61.4 yrs | 101 | Chronic Disease Social Support Scale | International Physical Activity Questionnaire | 16 of 26 |
| O'Brien Cousins, 1995 | Vancouver, Canada | Canadian Older Adults 67 yrs | 327 | Composite Social Support | Kcal/week | 16 of 26 |
| Oliveira et al., 2011 | <i>Pró-Saúde Study</i> Brazil | Brazilian Adults 40 yrs | 3253 | Medical Outcome Survey – Social Support | LTPA | 13 of 26 |
| Oliveira et al., 2014 | <i>Pró-Saúde Study</i> Brazil | Brazilian Adults 40 yrs | 1278 | Medical Outcome Survey – Social Support | LTPA | 12 of 26 |
| Paiva, Camargo, Silva, & Reis, 2016 | University of Parana, Brazil | Brazilian College Students 18-24 yrs | 349 | Ries Social Support Scale | CSEP Guidelines | 16 of 26 |
| Peterson et al., 2008 | Iowa, USA | Adults with Intel. Disability 37.2 yrs | 152 | Sallis Social Support for Exercise Scale | Physical Activity Participation | 18 of 26 |
| Petosa, Suminski, & Hertz, 2003 | Midwestern University, USA | USA College Students 18-24 yrs | 350 | Trieer Social Support Scale | Days of Vigorous Physical Activity in 4 weeks | 15 of 26 |
| Phillips & McAuley, 2013 | <i>Breast Cancer Study</i> Illinois, USA | Breast Cancer Survivors 56.2 yrs | 1527 | Sallis Social Support for Exercise Scale | Godin Leisure Time Exercise Questionnaire | 18 of 26 |

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|--|--|--|--------------------|--|---|-------------------------------|
| Plow, Matthew A, Mathiowetz, Virgil, Resnick, 2008 | <i>Multiple Sclerosis Intervention</i> Minnesota, USA | Adults with Multiple Sclerosis 48.5 yrs | 39 | Sallis Social Support for Exercise Scale | Health Promoting Lifestyle Profile II | 18 of 26 |
| Rogers, McAuley, Courneya, & Verhulst, 2008 | Midwest Country, USA | Breast Cancer Survivors 64 yrs | 192 | Sallis Social Support for Exercise Scale | Godin Leisure Time Exercise Questionnaire | 16 of 26 |
| Rovniak, Anderson, Winett, & Stephens, 2002 | Virginia, USA | USA University Students 19.56 yrs | 277 | Sallis Social Support for Exercise Scale | Kcal/week | 17 of 26 |
| Sarkar, Taylor, Lai, Shegog, & Paxton, 2016 | <i>Booster Break Study</i> Texas, USA | USA Adults 44 yrs | 144 | Sallis Social Support for Exercise Scale | International Physical Activity Questionnaire | 16 of 26 |
| Sasidharan, Payne, Orsega-Smith, & Godbey, 2006 | USA | USA Older Adults 50+ yrs | 1967 | Sallis Social Support for Exercise Scale | Physical Activity Survey for the Elderly | 14 of 26 |
| Silva, Azevedo, & Goncalves, 2013 | Brazil | Brazilian Adults 20+ yrs | 2732 | Sallis Social Support for Exercise Scale | CSEP Guidelines | 17 of 26 |
| Ståhl et al., 2001 | <i>MAREP Study</i> International Study | International Adults 47 yrs | 3342 | Sallis Social Support for Exercise Scale | Active/inactive classification | 16 of 26 |
| Suorsa et al., 2016 | <i>Asthma and Allergies Study</i> USA | USA College Students 19.56 yrs | 611 | Sallis Social Support for Exercise Scale | MVPA min/week | 14 of 26 |

| Study | Study name & location | Population | Sample Size | Social Support Measure | Physical Activity Measure | Quality of Methodology |
|----------------------|---|-------------------|--------------------|--|----------------------------------|-------------------------------|
| Treiber et al., 1991 | <i>Studies of Children's Activity and Nutrition (SCAN) Study</i> USA | USA Adults | 238 | Sallis Social Support for Exercise Scale | Baecke Physical Activity Scale | 13 of 26 |

CSEP, Canadian Society of Exercise Physiology; LTPA, Leisure Time Physical Activity; MVPA, Moderate to Vigorous Physical Activity; yrs, years

Quality of methodology of included articles averaged 16 of 26 criteria, ranging from 12-19, with a standard deviation of 1.73 as can be seen in Table 2. Reported bias was evaluated in detail (Table A.3). Included articles generally demonstrated limited risk of bias. Recruitment bias was identified in 7 articles as the participants were not representative of the target population to the standard held by the reviewers. Allocation bias was only identified in 3 articles as the vast majority of the articles compared nearly identical groups or were observational studies. Performance bias was identified in 1 article, and detection bias was not identified in any articles. Attrition bias was only identified in 1 article as the majority of articles were not longitudinal, thus not offering participants the opportunity to drop out of the study. Reporting bias was not identified in any of the articles, however 1 article's reporting bias was deemed unclear. Risk of bias was also determined for the studies involved in each meta-analysis outcome, with no risk of bias found (Table A.3).

Table A.3: Risk of bias of included studies

| Article | Selection Bias | | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias |
|---|------------------|-----------------|------------------|----------------|----------------|----------------|
| | Recruitment Bias | Allocation Bias | | | | |
| S. Anderson, Currie, Copeland, et al., 2016 | + | + | + | + | + | + |
| Aparicio-Ting et al., 2014 | + | + | + | + | + | + |
| Belanger & Patrick, 2018 | + | + | + | + | + | + |
| Böhm et al., 2016 | - | + | + | + | + | + |
| Bourdeaudhuij et al., 2005 | - | + | + | + | + | + |
| Carlson et al., 2012 | + | + | + | + | + | + |
| Cleland et al., 2010 | + | + | + | + | + | + |
| Coulon et al., 2013 | + | + | + | + | + | + |
| Eyler et al., 1999 | + | + | + | + | + | + |
| Haye et al., 2014 | + | + | + | + | + | + |
| Idowu et al., 2013 | + | + | + | + | + | + |
| H. Jackson et al., 2016 | + | + | + | + | + | + |
| Janisse et al., 2004 | - | - | + | + | + | + |
| Kaplan et al., 2001 | + | + | + | + | + | + |
| Leslie et al., 1999 | + | + | + | + | + | + |
| Loprinzi & Joyner, 2016 | + | + | + | + | + | + |
| Marquez & McAuley, 2006 | + | + | + | + | + | + |
| Motl et al., 2009 | + | + | + | + | + | + |
| Moy et al., 2010 | + | + | + | + | + | + |
| Muchicko et al., 2014 | + | - | + | + | + | + |
| Mudrak et al., 2017 | - | + | + | + | + | + |
| Murano et al., 2014 | - | + | + | + | + | + |
| O'Brien Cousins, 1995 | + | + | + | + | + | + |
| Oliveira et al., 2011 | + | + | + | + | + | + |
| Oliveira et al., 2014 | ? | + | + | + | ? | ? |
| Paiva et al., 2016 | + | + | + | + | + | + |
| Peterson et al., 2008 | + | + | + | + | + | + |

