

**The Effect of Physical Activity on Depression Risk and Quality of Life in Men**

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## Abstract

Physical activity (PA) is a key measure for preventing multiple chronic health conditions, including cardiovascular disease, diabetes, obesity, cancer, and poor mental health. Specific to mental health, increased PA has been associated with a decrease in depression risk and depressive symptomology, reductions in anxiety and stress as well as improved mood and overall cognitive function. Despite the physical and mental health benefits associated with PA, men's PA levels remain low. It has been suggested that this may be due to the inability to develop programs that consider masculine values and ideals. Many health promotion programs hold little 'manly' appeal and consequently fail to influence men's health promoting behaviour. Recent research has highlighted the potential for tailored, gender-sensitised programs to reach and engage men. Thus, the purpose of this research was to examine the impact of the HAT TRICK gender-sensitised PA intervention on risk of depression and quality of life (QoL) in men. HAT TRICK was a 12-week, 90-minute face to face, intervention that focused on PA, healthy eating and social connectedness in inactive and overweight men. Data were collected at baseline and at the completion of the program (12-weeks) and included PA, assessed by the Godin Leisure Time Questionnaire; Risk of Depression, assessed using the Male Depression Risk Scale; and QoL, assessed via the SF-12. Demographic and anthropometric measures were also collected. Paired samples t-tests and multiple regression were used to analyse the data. Results showed a significant increase in PA over time ( $p=0.000$ ), with a mean increase of 213.86 minutes per week. There was also a significant positive change in depression risk levels over time ( $p=0.000$ ), and significant improvement in QoL over time ( $p=0.002$ ). The results of this thesis provide more evidence for the importance of PA interventions for men's mental and physical health.

## **Lay summary**

This research aimed to explore the relationship between physical activity (PA), depression risk and overall well-being within a 12-week health promotion program designed for men. This weekly program, referred to as HAT TRICK, was carefully designed to meet the needs, interests, and preferences of men specifically. It was delivered in the Okanagan region of British Columbia Canada and included a PA component (e.g., strength training, sports, martial arts) as well as a health education component (e.g. education about PA, diet, stress and other health topics). Changes in PA, depression risk and quality of life (QoL) were evaluated at the start (week 1) and end of the program (week 12). The results indicated that men participated in more PA at the end of the program than they did at the beginning. In addition, the risk of depression decreased, and overall health related QoL improved at the end of the program. The results of this research provided important information on how men respond to PA interventions and on the relationship between PA and depression in men. Furthermore, data obtained from the HAT TRICK program highlighted that using a ‘man-friendly’ approach to aid men in getting more active may be an important factor for improving mental and physical health.

## Table of Contents

<b>Abstract</b> .....	iii
<b>Lay summary</b> .....	iv
<b>Table of Contents</b> .....	v
<b>List of Tables</b> .....	vii
<b>List of Abbreviations</b> .....	viii
<b>Glossary of Terms</b> .....	ix
<b>Acknowledgments</b> .....	xi
<b>Chapter 1 Introduction</b> .....	1
<b>1.1 Layout of Thesis</b> .....	1
<b>1.2 Overview</b> .....	1
<b>1.3 Purpose and Hypotheses</b> .....	3
<b>1.4 Significance and Contribution to Research Literature</b> .....	4
<b>Chapter 2 Review of Literature</b> .....	5
<b>2.1 Preface</b> .....	5
<b>2.2 Overview of Depression</b> .....	5
<b>2.3 Masculinities and Depression</b> .....	7
<b>2.4 Risk Factors for Depression</b> .....	8
<b>2.4.1 Modifiable Risk Factors</b> .....	9
<b>2.4.2 Non-modifiable Risk Factors</b> .....	11
<b>2.5 The Detrimental Effects of Depression for Men</b> .....	15
<b>2.5.1 Physical Effects</b> .....	15
<b>2.5.2 Psychological effects</b> .....	17
<b>2.6 The Prevention of Depression</b> .....	19
<b>2.7 Physical Activity for the Prevention of Depression</b> .....	20
<b>2.8 Physical Activity Levels and Engagement Techniques for Men</b> .....	24
<b>Chapter 3 Methodology</b> .....	28
<b>3.1 Preface</b> .....	28
<b>3.2 Study Design</b> .....	28
<b>3.3 Setting and Participants</b> .....	29
<b>3.3.1 Recruitment and Consent</b> .....	30
<b>3.4 HAT TRICK Intervention</b> .....	31
<b>3.5 Data Collection Procedures and Outcome Measures</b> .....	36
<b>3.5.1 Data Collection Procedures</b> .....	36

<b>3.5.2 Measures</b> .....	37
<b>3.6 Analyses</b> .....	40
<b>Chapter 4 Results</b> .....	45
<b>4.1 Description of Sample</b> .....	45
<b>4.2 Baseline and Follow-up Scores</b> .....	45
<b>4.2.1 PA levels and Health related Quality of Life</b> .....	47
<b>4.2.2 MDRS-22</b> .....	47
<b>4.3 Paired Samples t-test</b> .....	52
<b>4.4 Multiple Regression</b> .....	53
<b>Chapter 5 Discussion</b> .....	57
<b>Chapter 6 Conclusion</b> .....	74
<b>6.1 Overview</b> .....	74
<b>6.2 Strengths and limitations</b> .....	74
<b>6.3 Clinical Implications and Future Recommendations</b> .....	77
<b>References</b> .....	80
<b>Appendices</b> .....	113
<b>Appendix A: Consent form</b> .....	113
<b>Appendix B: Demographics Questionnaire</b> .....	117
<b>Appendix C: Godin leisure time questionnaire</b> .....	121
<b>Appendix D: MDRS-22</b> .....	122
<b>Appendix E: SF-12</b> .....	124
<b>Appendix F: Measurement Card</b> .....	126

**List of Tables**

Table 3.1 Weekly Outline of HAT TRICK..... 33

Table 4.1 Demographic Characteristics at Baseline..... 46

Table 4.2 MDRS-22 Risk Cut Off Points at Baseline..... 48

Table 4.3 MDRS-22 Risk Cut Off Points at 12-week Follow up..... 48

Table 4.4 MDRS-22..... 50

Table 4.5 Table 4.5 MDRS-22 Subscale Scores ..... 51

Table 4.6 Bivariate Correlations of Baseline and 12-week Values.....54

## **List of Abbreviations**

MDRS-22: Male Depression Risk Scale

PA: Physical Activity

QoL: Quality of Life

RCT: Randomised Control Trial

BMI: Body Mass Index

SF-12: Medical Outcomes Study-Short Form Survey

MVPA: Moderate Vigorous Physical Activity

## Glossary of Terms

*Exercise:* a form of leisure-time physical activity that is usually performed on a repeated basis over an extended period of time with the intension of improving fitness performance or health (Bouchard, Shephard, & Stephens, 1994).

*Physical Activity:* Any bodily movement produced by skeletal muscles resulting in substantial increase in energy expenditure over resting levels (Bouchard et al., 1994).

*Quality of Life:* a multi-dimensional construct comprised of one's physical, emotional, economic, and spiritual wellbeing (Courneya & Hellsten, 1998).

*Depression:* A common and serious medical illness that negatively effects how you feel, think, and act. Characterised by feelings of sadness, loss of interest in previously enjoyed activities and loss of energy (American Psychiatric Association, 2013).

*Body Mass Index:* A ratio of a person's weight to height. BMI is commonly used to classify weight as "healthy" or "unhealthy" (Hiza, Pratt, Mardis, & Anand, 2001).

*Prevalence:* the proportion of a population who have (or had) a specific characteristic in a given time period (Ahrnsbrak, Bose, Hedden, Lipari, & Park-Lee, 2017).

*Incidence:* the rate or range of occurrence of something, particularly a disease such as depression

*Modifiable risk factor:* health behaviours that can be changed or modified. (e.g., PA level, sedentary behaviour, alcohol consumption, substance use) (Bombardier et al., 2012).

*Non-modifiable risk factors:* potential health risks that are outside of an individual's control and are not permeable to change (e.g. age, sex, genetics, stressful life events) (Cairns, Yap, Pilkington, & Jorm, 2014).

*Masculinity:* possession of the qualities traditionally associated with men (i.e., muscular, stoic, unemotional).

*Gender sensitised:* the development of a program or writing in which the needs and effective means of reaching of a certain gender are taken into consideration.

*Mental Health:* A person's condition regarding their psychological and emotional well-being.

*Depression Risk:* The likelihood a person has of developing depression in the future due to certain behaviours and modifiable/non-modifiable risk factors.

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# **Chapter 1 Introduction**

## **1.1 Layout of Thesis**

This thesis has been organized into six chapters. Chapter one provides an overview and purpose for the current research. Chapter two presents a review of the literature to set the foundation for the current thesis by reporting insights regarding PA behaviours in men, depression in men, the effect of masculinity on depression, depression risk factors, the relationship between depression risk and physical activity (PA), and the effect of depression on health-related quality of life (QoL). Chapter three details the methodology used to conduct this research while chapters four and five present and discuss the results of the current study. The sixth and concluding chapter provides a summary of the findings, inclusive of the strengths and limitations of the current study and recommendations for future research.

## **1.2 Overview**

Depression affects over 300 million people globally (World Health Organization, 2017). In Canada, 1 in 5 people suffer a depressive episode and lifetime prevalence of depression ranges from 8-15% world-wide (Knoll & MacLennan, 2017). Depression can manifest itself in many ways, showing diverse symptoms across both sexes. The symptoms most commonly expressed by those suffering from depression are feelings of hopelessness, despair, self-loathing, and emptiness (World Health Organization, 2017; Uher, Payne, Pavlova, & Perlis, 2014). Although sadness, despair and hopelessness are most often exhibited, there are other ways in which depression can be expressed. For example, depression can be exhibited by someone who draws away from others and becomes socially isolated, cutting ties with friends and family, and disengages from previously enjoyed activities (National Collaborating Centre for Mental Health, 2010; Matthews et al., 2016; Pizzagalli, 2014). Depression can be a debilitating disorder that

impacts each facet of a person's life and is a leading cause of suicide in both males and females (Möller-Leimkühler, 2003; Narishige, Kawashima, Otaka, Saito, & Okubo, 2014; Otsuka et al., 2016). Although both men and women may experience similar feelings of depression internally, the outward expressions of depression can differ between sexes. For example, women are more likely to exhibit depressive behaviours such as sadness, tearfulness, and despair (Martin, Neighbors, & Griffith, 2013), while many men exhibit aggression, avoidance, substance use, and irritability (Möller-Leimkühler, 2002, 2003; Scholz, Crabb, & Wittert, 2017; Schuch, Roest, Nolen, Penninx, & De Jonge, 2014). It is possible for each sex to display the outward behaviours associated with either sex, as a large amount of variability exists through depression expression. That being said, each sex has a tendency to follow traditional norms (Hankin et al., 2015).

Gender norms can impact how men and women express feelings that are socially idealised. For example, societal pressures on men highlight the importance of dealing with problems alone, showing outward signs of aggression, problem solving, and not discussing emotional hardship (Connell & Messerschmidt, 2005). Many women on the other hand, openly display emotional hardship and have no issue seeking help (Oliver, Pearson, Coe, & Gunnell, 2005). A focus on mental health programs and interventions has increased in recent years and in turn increased the number of available programs for those with depression (Chisholm et al., 2016). An increase in available mental health programs should result in an increase in those experiencing mental health problems to come forward to seek help.

PA has been known to be a key preventive measure in multiple chronic health conditions (e.g., CVD, hypertension, osteoporosis, diabetes, and multiple forms of cancer) (Castrogiovanni et al., 2016; Katzmarzyk & Ardern, 2004; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010; Warburton, Nicol, & Bredin, 2006). Recently, researchers have reported numerous mental

health benefits of PA as well, including a decrease in depression risk and depressive symptomology, reductions in anxiety and stress as well as an improved mood and overall cognitive function (de Souto Barreto, Delrieu, Andrieu, Vellas, & Rolland, 2016; Hegberg & Tone, 2015; Penedo & Dahn, 2005).

Despite the physical and mental health benefits associated with PA, men's PA levels remain low (Colley et al., 2011; Fondell et al., 2016). Researchers have suggested that this may be due to the inability to reach men and develop programs that consider masculine values and ideals (Cormie et al., 2016; Jewkes et al., 2015; Koivula, 2001). Thus, innovative programs that are developed specifically for males and take into consideration the needs and interests of men are needed. The following thesis examined the impact of a gender sensitised PA program, called HAT TRICK, on decreasing depression risk, increasing PA levels and improving overall health-related QoL of men (Caperchione et al., 2017) living in the Okanagan region of BC.

### **1.3 Purpose and Hypotheses**

The overarching purpose of this study was to explore the impact a community-based PA intervention would have on PA levels, risk of depression, and overall health related quality of life in Canadian men who participated in the HAT TRICK program at baseline and at program completion (12-weeks).

Three separate hypotheses were proposed. First, it was hypothesised that HAT TRICK program participants would report an increase in PA levels from baseline to 12-weeks. Secondly, participating in the HAT TRICK program would result in improved (i.e. decreased) depression risk scores, and thirdly, improved overall health-related quality of life (QoL) compared to baseline scores. These variables were also examined in relation to each other to determine the impact each had on the other (PA and depression risk, PA and health-related QoL, and

depression risk and health-related QoL). It was predicted that: 1) decrease in depression risk would be associated with an increase in PA, 2) improvements in QoL would be associated with increased PA, and 3) depression risk would be associated with decreased health-related QoL at the conclusion of the HAT TRICK program.

#### **1.4 Significance and Contribution to Research Literature**

Although there is a great deal of literature surrounding PA as a treatment for depression and other aspects of mental health, very few of these studies target men specifically. Available studies also do not examine the difficulties associated with engaging men in PA programs that also include a focus on promoting mental health. Men do not readily seek out health promotion interventions, and this is even more apparent among those with poor mental health (Franco et al., 2015; Trost, Owen, Bauman, Sallis, & Brown, 2002). This may be due to the stigma surrounding help seeking behaviours in men. Of all the health promotion strategies available, men tend to gravitate to PA above all else. Engaging men in a PA program may be a way of addressing the lack of interest in positive health behaviours if the program is designed and developed in a way that is of interest to men.

As a way to address the current lack of interest men show in health programs, the HAT TRICK program was designed as an evidence-based, gender sensitised PA and healthy eating program that incorporates masculine ideals and interests of men (Caperchione et al., 2017). Furthermore, this program targets specific physical health components as well as behaviours associated with depression risk in order to improve men's overall health. The results obtained in this study provide researchers and health promotion practitioners with a foundation to build new PA programs and refine existing programs to encompass a preventive approach specific to men's physical health and depression risk.

## Chapter 2 Review of Literature

### 2.1 Preface

The following chapter contains a summation and overview of literature regarding the current state of research on depression in men. It also outlines the present role of masculinities on depression risk as well as modifiable and non-modifiable risk factors. In addition, the detrimental effects of depression, both physical and psychological are outlined along with preventable measures. Lastly, this chapter examines the use of PA as a preventive measure against depression and the current levels of PA and engagement among men.

### 2.2 Overview of Depression

Depression is a mood disorder that is characterised by a persistent feeling of sadness and loss of interest in life and enjoyable activities (American Psychiatric Association, 2013). Depressive moods that are short lived are considered ‘depressive episodes’ while a consistent feeling of despair and hopelessness is often referred to as clinical or major (Uher, Payne, Pavlova, & Perlis, 2014; American Psychiatric Association, 2013). Major depression affects how people feel, think, and behave and results in changes in overall behaviour. Following the criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) major depression can be identified using a list of symptoms that persist longer than a 2-week period (Bromet et al., 2011). One of these potential symptoms includes having a depressed mood for most of the day on nearly every day of the week as noted by the afflicted person in question or by an observation made by others (American Psychiatric Association, 2013). Another symptom commonly used to identify the possible presence of major depression is a diminished interest or pleasure taken from previously enjoyed activities, often referred to as anhedonia (Pizzagalli, 2014). Other symptoms include insomnia or hypersomnia, rapid and significant weight loss or gain, fatigue or energy

loss, and reoccurring thoughts of hopelessness and death (Beck & Alford, 2009; Cooney, Dwan, & Mead, 2014; Martin et al., 2013). Depression can also impair cognitive and social functioning, which can lead to a decreased performance in interpersonal relationships as well as workplace productivity (Lépine & Briley, 2011).

Depression can come about from many different circumstances varying from a genetic predisposition for mental health disorders, to a traumatic event or circumstance in one's life (e.g. the shock of losing a loved one) (Slavich, Monroe, & Gotlib, 2011). Depression affects over 300 million people globally (World Health Organization, 2017). Incidence rates of depression have risen annually since the early 20<sup>th</sup> century, partly due to the socioeconomic changes (e.g., rising house prices, unemployment rates, debt) facing the population. The World Health Organization has predicted that by 2020 depression will be one of the leading causes in overall global disease burden (Mammen & Faulkner, 2013; World Health Organization, 2017). Depression affects each person and each sex differently. In Canada, one in five men will experience a depressive episode in their lifetime (Knoll & MacLennan, 2017) and lifetime prevalence of depression ranges from 8-15% world wide, with Canada reporting a lifetime prevalence rate of 8% (Knoll & MacLennan, 2017). Results obtained from a US epidemiological survey found that in a 12-month time frame the likelihood of a major depressive episode was 29.9% among men and women (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012).