| Article | Selection Bias | | | | | |
|---|------------------|-----------------|------------------|----------------|----------------|----------------|
| | Recruitment Bias | Allocation Bias | Performance Bias | Detection Bias | Attrition Bias | Reporting Bias |
| Petosa et al., 2003 | + | + | + | + | ? | + |
| Phillips & McAuley, 2013 | + | + | + | + | + | + |
| Plow et al., 2008 | + | + | + | + | - | + |
| Rogers et al., 2008 | + | + | + | + | + | + |
| Rovniak et al., 2002 | - | + | + | + | + | + |
| Sarkar et al., 2016 | + | + | + | + | + | + |
| Sasidharan et al., 2006 | ? | + | + | + | + | + |
| Silva et al., 2013 | + | + | + | + | + | + |
| Ståhl et al., 2001 | + | + | + | + | + | + |
| Suorsa et al., 2016 | + | + | + | + | + | + |
| Treiber et al., 1991 | + | - | - | + | + | + |
| Wilcox et al., 2000 | + | + | + | + | + | + |
| Meta-Analysis Outcomes Risk of Bias | | | | | | |
| Odds Ratio: Friend Social Support | + | + | + | + | + | + |
| Odds Ratio: Family Social Support | + | + | + | + | + | + |
| Odds Ratio: Overall Social Support | + | + | + | + | + | + |
| Spearman's Correlation: Friend Social Support | + | + | + | + | + | + |
| Spearman's Correlation: Family Social Support | + | + | + | + | + | + |
| Spearman's Correlation: Overall Social Support | + | + | + | + | + | + |

low risk of bias;
 high risk of bias;
 unclear bias;

PRISMA guideline checklist (Table A.4) was used and all items were reported.

Table A.4: Checklist of PRISMA guidelines

| Section/topic | Item # | Checklist Item | Section Reported In |
|---------------------------|---------------|---|----------------------------|
| Title | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | <i>Introduction</i> |
| Abstract | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | <i>Introduction</i> |
| Introduction Rationale | 3 | Describe the rationale for the review in the context of what is already known. | <i>Introduction</i> |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS). | <i>Methods</i> |
| Methods | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | n/a |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | <i>Methods</i> |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | <i>Methods</i> |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated. | Table A.1 |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | Figure A.1 |

| Section/topic | Item # | Checklist Item | Section Reported In |
|------------------------------------|---------------|--|--|
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | <i>Search Strategy & Selection Criteria</i> |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | <i>Search Strategy & Selection Criteria</i> |
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis. | <i>Quality of Search Strategy & Risk of Bias</i> |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | <i>Search Strategy & Selection Criteria</i> |
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis. | <i>Search Strategy & Selection Criteria</i> |
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies). | Table A.1 |
| Additional analysis | 16 | Describe methods of additional analysis (e.g., sensitivity or subgroup analysis, meta-regression), if done, indicating which were pre-specified. | <i>Search Strategy & Selection Criteria</i> |
| Results | | | |
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram. | Figure A.1 |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations. | Table A.2 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12). | Table A.3 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot. | Table A.5 |

| Section/topic | Item # | Checklist Item | Section Reported In |
|-----------------------------|---------------|--|--|
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency. | <i>Literature Search and Findings, Table A.5</i> |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies (see Item 15). | Table A.3 |
| Additional analysis | 23 | Give results of additional analysis, if done (e.g., sensitivity or subgroup analysis, meta-regression [see Item 16]). | <i>Qualitative Analysis</i> |
| Discussion | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers). | <i>Discussion</i> |
| Limitations | 25 | Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias). | <i>Discussion</i> |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | <i>Conclusion</i> |
| Funding | | | |
| Funding | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | <i>Funding Source</i> |

Social Support and Physical Activity - Meta-Analyzed Results

Two separate analysis were completed in this meta-analysis using Sallis’ Social Support for Exercise Scale to measure social support (James F Sallis, Grossman, Pinski, Patterson, & Nader, 1988). Figure A.2A included 4 articles reporting odds of having high social support among those classified as meeting physical activity recommendations compared to those who did not. Figure A.2A of the meta-analysis included 4 articles that reported participants physical activity as either ‘active’ or ‘inactive’, and this classification was determined if the participants

met International physical activity guidelines of 150min/week of physical activity (Canadian Society for Exercise Physiology, 2018; U.S. Department of Health and Human Services, 2008; World Health Organization, 2010). This portion of the meta-analysis included studies mostly done in the USA, with a sample size of 929, and a range of ages from college/university students to older adults (60+ years). Meta-analysis includes odds ratios of meeting International physical activity guidelines by social support score, using those who did not meet the International physical activity guidelines as the reference group. Odds ratios were meta-analyzed for each domain of social support: overall-social support, friend-social support, and family-social support (Figure A.2A). The odds ratio of having high overall-social support and meeting the International physical activity guidelines compared to the reference group was 1.21 (1.16-1.26). The odds ratio of having high friend-social support and meeting the International physical activity guidelines compared to the reference group was 1.22 (1.16-1.28). The odds ratio of having high family-social support and meeting the International physical activity guidelines compared to the reference group was 1.20 (1.14-1.25).

The second meta-analysis, Figure A.2B, included 4 articles examining associations of social support with Godin Leisure Time Exercise Questionnaire (GLETQ) score (Godin & Shephard, 1985). Figure A.2B displays meta-analysis of 4 articles including studies from the USA, Australia, and the Czech Republic with a sample size of 15 031, and a variety of populations. Spearman's correlation values were meta-analyzed for physical activity scores and each domain of social support: overall-social support, friend-social support, and family-social support (Figure A.2B). Overall-social support had a correlation value with physical activity score of $r=0.41$. Friend-social support had a correlation value with physical activity score of $r=0.27$. Family-social support had a correlation value with physical activity score of $r=0.04$.

Figure A.2A

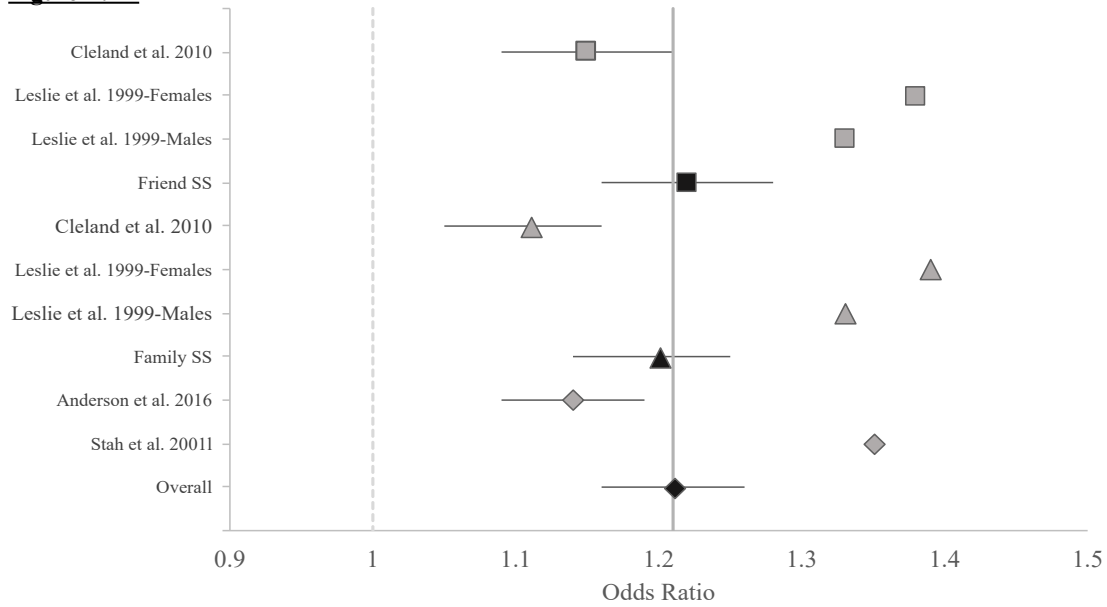


Figure A.2B

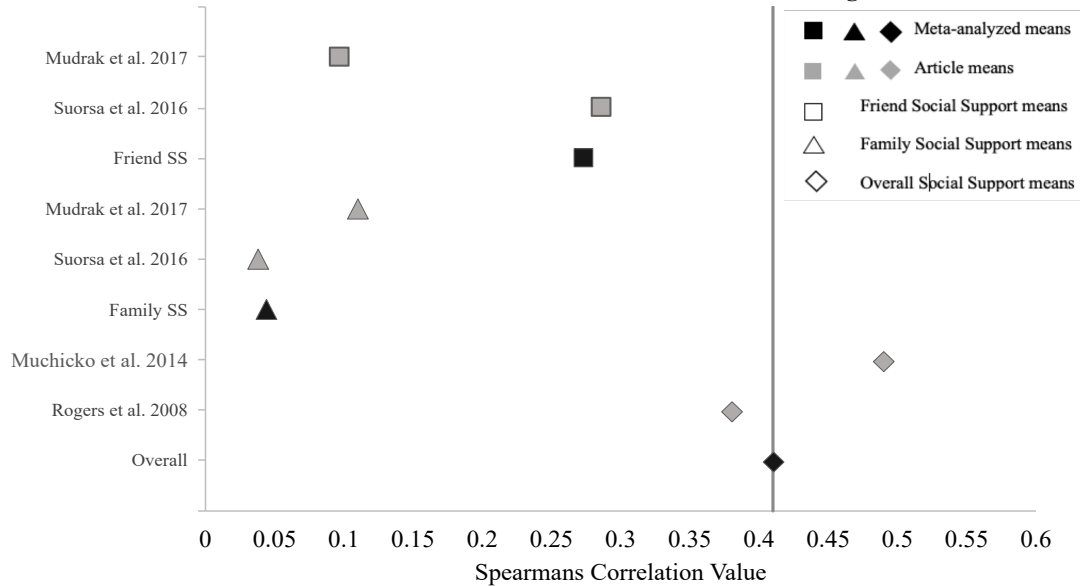


Figure A.2: Articles findings from the systematic review were meta-analyzed in two portions. Figure A.2A meta-analyzed the odds ratios for each domain of social support: overall-social support, friend-social support, and family-social support. Figure A.2A describes the odds ratios of having higher social support levels when the participant meets the International physical activity guidelines, using those who do not meet the physical activity guidelines as references. 4 articles findings are shown, and compiled means were meta-analyzed for each domain of social support. Figure A.2B describes the spearman's correlation values of social support levels and physical activity. Four articles findings are shown, and compiled means were meta-analyzed for each domain of social support.

Qualitative Analysis - Social Support & Physical Activity

Of the 39 articles included in the systematic review, 31 articles were only included in qualitative analysis, due to different measuring tools. Reported findings include differences in social support between physical activity groups, and physical activity differences between the domains of social support. The articles included in this analysis were completed internationally, with a variety of populations, and a total sample size of 41 401 (see Table A.2).

As outlined on Table A.5, various articles identified in this review examined correlations between social support and physical activity, using varying measurement tools. There were 7 articles that examined a correlation between overall-social support and physical activity; all 7 identified significant positive correlations (Idowu et al., 2013; Motl et al., 2009; Moy et al., 2010; Murano et al., 2014; Phillips & McAuley, 2013; Plow et al., 2008; Treiber et al., 1991). Of the 10 articles that examined a correlation between friend-social support and physical activity; 9 identified significant positive correlations and 1 identifying no significant findings (Bourdeaudhuij et al., 2005; H. Jackson et al., 2016; Janisse et al., 2004; Marquez & McAuley, 2006; Moy et al., 2010; Paiva et al., 2016; Peterson et al., 2008; Rovniak et al., 2002; Sarkar et al., 2016; Silva et al., 2013). Correlations between family-social support and physical activity were examined in 8 articles, with 4 identifying significant positive correlations and 4 not identifying significant findings (H. Jackson et al., 2016; Janisse et al., 2004; Marquez & McAuley, 2006; Moy et al., 2010; Paiva et al., 2016; Peterson et al., 2008; Sarkar et al., 2016; Silva et al., 2013).

Six studies used Beta (β) Coefficients to describe the relationship between social support and physical activity, each using different questionnaires. All 6 articles identified significant positive findings between overall-social support and physical, as outlined on Table A.5

(Belanger & Patrick, 2018; Carlson et al., 2012; Coulon et al., 2013; O'Brien Cousins, 1995; Petosa et al., 2003; Phillips & McAuley, 2013). Individuals who reported frequent physical activity reported significantly higher social support than individuals who reported infrequent physical activity ($p < 0.001$), with frequent physical activity defined as lasting ≥ 15 minutes and for ≥ 12 times a month (Kaplan et al., 2001).

Despite different measurement tools, some consistency was identified across studies using odds ratios to evaluate the relationship between social support and physical activity (Table 5). There were 4 articles that determined odds ratios of high social support among individuals meeting International physical activity guidelines compared to those not meeting International physical activity guidelines for overall-social support, with all 4 articles reporting odds ratios of having greater social support among those meeting International physical activity guidelines (Eyler et al., 1999; Haye et al., 2014; Kaplan et al., 2001; Loprinzi & Joyner, 2016). There was 1 article that determined odds-ratio for both higher friend- and family-social support for individuals meeting International physical activity guidelines compared to those not meeting International physical activity guidelines, with both odds ratios of higher friend-social support and higher family-social support among those meeting International physical activity guidelines (Aparicio-Ting et al., 2014). There were 2 articles which determined odds ratios for material and emotional social support for individuals meeting International physical activity guidelines compared to those not meeting International physical activity guidelines, with both articles reporting greater odds ratios of higher material and higher emotional social support among those meeting physical activity guidelines (Oliveira et al., 2011, 2014).

Table A.5: Physical activity and social support outcomes and their relationship from the systematic review articles

| Study | Physical Activity Outcome | Social Support Outcome | Correlation Value | p-value |
|-------------------------------|--------------------------------------|-----------------------------|---|-----------|
| Overall Social Support | | | | |
| Belanger & Patrick, 2018 | | | $\beta=0.51$ | $p<0.001$ |
| Carlson et al., 2012 | <i>MVPA min/week</i> 93.6 (115.4) | <i>SSSES</i> 2.4 (1.0) | $\beta=14.35$ (5.76-22.94) | $p<0.01$ |
| Coulon et al., 2013 | <i>MVPA min/day</i> 21.42 (26.29) | <i>SSEHS</i> 2.50 (1.03) | $\beta=2.40$ (SE=1.06) | $p=0.02$ |
| Eyler et al., 1999 | | | <u>Cumulative PA</u> OR=1.37 (1.05-1.77) | |
| | | | <u>Lifestyle PA</u> OR=2.07 (1.62-2.64) | |
| Haye et al., 2014 | | | OR=5.41 (1.82-6.10) | $p=0.002$ |
| Idowu et al., 2013 | | | $r=0.83$ | $p<0.001$ |
| Kaplan et al., 2001 | | | OR=1.06(1.03-1.09) | $p<0.001$ |
| Loprinzi & Joyner, 2016 | | | OR= 1.4(1.01-1.97) | $p<0.05$ |
| Motl et al., 2009 | | | $r=0.20$ | $p<0.05$ |
| Moy et al., 2010 | | | $r=0.33$ | $p<0.01$ |
| Murano et al., 2014 | <i>IPAQ</i> 9663.8(8482.6) | <i>CDSSS</i> 64.7(12.8) | $r=0.32$ | $p<0.001$ |
| O'Brien Cousins, 1995 | | | $\beta=0.264$ (SE=0.055) | $p<0.01$ |
| Petosa et al., 2003 | | | $\beta=0.23$ | $p<0.05$ |
| Phillips & McAuley, 2013 | | | $\beta=0.34$ (SE=0.14) | $p=0.02$ |
| Phillips & McAuley, 2013 | | | $r=0.37$ | $p<0.01$ |
| Plow et al., 2008 | | | $r=0.32$ | $p<0.01$ |
| Treiber et al., 1991 | | | $r=0.28$ | $p<0.01$ |