Women are twice as likely than men to be diagnosed with clinical depression, however this may be due to a higher likelihood of self-reported cases (Kessler & Bromet, 2013). Because men are less likely to come forward to discuss mental health issues, a large number of men suffer from depression without being formally diagnosed or treated and potentially without knowing what they are dealing with (Martin et al., 2013). In Canada, the gap between men and women

regarding depression is much smaller than previously believed. Data from the Canadian Community Health Survey on mental health and well-being found that 10% of men experienced depression symptoms of the surveyed mental health disorders and substance dependencies while 11% of women surveyed experienced similar symptoms (Satyanarayana, Enns, Cox, & Sareen, 2009). Seeing that the difference in prevalence of depression symptoms (as seen through self reported questionnaire data) between men and women is only 1% speaks volumes to the importance of furthering the study of mental health related experiences among men. In the past, researchers have primarily focused on women. Men and women vary greatly in depression manifestation and outward expression; this is impacted by the traditional gender norms surrounding men and masculinities.

### **2.3 Masculinities and Depression**

As depression diagnosis rates in men are half of what they are in women, there is growing consensus that depression as a health problem for men is often overlooked (Bebbington, 1998; Martin et al., 2013; Wolk & Weissman, 1995). The key issue surrounding diagnostic rates of depression in men is that the use of generic criteria may not be sensitive to depression in men. A second issue may be that men are not as forthcoming with issues surrounding mental health and are often reluctant to seek help from professional health care services (Levant & Wong, 2017; Oliffe & Phillips, 2008). Some of the other typically masculine behaviours that influence men's responses to mental health related issues are a tendency to deny illness, to self-treat symptoms, and risk their own health rather than improve it by abiding by a wait-and-see attitude (Courtenay, 2000; Rice et al., 2017; Sabo, 2005). Hegemonic masculine practices often stand in opposition to behaviours that are considered feminine. For example, men often avoid engaging in health promotion behaviours in fear of exhibiting feminine qualities and will instead exhibit

stoicism, self-reliance, and act out aggressively to relieve stress (Berger, Addis, Green, Mackowiak, & Goldberg, 2013; Rice et al., 2017; Robertson, Robertson, Jepson, & Maxwell, 2012).

A major theme throughout men's health research is a lack of help-seeking behaviours. This factor may have the largest impact on mental health for men. For example, Syzdek, Addis, Green, Whorley, and Berger (2014) recruited 23 community dwelling men with a range of depression levels to participate in a gender-based motivational interviewing (GBMI) intervention. The questions used in these interviews were specifically developed to help obtain insights into how men respond to depressive feelings. The purpose of this study was to understand the underutilisation of formal and informal help for men with depression. When followed-up three months later, the intervention showed no significant effect on help-seeking attitudes or intentions compared to baseline scores. Another study by O'Brien, Hunt, and Hart (2005) sought to understand the complex experiences associated with men and formal consultation regarding depression symptoms. Men (n=55) were included in 14 focus groups to discuss the challenges associated with men seeking help while maintaining a feeling of control over their own mental health. The results suggested a widespread endorsement of the view that men are reluctant to speak up and seek help, opting instead to sort things out alone. The behaviours exhibited by men may be a contributing factor to why women are more likely to be diagnosed with depression than men. Further, there are a number of risk factors regarding how depression is manifested and developed, many of which are explored further in this chapter.

## **2.4 Risk Factors for Depression**

There are several modifiable and non-modifiable risk factors associated with depression (Ogrodniczuk & Oliffe, 2011). Modifiable risk factors are considered health behaviours that can

be changed or modified which lead to a decreased risk of depression development (e.g., PA level, sedentary behaviour, alcohol consumption, substance use) (Bombardier et al., 2012). Non-modifiable risk factors are potential health risks that are outside of an individual's control and are not permeable to change (e.g. age, sex, genetics, stressful life events) (Cairns et al., 2014; Shortt & Spence, 2006). The following sections are focused on literature pertaining to the risk of depression among men.

#### **2.4.1 Modifiable Risk Factors**

Modifiable risk factors for male depression include social isolation, physical inactivity, substance use, and illness brought on by lifestyle choices (Bombardier et al., 2012; Cairns et al., 2014; Ogrodniczuk & Oliffe, 2011). Social isolation, regardless of the reason, can cause a person to feel alone and may lead to feelings of hopelessness and loneliness (De Jong Gierveld, Van Tilburg, & Dykstra, 2016). (De Jong Gierveld et al., 2016). Social isolation and loneliness can often result in depression among men (Alpass & Neville, 2003).

A lack of positive social relationships can be a major risk factor for depression and those suffering from interpersonal strain are more likely to be at risk for depression (Teo, Choi, & Valenstein, 2013). For example, a study conducted by Matthews and colleagues (Matthews et al., 2016) examined social isolation, loneliness and depression in adulthood. Utilising data from the Environmental Risk Longitudinal Twin Study (n=1116 same-sex twin pairs), researchers found that social isolation and loneliness were moderately correlated in both men and women ( $r=0.39$ ).

Physical inactivity and sedentary behaviour have also been found to impact depression (Carek, Laibstain, & Carek, 2011; Galper, Trivedi, Barlow, Dunn, & Kampert, 2006). An inactive lifestyle can result in an accumulation of fatty tissue due to an imbalance in diet and exercise. A caloric intake that is higher than the needs exhibited by the body in daily life as well

as during exercise can result in poor health outcomes such as cardiovascular disease, high blood pressure, and an increased risk of myocardial infarction (Kohl 3rd et al., 2012). The development of chronic diseases and health problems such as cardiovascular disease and high blood pressure have been known to be precursors to depression development (Guthrie et al., 2016). Carek, Laibstain and Carek (2011) found that in order to decrease negative health outcomes and depression development, a sufficient intensity of PA must be reached. For instance, studies have shown that weight lifting and running both significantly decreased depressive symptoms and risk of myocardial infarction in men (Carek et al., 2011; Doyne et al., 1987; Martinsen, 2008).

Another modifiable risk factor for developing depression is substance and alcohol use. A study conducted by Pompili, Innamorati, and Lester (2009) investigated the relationship between substance use, temperament and suicide risk. Thirty-one substance users (16 men) were compared to non-substance users and it was found that substance users had a different temperament profile (i.e. higher anxiety and irritability), higher hopelessness, increased global psychopathology severity, impulsivity/aggression, greater suicide risk (higher lifetime suicide ideation and suicide attempts), and were more frequently depressed. Another recent study conducted (Ortíz-Gómez, López-Canul, & Arankowsky-Sandoval, 2014) examined the factors associated with depression and suicide attempts in patients undergoing rehabilitation for substance use. Men (n=44) attending a center for drug use treatment were given a general information questionnaire along with questions associated with depression, and suicide attempts. Researchers found that substance use within the family was a risk factor for both depression and suicide in men. For substance use and depression, many of the statistics are inferred from suicide attempts of those currently dealing with drug or alcohol problems. Often times, depression and hopelessness are not uncovered until a serious attempt is made to commit suicide.

## 2.4.2 Non-modifiable Risk Factors

Non-modifiable risk factors for depression include age, sex, genetics, stressful life events, abuse, and serious illness. Depression is the leading cause of disability in North America for ages 15-44 and while depression can develop at any age, the median age of onset is 32.5 years old (Skarl, 2015). A study conducted by Rohde et al. (2013) examined the characteristics of major depression over four developmental periods (childhood: 5.0-12.9, adolescence: 13.0-17.9, emerging adulthood: 18.0-23.9, adulthood: 24-30). They found that first incidence of depression was lower in childhood compared to the other three categories, but that depression duration was longer. It was also found that depression incidence was highest in emerging adulthood (Rohde, Lewinsohn, Klein, Seeley, & Gau, 2013). In middle age (i.e. roughly 45 years old), depression is at its lowest point and increases drastically at the age of 80 where it is at its highest point of diagnosis (Luppa et al., 2012; Mirowsky & Ross, 1992). The highest rate of onset for depression in men occurs between the ages of 25-31 (Janszky, Ahnve, Lundberg, & Hemmingsson, 2010; Schuch et al., 2014). Late life depression can be caused by increasing medical morbidity and can result in an increased risk of suicide (Taylor, 2014).

Possibly the most widely studied risk factor in the field of depression is that of the impact of biological sex (Addis, 2008; Di Marco et al., 2006; Wide, Mok, McKenna, & Ogrodniczuk, 2011). A recent study conducted by Schuch et al. (2014) which included 1115 participants (364 men, 751 women) currently diagnosed with major depressive disorder (MDD) found that females reported an earlier age of onset than males (27.8 years vs. 31.6 years,  $p=0.001$ ) and males were more likely than females to suffer from comorbid alcohol use (48.1% vs. 24.5%  $p<0.001$ ) (Schuch et al., 2014). Biological sex appears to be an important non-modifiable risk factor to note, although research has been largely focused on females rather than males.

As new research develops, it has become clear that there is a diverse response to depression between men and women. The externalization of depression symptoms that men typically show such as anger, irritability, and substance use (Dutton & Karakanta, 2013; Martin et al., 2013) are not included in the current symptomology for clinical depression diagnosis (American Psychiatric Association, 2013). If these symptoms were included in depression diagnosis, it is believed that more men would be diagnosed with clinical depression. For example, a study conducted by Martin, Neighbors, and Griffith (2013) utilised a secondary analysis that addressed externalisation of depression symptoms (e.g. substance use, irritability, anger) along with traditional depression symptoms, which resulted in a higher percentage of men (26.3%) fitting the criteria for depression (Martin et al., 2013).

There also appears to be a link between genetics and depression (Cohen-Woods, Craig, & McGuffin, 2013; Elder & Mosack, 2011). A particular focus is set on serotonin, dopamine and norepinephrine pathways and their impact on depression. This impact is referred to as the monoamine hypothesis for major depressive disorder. The monoamine hypothesis suggests that a pathophysiological deficiency in serotonin and norepinephrine reuptake resulting in depression symptoms (Elder & Mosack, 2011; Healy, 2015). Acute bouts of PA have been seen to aid in hormone balance and increase the secretion of serotonin in men (Silalertdetkul, 2009).

Normal responses to the loss of a loved one such as sadness or grief can lead to symptoms of clinical depression (Stroebe, Abakoumkin, & Stroebe, 2010). These stressors can be unexpected and lead to consistent feelings of hopelessness. As depression progresses, researchers have shown that previously enjoyed activities no longer provide respite from the disorder (Bromet et al., 2011). Bromet et al., (2011) conducted a study of 10 high-income countries and 8 low-income countries (n=89,037) using the World Mental Health Survey

(WMH) and found that the loss of a loved one through separation, divorce, or death was the strongest correlate to depression development in both high and low-income countries for both men and women. Specifically referencing men, the sudden loss of a loved one has a drastic impact of depression emergence and future suicide attempts. The trauma from losing a loved one suddenly can also result in the emergence of post-traumatic stress disorder (PTSD). A literature review conducted on PTSD found that mental health disorders are elevated after a sudden or violent loss (Kristensen, Weisæth, & Heir, 2012). A recent study conducted by Heeke, Stammel, Heinrich, and Knaevelsrud (2017) on the emergence of mental health issues after significant loss and trauma found similar results. Three hundred and eight people (118 men) who had experienced trauma and loss were assessed using measures of Prolonged Grief Disorder (PGD, PG-13), Post Traumatic Stress Disorder (PTSD, PCL-C) and social support (DUKE-UNC). A latent class analysis was performed to analyse different profiles by symptoms. Four classes were revealed including resilient (23.6%), PTSD (23.3%) PGD (25.3%) and a high distress class with high levels of PGD and PTSD (27.8%) (Heeke, Stammel, Heinrich, & Knaevelsrud, 2017). Sex differences were found in regard to the PTSD category. Men were more likely to experience PTSD from a traumatic event, while women were more likely to experience PTSD from a perceived lack of social support. These results may have implications for mental health disorder development based on personal loss and trauma and may provide a baseline for other studies to work from to further understand how trauma and loss effect each sex.

Abuse can also be a risk factor for developing clinical depression. Past or present abuse in any form such as physical, sexual, or emotional can lead to feelings of worthlessness and depression throughout life (Young & Korszun, 2010). In a review conducted by Young and Korszun (2010) both men and women who experienced sexual abuse or other forms of trauma

became depressed and were twice as likely to attempt suicide than those who were not abused (Young & Korszun, 2010). In a recent study on mental health outcomes for men (n=129) who had experienced sexual abuse during childhood, researchers found an increased likelihood of depression, somatic symptoms and hostility (Easton & Kong, 2017).

Just as death of a loved one and abuse can lead to depression symptoms, so can a serious illness. Depression and hopelessness are very common in terminally ill patients or patients with a low chance of a full recovery. For example, in a study on patients with cancer (n=4553 men, 5600 women), 19% showed clinical levels of anxiety and another 23% had subclinical symptoms. Also, 13% of patients reported clinical symptoms of depression and additionally 17% described having subclinical symptoms (Linden, Vodermaier, MacKenzie, & Greig, 2012).

Analysis was conducted to understand depression and anxiety based on cancer type as well as by sex. It was found that men with bone and gastrointestinal cancer reported the highest levels of depression when compared to other participants diagnosed with cancer, and drastically higher than those not diagnosed. In comparison to the general population, men diagnosed with cancer scored higher on both anxiety and depression scales (Linden et al., 2012).

As it has been shown above, there are important sex and gender-related differences in factors influencing depression, experiences of depression and help-seeking patterns. Tailored approaches, therefore, hold promise for reducing the detrimental effects of depression. Using PA as a preventive measure for depression development in men may prove effective. Tailoring a PA program for men may allow them to seek treatment and improve through a program built around individual needs. The following sections focus on the detrimental effects and prevention of depression in men.

## **2.5 The Detrimental Effects of Depression for Men**

Depression may be a disorder of the mind, but the symptoms and detrimental effects impact multiple avenues of a person's life (Branney & White, 2008; Rice, Aucote, Eleftheriadis, & Möller-Leimkühler, 2018; Rice et al., 2017). A focus group study conducted by Rochlen et al., (2010) on the treatment of depression in men found that men reported feelings of sadness and loneliness throughout a depressive episode. However, rather than seek help or show their emotions, men internalized their feelings and attempted to solve the problem alone (Rochlen et al., 2010). In a similar fashion, Rice et al. (2015) examined the sex differences relating to the externalization of depression symptoms. A sample of 233 adults took part in this study (males=125, 54%) and all males completed the Male Depression Risk Scale (MDRS-22) and their results were then compared to the results from the Patient Health Questionnaire-Depression Module (PHQ-9). Marked differences were observed between men and women who experienced 2 or more stressful life events, where men reported significantly higher MDRS-22 scores at both Time-1 and Time-2 compared to women (Rice et al., 2017; Rice et al., 2015). A lack of externalization of depression symptoms remains a main detriment to help seeking and treatment. A lack of treatment can result in physical manifestations of depression and maladaptive coping mechanisms (Addis & Mahalik, 2003; Seidler, Dawes, Rice, Oliffe, & Dhillon, 2016). These maladaptive coping mechanisms can result in both physical and psychological effects resulting in increased depression risk and subsequent diagnosis.

### **2.5.1 Physical Effects**

There are a wide variety of physical effects brought on by the presence of depression in men. Depression can result in the long-term emergence of chronic disease. Examples of this can be seen in the development of CVD, type 2 diabetes, obesity, and myocardial infarction.

Chronic problems with diet, sleeping patterns, and body pain have also been associated with depression in men (Holmes, Christelis, & Arnold, 2013; Miller & Cano, 2009; Simmons et al., 2016).

Depression also indirectly affects chronic diseases through a number of lifestyle behaviours. For instance, those who are sedentary, have poor eating habits, and poor sleeping behaviours have an increased risk of the chronic diseases mentioned above. Men are already at an elevated risk of CVD due to poor diet and inactivity (Atkins et al., 2014) and developing depression increases CVD risk even further (Hare, Toukhsati, Johansson, & Jaarsma, 2013). In parallel, men with CVD are more likely to develop depression than the general population and those who have both depression and CVD have a worse treatment outcome than those who are not depressed (Hare et al., 2013). A graded relationship between depression and CVD has been found, resulting in higher subsequent risk of mortality, CVD, and other cardiovascular events (Hare et al., 2013). Healthy patients with major depressive disorder are at higher risk of coronary heart disease, and those with established heart conditions see more adverse effects than those without depression (Hare et al., 2013; Whooley, 2006). Diabetes can lead to complications and health problems that may worsen symptoms of depression or make symptoms evident to someone who otherwise may not have become depressed. A meta-analysis conducted by Rotella and Mannucci (2013) found that a higher incidence of diabetes was found in depressed patients when compared to non-depressed patients (0.72% vs 0.47% yearly). In this analysis, researchers also found that the use of antidepressant drugs and untreated depression were associated with an adjusted risk of diabetes (Rotella & Mannucci, 2013).

Although depression is not the only factor involved in the development of these disorders and diseases, it is an important contributor. Two additional negative lifestyle changes brought on

by depression in men are a change in eating habits and the development of chronic pain. Depression can result in an individual over eating or may have the opposite effect and result in poor nutrition intake and insufficient consumption (Simmons et al., 2016). Chronic pain brought on by depression has a far-reaching negative effect due to the physical nature of many activities enjoyed by men throughout life. A study on chronic pain conducted by Miller and Cano (2009) found that 35% of participants (n=1,179) with chronic pain also had depression. The presence of depression in someone with chronic pain is associated with decreased function, poorer response to treatment, and an increase in health care costs (Holmes et al., 2013). Further, chronic pain and fatigue may also result in a lack of PA due to the increased difficulty in participating in PA without discomfort, which in turn further progresses a person's depression (Sluka, O'Donnell, Danielson, & Rasmussen, 2012).

Depression can also impact the body through an erratic sleeping pattern (i.e., insomnia, hypersomnia), which in turn can lead to consistent fatigue and chronic muscle pain (Holmes et al., 2013). For example, data from the Nord-Trøndelag Health Study on insomnia and depression found that the presence of depression significantly predicted the onset of insomnia in participants (Sivertsen et al., 2012).