| Study | Physical Activity Outcome | Social Support Outcome | Correlation Value | p-value |
|------------------------------|---|--|--------------------------------------|---------|
| Friend Social Support | | | | |
| Aparicio-Ting et al., 2014 | | | <u>Women</u> OR=1.15(1.00-1.33) | |
| | | | <u>Men</u> OR=1.10(0.92-1.32) | |
| Böhm et al., 2016 | | | PR=3.20(2.45-4.20) | |
| Bourdeaudhuij et al., 2005 | <i>MVPA min/week</i> | <i>SSSES</i> | <i>r=0.13, p<0.05</i> | p<0.05 |
| | <u>Portuguese</u> 147(231) | <u>Portuguese</u> Family-SS: 2.2(0.7) Friends-SS: 2.5(0.9) | | |
| | <u>Belgian</u> 52(230) | <u>Belgian</u> Family-SS: 2.3(0.9) Friends-SS: 2.5(0.9) | | |
| H. Jackson et al., 2016 | <i>LT MET min/week</i> 583.3 (198.0) | Friends: 18.6(8.4) | <i>r=0.26</i> | p>0.05 |
| Janisse et al., 2004 | | | <i>r=0.15</i> | p<0.05 |
| Marquez & McAuley, 2006 | | | <i>r=0.20</i> | p<0.05 |
| Moy et al., 2010 | | | <i>r=0.30</i> | p<0.01 |
| Paiva et al., 2016 | | | <i>r=0.30</i> | p<0.001 |
| Peterson et al., 2008 | | | <i>r=0.280</i> | p<0.001 |
| Rovniak et al., 2002 | | | <i>r= 0.32</i> | p<0.01 |
| Sarkar et al., 2016 | | | <i>r=0.19</i> | p<0.05 |
| Sasidharan et al., 2006 | | | <u>Women</u> PoR=2.68 (1.65-4.33) | p<0.001 |
| | | | <u>Men</u> PoR=3.28 (2.35-4.58) | p<0.001 |

| Study | Physical Activity Outcome | Social Support Outcome | Correlation Value | p-value |
|------------------------------|---|------------------------|--|-----------|
| Silva et al., 2013 | | | <u>African Women</u> $r=0.47$ | $p<0.001$ |
| | | | <u>White Women</u> $r=0.28$ | $p<0.01$ |
| | | | <u>African Men</u> $r=0.05$ | $p>0.01$ |
| | | | <u>White Men</u> $r=0.48$ | $p<0.001$ |
| Family Social Support | | | | |
| Aparicio-Ting et al., 2014 | | | <u>Women</u> OR=1.39(1.16-1.67) PR=3.11(2.12-4.56) | |
| Böhm et al., 2016 | | | $r=0.20$ | $p>0.05$ |
| H. Jackson et al., 2016 | <i>LT MET min/week</i> 583.3 (198.0) | Family: 18.7(7.6) | | |
| Janisse et al., 2004 | | | $r=0.7$ | $p>0.05$ |
| Marquez & McAuley, 2006 | | | $r= 0.11$ | $p>0.05$ |
| Moy et al., 2010 | | | $r=0.26$ | $p<0.01$ |
| Paiva et al., 2016 | | | $r= 0.32$ | $p<0.001$ |
| Peterson et al., 2008 | | | $r= 0.160$ | $p<0.001$ |
| Sarkar et al., 2016 | | | $r=0.06$ | $p>0.05$ |
| Sasidharan et al., 2006 | | | <u>Women</u> PoR=2.17(1.31-3.59) | $p<0.001$ |
| | | | <u>Men</u> PoR=2.34(1.63-3.36) | $p<0.001$ |

| Study | Physical Activity Outcome | Social Support Outcome | Correlation Value | p-value |
|-------------------------------------|---------------------------|------------------------|---|-----------|
| Silva et al., 2013 | | | <u>African Women</u> $r=0.53$ | $p<0.001$ |
| | | | <u>White Women</u> $r=0.33$ | $p<0.01$ |
| | | | <u>African Men</u> $r=0.18$ | $p>0.01$ |
| | | | <u>White Men</u> $r=0.22$ | $p<0.01$ |
| | | | | |
| Other Social Support Domains | | | | |
| Oliveira et al., 2011 | | | <u>Material-SS</u> OR=1.90, (1.1-3.1) | |
| | | | <u>Emotional-SS</u> OR=2.01, (1.0-3.9) | |
| Oliveira et al., 2014 | | | <u>Material-SS</u> OR= 2.76, (1.2-6.5) | |
| | | | <u>Affective-SS (men)</u> OR= 1.80 (1.1-3.2) | |
| Paiva et al., 2016 | | | <u>Staff-SS</u> $r=0.31$ | $p<0.001$ |
| Sarkar et al., 2016 | | | <u>Co-worker-SS</u> $r=0.31$ | $p<0.01$ |

β , Beta value; CDSSS, Chronic Disease Social Support Score; IPAQ, International Physical Activity Questionnaire; LT MET, Leisure Time Metabolic Equivalent; MVPA, Moderate to vigorous physical activity; OR, Odds Ratio; PA, Physical Activity; PoR, Probability odds ratio; PR, Probability Ratio; r, Pearson's correlation; SS, social Support; SSEHS, Social Support for Exercise Habits Scale; SSES, Sallis Social Support for Exercise Scale

Friend vs. Family Social Support Domains

Two definitive domains of social support were previously highlighted; friend-social support and family-social support. Of the articles that examined associations of friend-social support with physical activity, 90% found significant positive correlations to physical activity whereas the rest were non-significant (Bourdeaudhuij et al., 2005; H. Jackson et al., 2016; Janisse et al., 2004; Marquez & McAuley, 2006; Moy et al., 2010; Paiva et al., 2016; Peterson et al., 2008; Rovniak et al., 2002; Sarkar et al., 2016; Silva et al., 2013). Of the articles that examined associations of family-social support with physical activity, 50% found significant positive correlations whereas the rest were non-significant (H. Jackson et al., 2016; Janisse et al., 2004; Marquez & McAuley, 2006; Moy et al., 2010; Paiva et al., 2016; Peterson et al., 2008; Sarkar et al., 2016; Silva et al., 2013). Of the three articles that evaluated both friend- and family-social support, friend-social support was significantly correlated ($p < 0.05$) to physical activity, and no significant correlations ($p > 0.05$) were identified among family-social support and physical activity (Janisse et al., 2004; Marquez & McAuley, 2006; Sarkar et al., 2016).

Discussion

A lack of physical activity in Canada contributes to higher rates of chronic conditions (Booth et al., 2012, 2017; González et al., 2017). Physical activity is one of the most effective avenues to decrease risks of chronic disease (Warburton et al., 2006a). It is crucial to understand what drives people and communities to be physically active (Durstine et al., 2013; Warburton et al., 2006a). The qualitative analysis highlighted significant positive correlations, β -coefficients and odds ratios between physical activity and social support. The friend-social support domain had 90% significant correlations whereas family-social support had 50% significant correlational

findings. Thus, as social support increases or decreases there is potential that physical activity may do the same. This meta-analysis and review is prominent in that it determined a moderate-large (0.3-0.5), positive correlation between social support and physical activity, with those who report high social support also reporting higher physical activity and increased odds of meeting international physical activity guidelines in all domains of social support.

Not only is it important to identify the significance that social support has on physical activity, but it is also important to know specifically which domains of social support have an influence on physical activity. Friend-social support was found to be consistently related to reporting high leisure time physical activity, meeting international physical activity guidelines, physical activity volume, and physical activity classifications. Family-social support was inconsistently linked to physical activity, including greater odds of meeting international physical activity guidelines, and inconsistent correlations between family-social support and physical activity. Overall, the meta-analysis determined both increased family- and friend-social support to have greater odds ratios of meeting international physical activity guidelines. Both domains are influential in determining physical activity, yet our findings show that friend-social support may be a more consistent determinant of physical activity than family-social support. These findings are consistent with research that shows how friendships have been found to predict better health and happiness compared to family relationships (Chopik, 2017). Friendship also predicts chronic illness and suicide more accurately than other relationships (Bearman & Moody, 2004; Chopik, 2017; Christakis & Fowler, 2007). Friend-social support may be a more consistent determinant due to adults valuing friend relationships more than familial relationships, as friendships result from choice and selectivity whereas removing familial relationships can be very difficult (Chopik, 2017; Giles, Glonek, Luszcz, & Andrews, 2005). Overall, friend-social

support is more consistently related to physical activity, with less consistent findings among family-social support (H. Jackson et al., 2016; Janisse et al., 2004; Paiva et al., 2016).

These findings relate similarly to other studies linking social support to health. These findings highlight that social support may have an impact on physical activity, and social support has been shown to be a large determinant of health (Harandi et al., 2017; Ohrnberger et al., 2017; Ozbay et al., 2007; Reblin & Uchino, 2008; Richmond et al., 2007a). Social support is found to have a positive impact on life expectancy (Ozbay et al., 2007). The intergenerational transmission of obesity can be protected by social support (Serlachius et al., 2016). Social support and physical activity can both beneficially impact mental health (Harandi et al., 2017; Ohrnberger et al., 2017; Ozbay et al., 2007; Paluska & Schwenk, 2000; Scheid & Brown, 2010; Xingmin Wang et al., 2014; Warburton et al., 2006a). Social support is deeply rooted in health, leading to the adoption of health promoting behaviours, providing access to goods and services, increasing coping responses, and buffering negative health outcomes (McNeill et al., 2006). Friend support has been found to be associated with obesity, suicide, and various chronic illnesses, with friend support being a good predictor of health (Bearman & Moody, 2004; Chopik, 2017; Christakis & Fowler, 2007). Family support has been shown to improve mental health and decrease the risks of depression and suicide (Amiya, Poudel, Poudel-Tandukar, Pandey, & Jimba, 2014).

Intervention and policy makers should recognize the important role that social support plays in determining physical activity. Policies and interventions focusing on increasing a populations' physical activity could incorporate settings where social support is encouraged. For example: create environments conducive to group physical activities, where family and friends

can easily watch, encourage each other and participate together to be physically activity, and create environments which discourage isolation.

The main limitation of this systematic review and meta-analysis was the lack consistent measures used across studies. Of the 39 articles used in the systematic review each meta-analysis included only 4 articles which used identical social support and physical activity measures. Given that studies choose the best measures to fulfil their objectives, a wide variety of measures is expected. Given the numerous physical activity measurements and classifications evaluated, the consistent finding of positive influence of social support on physical activity is likely correct. Further meta-analysis should be considered in the future when there are more studies available using similar measurement tools.

Conclusion

Social support has a positive association with physical activity. Having higher social support is associated with a higher probability of meeting International physical activity guidelines. Overall social support is an important determinant of physical activity, with friend-support being a more consistent determinant than family-support.

Acknowledgements

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Funding Source

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Appendix B:
Consent Form

PARTICIPANT INFORMATION AND CONSENT FORM

SOCIAL AND CULTURAL DETERMINANTS OF INDIGENOUS PEOPLES OF CANADA'S PHYSICAL ACTIVITY LEVELS

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INTRODUCTION

You are being invited to take part in a research study because you are a member of the University of Saskatchewan campus community, you are 18 years of age or older and self-identify as Indigenous. Your participation is voluntary. It is up to you to decide whether or not you wish to take part. If you wish to participate, you will be asked to sign this form. If you decide not to take part, you do not have to provide a reason and it will not affect your relationship with any of the investigators or your standing in the College of Kinesiology. If you do decide to take part in this study, you are still free to withdraw at any time without giving any reasons for your decision.

Please take time to read the following information carefully. You can ask the researcher to explain any words or information that you do not clearly understand. You may ask as many questions as you need.

STUDY PURPOSE

Improved physical activity (PA) levels have been shown to attenuate the risk of many chronic diseases. It is recognized that certain social and cultural factors play key roles in determining a person's PA level, including family income, education, social support, and community involvement. Once known, these social and cultural determinants can be used to increase the effectiveness of PA interventions, thus decreasing the risk of chronic diseases. With Indigenous populations experiencing the highest risks for chronic diseases, PA may be an ideal target for Indigenous health related interventions. To date, little research is available on the social and cultural determinants of physical activity in Indigenous peoples, as most measurements are based on non-Indigenous populations. As such, these interventions may not be reaching their peak effectiveness. More research is needed to evaluate the sociocultural determinants of PA, unique to Indigenous populations.

PARTICIPANTS

You are eligible to participate in this study if you are 18 years old or older. You must also self-identify as Indigenous. A planned target of 400 participants recruited includes 100 attending in-person and another 300 completing the online survey. You will be ineligible to participate if you are unable to consent to participate in this study.

TIME REQUIRED

This study will be open to enrollment of participants for 1 year, with a results sharing gathering to share study results hosted two months following the closure of enrollment. The total time for individual participation in the in-person session is anticipated to require 60 minutes. You will be asked to complete an in-person, interviewer administered questionnaire as well as physical fitness, blood pressure and heart rate and height, weight and waist circumference measurements. The in-person interviewer administered questionnaire is expected to take 20-40 minutes and will be accompanied with 20 minutes of anthropometric and physical fitness testing at the Physical Activity Center on the University of Saskatchewan campus. You will also be invited to attend an optional results sharing gathering (~120min) after the data has been analyzed.

If you decide to take part in-person in this study, you will be asked to come to the Physical Activity Complex (PAC) for one study visit at a time that is convenient for you. At this visit you will be asked to complete consent form (~5 min).

STUDY PROCEDURES

1. In-Person Interviewer Administered Questionnaire (20-40 min)

You will be asked to complete an interviewer administered questionnaire with one of the researchers. An interviewer administered questionnaire is simply an interviewer asking you a set of questions and inscribing your answers. This questionnaire will ask questions about social and cultural factors and physical activity levels. You are free not to answer any questions asked.

2. Anthropometric Data Collection (20min)

You will be asked to participate in a collection of physical and fitness measurements. Physical and fitness measures collected will include blood pressure, heart rate, height, weight, waist circumference, grip strength, and aerobic fitness. Blood pressure will be assessed by one of the researchers at the testing session using a mercury sphygmomanometer, with three measures averaged. Heart rate will be assessed from your pulse at your wrist, with three measures averaged. Height, weight, and waist circumference will also be taken during the testing session using the same measurement tools for all participants. Physical fitness measurements will include a 6-minute walk test and a grip strength assessment. The 6-minute walk test requires you to walk as many laps along a hallway as you can in 6 minutes. Grip strength will be assessed twice in each hand, where you will grip the device and squeeze two bars together with your hand.