### **2.5.2 Psychological effects**

Men are impacted by feelings of depression differently than women and react differently to the feeling's depressive symptoms cause. These feelings have negative effects (e.g., increased stress levels, more likely to avoid social interaction) on men if they are repressed or expressed through anger or frustration. These effects can often go unseen due to the fact that the majority of men try and hide how they feel. This behaviour results in men attempting to appear tough and not in need of help due to a fear of losing masculinity. Two more effects to be considered would

be feelings of hopelessness and a loss of ability to control emotions. A sense of mastery over personal feelings has been shown to be an important coping mechanism for men that is disrupted by depression. These effects are described further below.

Societal pressures on how men should act in North American society (e.g., independence, stoicism, toughness, competitiveness) can result in men believing that they should not seek treatment (Courtenay, 2000; Evans, Frank, Oliffe, & Gregory, 2011; Johnson, Oliffe, Kelly, Galdas, & Ogrodniczuk, 2012; Koivula, 2001; Oliffe et al., 2010a; Oliffe, Ogrodniczuk, Bottorff, Johnson, & Hoyak, 2012; Oliffe, Robertson, Kelly, Roy, & Ogrodniczuk, 2010b). Rather than dealing with the emotions that stem from a depressive episode, men tend to convey feelings in a more 'masculine' way through irritability, anger, or substance use (Oliffe et al., 2010b; Wide et al., 2011). By conforming to societal pressures on how to be more masculine, such as a need to be strong and stoic and in control of their own emotions at all times, men may avoid seeking the help of a physician or mental health professionals.

The diagnostic criteria for depression focuses on hopelessness and sadness (American Psychiatric Association, 2013) however, multiple theories have been offered to account for a different emotional response in men (Kessler et al., 2012). For example, a study conducted on participants of the National Comorbidity Survey evaluated sex differences in symptoms of depression. Men reported higher rates of anger and aggression, along with substance abuse and risk taking when compared to women (Martin et al., 2013). The psychological effects of depression and a lack of help seeking behaviour can result in the extreme response of men taking their own life (Evans et al., 2011). A common theme found by Oliffe et al. (2012) based on an analysis of 1-on-1 interviews was that men often waited until suicidal thoughts became persistent before seeking help. In Canada, 17.4 men die by suicide per 100,000 people and men between

the ages of 45-49 see an increase to 28.5 suicides per 100,000 population (Navaneelan, 2012). Severe depression is a known risk factor for suicide and men's suicide rates continue to outnumber reported depression rates in men (Olfiffe et al., 2012).

In addition, men who would be considered typically masculine (adhering to the societal pressures placed on their behaviour outlined earlier in this section) may struggle with loss of mastery and control in regard to their own mental health state (Möller-Leimkühler, 2003). Depression can manifest itself in feelings of helplessness and lack of control over ones own feelings. In males, a sense of control over one's own feelings and behaviours has been shown to be important (Möller-Leimkühler, 2003).

## **2.6 The Prevention of Depression**

Preventing depression before it occurs may be the most beneficial form of 'treatment'. Engaging in healthy behaviours, such as being physically active, eating healthy, and forming social relationships have been identified as measures that aid in preventing onset of depression symptoms before they occur. However, as men are often in denial of their current mental health status, preventive health measures are usually not taken (Rice et al., 2017). Evidence from recent depression prevention interventions have shown that a focus on improving social support and engaging in preventive health behaviours (as mentioned above), can help decrease the development of depression in men (England & Sim, 2009; Lopresti, Hood, & Drummond, 2013; Sanchez-Villegas & Martínez-González, 2013; Wolf & Rosenstock, 2017). A systemic review of diet interventions on depression and anxiety found that nearly half (47%) of the 17 studies observed significant effects on depression scores in favour of the treatment group (Opie, O'Neil, Itsiopoulos, & Jacka, 2015). PA and its preventive effects are explored in detail later in this chapter.

Society has fostered certain ideals for men that chastise any emotional display as a sign of weakness, and that appearing tough is more important than being mentally healthy (Addis & Hoffman, 2017; Addis & Mahalik, 2003; Valkonen & Hänninen, 2013; Wang et al., 2016). A review conducted by Addis (2003) on help seeking behaviours in men analysed the frequencies in which men and women sought help for medical, mental health, and substance use problems. The findings from this review showed that men of different ages, nationalities, and ethnic backgrounds seek help less frequently than women. It is believed that this is due to the behaviours associated with seeking help such as relying on others, admitting a need for help, and recognizing an emotional problem conflict with traditional masculine ideals of self-reliance and emotional control (Addis & Mahalik, 2003; Hammer & Vogel, 2010; O'brien et al., 2005; Rice et al., 2017). Societal restrictions placed upon men keep them from seeking help, therefore providing programs that are available and focused on men and mental health, would enable more men to undertake preventive measures. An example of this would be the Heads Up Guys website (Ogrodniczuk, Oliffe, & Beharry, 2018). This website offers Canadian men information, practical life tips, and guidance regarding mental health and depression (Gagnon & Oliffe, 2015; Ogrodniczuk et al., 2018; Ogrodniczuk, Oliffe, Kuhl, & Gross, 2016). The use of a website in which men can browse on their own provides an educational component and support for men who may be at risk for developing depression.

## **2.7 Physical Activity for the Prevention of Depression**

Being physically active and participating in a healthy lifestyle can have the strongest protective effect against developing depression (Bhui & Fletcher, 2000; Fox, 1999; Goodwin, 2003; Hallgren et al., 2016; Hegberg & Tone, 2015; Landers & Arent, 2007; Lindwall, Gerber, Jonsdottir, Börjesson, & Ahlberg Jr, 2014; Mammen & Faulkner, 2013; Martinsen, 2008). Using

PA as a preventive measure against depression development may be key to men as PA promotes autonomy and a sense of control, which aligns with typical masculine ideals (Olliffe et al., 2010a). Researchers conducting PA intervention studies describe an anxiolytic and anti-depressive effect of PA in both healthy subjects and depressed patients (Ströhle, 2009). PA has been recommended for the prevention and treatment of numerous diseases with physical manifestations (e.g., osteoporosis, obesity, cancer, diabetes) and is now increasingly recommended by doctors and psychiatrists to treat mental health and mental health disorders (Hallgren et al., 2016; Hamer & Smith, 2018; Martinsen, 2008). Current literature provides evidence that people who are physically active are at a reduced risk of developing depression (Bjerkeset, Romundstad, Evans, & Gunnell, 2007; Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Carek et al., 2011; Hallgren et al., 2016; Lambert, D'Cruz, Schlatter, & Barron, 2016; Martinsen, 2008) and that PA interventions are associated with multiple benefits for patients with moderate forms of depression (Blumenthal et al., 1999; Carek et al., 2011; Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; Hallgren et al., 2016; Hallgren et al., 2017).

PA is also used to improve depression symptoms in those who are currently not responding to antidepressant medication. By supplementing medication with PA, previously unresponsive patients saw an improvement in depressive symptoms (Hallgren et al., 2017; Mather et al., 2002; Schuch et al., 2016). Unfortunately, with this study and many others in this field, data were not analysed to examine if the treatment effects were different between men and women.

PA in all contexts has great benefits on decreasing the risk of depression development and on depression itself. For example, a review conducted by Mammen and Faulkner (2013) examined 30 intervention trials specific to depression and PA with measurements at two or more

time points. These studies included both men and women and only one study of the thirty produced null findings, while the remaining 29 provided evidence that PA has a preventive effect on future depression and reduced risk of subsequent depression. In 25 of the 30 intervention trials, researchers found a significant, inverse relationship between baseline PA levels and follow-up depression (follow up times varied in each study, ranging from 1- 27 years post analysis). This evidence was acquired using depression questionnaires such as the Center for Epidemiological Studies Depression Scale (CESD) at baseline and at follow up (post PA intervention). Scores on the post intervention questionnaire indicated a decrease in depressive symptoms directly associated with increased activity. PA was defined in these studies as any activity done that raises the heart rate above basal metabolic rates (e.g. walking, running, swimming, cycling). Five of the 25 studies mentioned above featured a sample of only men. These five studies found similar results to one another, indicating a decrease in depression scores post PA interventions. Men from these five studies also saw an even greater benefit with greater amounts of PA. Researchers of this same review examined the amount of PA required to provide benefits against developing depression. Results from seven intervention trials showed that those who engaged in 120 minutes or more of low intensity PA per week (e.g. gardening/walking) were at a 63% reduced risk of developing future depression after one year follow up relative to those who were sedentary. The studies used in this review were of high methodologic quality and provided consistent evidence that PA at any level can prevent the development of depression (Mammen & Faulkner, 2013).

Benefits of PA on the prevention of depression should be considered based on sex. For example, a 2006 study using a sample of 5,412 men found that relative increases in maximal cardiorespiratory fitness and consistent PA were associated with higher levels of emotional well

being and lower depressive symptoms (Galper et al., 2006). The method, duration, and intensity in which men are physically active and the effect that has on depression has been extensively investigated as well. A meta-analysis examining 37 studies including RCT's and quasi-experimental designs, found that all levels of PA (light-moderate-vigorous intensity) reduced symptoms of depression as well as decreased risk of depression development in both sexes. For men, a relationship between greater intensity of PA and a greater reduction of depression was seen across the majority of reviewed studies (Dunn et al., 2005). Evidence also showed that there were similar reductions in depressive symptoms with both aerobic activity and resistance training in men (Abrahão, Gomiero, Peccin, Grande, & Trevisani, 2016; Dunn et al., 2005; Lee, Kim, Lee, Oh, & Kim, 2016) with multiple studies reporting a greater clinical effect with a mixed model of exercise that included both aerobic and resistance training (Dinas, Koutedakis, & Flouris, 2011; Stanton & Reaburn, 2014).

PA has also been found to provide anti-depressive risk benefits and increase perceived QoL in both men and women. As little as 10-29 minutes of PA per day has been shown to provide a decreased risk of developing depression, however, greater levels (>90 minutes/day) were found to be even more beneficial (Dunn et al., 2005). A study on the dose-response relationship (more exercise=more benefits) of PA and depression reduction conducted by Dunn and colleagues (2005), found that those who exercised three to five times a week with a weekly energy expenditure of 17.5kcal/kg/week had significantly larger reductions in depression when compared with those who exercised with a caloric expenditure of 7kcal/kg/week. Larger reductions are evident when following an exercise program in line with the Canadian Physical Activity Guidelines, defined as the accumulation of at least 150 min of moderate to vigorous intensity aerobic activity per week in bouts of 10 minutes or more (Tremblay et al., 2011). The

dose response relationship seen in the most recent literature supports the recommended guidelines for PA, reporting that they are sufficient to decrease depression risk as well as overall severity of symptoms. Short bouts of intense PA also work as an antidepressant in depressed men and women (Dunn et al., 2005; Lindwall et al., 2014; Mammen & Faulkner, 2013; Meyer, Koltyn, Stegner, Kim, & Cook, 2016). This relationship is also supported by data from the Scottish Health Survey that reported a greater decrease in depression risk and symptoms with an increase in frequency and intensity of PA (Stamatakis, Hamer, & Lawlor, 2009).

There are also mental health benefits for those who engage in PA as a method of transportation (i.e. walking, biking to work). A study conducted on worksite mental health promotion found that walking or cycling 30 minutes or more while commuting to work may be linked to an overall increased perception of mental health in men (Ohta, Mizoue, Mishima, & Ikeda, 2007). This perception of a more positive mental state may result in better adherence to PA interventions as participants continue to feel improvements in their mental health. Evidence of this comes from a review conducted by Thompson et al., (2011). In this systemic review researchers examined 11 different trials totalling 833 adults and found that those who participated in outdoor PA showed increased feelings of revitalization and positive engagement and decreases in tension, confusion, anger, and depression. Studies in this review also found that participants who engaged in outdoor activities reported greater enjoyment and satisfaction as well as a greater intent to repeat the activity in the future (Thompson Coon et al., 2011).

## **2.8 Physical Activity Levels and Engagement Techniques for Men**

PA levels among Canadian adults remain an important topic of current studies, with the reoccurring theme of finding ways in to increase PA levels. Despite the numerous health benefits associated with PA, men's engagement in PA still remains low (Thomas, Silverman, & Nelson,

2015). For example, Statistics Canada found that between the ages of 20-39 men accumulate more PA than women with an average of 33 minutes per day in comparison to 24 minutes. In later years (40-79) there is no significant sex difference. The largest difference in PA comes between healthy weight men and overweight men. Healthy weight men average 35 minutes of PA a day (which totals to more than Canada's recommended PA guidelines) while overweight men average 26, and obese men averaging only 16 minutes of MVPA per day (Colley et al., 2017). In addition, the Canadian Health Measures Survey (2016) found that only 15% of adults (17% of men) accumulate the recommended 150 minutes of PA per week in bouts of 10-minutes or more. On a consistent basis only 5% of men and women are accumulating the recommended 150 minutes per week (Colley et al., 2017).

Most recently, researchers have sought to understand the best approach to engage men in PA programs. One study conducted by Carroll, Kirwan, and Lambe (2014) aimed to improve health and well-being for men (n=50) over a 6 week period. The researchers found that a structured program with a tangible outcome (i.e., a 5-km walk/run) provided the best motivation for men. Previously, interventions for men have tried to teach men about the importance of healthy eating and PA (Baranowski, Anderson, & Carmack, 1998; Michie, Abraham, Whittington, McAteer, & Gupta, 2009) however, these proved to be ineffective because they were not specifically tailored to the male population and simply used traditional information on what it means to eat healthy (i.e. following Canadas Food Guide for portions and different food groups).

Recent success of PA programs such as Football Fans in Training, Hockey Fit, Tackling men's health and HAT TRICK itself (De Cruz, 2016; Gray et al., 2013; Sharp et al., 2018; Witty, 2011) has been largely due to the use of techniques tailored directly to the interests of men,

providing them with relevant tips and examples of ways to increase their PA, and designing program materials that are attractive to men. A prime example is the Football Fans in Training (FITT) program conducted by Hunt et al., (2014). FFIT was designed specifically to target the male population utilising messaging and resources (e.g. websites, educational information etc.) with themes and dialogue that would resonate with men (Hunt et al., 2014). In addition, FFIT was a 12-week gender sensitised program which focused on masculine ideals of PA by partnering with professional football clubs and engaging in sport-based activity. This program included men only groups and focused on sport-based activity to promote weight loss, build comradery, and instill a sense of belonging and teamwork, characteristics found to be important to men (Hunt et al., 2014). This RCT included an intervention group and waitlist comparison group who did not receive any form of treatment. Results showed that the participants in the intervention group saw a mean difference in weight loss of 4.94 kg and a percentage weight loss of 4.36% when compared to the comparison group (Hunt et al., 2014).

A review by Botorff et al. (2015) that examined PA interventions for men reported that 24 out of 35 (69%) studies that were offered provided a number of gender-specific approaches including dynamic and culturally sensitive language, upholding masculine virtues, as well as a light hearted and often times humorous approach to PA and dietary behaviours (Botorff et al., 2015b). Results indicated that 24 out of the 25 (69%) reported significant increases in men's PA levels. Of these 24 studies, 12 included a follow-up (ranging from 7 weeks-15 months) and 10 of 12 studies demonstrated successful maintenance of PA levels. (Botorff et al., 2015b; Carroll, Kirwan, & Lambe, 2014).

Improvements in mental health have also been reported as a positive result of gender-sensitised programs. A prime example of this is the Men's Shed study conducted in Australia by

Morgan et al. (2012). Creating Men's Sheds (i.e. a place for men to meet and talk with other men about their health and any problems they may have) provided men with a safe place to communicate about their problems and how they felt surrounding their own mental health. These sheds were situated in a variety of settings including old church halls, barns, train carriages, or learning centers (Morgan, Young, Smith, & Lubans, 2016). The Men's Shed Program has expanded to other countries including Canada. Canadian men (N=22) of one Shed were included in a focus group that found three prevalent themes important to men. These themes included independence, a major focus on work, and a need for a male focused space (Mackenzie et al., 2017).

Designing gender-sensitised programs that consider the masculine values and interests of men show promise in reaching and engaging men in preventive health behaviour (Sharp et al., 2018). In moving forward, it is important to consider the current evidence surrounding men and masculinities when developing programs focused on the physical and mental health of men. Given recent success of gender-sensitised programs in the adult male population, a PA intervention may be a viable tool for the prevention and treatment of depression and may provide opportunity to link these programs to a decrease in depression risk through increased activity. The HAT TRICK program has provided an opportunity to examine the impact that a 12-week PA intervention has on depression risk in men. The following chapter reflects the layout of the HAT TRICK study and how the data examined in this thesis was collected and analysed.

## **Chapter 3 Methodology**

### **3.1 Preface**

The following chapter outlines the methods used to conduct this research project. This study was exploratory in nature and utilised a pre-post quasi-experimental design to provide information regarding the impact a PA intervention had on PA levels as well as the impact increased PA levels/PA intervention had on depression risk and health related QoL in men. Self-reported questionnaires were utilised to collect information concerning demographics, self-perceived depression risk, overall health related QoL, and PA behaviour. Ethical approval was obtained from the University of British Columbia Okanagan Behavioural Research Ethics Board (#H1600736). The following sections describe the study design, participants, setting, recruitment, procedures, data collection as well as data management and analysis.

### **3.2 Study Design**

This exploratory study was conducted as part of the HAT TRICK project, a larger pragmatic feasibility study that evaluated the efficacy of a gender sensitised PA intervention focused on improving PA, healthy eating, and connectedness among overweight and inactive men (Caperchione et al., 2017). A pre-post quasi-experimental design was used to evaluate the HAT TRICK project outcomes (i.e., PA, healthy eating, sleep, smoking, risk of depression, quality of life (QoL) and social support) at baseline, at the completion of the intervention (3 months) and 9 months follow-up. A detailed description of the HAT TRICK program, including the rationale and methodology has been reported previously (Caperchione et al., 2017). This thesis specifically examined the impact a PA program had on PA levels, risk of depression and health related QoL in men who participated in the HAT TRICK program from baseline to program completion (12-weeks).