3. Study Results Sharing Gathering (~120 min-Optional)

You have the option of attending a gathering to share the results of the study. This session gives the researchers the opportunity to give back to the Indigenous community in the form of food and the results of the data collection. A draft of results and interpretations will be brought to the gathering, and you and other community members will have the opportunity to review and discuss the results and interpretations. Discussion will address if the conclusions drawn from the data is representative of the Indigenous community's views, before potential publication occurs. This discussion will also allow you, other participants and community members to share any other experiences you deem relevant to the study.

The gathering will give you, other participants and community members the opportunity to discuss the significance of the results, and opportunities for these results to benefit the community. Once the findings are published, a copy will be sent to you if you would like to receive study results regardless if you attended the study results sharing gathering.

Please feel free to ask any questions regarding the procedures and goals of this study or your role as a participant in this study.

BENEFITS

If you choose to participate in this study, there may not be direct benefits to you. It is hoped the information gained from this study can be used in the future to benefit Indigenous populations through making physical interventions more effective. You will be provided with your own results, giving you information about your cultural identity, physical activity, physical fitness, blood pressure, heart rate and body size.

RISKS AND DISCOMFORTS

If you choose to participate in this study, you may feel emotional discomfort in relation to answering questions on certain social factors, cultural factors, and physical activity levels to the researcher. For example, some questions will ask you about your personal and community experiences of racism, and if you or a family member attended residential school or was in the foster care system. However, you are not obligated to answer all of the questions, you may leave any questions unanswered and you may leave the interview at any time. You will be provided with contact information for health resources available at the University of Saskatchewan. Resources will be provided if emotional discomfort or injury occur. In the unlikely event, a study related injury occurs, necessary medical treatment will be made available at no additional cost to you.

Support Services available include:

1. Student Wellness Centre

Link: <https://students.usask.ca/health/centres/wellness-centre.php>

Phone: (306) 966 5768

Email: student.wellness@usask.ca

2. Mental and Physical Health

Link: <https://students.usask.ca/health/be-well.php>

3. Student Affairs and Outreach

Link: <https://students.usask.ca/health/centres/student-affairs-and-outreach.php>

Phone: Contact - (306) 966 5757 Manager- (306) 966 6079

4. Employee and Family Assistance Program

Link: <https://wellness.usask.ca/help/efap.php>

Phone: 306-966-4300 or 1844-448-7275

5. Saskatoon Crisis Intervention Service

Link: <http://www.saskatooncrisis.ca/>

Phone: (306) 933 6200

6. Royal University Hospital Emergency Department

Address: 103 Hospital Drive. Saskatoon, SK.

7. Campus Protective Services

Phone: (306) 966-5555

8. Saskatoon Police Services

Phone: 911 (or 9-911 on campus)

9. Saskatchewan HealthLine

Phone: 811 (or 9-811 on campus)

COST AND REIMBURSEMENT

You will not be charged for any research-related procedures. You will not be paid for participating in this study. You will not receive any compensation (other than a \$5 gift card to Little Bird Café or Micisotan Bannock Café, and a chance to win a \$50 gift card to Neechie Gear or SheNative Goods, and food), or financial benefits for being in this study, or as a result of data obtained from research conducted under this study.

CONFIDENTIALITY AND LEGAL RIGHTS

In Saskatchewan, the *Health Information Protection Act (HIPA)* defines how the privacy of your personal health information must be maintained so that your privacy will be respected.

Your confidentiality will be respected. The signed consent forms will be stored in separate locked cabinets from data collected. No information that discloses your identity will be released or published without your specific consent to the disclosure. The investigators will keep your personal information confidential and your name will not be used in the study records. Your information will be identified by a special number that will not include identifiable information such as birth date, initials or address.

Your study records including your questionnaires and personal measurements will be kept for a minimum of 5 years in a locked cabinet in Dr. Foulds' office at the College of Kinesiology. Your information and the results of the study will also be recorded in a password protected, encrypted computer database. Only the investigators will have access to your study records, and know your name. No other people or groups will have access to the data or information, with the exception of representative of the University of Saskatchewan Research Ethics Board for the purpose of monitoring the research, which will be done in the presence of Dr. Foulds. However, no records, which identify you by name or initials, will be allowed to leave the Investigators' offices. The results of this study may be presented in a scientific meeting and published in a scientific journal, but your identity will never be disclosed.

By signing this document, you do not waive any of your legal rights.

VOLUNTARY WITHDRAWAL FROM THE STUDY

Your participation in this research is voluntary. You may withdraw from this study at any time. You do not have to provide a reason. There will be no penalty or loss of benefits if you choose to withdraw. Your future medical care will not be affected.

If you choose to enter the study and then decide to withdraw later, all data collected about you during your enrolment will be retained for analysis.

AFTER COMPLETION OF THE STUDY

Your individual results of the study will be provided to you at the end of the testing session from the research team. These results will be explained and you will be provided with a paper copy of your individual results along with interpretations and explanations of the measures. Results of the overall study will be disseminated through journal articles, expected to take at least one year to be published. Interested participants will be provided with a copy of any publications arising from this study when they become available via email or regular mail.

CONTACT INFORMATION

If you have any questions about this study or your care/treatment or desire further information about this study before or during participation, you can contact Dr. Heather Foulds by emailing knc139@mail.usask.ca or calling 306-966-1067.

If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, contact the Chair of the University of Saskatchewan Research Ethics Board, at 306-966-2975 (out of town calls 1-888-966-2975) or ethics.office@usask.ca. The Research Ethics Board is a group of individuals (scientists, physicians, ethicists, lawyers and members of the community) that provide an independent review of human research studies. This board protects the rights and welfare of the people taking part in those studies.

CONSENT TO PARTICIPATE

Study Title: Social and Cultural Determinants of Indigenous Peoples of Canada’s Physical Activity Levels

- I have read the information in this consent form.
- I understand the purpose and procedures and the possible risks and benefits of the study.
- I was given sufficient time to think about it.
- I had the opportunity to ask questions and have received satisfactory answers.
- I understand that I am free to withdraw from this study at any time for any reason and the decision to stop taking part will not affect my future relationships.
- I give permission to the use and disclosure of my de-identified information collected for the research purposes described in this form.
- I understand that by signing this document I do not waive any of my legal rights.
- I will be given a signed copy of this consent form.

I agree to participate in this study:

Printed Name of Participant Signature / /
Date/Month/Year

Name of Person Obtaining Consent Signature / /
Date/Month/Year

A copy of this consent will be left with you, and a copy will be taken by the researcher.

I want to receive a copy of the final article through email:

Yes / No (please circle one) email: _____

I consent to be contacted in the future about further participation:

Yes / No (please circle one) email: _____

Appendix C:

Cultural and Social Determinants of Indigenous Peoples of Canada's Physical

Activity and Sedentary Behaviour Survey

C.1 Demographic Measures

| | | | |
|--|------------------------|---------------------------------------|----------------------------|
| Age | | | |
| _____ years | | | |
| Job situation. Please check one that fits you best. | | | |
| Student | Temporarily unemployed | Paid part-time employment | Paid full-time employment |
| Assigned Sex at Birth <i>What sex were you assigned at birth, on your original birth certificate?</i> | | | |
| Male | Female | Other | |
| Current Gender Identity <i>How do you describe yourself (Check all that apply)</i> | | | |
| Man | Woman | Two-spirited Man | |
| Two-spirited Woman | Transgender | Other (specify if you wish): _____ | |
| Indigenous Group | | | |
| Inuit | Métis | First Nations – Status | First Nations – Non-Status |
| Indigenous Nation, ex) Cree, Dene, Métis | | | |
| _____ | | | |
| What is your annual personal income? Please check only one | | | |
| \$5000 or less | \$5001 to \$10,000 | \$10,001 to \$20 000 | |
| \$20,001 to \$40,000 | \$40,001 to \$75,000 | More than \$75,000 | |
| What is your current marital status? Please check only one. | | | |
| Single, never married | In relationship | Married | Common-law |
| Separated | Divorced | Widowed | Other |
| What is the highest level of education that you have achieved? Please check only one. | | | |
| 8 th grade or less | Some high school | High School Diploma | |
| Vocational school or some college | College Degree | Professional or graduate degree | |
| <i>Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Physical activity includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, house chores and recreational activities.</i> | | | |
| Do you consider yourself physically active? | | | |
| Yes | | No | |
| When you are physically active is it typically... | | | |
| Alone | | With Others | |

| Did you have a physical activity mentor/role model in your life? | |
|---|----|
| Yes | No |

C.2 Home Residence

| Did you grow up in a rural or urban setting? | | |
|--|-------------|--------|
| Rural | Urban | Both |
| Did you grow up in a Northern Community? | | |
| Yes | No | Unsure |
| Did you grow up on reserve or off reserve? | | |
| On reserve | Off reserve | Both |
| Have you ever had to move away from your home community for an extended period of time (work or study)? | | |
| Yes | No | |

C.3 Family/Friend Support Questions

| How many days per week on average do your families/friends encourage you to engage in physical activity? | | | | |
|--|---------------|---------------|---------------------------|----------------|
| Never or less than weekly | 1-2 days/week | 3-4 days/week | More than 5 days per week | |
| How many days per week on average do your families/friends watch you engaging in physical activity? | | | | |
| Never or less than weekly | 1-2 days/week | 3-4 days/week | More than 5 days per week | |
| How many days per week on average do your families/friends involve themselves in your activities, that is, being physically active together with you? | | | | |
| Never or less than weekly | 1-2 days/week | 3-4 days/week | More than 5 days per week | |
| My family/friends are very physically active | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| Do you feel you have adequate family/friend support structures at the University of Saskatchewan? | | | | |
| Yes | | | No | |

C.4 Tobacco and Alcohol Use

| What is your current tobacco/smoking use? (Please check all that apply) | | | |
|---|---|-------------------------------------|--|
| Never Used | Use 11 to 20 cigarettes or tobacco products a day | Quit LESS than 2 years ago | Exposed to 2nd hand smoke |
| Use 10 or less cigarettes or tobacco products a day | Use 20 or more cigarettes or tobacco products a day | Quit MORE than 2 years ago | I only use tobacco for ceremonial purposes |
| If you have used tobacco in the past 30 days, do you use mainly: | | | |
| When you are with other people | Mainly when you are alone | As often by yourself as with others | You haven't used tobacco in the past 30 days |
| I only use tobacco for ceremonial purposes | | | |
| During the past 12 months, how often did you drink alcoholic beverages? | | | |
| Never | Once a month | Once a week | 4 to 6 times a week |
| Less than once a month | 2 to 3 times a month | 2 to 3 times a week | Every day |
| How often in the past 12 months have you had 5 or more alcoholic drinks on one occasion? | | | |
| Never | Once a month | Once a week | |
| Less than once a month | 2 to 3 times a month | More than once a week | |
| If you have had alcohol in the past 30 days, do you drink mainly | | | |
| When you are with other people | When you are alone | As often by yourself as with others | |

C.5 Personal Health

| Have you previously or currently had/have any of the following medical conditions? Please check all that apply | | | | | |
|---|-----------|------------|-------------------|-----------|------------|
| | Currently | Previously | | Currently | Previously |
| High blood pressure | | | Cancer | | |
| High cholesterol | | | Endometriosis | | |
| Heart Disease | | | Asthma | | |
| Stroke | | | Stress | | |
| Heart attack | | | Depression | | |
| Angina | | | Anxiety | | |
| Bypass surgery | | | Thyroid | | |
| Blood clots | | | Arthritis | | |
| Diabetes | | | Muscle/Joint pain | | |
| Gestational diabetes | | | Back pain | | |
| Pre-diabetes | | | Osteoporosis | | |

C.6 Physical Activity

| | | |
|--|------------------------|---------------------|
| Do you participate in traditional activities which also involve being physically active? Ex) Ceremonies, Dance, Hunting, Trapping, Snowshoeing etc. | | |
| Frequently | Infrequently | Never |
| In a typical 7-day period (one week), how many times do you engage in physical activity that causes sweating and a rapid heart rate? | | |
| Five or more times | Normally once or twice | Never |
| Three to four times | Rarely | |
| When you are physical active, do you: | | |
| Make an intense effort | Make a moderate effort | Make a light effort |
| How would you rate your current physical fitness? | | |
| Very good | Average | Very poor |
| Good | Poor | |
| In a typical 7-day period (one week), how many times on average do you engage in the following kinds of exercise for more than 15 minutes during your free time? | | |
| Strenuous Exercise: (Sweating, high heart rate, exhaustive exercise) <i>e.g. running, jogging, vigorous dancing, lacrosse, soccer, cross country skiing, vigorous biking, vigorous snowshoeing, hockey</i> | | |
| _____ Times/week | _____ Minutes/session | |
| Moderate Exercise: (not exhausting exercise, light perspiration) <i>e.g. fast walking, moderate snowshoeing, dancing, Anishinaabe Jingle Dancing, baseball, easy biking, easy swimming, archery, hunting large game, Alaskan Native Games, Eskimo Olympics, horseback riding, canoeing, dog sledding</i> | | |
| _____ Times/week | _____ Minutes/session | |
| Mild Exercise (minimal effort, no perspiration) <i>e.g. easy walking, certain ceremonies, trapping, bowling, fishing, golf, snow-mobiling, household cleaning,</i> | | |
| _____ Times/week | _____ Minutes/session | |
| In a typical week, how many times do you do muscle strengthening activities (such as resistance training or very heavy gardening)? | | |
| _____ Times/week | | |
| When you exercise, what time of day do you most often exercise? | | |
| Morning | Afternoon | Evening |

C.7 Sedentary Behaviour

| On a typical day, how many hours do you spend in continuous sitting? Ex) at work, in meetings, volunteer commitments and commuting (i.e., by motorized transport) | | | |
|--|-------------------|-------------------------|-----------------|
| None | 1 to <2 hours | 3 to <4 hours | 5 to <6 hours |
| < 1 hour | 2 to <3 hours | 4 to <5 hours | >6 hours |
| <i>Please answer the following questions in numerical form ex) 1, 2, 4, 7 and not in word form ex) one, two, four, seven</i> | | | |
| How much time do you usually spend watching television on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| How much time do you usually spend on the computer, laptop, and/or tablet on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| How much time do you usually spend sitting and listening to music/radio, talking on the phone, or using the phone (examples texting or snapchat) on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| How much time do you usually spend doing paperwork (ie. working but not looking at a screen) on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| How much time do you usually spend sitting reading a book/magazine on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| How much time do you usually spend sitting in a car, bus, train or plane on a typical: | | | |
| Weekday _____ hours | | Weekend day _____ hours | |
| When sitting for prolonged periods (one hour or more), at what interval would you typically take a break to stand and move around for two minutes? | | | |
| <10 minutes | 20 to <30 minutes | 45 minutes to <1 hour | 1.5 to <2 hours |
| 10 to <20 minutes | 30 to <45 minutes | 1 to <1.5 hours | >2 hours |