### 3.3 Setting and Participants

This study was conducted in the City of Kelowna, which is part of the Regional District of Central Okanagan, British Columbia, Canada. This region encompasses the areas of Peachland, Lake Country, and West Kelowna, as well as other unincorporated communities on both sides of Okanagan Lake. Kelowna is the largest community in the Regional District with a population of 194,882 people (Statistics Canada, 2017). Participants were eligible to take part in the program if they lived in these main cities or the surrounding areas and could commute to downtown Kelowna where the program took place. The setting for the study was primarily located at Prospera Place™ the largest skating arena and concert venue in Kelowna and home of the Kelowna Rockets™, a major junior ice hockey team within the Western Hockey League (WHL). A total of 60 participants (20 participants X 3 groups) were recruited for this study. To be eligible participants had to:

- 1) Be men 35 years of age or older
- 2) Reside in the Central Okanagan Region of Canada
- 3) Accumulate less than 150 minutes of PA per week,
- 4) Have a body mass index (BMI) of over 25kg/m<sup>2</sup>
- 5) Have a pant waist size of 38” or greater.

It was not a requirement of the program to be able to skate or play hockey. It was also not required for these participants to have a history of mental health issues. This sample was chosen because men are a typically hard to reach population for PA programs (Carroll et al., 2014) and studies have shown that men who are inactive may be at increased risk of depression development (Hamer & Stamatakis, 2014). The only major exclusion criterion was that each participant needed to be ambulatory without assistance.

### **3.3.1 Recruitment and Consent**

Participants were recruited in three phases corresponding to the delivery of each of the three 12-week HAT TRICK sessions. The first phase of recruitment began in November of 2016 (for the January 2017 session); phase 2 recruitment occurred in January 2017 (for the March 2017 session); and phase 3 recruitment occurred in July 2017 (for the September 2017 session). A variety of recruitment strategies were utilised including local media (e.g., print newspaper, radio broadcast, website postings on castanet.net and Kelowna Now.com), social media (e.g., Facebook, Twitter), and poster advertisements at local community centres, ice hockey arenas, coffee shops, pubs and bars, and large hardware and automotive commercial entities (e.g., Home Depot, Canadian Tire). Following the initial HAT TRICK session, word of mouth was also used as a means of recruitment. Lastly, a HAT TRICK website was developed ([www.hattrick.ok.ubc.ca](http://www.hattrick.ok.ubc.ca)) as an additional recruitment strategy. The website provided information about the program, eligibility criteria and instructions for signing up.

Participants interested in the HAT TRICK program were encouraged to contact the research team to confirm eligibility. Those deemed eligible were asked to complete a Physical Activity Readiness Questionnaire (PAR-Q+), a medical screening tool which has been recommended for use in exercise related interventions (Bredin, Gledhill, Jamnik, & Warburton, 2013). All completed PAR-Q+ were reviewed by a Certified Exercise Physiologist, and individuals who required further medical screening were required to gain medical clearance from a doctor in order to participate. Participants were recruited on a first come first served basis with additional individuals placed on a waitlist to be contacted for future sessions. Written informed consent was obtained from all HAT TRICK participants at each baseline measurement session. During the baseline measurement session, participants were made aware that participation was

completely voluntary and that they could withdraw from the program at any time without consequence.

### **3.4 HAT TRICK Intervention**

HAT TRICK was designed as a gender sensitised intervention for inactive (less than 150 min of PA per week) and overweight men ( $BMI > 25 \text{ kg/m}^2$ ). HAT TRICK focused primarily on PA, healthy eating and social connectedness and was delivered in partnership with the Kelowna Rockets hockey team. The intervention was guided by two theoretical frameworks; The Self-Determination Theory (Deci & Ryan, 1985) and The Social Cognitive Theory (Bandura, 1986, 1991). The self-determination theory (SDT) is a theory of motivation and is concerned with supporting natural intrinsic tendencies human beings have to behave in healthy ways. Motivation is a critical factor in supporting sustained increases in PA. Results from a recent systemic review found consistent support for a positive relationship between more autonomous forms of motivation and increased levels of PA (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). The HAT TRICK program utilised SDT by focusing largely on the intrinsic aspects of motivations and why the participants chose to be a part of this program. Asking questions at the onset of the program regarding what they hoped to achieve and why they signed up for the program. During the first session, participants wrote these goals down on hockey pucks and tossed them into an awaiting net to help cement their commitment to the program and to themselves.

Social cognitive theory (SCT) is based on the observation and learning of skills from a model exhibiting a certain behaviour. The facilitators of the HAT TRICK program attempted to provide participants with a positive model to pattern new health behaviours from. Facilitators of HAT TRICK drew on personal experiences within health and wellness in their own lives and tried to pass on these behaviours to participants (such as healthy eating tips and proper form for

exercise). Throughout the HAT TRICK program health professionals (e.g., yoga instructor, nutritionist, strength and conditioning coach) to present different health related topics (yoga instructor, nutritionist, strength and conditioning coach) and the benefits associated with undertaking healthy lifestyle behaviours. By doing this it was thought that participants would be provided with the knowledge to make their own healthy changes and the confidence to continue to engage in such behaviours. A study conducted 2011 found that using SCT in PA interventions increased self efficacy which influenced PA directly and indirectly (White, Wójcicki, & McAuley, 2011).

The program consisted of 12 weekly face-to face 90-minute group sessions, which included an educational component and PA component. The educational component, which was framed around hockey related themes, included health-related information on PA, healthy eating, and behaviour change techniques (e.g., goal setting, social support, self-monitoring). The PA component was comprised of multiple activities where participants were guided through a progressive (i.e., step-wise increase in duration and intensity of PA over time) program within the Rockets facility using the team gym, lower concourse loop, and grandstand area. Some of the PA sessions also occurred away from Prospera Place, at the facilities of local community partners. Weekly PA and healthy eating challenges were also incorporated into the HAT TRICK Program. Further details of the education components, PA components and weekly challenges are outlined in Table 3.1.

Table 3.1: *Weekly Outline of HAT TRICK*

Education Component	Group PA	Weekly Challenge
Week 1: Pre Game		
<ul style="list-style-type: none"> <li>• Program introduction</li> <li>• Why HAT TRICK?</li> <li>• The first step</li> <li>• Take stock of current activities</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to Fitbits</li> <li>• Hockey area facility tour with Rockets Strength and Conditioning Coach</li> </ul>	<p>On every day this week:</p> <ul style="list-style-type: none"> <li>• Record how many steps you do</li> <li>• Record everything that you eat and drink</li> <li>• Wear your Accelerometer</li> </ul>
Week 2: Face Off		
<ul style="list-style-type: none"> <li>• Change a bit</li> <li>• Break the cycle</li> <li>• Top 5 tips for success</li> </ul>	<ul style="list-style-type: none"> <li>• Activities around hockey arena                             <ul style="list-style-type: none"> <li>○ Climb bleachers, walk the loop, seat dips, Squats, Push-ups</li> <li>○ Fitbit usage and barriers</li> </ul> </li> </ul>	<p>On at least <b>3</b> days of the week:</p> <ul style="list-style-type: none"> <li>• walk an extra 1,500 steps (from baseline value)</li> <li>• Choose water instead of a sugary drink</li> </ul>
Week 3: Power Play		
<ul style="list-style-type: none"> <li>• HAT TRICK to healthy eating: carbs, proteins, and fats</li> <li>• Top 6 healthy eating tips</li> <li>• Power food swaps</li> </ul>	<ul style="list-style-type: none"> <li>• Hockey team training gym                             <ul style="list-style-type: none"> <li>○ Fundamental activities with Athletic Trainer</li> <li>○ Circuit-style workout</li> </ul> </li> </ul>	<p>On at least <b>3</b> days of the week:</p> <ul style="list-style-type: none"> <li>• walk an extra 1,500 steps (from baseline value)</li> <li>• Start your morning with a healthy breakfast</li> </ul>
Week 4: Tic Tac Toe		
<ul style="list-style-type: none"> <li>• Size: Then and now</li> <li>• Handy portion guide</li> <li>• Top 7 tips for dining out</li> <li>• Rethink beer o'clock</li> </ul>	<ul style="list-style-type: none"> <li>• Lower concourse workout                             <ul style="list-style-type: none"> <li>○ Fast/Slow walking pace changes</li> <li>○ Dynamic movements</li> <li>○ Discuss week 3 challenge</li> </ul> </li> </ul>	<p>On at least <b>5</b> days of the week:</p> <ul style="list-style-type: none"> <li>• walk an extra 1,500 steps (from baseline value)</li> <li>• Use the handy portion guide to plan a meal</li> </ul>
Week 5: Long Change		
<ul style="list-style-type: none"> <li>• Active living 101</li> <li>• HAT TRICK to active living</li> <li>• Canada PA Guidelines</li> <li>• Recruit a deep bench</li> </ul>	<ul style="list-style-type: none"> <li>• New Wave Workout                             <ul style="list-style-type: none"> <li>○ Compound movements taught by Personal Trainer</li> <li>○ Circuit-style workout</li> </ul> </li> </ul>	<p>On at least <b>5</b> days of the week:</p> <ul style="list-style-type: none"> <li>• walk an extra 1,500 steps (from baseline value)</li> <li>• Choose water instead of a sugary drink</li> </ul>
Week 6: Neutral Zone		
<ul style="list-style-type: none"> <li>• Energy balance</li> <li>• The 80/20 rule</li> <li>• Top 8 keys to weight loss</li> <li>• Drink wisely</li> </ul>	<ul style="list-style-type: none"> <li>• Exercise at a moderate intensity (3 bouts of 15 minutes)- Include short intervals of higher intensity</li> <li>• Intermission:                             <ul style="list-style-type: none"> <li>○ Discuss week 5 challenge</li> </ul> </li> </ul>	<p>On at least <b>3</b> days of the week:</p> <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Apply the 80/20 rule</li> </ul>

Education Component	Group PA	Weekly Challenge
Week 7: Penalty Kill		
Keep your stick on the ice <ul style="list-style-type: none"> <li>• Top 6 relapse prevention strategies</li> <li>• Top 6 healthy snacking tips</li> <li>• Rewarding yourself</li> </ul>	<ul style="list-style-type: none"> <li>• “Boot camp” style workout               <ul style="list-style-type: none"> <li>○ Discuss week 6 challenge</li> </ul> </li> </ul>	On at least <b>3</b> days of the week: <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Choose healthy snacks options</li> </ul>
Week 8: Odd Man Rush		
<ul style="list-style-type: none"> <li>• Principles of strength training</li> <li>• Circuit training</li> <li>• At home workout</li> <li>• Turning up the heat</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to at-home bodyweight workout               <ul style="list-style-type: none"> <li>○ Discuss week 7 challenge</li> </ul> </li> </ul>	On at least <b>5</b> days of the week: <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Start your morning with a healthy breakfast</li> </ul>
Week 9: Icing		
<ul style="list-style-type: none"> <li>• Top 5 tips for “brocery” shopping</li> <li>• Reading the fine print</li> <li>• The many names for sugar and salt</li> <li>• Product buzz words</li> </ul>	<ul style="list-style-type: none"> <li>• Exercise at moderate-vigorous intensity (3 bouts of 15 minutes)-15 minutes included high intensity training (HIT)</li> </ul>	On at least <b>5</b> days of the week: <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Apply the 80/20 rule</li> </ul>
Week 10: Fast Break		
<ul style="list-style-type: none"> <li>• Making healthy trades</li> <li>• Label reading and comparison activity</li> <li>• The BBQ king</li> </ul>	<ul style="list-style-type: none"> <li>• Boxing and Jiu- Jitsu at local MMA gym               <ul style="list-style-type: none"> <li>○ Discuss week 9 challenge</li> </ul> </li> </ul>	On at least <b>5</b> days of the week: <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Choose healthy snacks options</li> </ul>
Week 11: Set Play		
<ul style="list-style-type: none"> <li>• Sit less</li> <li>• Top 4 stress management tips</li> <li>• Sleep and health</li> <li>• SMART GOALS</li> </ul>	<ul style="list-style-type: none"> <li>• Ball Hockey Game and circuit workout               <ul style="list-style-type: none"> <li>○ Discuss week 10 challenge</li> </ul> </li> </ul>	On at least <b>5</b> days of the week: <ul style="list-style-type: none"> <li>• walk an extra 3,000 steps (from baseline value)</li> <li>• Use the handy portion guide to plan a meal</li> </ul>
Week 12: He shoots, he scores!		
<ul style="list-style-type: none"> <li>• Highlight reel</li> <li>• Dealing with set-backs</li> <li>• What’s the next step?</li> <li>• Keeping yourself accountable</li> </ul>	<ul style="list-style-type: none"> <li>• Data collection with Healthy snacks and water               <ul style="list-style-type: none"> <li>○ Discuss week 11 challenge</li> </ul> </li> </ul>	Be HAT TRICK healthy. Keep working towards your goals and making small lifestyle changes.

Social connectedness was promoted through an interactive and relaxed style of learning (i.e., open question periods, joking between participants, free discussion) during each weekly session. During this time, the program facilitators promoted a sense of belonging and comradery through group activities and friendly competition. Men were also encouraged to exchange email addresses and other contact information (e.g. phone numbers, Fitbit accounts) and meet outside the program to engage in further PA together.

HAT TRICK was facilitated by research personnel trained in health promotion behaviour change techniques, and at certain sessions, were also joined by external guests from the community (e.g., personal fitness trainers, nutritionists, physical therapists). These external guests touched on different PA examples, proper diet and portion control, and the importance of stretching respectively. The Rockets athletic therapist was brought in for the first session to give a tour of the Rockets facilities (including the dressing room and private gym) and lead the first PA session with each group. A group photo was taken in the Rockets dressing room around the team logo as a strategy to initiate a sense of comradery and association with the team. The Rockets nutrition specialist was also involved as a guest speaker to implement the nutrition education sessions. Examples of topics that were discussed during these sessions included; the importance of a healthy breakfast, eating smaller portions throughout the day, and examples of each macronutrient (i.e., carbohydrates, proteins, and fats) required for a healthy diet. Participants from previous HAT TRICK sessions were also invited back as guest speakers to share their own personal HAT TRICK experience with current program participants. At the beginning of the program (weeks 1-4) more emphasis was placed on the educational component of HAT TRICK which lasted for approximately 60 minutes with the remaining 30 minutes devoted to PA. As the program progressed (weeks 4-8), the PA component began to increase (45

minutes) while the educational component decreased (45 minutes). The final four weeks of HAT TRICK focused mainly on PA with 30 minutes of classroom time and 60 minutes of PA.

### **3.5 Data Collection Procedures and Outcome Measures**

#### **3.5.1 Data Collection Procedures**

Data collection took place between December 2016 and November 2017. Baseline data for group one was collected in December 2016 and 12-week data collected in March 2017. Baseline data for group two was collected in February 2017 and 12-week data was collected in May 2017. Lastly, baseline data for group three was collected in August 2017 and 12-week data was collected in November 2017. All assessments were conducted at Prospera Place, however, participants who were unable to attend baseline or follow up measures at Prospera Place completed these assessments at an agreed upon time (within a week of the original data collection period) and place (e.g., at their home or at the University of British Columbia Okanagan Campus). At each baseline measurement session, participants were given a personal data collection package (participant ID number and accelerometer number written on each package) that included a self-report questionnaire, anthropometric and physiological measures form, an accelerometer and an accelerometer instruction sheet and log sheet. After the questionnaires were completed by participants and anthropometric and physiological measures (i.e., height, weight, waist circumference-WC, blood pressure-BP, and heart rate-HR) were taken by a trained researcher, program facilitators provided information about the accelerometers (i.e., what they do, what they are used for) and gave instructions on how to use them. In addition, participants were instructed to record the wear time on an accelerometer log sheet provided in the envelope. Participants were also instructed to record any activities done that would not have been recorded by the accelerometer (e.g., swimming, stationary bike). Researchers and

facilitators were present during the completion of the questionnaires to provide feedback and answer questions. Questionnaires were collected by the researchers before participants left each data collection session (i.e., baseline and 12-weeks). Participants were instructed to return their accelerometers to the front desk at Prospera Place after the assigned wear time of 7 days.

### **3.5.2 Measures**

#### **Demographic Characteristics**

Baseline demographic information was collected via self-report questionnaire and included date of birth, ethnic background, level of education, marital status, chronic disease conditions, main activity, occupation, and household income.

#### **Anthropometrics and Physiological Measures**

Height (cm), weight (kg), WC (cm), BP (mmHg), and HR (bpm) were measured by a trained research team member. Height and weight were measured with the participant standing normally, with feet together and head in the Frankfort plane, using a Seca 700 mechanical balance scales and a Seca 220 measuring rod (Seca GmbH, Hamburg). Body Mass Index (BMI) was calculated using height and weight. BMI is a measure of body fat based on the weight of an individual in relation to their height calculated by dividing weight in kilograms by height in meters squared and is often used in community-based research as an estimate of body fat (McAdams, Van Dam, & Hu, 2007). WC was measured on the transverse plane at the top of the iliac crest using a measurement tape. BP (mmHg) and HR (bpm) were measured two times at two-minute intervals with a Life Source Digital Deluxe One Step Blood Pressure Monitor. Participants were asked to sit quietly for five minutes prior to the first measurement. BP was measured on the left arm with forearm on a table, palm of the hand facing up. Participants were asked to rest the arm comfortably at heart level, sitting with their back against the chair, legs

uncrossed. All anthropometric and physiological measures were assessed at baseline and 12-weeks. See Appendix A for the anthropometric and physiological measures form.

### **Physical activity**

PA was assessed using a modified version of the self-reported Godin Leisure-Time Exercise Questionnaire- GLTEQ (Godin, 2011; Godin & Shephard, 1985). Previous studies using the GLTEQ have found support for construct validity of test scores across a number of different populations as well as strong test-retest reliability (Amireault & Godin, 2015; Godin & Shephard, 1985; Sallis, Buono, Roby, Micale, & Nelson, 1993). The modified GLTEQ is a 3-item self-report PA measure that assesses the frequency and duration of strenuous (heart beating rapidly; e.g. running, hockey, skiing), moderate (not exhausting; e.g. fast walking, cycling at an easy pace, easy swimming) and mild (minimal effort; e.g. housework, easy walking, relaxing yoga) PA performed in bouts of 10 minutes or more during a typical week. In order to score this questionnaire, the weekly frequencies for each category were multiplied by their corresponding MET (Mild=3, Moderate=5, Strenuous=9). These scores are then totaled and scores adding to or greater than 24 are considered 'active' while scores of 23 units or less are described as 'inactive' (Godin & Shephard, 1985). Scores from the GLTEQ have been validated in multiple studies (Trinh, Plotnikoff, Rhodes, North, & Courneya, 2011) and compare favourably with other self-report measures of PA. The GLTEQ also correlates with indicators of physical fitness expected as a function of an increased frequency of exercise (Jacobs, Ainsworth, Hartman, & Leon, 1993). This questionnaire is popular in multiple different populations because it is easy to understand and quick to administer; it also appears stable across multiple test administrations (Rhodes, Courneya, Blanchard, & Plotnikoff, 2007).

## **Depression Risk**

Risk of depression was assessed using the Male Depression Risk Scale (MDRS-22) (Rice, 2011). The MDRS-22 assesses potential risk factors that may be indicators of current depression or a risk of depression on a 22-item Likert scale ranging from 0 (not at all) to 7 (almost always). Participants were asked to think back over the last month and respond to each item considering how often it applied. The MDRS-22 provides a total score of depression risk via the summation of all 22 items and six subscale scores that follow six symptom domains. These domains include: emotional suppression, drug use, alcohol use, somatic symptoms, risk taking, and anger and aggression. A higher score indicates a greater risk of depression. The MDRS-22 has demonstrated validity and reliability among men (Rice et al., 2017; Rice, Fallon, Aucote, & Möller-Leimkühler, 2013). In a recent study testing the validity and reliability of the MDRS in a Canadian sample (n=1000 men), researchers compared the MDRS-22 (and the corresponding sub scales) to the widely used Patient Health Questionnaire-9 (Manea, Gilbody, & McMillan, 2011). CFA model fit indices indicated adequate model fit for the six-factor MDRS-22 model. ROC curve analysis indicated that the MDRS-22 was effective for identifying those with a recent (past four weeks) suicide attempt and identified a greater number of recent suicide attempts (84.62%) than the PHQ-9 (53.85%) (Rice et al., 2017). The MDRS-22 is the first male-sensitised risk of depression scale to be validated using CFA techniques in independent and cross nation samples.

## **Health-related Quality of Life**

Health related QoL was assessed using the Short Form Health Survey (SF-12) (Ware, Kosinski, & Keller, 1998). The SF-12 was developed as a shorter alternative to the SF-36 (Ware Jr & Sherbourne, 1992) and it includes 12 questions nested within 8 physical and mental health

dimension scales including; physical functioning, role-physical, bodily pain, general health, vitality, social function, role-emotional and mental health. Scoring for this survey includes pre-coded numeric values that are assigned to each of the eight scales and then scored from 0 to 100, with a higher score indicating better health. The SF- 12 is one of the most widely used health related QoL evaluation tools and has been shown to be valid and reliable in a number of populations including men (Burdine, Felix, Abel, Wiltraut, & Musselman, 2000; Jakobsson, 2007; Jenkinson, Chandola, Coulter, & Bruster, 2001; Wee, Davis, & Hamel, 2008). Upon analysis of the data all 12 items were checked for out-of-range values prior to assigning the final item value. Out-of-range values were those that were lower than an item's pre-coded minimum value or higher than an item's pre-coded maximum value. No out-of-range values were found. Reverse scoring was conducted on four items in the SF-12 because these items had a higher pre-coded value indicating poorer health. Participant's final values were totalled and entered into SPSS (Version 21) for frequency analysis.

### **3.6 Analyses**

Descriptive analyses were performed using the IBM program SPSS V21.0 to provide information on frequencies, proportions, means, and standard deviations (SD). Questionnaire and demographic data were entered into SPSS (version 21) for analysis. The descriptive variables included demographics, depression risk, and health related QoL, while the outcome variables were PA levels, QOL levels, and risk of depression scores post- intervention. In order to understand and analyse change in PA levels, depression risk and health related QoL paired samples t-tests were conducted using baseline and follow-up data for each pair. Three hypotheses were tested using a paired samples t-test. First, it was hypothesized that HAT TRICK program participants would report an increase in PA levels from baseline to 12-weeks. In order to test this

hypothesis, data were collected on self reported PA levels at baseline and again after participating in the HAT TRICK PA program. Using a paired samples t-test, a comparison was made to describe the difference between the two time points within the same group (n=58). In similar fashion, a decrease in depression risk scores from baseline to 12-weeks was hypothesized. A separate paired samples t-test was used to compare the depression risk values from baseline to 12-week via pre and post interventions measures collected via the MDRS-22. In addition, a third hypothesis was that there would be an improvement in overall health-related QoL as measured by the SF-12 scale at completion of the HAT TRICK program. In order to test this hypothesis, data collected before and after the PA intervention were compared using a third paired samples t-test. An alpha level of  $p < 0.05$  was used to determine statistical significance.

The paired samples t-test compares two means that are from the same data set/participants. These two means typically represent two different time points (i.e., pre-test and post-test with an intervention between them). The purpose of the paired samples t-test is to determine whether there is statistical evidence that the mean difference between paired observations on a particular outcome is significantly different than zero. The variables measured in this test are known as the dependent variables. In this thesis the paired samples t-test was used in the pre-post test analysis as well as to compare means between the change values from baseline to post intervention on the PA levels, MDRS-22 scores, and QoL scores. In order to run a paired samples t-test there are several assumptions that must be met. Firstly, the dependent variable(s) used must be continuous (i.e., interval or ratio level). This assumption was met because all data used were on a continuous ratio scale. Secondly, the data obtained must come from related samples, therefore subjects in the first measurement must also be present in the second measurement. Since the data collected were from one group, this assumption was also

met and any participants who were not present at 12-weeks were not included in the analysis. In some cases, it is preferred that the data be from a random sample from the population. However, most population-based studies do not provide a random sample. An article written in 2004 shows that although random sampling may be preferred, data collected and analysed using a paired samples t test that is not a random sample still provides valid and comparable results (Ernst, 2004).. The data used must also be normally distributed between the paired values and there must be no outliers in the difference between the two related groups. This assumption was met after controlling/removing extreme or unrealistic values and replacing them with mean values for a given variable. A bivariate analysis such as a t-test does not control for potential confounders, or other unmeasured variables that may account for some of the observed changes over time, therefore any changes seen cannot be directly attributed to the PA intervention because there is not a control group to compare change values.

To further analyze the significance of the results obtained by the HAT TRICK study, three multiple regression analyses were conducted. It was hypothesized that depression risk would decrease as health-related QoL increased. Multiple regression analyses are conducted in order to discover supportive evidence for the results found in the previous paired samples t-tests. If the relationship between variables is also found during the multiple regression analysis after controlling for the specific extraneous variables such as age and household income, then the t-test results remain significant. A multiple regression analysis is used to identify potential predictors of the outcome variable while controlling for possible confounders. That way conclusions that were obtained from pre to post intervention t tests are strengthened by the controlling of extraneous variables. In order to examine these relationships, three separate multiple regressions were conducted: 1) between PA change scores and depression risk change

scores while controlling for age, household income, and QoL change scores, 2) between PA change scores and health-related QoL change scores while controlling for age, household income and depression risk change scores, and 3) between depression risk change scores and health-related QoL change scores while controlling for age, household income, and PA change scores

An alpha level of  $p < 0.05$  was used to determine statistical significance. A standard multiple regression was used because it provides the most power with small samples ( $n=58$ ). In a standard multiple regression, multiple independent variables (IV) may be entered at once and each one is assessed on what it adds to the prediction of the dependent variable (DV). Therefore, certain variables were considered the DV in one analysis, but an IV in a different analysis. In this study, the IVs included age, household income, depression risk change, QoL change scores, and PA level change scores. The DVs were PA change score, depression risk change score and health-related QoL change score. Each IV can provide a correlation with the DVs. A standard multiple regression allows for researchers to control for separate variables and determine the correlation as a whole and in parts. This regression also provides the overall best fit (variance explained) of the model and the relative contribution of the predictors to the total variance explained. For this study, this regression analysis allowed us to see the contribution each IV had on the given DV, while simultaneously controlling for the effects of all other independent variables in the equation.

The standard multiple regression was estimated using the REGRESSIONS program on IBM SPSS (Version 21). Seven assumptions needed to be met before a standard multiple regression analysis could be ran. The first assumption was that the DV must be measured on a continuous scale (i.e., either an interval or ratio variable) which was satisfied through the use of total PA time (measured in minutes) and using the total summation of scores from each

participant on the MDRS-22 and total sum scores from the SF-12 from baseline to 12-weeks. The second assumption was that there must be two or more IVs that can be either continuous or categorical, and this was met for all IVs used in these regression analyses (see above for IVs). The third assumption was independence of observations which was checked using the Durbin-Watson statistic on SPSS. Assumption 4 required a linear relationship between the DV and each of the IVs while assumption 5 required homoscedasticity of data, where the variances along the line of best fit remain similar along the line at any given point. This assumption was met through plotting the standardized residuals against the unstandardized predicted values. The sixth assumption was that the data needed to not show any multicollinearity, which occurs when two or more IVs that are highly correlated with each other. Lastly, the data were checked for significant outliers and two participants were removed due to extreme values that were not representative of the population.

### **3.7 Data storage**

Data obtained for this study will remain confidential and securely stored. Participants were identified by participant numbers only. Physical paper-based data is stored in a secure and locked filing cabinet located on the University of British Columbia Okanagan campus in the Physical Health and Activity Behaviour (PHAB) lab, directed by Dr. Cristina Caperchione. Electronic data, such as the questionnaire information and SPSS files, were stored on an encrypted password-protected computer also located in the PHAB lab. Only the primary investigator (Ryley Price) and supervisor (Dr. Cristina Caperchione) had access to these data. Destruction of data will occur at the end of 5 years after data publication in the form of this thesis to ensure that confidentiality will not be breached.

## Chapter 4 Results

The aim of this research was to understand the impact a gender-sensitised PA intervention had on the increase of PA levels as well as the changes in depression risk and health related QoL in inactive (obtaining less than 150 minutes of MVPA per week) and overweight (BMI over 25 kg/m<sup>2</sup>) Canadian men.

### 4.1 Description of Sample

Data from 62 men in the Okanagan Region of British Columbia, Canada were collected at baseline. The majority of the participants were Caucasian (90.3%), while the remaining percentage was made up of Latin, South Asian, West Asian, or other (9.7%). Most of the participants were married or in a relationship (87.1%) and had post secondary education (i.e., college/technical school or university) (90.3%). Participants were largely employed full time (80.6%) with several participants being retired or in part time work (16.1%). The participants had a mean age of  $50.98 \pm 10.08$  with the youngest being 35 and the oldest being 77. Participants at baseline had a mean BMI of  $36.19 \pm 6.02$  kg/m<sup>2</sup>. Table 4.1 shows mean age, age range, BMI category, ethnicity, education level, marital status, employment status, and household income.

### 4.2 Baseline and Follow-up Scores

The dependant variables of interest in this thesis included PA change, risk of depression change, and health related QoL change. Other variables included age and household income. Data were collected at baseline and again at completion of the program (12-weeks). The current thesis used a pre-post data collection strategy that allowed for comparisons to be made across the same group of participants at two different time points. Utilising a paired samples t-test and three multiple linear regressions allowed comparison between baseline and follow-up scores for depression risk, PA levels, and health related QoL.

Table 4.1 *Demographic Characteristics at Baseline*

Variable	Participants %, (n=62)
Age (years)	
50.98 (SD±10.08)	
Age Range	
35-77 years	
Racial Background	
White	90.3 (56)
Metis	1.6 (1)
Latin	1.6 (1)
South Asian	1.6 (1)
West Asian	1.6 (1)
Other	3.2 (2)
Highest level of education	
Some high school or less	1.6 (1)
High school diploma	8.1 (5)
Some post-secondary without diploma or degree	12.9 (8)
College or technical diploma or certificate	33.9 (21)
University degree	43.5 (27)
Marital Status	
Married or living with a life partner	87.1(54)
Single/ Never Married	3.2 (2)
Divorced	4.8 (3)
Widowed	1.6 (1)
Separated	3.2 (2)
Main Activity	
Full time work	80.6 (50)
Part time work	1.6 (1)
Caring for family/managing household	1.6 (1)
Retired	14.5 (9)
Other	1.6 (1)
Income	
25,000-34,99	3.2(2)
35,000-49,999	6.5(4)
50,000-74,999	16.1(10)
75,000-99,999	25.8 (16)
100,000 or more	48.4 (30)
BMI ( $kg/m^2$ ) <sup>c</sup>	
Overweight (25-29.9)	8.1 (5)
Obese Class 1 (30-34.9)	33.9 (21)
Obese Class 2(35-39.9)	40.3 (25)
Obese Class 3 (40+)	17.7(11)

#### **4.2.1 PA levels and Health related Quality of Life**

Baseline PA levels varied greatly among participants with a mean score of 227.16 minutes and a SD of 224.21. A pre-requisite for enrollment in the HAT TRICK program was that each participant must get less than 150 minutes of PA per week. Potential reasons for this higher than expected level of self reported PA at baseline are outlined in the discussion chapter.

According to questionnaire data, 36 participants (58.1%) met Canada's PA guidelines to be considered active while 26 (41.9%) did not. Two participant values were replaced with the mean score due to unrealistic self-report values (>2000 minutes of PA per week at baseline). At 12-weeks the participant mean for PA was 438.07 minutes with a SD of 276.35. One value (>2000 minutes at 12-weeks) was deemed to be an outlier and was replaced with the 12-week PA mean. At the conclusion of the HAT TRICK program 91.4% (n=53) of participants were deemed active by meeting Canada's PA guidelines (150 minutes of PA per week). The SF-12 QoL measure showed a mean of 40.8 (SD=5.95) with a minimum score of 25, and a maximum score of 52. At 12-weeks the mean for QoL was 43.36 with a SD of 6.7. The minimum score was 27, and a maximum of 52.

#### **4.2.2 MDRS-22**

Mean scores for the MDRS-22 at baseline were 27.17 (SD= 17.53). Scores were then assigned to a risk category (Low, Elevated, High, Extreme) developed by the creator of the questionnaire (Rice, Oliffe, Kealy, & Ogrodniczuk, 2018). Table 4.2 & 4.3 break down the frequency of scores in the risk categories provided by the MDRS-22 at baseline and follow-up.

Table 4.2 *MDRS-22 Risk Cut off Points at Baseline*

	Frequency	Percent	Valid Percent	Cumulative Percent
0-31 Low	39	62.9	62.9	62.9
32-50 Elevated	17	27.4	27.4	90.3
51-86 High	6	9.7	9.7	100.0
Extreme	0	0	0	100.0
Total	62	100.0	100.0	

Mean scores for the MDRS-22 at 12-week follow up were 20.98 (SD= 15.50). A mean decrease of 6.2 (27.1774-20.9828) was observed from baseline to follow-up at 12-weeks. The number of participants (n=17) in the elevated score section (32-50) of the MDRS-22 at baseline was reduced to 6 participants with all of them moving down into the low risk section increasing the percentage of participants at low risk from 62.9% to 77.6%, a gain of 14.7%.

Table 4.3 *MDRS-22 Risk Cut off Points at 12- week Follow up*

	Frequency	Percent	Valid Percent	Cumulative Percent
0-31 Low	45	72.6	77.6	77.6
32-50 Elevated	6	9.7	10.3	87.9
51-86 High	7	11.3	12.1	100.0
Extreme	0	0	0	100.0
Total	58	93.5	100.0	100.0
Missing	4	6.5		
Total	62	100.0		

The MDRS is broken down further into 6 subtypes/categories which include emotional suppression (ES) drug use, alcohol use, anger and aggression, somatic symptoms, and risk taking. The MDRS-22 is shown below in its entirety along with a detailed scoring of the subtypes at baseline and at follow-up in Table 4.4 and 4.5. This detailed analysis was conducted in order to further unpack the evidence acquired in support of the hypothesis that depression risk would decrease after participation in PA interventions (such as the HAT TRICK PA program). The MDRS-22 results provide detailed information on which aspects of depression risk are

impacted after participating in the HAT TRICK program. The largest changes were seen in the emotional suppression subscale after the completion of the HAT TRICK program. A decrease from a mean of 11.75 out of a possible 28 down to 9.77 at follow-up (12-weeks) was also seen in the ES section. This represents a mean decrease of 1.98 points after participants took part in the HAT TRICK program. As shown in Table 4.5 decreases in mean scores were also observed in four other subscales: anger & aggression (1.52), somatic symptoms (1.39), alcohol use (1.21), and risk taking (0.18). The drug use subscale was the only one to show a very small (0.10 points) increase at the conclusion of the program.