C.8 Multigroup Ethnic Identity Measure:

| | | | |
|---|-------|----------|-------------------|
| In this country, people come from many different countries and cultures, and there are many different words to describe the different backgrounds people come from. These questions are about your attachment to your Indigenous group and how you feel about your Indigenous group or react to it. | | | |
| I have spent time trying to find out more about my Indigenous group, such as its history, traditions, and customs. | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I am active in organizations or social groups that include mostly members of my own Indigenous group | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I have a clear sense of my Indigenous background and what it means for me | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I think a lot about how my life is being (or to be) affected by my Indigenous group membership | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I am happy that I am a member of the Indigenous group I belong to | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I have a strong sense of belonging to my own Indigenous group | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I understand pretty well what my Indigenous group membership means to me | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| In order to learn more about my Indigenous background, I have often talked to other people about my ethnic group | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I have a lot of pride in my Indigenous group | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I participate in cultural practices of my own Indigenous group, such as special food, music, dance, or customs | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I feel a strong attachment towards my own Indigenous group | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |
| I feel good about my cultural or Indigenous background | | | |
| Strongly Agree | Agree | Disagree | Strongly Disagree |

C.9 Cultural Connectedness Scale

| | |
|--|-----|
| I know my culture/spirit name. | |
| No | Yes |
| I can understand some of my groups language. | |
| No | Yes |
| I adhere to and follow my aboriginal spirituality. For example, I believe all objects have a spirit like (First Nations (status or non-status)/Métis/Inuit) people and should be respected as such. | |
| No | Yes |
| I use tobacco/sage/sweetgrass/cedar for prayer and guidance. | |
| No | Yes |
| I have participated in a cultural ceremony (examples: Sweatlodge, Moon Ceremony, Sundance, Longhouse, Feast, Firekeeper, or Giveaway). | |
| No | Yes |
| I have helped prepare for a cultural ceremony (examples: Sweatlodge, Moon Ceremony, Sundance, Longhouse, Feast, Firekeeper, or Giveaway). | |
| No | Yes |
| I have offered food or feasted someone/something for a cultural reason. | |
| No | Yes |
| Someone in my family or someone I am close with attends cultural ceremonies (examples: Sweatlodge, Moon Ceremony, Sundance, Longhouse, Feast, or Giveaway). | |
| No | Yes |
| I plan on attending cultural ceremony or ceremonies in the future (examples: Sweatlodge, Moon Ceremony, Sundance, Longhouse, Feast, Firekeeper, or Giveaway). | |
| No | Yes |
| I plan on trying to find out more about my (First Nations (status or non-status)/Métis/Inuit) culture, such as its history, traditions, and customs. | |
| No | Yes |
| I have a traditional person, Elder or Clan Mother who I talk to. | |
| No | Yes |

| | | | | |
|---|----------|--------------------------|-------|----------------|
| I have spent time trying to find out more about being (First Nations (Status or non-Status)/Métis/Inuit) such as its history, traditions, and customs. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| I have a strong sense of belonging to my (First Nations (Status or non-Status)/Métis/Inuit) community or Nation. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| | | | | |

| | | | | |
|--|----------|--------------------------|-------|----------------|
| I have done things that will help me understand my (First Nations (Status or non-Status)/Métis/Inuit) background better. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| I have talked to other people in order to learn more about being (First Nations (Status or non-Status)/Métis/Inuit). | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| When I learn something about my (First Nations (Status or non-Status)/Métis/Inuit) culture, I will ask someone more about it later. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| I feel a strong attachment towards my (First Nations (Status or non-Status)/Métis/Inuit) community or Nation. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| If a traditional person, Elder or Clan Mother spoke to me about being (First Nations (Status or non-Status)/Métis/Inuit), I would listen to them carefully. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| I feel a strong connection to my ancestors. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| Being (First Nations (Status or non-Status)/Métis/Inuit) means I sometimes have a different way of looking at the world. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| The eagle feather or another similar item has a lot of meaning to me. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| It is important to me that I know my (First Nations (Status or non-Status)/Métis/Inuit) language. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| When I am physically ill, I look to my (First Nations (Status or non-Status)/Métis/Inuit) culture for help | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| When I am overwhelmed with my emotions, I look to my (First Nations (Status or non-Status)/Métis/Inuit) culture for help. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |

| When I need to make a decision about something I look to my (First Nations (Status or non-Status)/Métis/Inuit) culture for help. | | | | |
|---|----------|--------------------------|-------|----------------|
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |
| When I am feeling spiritually disconnected, I look to my (First Nations (Status or non-Status)/Métis/Inuit) culture for help. | | | | |
| Strongly Disagree | Disagree | Do Not Agree or Disagree | Agree | Strongly Agree |

| How often do you make tobacco offerings for cultural purposes? | | | | |
|---|-----------------------------|-------------|------------|-----------|
| Never | Once/Twice in the Past Year | Every Month | Every Week | Every Day |
| How often do you use sage, sweetgrass, or cedar in any way or form? | | | | |
| Never | Once/Twice in the Past Year | Every Month | Every Week | Every Day |
| How often does someone in your family or someone you are close with use sage, sweetgrass, or cedar in any way of form? | | | | |
| Never | Once/Twice in the Past Year | Every Month | Every Week | Every Day |

C.10 Discriminatory Experience

| Does racism and discrimination have an impact on your day to day life? | | |
|--|----|--------|
| Yes | No | Unsure |
| Has racism and discrimination had an impact on you at one point in your lifetime? | | |
| Yes | No | Unsure |
| Is racism and discrimination a problem in your community? | | |
| Yes | No | Unsure |
| Has racism and discrimination had an impact on your physical activity levels? | | |
| Yes | No | Unsure |

C.11 Social Support Index

| | | | | |
|---|----------|---------|-------|----------------|
| I feel if I had an emergency, even people I do not know in this community would be willing to help. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel members of my family seldom listen to my problems or concerns; I usually feel criticized. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel good about myself when I give time and energy to members of my family. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel my friends in the community area a part of my everyday activities. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel what I do for members of my family and they do for me make me feel part of this very important group. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel there are times when family members do things that make other family members unhappy. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel people here know they can get help from the community if they are in trouble. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel I need to be very careful how much I do for my friends because they take advantage of me. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel I have friends who let me know they value who I am and what I can do. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel living in this community gives me a secure feeling. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel people can depend on each other in this community. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| | | | | |

| | | | | |
|---|----------|---------|-------|----------------|
| I feel the members of my family make an effort to show their love and affection for me. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel there is a feeling in this community that people should not get too friendly with each other. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel this is not a very good community to bring children up in. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel secure that I am as important to my friends as they are to me. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel I have some very close friends outside the family who I know really care and love me. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I feel members of my family do not seem to understand me; I feel taken for granted. | | | | |
| Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |

C.12 Residential School Attendance and Foster Care Experience

| | | |
|--|-----------|----------------|
| Have you attended residential school? | | |
| Yes | No | |
| Has anyone in your family attended residential school? | | |
| Yes | No | Unsure |
| <i>If yes, please indicate which family members (check all that apply)</i> | | |
| Parents | Siblings | Grandparent(s) |
| Auntie(s)/Uncle(s) | Cousin(s) | Children |
| Other: _____ | | |
| Have you ever been placed in the foster care system? | | |
| Yes | No | |
| If yes, were you placed in a home outside of your extended family? | | |
| Yes | No | |
| Has anyone in your family been placed in the foster care system? | | |
| Yes | No | Unsure |
| <i>If yes, please indicate which family members (check all that apply)</i> | | |
| Parents | Siblings | Grandparent(s) |
| Auntie(s)/Uncle(s) | Cousin(s) | Children |
| Other: _____ | | |