Table 4.4 *MDRS-22*

MDRS-22 item	Subscale	Range	Mean (Baseline)	SD (Baseline)	Mean (Follow-up)	SD (Follow-up)
1. I bottled up my negative feelings.	ES	0-7	3.2742	2.01770	2.5682	1.65471
2. I covered up my difficulties.	ES	0-7	2.9355	2.27510	2.4310	1.91130
3. I drank more alcohol than usual.	Alcohol	0-7	1.1935	1.89770	0.7931	1.41122
4. I drove dangerously or aggressively.	Risk	0-7	1.0161	1.43140	0.9828	1.43260
5. I had more heartburn than usual.	Somatic	0-7	1.2742	1.66122	0.7586	1.23275
6. I had regular headaches.	Somatic	0-7	1.1452	1.77271	0.6034	1.13848
7. I had stomach pains.	Somatic	0-7	0.5000	1.21129	0.3276	0.86629
8. I had to work things out by myself.	ES	0-7	3.4355	2.31617	3.1379	2.25130
9. I had unexplained aches and pains.	Somatic	0-7	1.5645	1.99689	1.4138	2.03508
10. I needed alcohol to help me unwind.	Alcohol	0-7	0.8871	1.74717	0.5345	1.31410
11. I needed to have easy access to alcohol.	Alcohol	0-7	0.5484	1.55245	0.3621	1.02081
12. I overreacted to situations with aggressive behaviour	Anger	0-7	1.5000	1.59662	1.1379	1.46836
13. I sought out drugs.	Drug Use	0-7	0.0484	0.28211	0.1552	0.55573
14. I stopped caring about the consequences of my actions.	Risk	0-7	0.5484	1.14057	0.3966	0.99012
15. I stopped feeling so bad while drinking.	Alcohol	0-7	0.6744	1.46851	0.4035	0.97942
16. I took unnecessary risks.	Risk	0-7	0.5806	1.37362	0.5862	1.10873
17. I tried to ignore feeling down.	ES	0-7	2.1129	1.83861	1.6207	2.01597
18. I used drugs to cope.	Drug Use	0-7	0.1774	0.75800	0.1034	0.44681
19. I verbally lashed out at others without being provoked.	Anger	0-7	1.0161	1.49850	0.7586	1.15941
20. I was verbally aggressive to others.	Anger	0-7	1.4194	1.62509	0.8793	1.21507
21. It was difficult to manage my anger.	Anger	0-7	1.0968	1.57553	0.7414	1.31870
22. Using drugs provided temporary relief.	Drug Use	0-7	0.2097	0.85194	0.2759	0.95133

Table 4.5 *MDRS-22 Subscale Scores*

Subscale / Total score	Scale ±	Range	Mean (Baseline)	SD(Baseline)	Mean (Follow-up)	SD(Follow- up)	Mean Difference	SD Difference
MDRS- Emotion Suppression Subscale	0.87	0-28	11.7581	8.44758	9.7758	7.83328	1.9823	0.61430
MDRS - Drug Use Subscale	0.96	0-21	0.4355	1.89205	0.5345	1.95387	-0.099	-0.06182
MDRS - Alcohol Use Subscale	0.94	0-28	3.3064	6.66762	2.0932	4.72555	1.2132	1.94207
MDRS - Anger & Aggression Subscale	0.93	0-28	5.0323	6.29579	3.5172	5.16154	1.5151	1.13425
MDRS- Somatic Symptoms Subscale	0.87	0-28	4.48939	6.64211	3.1034	5.2726	1.38599	1.36951
MDRS- Risk Taking Subscale	0.83	0-21	2.1454	3.94559	1.9656	3.53145	0.1798	0.41414
MDRS-22 total score	0.95	0-154	27.1774	17.52518	20.9828	17.50438	6.1946	0.02081

### **4.3 Paired Samples t-test**

It was hypothesized that HAT TRICK program participants would report an increase in PA levels, improved depression risk and improved health related QoL from baseline to the completion of the program (12-weeks). Three paired samples *t* tests were conducted to test these hypotheses. One paired samples *t* test was conducted using pre-post intervention data for PA change, a second *t* test was conducted regarding depression risk changes (MDRS-22), and a third *t* test using pre-post intervention data on health related QoL changes (SF-12).

#### **PA Change**

A paired samples *t* test was conducted to examine the change in PA (measured in minutes) from baseline to 12-weeks post intervention. This *t* test was conducted in order to test the hypothesis that there would be a significant increase in PA levels from baseline to 12-weeks after participating in the HAT TRICK PA program. There was a significant difference between baseline scores for PA ( $M=231.53$ ,  $SD=225.80$ ) and 12-week scores ( $M=477.27$ ,  $SD=369.11$ );  $t(57)=-4.45$ ,  $p=0.000$ .

#### **Depression Risk Change**

A second paired samples *t* test was conducted to examine baseline MDRS-22 scores with post-intervention MDRS-22 scores. This *t* test was conducted to test the hypothesis that we would see a significant decrease in depression risk scores from baseline to 12-weeks after participating in the HAT TRICK PA program. There was a significant difference in the scores for the MDRS-22 from baseline ( $M=26.74$ ,  $SD=17.73$ ) and post intervention ( $M=20.98$ ,  $SD=17.50$ ) conditions;  $t(57)=3.69$ ,  $p=0.000$ .

### **Health-related QoL Change**

A third paired sample *t* test was conducted on QoL scores. This *t* test was conducted to test the previously mentioned hypothesis that after participating in the HAT TRICK program, participants would see a significant increase in self-perceived health-related QoL from baseline to 12-weeks. There was a significant difference between scores at baseline (M=40.93, SD= 5.98) and 12-weeks (M=43.36, SD=6.70);  $t(57) = -3.23, p=0.002$ .

### **4.4 Multiple Regression**

Three standard multiple regressions were performed in order to further examine the results of the paired samples *t* tests. The dependent variables in the multiple regressions were PA change scores, depression risk change scores, and health related QoL scores. The independent variables included age, household income, PA change scores, depression risk change scores, and health-related QoL change scores. Due to the nature of the multiple regression analysis, a variable of interest can be selected as the DV, while all other variables remain IVs. As different variables of interest are selected they become the DV (Konasani & Kadre, 2015). Analysis was performed using IBM SPSS REGRESSION and DESCRIPTIVES and EXPLORE functions for evaluation and assumption testing. Results from the evaluation of assumptions and data led to some transformation of certain participant scores to reduce standard deviations for PA change (mean replacement for 2 participants with unrealistic change values). This was done in order to reduce the number of outliers and improve the normality, linearity, and homoscedasticity of the data. With the use of a  $p < .001$  criterion the Mahalanobis distance was met. Four cases had missing data and were excluded leaving a sample of N=58 for this analysis. The bivariate correlations are shown in the table below.

Table 4.6 *Bivariate Correlations of Baseline and 12-week Values (p<0.05)*

Variables	1	2	3	4	5
1. MDRS Change	-	.001	.188	.746	.180
2.QoL Change		-	.351	.746	.477
3. Household Income			-	.538	.206
4. PA Change				-	.589
5. Age					-

### **PA Change Score and Depression Risk Change Score**

The first multiple regression was calculated to predict depression risk change scores based on PA change scores, while controlling for QoL change scores, age, and household income. A significant regression equation was found ( $F(4,51)=4.449, p<.004$ ), with an  $R^2$  of .259 and an adjusted  $R^2$  of .201. Participants MDRS-22 change score is equal to  $-2.527-.115(\text{age})+2.244(\text{household income})+1.007(\text{health change})-3.552(\text{PA change})$ , where PA change was measured in minutes, QoL change was measured in unit changes, age was measured in years, and household income was coded as 1= less than 25,000 2= 25,000-34,999 3= 35,000-49,999 4=50,000-74,999 5=75,000-99,999 6=100,00 or more. There was no significant relationship found between PA change scores (-3.552) and depression risk change scores (-2.527). The significant regression equation was due to the significant relationship between the dependent variable of depression risk change score and the independent variable of health related QoL change score.

### **PA Change Score and Health-related QoL Change Score**

The second multiple regression was calculated to predict changes in health-related QoL scores based on PA change scores, while controlling for depression risk change scores, age, and household income. A significant regression equation was found ( $F(4,51)=3.807, p<.009$ ), with an  $R^2$  of .230 and an adjusted  $R^2$  of .170. Participants predicted health-related QoL change scores is equal to  $5.741+.000$  (PA change)  $+.217$ (MDRS change)  $+.002$  (Age) $-.883$  (Household income), where PA change is measured in minutes, MDRS change measured in unit changes, age in years, and household income is coded as 1= less than 25,000 2= 25,000-34,999 3= 35,000-49,999 4=50,000-74,999 5=75,000-99,999 6=100,00 or more. Participants health related QoL change score was unaffected by PA change score when controlling for depression risk change score, age, and household income. There was a significant regression equation due to the significant relationship found between depression risk scores and health-related QoL scores.

### **Depression Risk Change Score and Health-related QoL Change Score**

A third and final multiple regression was calculated to predict depression risk change scores based on health-related QoL change scores while controlling for PA change scores age, and household income. A significant regression equation was found ( $F(4,51)=4.449, p<.004$ ), with an  $R^2$  of .259 and an adjusted  $R^2$  of .201. Participants MDRS-22 change score is equal to  $-2.527-.115$  (age) $+ 2.244$  (household income)  $+1.007$  (health change) $- 3.552$ (PA change), where PA change was measured in minutes, health-related QoL change was measured in unit changes, age was measured in years, and household income was coded as 1= less than 25,000 2= 25,000-34,999 3= 35,000-49,999 4=50,000-74,999 5=75,000-99,999 6=100,00 or more. Depression risk change scores increased 1.007 units for every unit change in health related QoL change scores. A significant relationship was found between depression risk change score and health-related

QoL change scores. Only health related QoL change score was a statistically significant predictor of depression risk change scores ( $p=0.000$ ). Physical activity, age, and household income did not contribute to changes in scores for health or depression risk change scores. Table 4.6 explains the bivariate correlations among the independent and dependent variables used throughout this study. These results are discussed and explained, with reference to the research literature, in the following chapter.

## Chapter 5 Discussion

The following chapter discusses the main findings of this study with reference to the existing research literature. The main results were that participants in the 12-week PA intervention HAT TRICK demonstrated increased PA levels and improved health-related QoL, as well as a decreased depression risk at the end of the program. Findings from this study are supported by current literature on depression treatment and prevention using PA interventions (Bhui & Fletcher, 2000; Cooney et al., 2014; Fox, 1999; Goodwin, 2003; Hallgren et al., 2016; Hallgren et al., 2017; Hegberg & Tone, 2015; Lindwall et al., 2014; Mammen & Faulkner, 2013). The primary findings of this thesis showed that community PA interventions can result in an increase in PA levels from baseline to 12-weeks, as well as improvements in health-related QoL and decreased depression risk. The findings of this study also begin to provide evidence for the use of gender-sensitised PA programs as a way to increase PA levels and improve health-related QoL scores. Decreased depression risk scores at the conclusion also support current literature for the use of PA programs as a preventive measure against the development of depression in men. Although the results regarding PA level increases, depression risk decrease, and health related QoL increase found in the paired samples t tests were not further supported by the regression analysis, a relationship between variables may still be present, just not statistically significant. The statistically significant relationship found between depression risk change scores and health-related QoL change scores is worth exploring in more depth.

### Physical Activity

As mentioned previously, the HAT TRICK program is a gender sensitised PA intervention created to specifically impact PA in men (Caperchione et al., 2017). In the current study, PA levels nearly doubled throughout the 12-weeks. Although PA levels at baseline were

high in comparison to the general population, there was still a large increase in PA levels across participants. This impact may have directly resulted from the strategy to increase PA through a tailored approach and environment, where men felt comfortable engaging in new PA behaviours. Men also were encouraged to express their ideas associated with PA in a group of their peers without feeling judged or scrutinized. It has been shown in recent research that maintaining the masculine ideals of male participants throughout a PA program can result in greater adherence and increased PA (Allison et al., 2005; Hunt et al., 2014). A primary reason PA levels increased, and the HAT TRICK program was so successful, may have been due to the way the program focused on masculine ideals and provided activities that could work for all participants, avoiding any emasculation by an inability to perform a certain activity. This design allowed for the men to maintain a feeling of control over their own health. For instance, many of the PAs did not require equipment and were modified to be able to be done at home giving participants the ability to do them on their own time. Also, these activities were structured to appeal to men through the use of strength training and functional movements that could improve activities of daily life.

Participants were also introduced to a variety of activities (e.g., Strength training, Yoga, HIIT, Martial Arts, Circuit training) throughout the 12 weeks. Previous research has highlighted the importance of including a variety of PA for men as an important way to keep men engaged and has been reported to assist with adherence (Jefferis et al., 2014; Noon, Nwose, & Breheny, 2018; Sallis, Hovell, & Hofstetter, 1992). Additionally, the PA delivered in HAT TRICK was progressive in nature and allowed for modifications to fit the fitness level and abilities of each participant. This overall structure for delivering and implementing PA within the program may have contributed to the increase in PA. The HAT TRICK intervention also fostered men's self-management for increasing PA. All topics throughout the program were tailored to be appealing

to men. This was done through every facet of the program including information delivery, content discussed at the weekly meetings, and the context in which methods to increase PA were discussed. The hands-on activity-based nature of the program was tailored to men to keep them interested and to address the goal of becoming more active. It was also stressed that HAT TRICK was primarily a place to come and be active with peers to provide social support for a positive change in behaviour. The amenities of the hockey arena, including the hockey rink itself, as well as the sports memorabilia lining the walls, catered to masculine ideals reinforcing sport and competition and allowed for men to be active in a setting that encouraged activity. As men are a notoriously hard to reach population regarding PA interventions (Carroll et al., 2014; Pringle et al., 2013; Zwolinsky et al., 2012), a program designed to meet the specific needs and preferences of men was a clear key to increasing PA participation and adherence.

Moreover, specific components of the program, particularly the goals/challenges set forth each week, instilled accountability in participants and kept the goals of the program clear. Every week participants were given goals for PA, healthy eating, and steps per day that gradually increased as the program progressed. Additionally, take home messages were provided to participants (e.g., keep it simple, fit in PA where you can, think of healthy food swaps, don't change much just a little) as a way to further support a positive change in PA behaviour. Increase daily and weekly steps were a primary focus for PA but other goals for increasing PA, such as participating in community sports, engaging in strength training or participating in a circuit type workout on additional days outside of the program, were also encouraged. Each week participants were encouraged to adopt new PA goals as well as increase their step counts throughout the week. These goals were discussed at the beginning of each session to determine how everyone fared and if there was any trouble in reaching them. Additional modifications to

goals were explained if participants had trouble reaching them (e.g., if they could not complete the circuit some of the exercises were removed to make it shorter and potentially more manageable). Participants were also encouraged to track and self monitor how these goals worked or didn't work for them and then discuss their experiences the following week. This was done with the intention that other participants may benefit from these first-hand experiences and these goals could be modified to better suit the participants in the future. This accountability likely contributed to the large increases in PA from baseline to 12-weeks. Similar gender sensitised PA interventions that use weekly check-ins and goal setting have produced increases in PA as well as PA adherence in men (Gray et al., 2013; Morgan et al., 2016; Pringle et al., 2013).

Furthermore, this PA intervention focused largely on increasing daily steps with a 10,000 step per day goal in mind. As seen in multiple PA interventions, 10,000 steps per day often results in meeting weekly PA guidelines and has been associated with physical and mental health benefit (Choi, Pak, & Choi, 2007; Hunt et al., 2014; Poirier et al., 2016; Sharp & Caperchione, 2016). A pedometer-based walking program for men was implemented by Hunt et al. (2014). Study results indicated that men appreciated the use of the pedometer technology, and that tracking their steps in this way motivated them to work towards self-defined goals and increase their PA. In the HAT TRICK program, a Fitbit was given to each participant to help motivate them and assist them with self-monitoring and PA motivation. Fitbits and other forms of technology-based PA tools (i.e., pedometers) have been shown to be a tangible tool to help motivate men and improve participation in PA (Dean, Griffith, McKissic, Cornish, & Johnson-Lawrence, 2018; Edwards, 2017; Rosenberg et al., 2016).

Throughout the HAT TRICK program, participants anecdotally reported meeting their PA goals and as these goals were met their confidence in their abilities may have increased. This confidence can be referred to as improved self-efficacy (Bandura, 1977), which is defined as the belief a person has in themselves to succeed or accomplish a specific task. Current literature surrounding the effectiveness of PA interventions for men has uncovered the importance of self efficacy to increase program adherence and to adapt these behaviours over the long term (Jemmott III et al., 2015; Sallis et al., 1992). Participants were always encouraged to push themselves and improve on what they were capable of throughout the program. This encouragement may have allowed participants to learn something new and become more comfortable and build their self-efficacy further. Moreover, the HAT TRICK program also facilitated many opportunities to practice new skills, allowing ample time during each session to review, make modifications and ask questions about the new information or activities. Allowing time to practice and master skills is a recognised key component to increased self-efficacy (Bernacki, Nokes-Malach, & Alevan, 2015) and thus may have contributed to the increased PA reported in this study.

Although the increase in PA levels was a positive outcome, it should be noted that a number of participants (58%) reported meeting PA guidelines at baseline. Examining the baseline self-report PA levels and comparing those to the average adult male population (only 18% of adult males over the age of 18 currently meet Canada's PA guidelines) (Statistics Canada, 2017) may raise some questions as to why the participants in this study reported such high values. Firstly, the participants of this study volunteered to participate in the HAT TRICK program. Previous research has suggested that those who volunteer to participate in health promotion interventions are highly motivated to change their current behaviours (Downs, Van

Hoomissen, Lafrenz, & Julka, 2014; Kinnafick, Thøgersen-Ntoumani, & Duda, 2016), and thus may have already started to work towards this by initiating PA prior to the program. This may be further compounded by the fact that recruitment of participants occurred a few weeks before the start of the program and subsequently before baseline data collection. Despite being instructed to maintain normal behaviour participants may have increased their PA in preparation for the program. Secondly, the high proportion of participants meeting PA guidelines at baseline could also be explained by the use of the Godin Leisure Time Physical Activity Questionnaire-GLTEQ (Godin & Shephard, 1985) which asked participants to reflect on the previous week in terms of their PA participation. Thus, if participants were highly motivated to participate in HAT TRICK and initiated some PA prior to the start of the program, then this may have been reflected in the GLTEQ.

The high levels of PA seen at 12-weeks may have also played a role in the improvement of depression risk and QoL. Although no statistical significance was found relating increases in PA to improvements in depression risk or health related QoL, previously mentioned literature has found direct links between these variables. Also, through the use of a paired samples t test, we are only able to see that there is in fact a difference in depression risk and health-related QoL from baseline to follow-up, but we are unable to say that it is a direct result of the PA intervention. In future, the use of a control group would allow for direct comparisons to be made. The results of the multiple regression analysis also did not provide further support for PA as a significant factor for change in depression risk or health related QoL. However, positive changes were still seen in both of these variables. These outcomes are discussed in further detail below.

## **Depression Risk**

A significant difference in depression risk was seen in this study from baseline to 12-weeks when examined using a paired samples t test. Specifically, many participants (78%) moved down from the elevated risk category into the low risk category. Depression risk was higher in those who were less physically active at baseline and at 12-weeks which is consistent with current literature (Hamer & Smith, 2018). The current study utilised a PA intervention to provide a means of healthy behaviour change, which in turn may have been a contributing factor in reducing depression risk in an otherwise at-risk population (i.e., overweight and inactive men) (Armstrong et al., 2017; Hamer & Smith, 2018). However, when examined further using a multiple regression analysis, no significant relationship between PA change score and depression risk change score was found. Therefore, the decrease in depression risk scores observed at the end of the program can not be said to be directly related to increased PA levels. None the less, a positive change (i.e. a decrease) in depression risk was observed in participants after participating in the HAT TRICK PA program. Specifically, participants saw the largest decrease in the emotional suppression sub category of the MDRS-22. Five of a possible six sub categories for depression risk decreased after the conclusion of the HAT TRICK program. A potential reason for a decrease in risk of depression may be due to an increase in PA levels. It is well known that PA is beneficial for overall health in men (Bottorff et al., 2015b; Gray et al., 2013; Hunt et al., 2014) and is often used as a treatment method for mental health disorders (Mammen & Faulkner, 2013; Martinsen, 2008; Michie et al., 2009; Pareja-Galeano, Sanchis-Gomar, & Lucia, 2015; Tremblay et al., 2011). Specific to depression, a review conducted by Mammen and Faulkner (2013) found that 25 out of a total 30 studies that utilised PA as a preventive measure against depression reported a significant inverse relationship, where as PA levels increased

depression risk decreased.

Past research has indicated that men are significantly less likely than women to seek help regarding mental health issues and therefore are hard to reach for treatment (Addis & Mahalik, 2003; Berger et al., 2013; Hammer & Vogel, 2010; Rice et al., 2017). As such, depression diagnosis is reported to be low, yet depression risk is often high because men do not seek preventive health measures (Rice et al., 2017). A combination of depression manifesting itself differently in men (i.e. showing anger early on) and the lack of services available for men, may result in further depression development without treatment (Hammer & Vogel, 2010). To increase the number of men participating in healthy behaviours that may reduce depression risk, a PA intervention designed for men may be a viable option. The decrease in depression risk observed in the participants of the HAT TRICK program provides some support for this hypothesis. Similarly, Pringle et al. (2013) attempted to reach men who did not seek clinical help (i.e., doctor's treatment for mental or physical ailments) by involving English Premier League Football Clubs to increase PA in men. The involvement of local sports teams may be an integral part of PA interventions involving men. A sense of belonging is associated with being fans of these clubs and by participating in a program alongside their favorite football club may contribute to their continued participation. Similarly, Hunt et al. (2014) developed the Football Fans in Training (FFIT) Program. This program was tailored to men via the link with local professional soccer teams and focused largely on the comradery between participants and the feeling of belonging to the soccer team. The results from FFIT focused on QoL and selected mental health indicators rather than risk of depression. Researchers found that participants who increased their PA also reported positive changes in QoL and scored higher on the mental health portion of the surveys at the conclusion of the 12-week program. These improvements were

maintained at the 12-month follow-up. Evaluations of other similar gender-sensitised programs tailored specifically for men, including Men on the Move (Carroll et al., 2018), Hockey Fit (De Cruz, 2016) and Tackling Men's Health (Witty, 2011) have also supported these findings.

Additionally, one of the primary components of programs like FFIT and Hockey Fit as well as Tackling Men's Health was the importance of comradery and social connectedness amongst the men (De Cruz, 2016; Witty, 2011; Wyke et al., 2015). This sense of comradery and belonging may have played a large role in the decrease in emotional suppression subscale of the MDRS-22. Research has indicated that developing comradery and connectedness, particularly amongst men, has been found to be positively associated with improvements in depression and mental health issues (Caperchione et al., 2017; Creaven, Healy, & Howard, 2017; Santini, Koyanagi, Tyrovolas, Mason, & Haro, 2015; Wyke et al., 2015). Feeling a sense of belonging and a belief that they are in a safe space among fellow men may have contributed to the changes in emotional suppression seen at the conclusion of the program. This study found that improvements in health-related QoL were associated with decreases in depression risk. A statistical significance was found between depression risk change scores and health-related QoL change scores after the conduction of a multiple regression when PA levels, age, and household income were controlled. The HAT TRICK program was designed to promote social connectedness and improve health-related QoL. The gender-sensitive group setting (i.e. in a hockey rink surrounded by sporting memorabilia and gym equipment) may have also been a contributing factor for the decrease in depression risk and improvements in health related QoL. HAT TRICK focused on group discussion about multiple topics including PA, healthy eating, and mental health. Specifically concerning mental health, topics surrounding a healthy work-life balance, managing time in the day to focus on personal health and feelings, and the effect of

burn-out (over work and no time for relaxation) were discussed. Within this context, men began to discuss their own personal struggles with both diet and mental health and were affirmed by other participants in the program.

Furthermore the HAT TRICK program aimed to create a supportive environment for discussions. Providing men opportunities to discuss how they feel in a comfortable environment has been seen to positively impact depression risk (Moylan, Carey, Blackburn, Hayes, & Robinson, 2015). An example that provides a similar service is The Men's Shed programs (Taylor, Cole, Kynn, & Lowe, 2017). Men's Sheds provide space for men to come and discuss different topics with other men in a setting in which would be traditionally masculine (e.g. woodworking areas, warehouses). These sheds have been shown to provide men with multiple health and well-being benefits including improved self-esteem and empowerment as well as encouraged inter-personal relationships (Moylan et al., 2015). It is possible that the similar 'man-friendly' environment created in HAT TRICK helped combat the stigma associated with masculinity and mental health, which may have further assisted with the decrease in depression risk.

Changes in depression risk and increases in PA at the end of the HATTRICK program highlights the need for more research into PA and depression in men. Although there was a positive change in depression scores at the conclusion of the program, statistical analysis did not find a significant relationship between PA and depression risk. Also, through the use of a paired samples t test, we are unable to conclude that it was in fact the HAT TRICK PA program that impacted depression risk. However, the relationship between health-related QoL and depression risk change score is a result worth exploring further. In order to determine a causal relationship, future studies need to be done to include an experimental group as well as a control group. The

results of this study are promising and provide direction for exploring factors that influence men's depression risk. The creation of a program specific to men that addresses mental health in a way that is not stigmatising and is done in an environment that creates a sense of comradery and social connectedness shows promise.

### **Health-related Quality of Life (QoL)**

Another key finding from the current study was an increase in health-related QoL from baseline to 12-weeks when examined using a paired sample t test. There is a great deal of research regarding an increase in PA levels in men and a positive impact on perceived QoL (Balboa-Castillo, León-Muñoz, Graciani, Rodríguez-Artalejo, & Guallar-Castillón, 2011; Gill et al., 2013). Similar to the findings surrounding risk of depression, it is possible that the increase in PA levels seen across the duration of the HAT TRICK program may be partially responsible for the increase in QoL. Similar to the depression results earlier, an increase in PA was not a significant predictor of improvements in QoL scores. That being said, current literature supports the idea that an increase in PA results in better QoL (Broekhuizen et al., 2016; Gill et al., 2013; Herman, Hopman, Vandenberg, & Rosenberg, 2012). Herman, Hopman, and Vandenberg (2012) examined survey data from 22,563,527 Canadian adults and found those who were inactive reported poor or fair levels of QoL. In comparison, they also found that men who were deemed active reported higher QoL than those who were inactive (Herman, Hopman, & Vandenberg, 2012). Comparable results were also obtained by Balboa-Castillo et al. (2011) who found that men who engaged in more leisure-time physically active (LTPA) reported better QoL, and those in the highest quartile of LTPA saw better scores on specific QoL domains, including physical and social functioning, emotional role, and mental health. Improvements in QoL were seen at the conclusion of the HAT TRICK program. A portion of these results were

mirrored in the HAT TRICK results, specifically in regard to higher levels of PA improving health-related QoL more than participants with lower PA levels. This further contributes to the research literature, supporting the evidence that suggests that engaging in more PA provides greater health benefit than only meeting the recommended PA guidelines (i.e., >150 minutes a week of moderate to vigorous physical activity) (Tremblay et al., 2011; Warburton, Katzmarzyk, Rhodes, & Shephard, 2007).

A potential way in which a PA program like HAT TRICK may influence health-related QoL could be due to an increase in skill mastery and increased ability to perform new PA and exercises. As participants of the HAT TRICK program improved their physical health and fitness through an increase in activity, new abilities (e.g., jogging, push-ups, jumping jacks) or skills (e.g., balance, posture) were developed. A new ability, or the re-emergence of an old ability that was thought to be unattainable, may have motivated the participants to continue with their positive health behaviours. Research has shown that an increase in ability helps improve self-efficacy and motivation to continue to maintain a new behaviour (Bandura, 1977; Maddux, 2016; Williams & French, 2011). Current literature highlights the importance of comfort, suggesting that men who are more comfortable in their environment are more likely to feel confident about attempting more modes of PA and benefit greatly from a feeling of accomplishment of new abilities (Pringle et al., 2013; Witty, 2011). This feeling of accomplishment may have persisted week-to-week leading to an increase in perceived QoL thanks to increased abilities and accomplishments.

The HAT TRICK team aimed to facilitate a comfortable environment by delivering the program in a 'man-friendly' setting such as an ice hockey arena. This setting was a perfect choice for these men as the majority of them were local hockey fans. Even for those who were

not hockey fans, the environment created was ‘man friendly’ in other ways as well. For example, this program was set in the evening where the men in the program were the only people in the immediate area, so their privacy was not impacted, and they could be comfortable. Also, within the hockey arena there was plenty of hockey memorabilia and the entire environment was designed around hockey and sport. Moreover, the elite hockey team would often practice during the times that HAT TRICK was being delivered, which may have also added to the sporting environment. Workouts were also conducted within the vicinity of the concession and bar area, where many jokes were made about earning a beer for the night. A similar strategy was used in the FFIT program in which the intervention was delivered in partnership with local Scottish professional football (i.e. soccer in North America) teams at the venues in which they trained and played their matches. This strategy was also successfully utilised to create a man-friendly environment by Witty et al. (2011) and De Cruz et al. (2016), who developed a gender-sensitised weight loss program for men in partnership with professional rugby clubs in Australia and hockey teams in Ontario, Canada (De Cruz, 2016; Witty, 2011; Wyke et al., 2015). It could be suggested that these ‘man-friendly’ environments created a sense of comfort amongst the participants which positively influenced their confidence and improved their self-efficacy, resulting in increases in perceived QoL. Furthermore, men were able to attempt activities at different levels of difficulty and progress to the next level once each stage was mastered. This step-by-step improvement, within a comfortable and relaxed environment, may have increased feelings of accomplishment and skill mastery, thus resulting in greater QoL.

Additionally, participants of the current study may have been exposed to their first feelings of exercise-induced euphoria or simply were positively impacted by a new sense of accomplishment. There is a wide variety of literature available regarding the increase in hormone

release post PA that can lead to an elevated mood (i.e. “runners high”) (Berger, Darby, Zhang, Owen, & Tobar, 2016; Mcdowell, Campbell, & Herring, 2016; Powers, Asmundson, & Smits, 2015) and it is this elevated mood that may offset the feelings of hopelessness and sadness brought on by depression (Berger et al., 2016). The men who participated in the HAT TRICK program underwent at least one PA session per week delivered and monitored by trained facilitators, which alone can be enough to improve hormone secretion and thus positively affect mood (Cohen-Woods et al., 2013).

As a person improves more aspects of their personal health, their perceived QoL may also improve (Medeiros, Sousa, Lunardi, Oliveira, & Freitas, 2017). The HAT TRICK program attempted to improve QoL by providing an all-encompassing holistic approach to healthy lifestyle behaviour change. This was done through focusing on multiple factors that improve overall health including diet, PA, social connectedness, and mental health. Similar studies also report that QoL in men is impacted by a variety of factors including dietary changes and social support (Hunt et al., 2014; Morgan, Hayes, Williamson, & Ford, 2007; Morgan, Lubans, Collins, Warren, & Callister, 2011; Wyke et al., 2015). A systemic review conducted by Johns, Hartmann-Boyce, Jebb and Aveyard (2014) compared the impact of weight loss programs that used multiple behavioural weight management techniques with those that only focused on diet or PA alone. Examples of these additional techniques included the impact of healthy lifestyle behaviour change on mental health, ways to lower alcohol consumption, and how PA impacts QoL. These researchers found that the programs that used multiple techniques found significantly greater weight loss at 12-months in comparison to the diet only programs, and significantly greater weight loss for the combined group compared to a PA only group at 3-6 months (Johns, Hartmann-Boyce, Jebb, Aveyard, & Group, 2014). This study also found that

improvements in disease risk factors and QoL were observed with a modest loss of weight.

When addressing more than one health behaviour it has been recommended that doing this incrementally and focusing on making small changes in these areas is helpful (Kirkland & Raphael, 2018). Previous research has indicated that small changes over time allow for men to manage gradual changes in healthy lifestyle behaviour (Helgadóttir, Forsell, & Ekblom, 2015; Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). A recent men's health initiative led by the Canadian Men's Health Foundation (CMHF) called Don't Change Much has stressed this very same point, that small changes make all the difference (Canadian Men's Health Foundation, 2018). Don't Change Much is a web-based resource for healthy living specifically created for men and provides a wide variety of tools for men to make small but meaningful changes to their lifestyle. This attitude was mirrored in the HAT TRICK program and may have been an important factor regarding the healthy lifestyle behaviour changes that resulted in improved QoL.

In the HAT TRICK program specific small changes concerning PA, diet and mental health were discussed weekly and often included interactive small group work to further discuss and learn about ways to adopt these small changes. For example, one of these topics included making small changes when the men were out for dinner with friends or family. Specifically, it was discussed and demonstrated (with label reading and restaurant menus) that choosing a burger made of a higher quality beef when applicable and then opting to order half fries-half salad rather than a higher fat burger and only fries, was on way to make a small change.

An increase in QoL is strongly correlated ( $p=0.002$ ) with a decrease in feelings of depression (Schuch, Vancampfort, Rosenbaum, Richards, Ward, & Stubbs, 2016). As seen through the use of the multiple regression analysis, a statistically significant relationship between

depression risk change scores and health-related QoL change scores was found. As outlined above, the improvement in depression risk at the end of the HAT TRICK program may be a result of improved QoL. Negative feelings about one's self may be negated by the improvement in self efficacy and QoL due to participation in the HAT TRICK program. As the men work to improve their health through PA and dietary changes as well as by developing a sense of belonging and connection to their peers, it may create an all-encompassing change in behaviour that improves QoL and decreases depression risk.

There was no statistically significant relationship between PA change scores and health related QoL change scores after the conclusion of the program. However, the model did indicate a significant relationship between health related QoL change scores and depression risk change scores when either variable was the dependent variable. This relationship between health related QoL change scores and depression risk change scores was an interesting discovery that may lend itself to further analysis in different studies. The lack of relationship between PA and health-related QoL change score could have been influenced the way in which PA was measured. Using minutes as the primary measuring unit for PA resulted in a large SD across the participants which may have impacted the strength of the analysis.

The relationship between depression risk change scores and health-related QoL change scores was explored further using the multiple regression and findings supported those seen in the paired samples t-test which indicated that as depression risk decreased, QoL increased and vice versa. These findings are comparative to the literature mentioned above regarding a decrease in depressive symptoms and an increase in perceived health-related QoL. It is not overly surprising to see that as depression risk decreased perceived health-related QoL increased and as health-related QoL increased, depression risk decreased. This co-dependent relationship

may have occurred due to the similarity in feelings associated with depression and overall health related QoL and that the absence of negative feelings most likely results in a more positive outlook on life (Keyes, 2002; Shin & Johnson, 1978). This being said, the relationship between depression and health-related QoL may still have been impacted by increased PA levels. Multiple studies have cited that PA programs for men have resulted in a drastic increase in self efficacy and improved QoL (French, Olander, Chisholm, & Mc Sharry, 2014; Pringle et al., 2013; Warner et al., 2014; Wyke et al., 2015). Similar to the findings mentioned above, an increase in mastery and an understanding of control over their mental and physical health may have contributed to the improvement in self-perceived QoL and decreased feelings of depression.

### **Summary**

The results obtained in the current study show strong support for tailored interventions aimed at improving PA levels in men. Results of this study also indicate that participants who took part in the HAT TRICK program demonstrated improvements in depression risk (i.e. decreases in depression risk) and improvements in health related QoL. The statistically significant relationship between depression risk change scores and health related QoL change scores highlights the impact that improving overall health can have on improving depression risk. An increase in PA interventions tailored towards the needs of men and their mental health will provide this field of research with more evidence to better determine how to support men's mental health.

## **Chapter 6 Conclusion**

### **6.1 Overview**

Research has shown that PA can positively impact depression risk in men (Bhui & Fletcher, 2000; Fox, 1999; Hallgren et al., 2016; Hallgren et al., 2017; Hegberg & Tone, 2015; Lindwall et al., 2014; Mammen & Faulkner, 2013) therefore, PA promotion should be considered as a potential component of depression risk prevention and treatment programs. The overarching aim of the current research was to examine the impact a community-based PA intervention had on PA levels, depression risk, and health-related QoL in Canadian men. The results showed a positive increase in PA levels from baseline to follow-up as well as lower depression risk and improved health-related QoL at the conclusion of the program. Furthermore, a statistically significant relationship between depression risk change scores and health-related QoL change scores was discovered; as depression risk decreased, perceived health related QoL change scores increased.

### **6.2 Strengths and limitations**

A major strength of this study was being able to reach and recruit a notoriously 'hard to reach' population group (Carroll et al., 2014; Curran, Drust, Murphy, Pringle, & Richardson, 2016; Gavarkovs, Burke, & Petrella, 2016; Pringle et al., 2014). As past research has indicated a high level of difficulty in recruiting men for PA programs, a variety of recruitment methods were utilised in order to extend the reach specific to men. These included radio interviews outlining the program, flyers posted at typically male centered businesses in the community (e.g., local bars, restaurants, hockey arenas, Home Depot, Canadian Tire, etc.), a project specific website (<http://hattrick.ok.ubc.ca/>), advertisements in print and online news outlets (Kelowna Now, Courier, Castanet), and social media outlets such as Facebook and Twitter. For instance, the 20 spots available for the first HAT TRICK group (delivered January-March 2017) were full within

one week of the first media release. In fact, a number of individuals who registered interest were put on a wait list for the second HAT TRICK group, which ran from March-May 2018. This same situation occurred when recruitment was initiated for the second and third group (delivered September-November 2018). Moreover, the men that were recruited represented a sub-sample that could be considered as at-risk as the majority were categorised as obese (mean BMI of 36.19 kg/m<sup>2</sup>), and many suffered from more than one chronic disease or associated risk factor. Thus, the sample in the current study represented a sub-sample of men that would greatly benefit greatly from such a program.

Another major strength of this study was that the entire HAT TRICK program was developed to be male focused paying close attention to their needs, preferences and reported barriers to engaging in healthy lifestyle behaviours. Moreover, HAT TRICK is based on previous and current evidence surrounding masculinities and men's health (Bottorff, Oliffe, Sarbit, Kelly, & Cloherty, 2015a; Bottorff et al., 2015b; Gray et al., 2013; Hunt et al., 2014; Pringle et al., 2013; Rice, Fallon, & Bambling, 2011), thus making a significant contribution to the current literature. Further, program attrition was very low (6.45%) suggesting that this gender-sensitised program was well accepted by the participants and shows promise for further dissemination.

An additional strength of the HAT TRICK program was the inclusion of a prominent mental health component. As previously mentioned, most male-focused PA programs are heavily aimed at weight loss and dietary changes (De Cruz, 2016; Gray et al., 2013; Hunt et al., 2014; Rock et al., 2015) however, HAT TRICK was holistic in a tripartite focus on PA, healthy eating and mental health. Concerning mental health, HAT TRICK addressed topics such as how to deal with stress, the importance of social support and connectedness, what depression can look and feel like, and how PA can positively impact multiple facets of a mans life. All of these topic

areas were delivered in a manner that was ‘man-friendly’, in an attempt to circumvent some of the stigma around mental illness in men.

Although this study demonstrated a number of strengths, it is not without its limitations. Firstly, the relatively small (n=58) homogenous sample size limits generalizability and thus this intervention may not be transferable to different sub-populations (e.g. men of different ethnic backgrounds, ages, those diagnosed with depression, etc.). The Hawthorne effect also needs to be considered when examining and reporting results obtained through self-report questionnaire data. This effect explains that participants may begin to gain an idea of what a desired answer would be and report that value. This is true for any self report questionnaire and could have occurred for PA, depression risk, or health-related QoL (Adair, 1984). Although the questionnaires have all been reported to be valid and reliable (Godin & Shephard, 1985; Ware, Keller, & Kosinski, 1998; Rice, 2011; Rice, Fallon, Aucote, & Moller-Leimkuhler, 2013), the fact remains that participants often tend to over report when asked to complete self-report questionnaires (Dyrstad, Hansen, Holme, & Anderssen, 2014; Sallis & Saelens, 2000). For example, the use of the GLTEQ may have seen an over report of PA levels at baseline which may have been responsible for the increased percentage of participants recorded as meeting Canada’s PA guidelines. In addition, the small sample size was not powered sufficiently and thus it is difficult to obtain accurate effect sizes. This is further compounded by the fact that this study did not include a control group and thus cause and effect of the intervention cannot be determined. Also, the sample of participants was obtained on a first come first serve basis and selected using random sampling. Since male participants in PA interventions are notoriously hard to recruit, it was thought that a random sample would be unattainable, and we should focus on filling the program with as many participants who were willing to take part. The effects of this recruitment strategy

are mentioned previously in this thesis, and essentially result in a lack of generalization to different populations.

### **6.3 Clinical Implications and Future Recommendations**

The results from this research have several clinical implications for health professionals in the PA and depression field. Findings from this research suggest that the use of a health promotion intervention that is tailored for men and includes a focus on PA, healthy eating and mental health can increase PA levels in men as well as lower men's depression risk and improve overall health-related QoL. Past treatment for depression has been primarily pharmacological and dependant on patients speaking with a doctor regarding their current mental health status (Al-Harbi, 2012; Beck & Alford, 2009; Branney & White, 2008). However, the use of a PA intervention with a prominent mental health component did result in a decrease in depression risk at the conclusion of the program. In recent years there has been evidence suggesting that men are also interested in talk therapy and that men are recognizing that internalizing feelings and being socially isolated is a primary risk factor for depression (Seidler, Rice, Oliffe, Fogarty, & Dhillon, 2017). Also, this research found results indicating a strong relationship between depression risk and health-related QoL. These two variables produced a co-linear relationship and as one decreases (depression) the other increases (health-related QoL). Improvements in health-related QoL may be related to positive behaviour changes (e.g. increased social interaction/connectedness, healthy eating changes, decreased alcohol consumption or drug use) and improvements/increases in PA and diet. This important because gender norms that support self-management of feelings may limit treatment options for men (Addis & Mahalik, 2003; Berger et al., 2013; Clement et al., 2015; Hammer & Vogel, 2010).

Further, based on the results from this study and the observed strengths and limitations, there are several recommendations that should be considered in order to progress this field of research. As alluded to above, HAT TRICK included aspects of mental health, however the main focus of the intervention was focused on PA and healthy eating. Future research and practice should consider a more balanced program consisting of equal coverage of physical and mental health. Specific to men, re-branding mental health will be important to reaching and engaging men. For instance, considering the term ‘mental fitness’ may help tailor the program for men and increase men’s comfort levels in discussing their mental health with others. When developing these extended mental health modules, it would be extremely beneficial to consult with mental health professionals, such as the Canadian Mental Health Association (CMHA) and the Canadian Men’s Health Foundation (CMHF), on how to reach men in terms of their mental health. Partnering with CMHA and CMHF provides an opportunity to tailor the program in a way that will attract men as well as assist with program sustainability and participant adherence.

Additionally, including a more diverse sample (e.g., Indigenous men, ethnically diverse men, older men, men with chronic disease, gay men) would provide further information concerning program efficacy and transferability. An example would be to provide a similar program to HAT TRICK that is tailored to the Indigenous population of BC as well as to other ethnic groups throughout Canada. The program must include culturally appropriate activities and information concerning diet and mental health and be delivered in a culturally appropriate manner, including program design and tailored resources.

As indicated above this was an exploratory study and did not include a control group. A next important step would be to test this intervention with a randomised control trial (RCT) in order to assess the efficacy of the intervention. Moreover, this evaluation of HAT TRICK was

short-term (i.e., end of program evaluation) and although it did provide some preliminary important information concerning intervention effectiveness, future research should consider long-term follow-up (i.e., 1 year+) to provide greater insight regarding the maintenance and sustainability of program outcomes.

Depression is impacting men whether it is being reported or not. By increasing available programs for men that positively influence their mental health may help undiagnosed cases. Mental health in men is a promising emerging field of study that is starting to garner world-wide attention, and the stigma associated with depression and mental health is beginning to fade. This transition period is the perfect time to increase the amount of attention and research given to mental health in men and new health programs that integrate support for mental health in PA programs may provide a means to do that.

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## **Appendices**

### **Appendix A: Consent form**

#### **Consent Form**

**Title: HAT TRICK: Examining the feasibility of a gender-sensitive intervention focused on physical activity, healthy eating and connectedness In male hockey fans**

#### **Lead Investigators:**

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#### **Purpose of the study**

The purpose of this research is to evaluate the feasibility of the HAT TRICK Program, a program targeting physical activity, healthy eating and connectedness in men living in Kelowna, BC. The intervention will be delivered in connection with the Kelowna Rockets Hockey team.

#### **Eligibility**

You are being invited to voluntarily take part in this study because you are a man over the age of 35 years, residing in the Okanagan Region-, who accumulates less than 150 minutes of moderate to vigorous physical activity a week, who has a Body Mass Index (BMI) greater than 25kg/m<sup>2</sup> , and a pant size greater than 38”.

#### **Study Procedures**

As a participant of this research project you will be invited to participate in twelve 90-minute weekly sessions, provide feedback on aspects of the program, and complete three assessment periods (baseline, 12-week, and 9-month follow-up). Weekly sessions will include a physical activity component, nutrition component, and behaviour change component. Participants will be encouraged to make gradual changes to their lifestyle with the goal of improving overall health and well-being. Throughout the program, presentations will be given from local health

professionals (e.g., nutritionist, fitness trainer), Kelowna Rockets staff and players, as well as other community personalities. Version 2-November 22, 2016 2 Assessment sessions will be held at a convenient location. These assessment periods will last up to 1.5 hours. At these assessment periods, you will be asked to complete a brief questionnaire about your; physical activity and dietary behaviours, social relatedness, general health and well-being questions as well as general demographic information (e.g., age, education, marital status). During these times you will also be given an accelerometer and instructions on how to use the accelerometer. Accelerometers are a device for measuring your daily physical activity. It is a small, non-invasive device which is worn around your chest. You will be asked to wear this accelerometer for 7 consecutive days during all waking hours. You will also be asked to return the accelerometers to the research team after these 7 days. Return instructions will be provided to you when you receive your accelerometer. Following the completion of the program you may also be asked commit an additional 1 hour of your time to participate in a semi-structured telephone interview with a member of the research team. If you are selected, a member of the research team will contact you to arrange a time that is convenient for you to conduct the interview. All telephone interviews will be audio recorded with your consent. During this interview we hope to hear about your thoughts, opinions and perceptions about the HAT TRICK Program and provide general comments about how you think the HAT TRICK Program could be improved

### **Potential Risks and Benefits**

The HAT TRICK program and data collection procedures involve no foreseeable risks or harm to you. However, you will be asked to work towards meeting the minimum recommended Canadian Physical Activity Guidelines (150minutes per week in bouts of 10 minutes or more) and depending on your initial activity levels, you will be encouraged to safely increase your physical activity levels throughout the project. Becoming physically active and progressively increasing your physical activity may potentially include some risk of injury, such as common muscle soreness or strains associated with being physically active. To limit any concerns you may have regarding these minor injuries, information about reducing this risk of injury, such as education about stretching and starting off slowly and building up your physical activity levels will be provided during the weekly sessions. Although no benefits can be guaranteed, potential benefits that may occur include; improvements in overall physical and mental health as a result of increasing your physical activity levels, improved understandings about the benefits of physical activity and other healthy lifestyle behaviours (i.e., healthy eating, stress management), increased social interaction and support

### **Confidentiality**

Your confidentiality will be respected at all times. Only research team members and research staff will have access to data collected in this study. All documents will only be identified by a code number and kept in a locked filing cabinet and/or secure password protected system. Participants will not be identified by name in any reports or materials associated with this research. Paper copies and electronic audio files will be kept for 7 years in the Physical Health and Activity Behaviour Laboratory at UBC Okanagan. All participants taking part in the sessions will sign the confidentiality agreement at the bottom of this consent form; however, we cannot control what the other participants do with the information discussed. Findings from the study may be shared through conference presentations, articles for publication, and other media outlets.

An electronic or print copy of the research report will be available to you on request.

**Contact for information about the study**

If you have any questions or would like additional information, please contact Dr. Cristina Caperchione at 250-807-9679

**Contact for concerns about the rights of research participants**

If you have any concerns about your treatment or rights as a research participant and/or your experiences while participating in this study you may contact the Research Participant Complaint Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832. It is also possible to contact the Research Participant Complaint Line by email ([RSIL@ors.ubc.ca](mailto:RSIL@ors.ubc.ca)).

**Consent**

Your participation is entirely voluntary. You may refuse to participate or withdraw at any time without penalty or consequence. If you choose to participate and then decide to withdraw at a later time, you have the right to request the withdrawal of your information collected during the study. This request will be respected to the extent possible. By signing this consent form, you are agreeing to participate in all study protocols. By signing this consent form you are acknowledging that you have received a signed copy of the consent form for your records. By signing this consent form, you do not waive any of your legal rights.

**Consent**

I have read and understood the information on this consent form and voluntarily consent to participate in this study. I have had a chance to ask questions about the study and my involvement in it and have received a copy of the consent form.

\_\_\_\_\_

Participant's Name (please print)

\_\_\_\_\_

Participant's Signature

\_\_\_\_\_

Date

**Confidentiality Agreement**

I agree to respect the confidentiality of all program participants. This means I will not discuss participants' personal information with anyone outside of this program.

\_\_\_\_\_

Participant's Name (please print)

\_\_\_\_\_

Participant's Signature

\_\_\_\_\_

Date

**Contact for a Follow-up Interview**

Upon completion of the program, would you be interested in taking part in a 1-hour semi-structured telephone interview with a member of the research team regarding your thoughts, opinions, and perceptions of the HAT TRICK Program?

- Yes, I would be interested in taking part in a telephone interview.
- No, I would not be interested in taking part in a telephone interview

\_\_\_\_\_  
Participant's Name (please print)      Participant's Signature      Date

\_\_\_\_\_  
Telephone Number      Email Address

**Contact for Future Studies**

Would you like to be contacted in the future about other studies?

- Yes, I would like to receive information about future studies on men's health and physical activity
- No, I would not like to receive information about future studies.

\_\_\_\_\_  
Participant's Name (please print)      Participant's Signature      Date

## Appendix B: Demographics Questionnaire



**a place of mind**

THE UNIVERSITY OF BRITISH COLUMBIA

### **HAT TRICK: Examining the feasibility of a gender-sensitive intervention focused on physical activity, healthy eating and connectedness in male hockey fans**

This survey seeks to gather information about some of your health-related behaviours as well as mental health factors associated with general wellbeing. The information you provide will help us better develop programs that support men's health.

The following series of questions is not a test in any way. There are no right or wrong answers and there are no good or bad answers. Please complete the questionnaire on your own and as best you can. This will take between 20-30 minutes. Your answers are very important to us, so please make sure you complete all questions honestly.

You do not need to put your name on the survey. Your answers will be kept private and confidential by using a personal identification number.

Once you have read these instructions, please complete the questionnaire, look it over to see if any questions were missed, and return it to the research coordinator.

If you have any questions, contact: Paul Sharp, Research Coordinator, UBC Okanagan  
Email: paul.sharp@ubc.ca Phone: (250) 807-9907.

Thank you for your support of this research,

A handwritten signature in black ink, appearing to read 'Cristina M. Caperchione', written over a light blue horizontal line.

Dr. Cristina M. Caperchione, Principal Investigator  
Assistant Professor  
School of Health and Exercise Sciences  
UBC Okanagan

## BACKGROUND AND DEMOGRAPHICS

The following information provides background information and will only be asked of you once. Please report as accurately as possible.

### *Personal Information*

1) Identification number (provided by researcher): \_\_\_\_\_

2) What is your date of birth (day/month /year) \_\_\_\_\_

3) How do you best describe your ethnic background (Check all that apply):

- White
- Metis
- First Nation
- Inuit/Inuuk
- Black
- Chinese
- Latin American
- South Asian (e.g., East Indian, Pakistani, Sri Lankan)
- Southeast Asian (e.g., Vietnamese, Cambodian, Malaysian, Laotian, etc.)
- West Asian (e.g., Iranian, Afghan, etc.)
- Korean
- Japanese
- Other (please specify): \_\_\_\_\_

4) What is your highest level of education? (Please check one)

- Some high school or less
- High school diploma
- Some post-secondary without diploma or degree
- College or technical diploma or certificate (CEGEP, vocational, trade)
- University degree
- Other (please specify): \_\_\_\_\_

5) What is your marital status or living arrangement?

- Single / Never Married
- Married / Domestic Partnership
- Divorced
- Widowed
- Separated

6) Have you ever been told that you have any of the following (check all that apply):

- Heart disease (e.g., coronary heart disease, heart failure)
- High blood pressure or hypertension
- High cholesterol
- Diabetes
- Cancer
- Stroke or cerebrovascular event
- Arthritis or osteoporosis
- Mental health problems
- Respiratory disease (e.g., chronic obstructive pulmonary disease, asthma)
- Any other medical conditions (please specify): \_\_\_\_\_
- None

7) What is your main activity (Please check one):

- Full time work
- Part time work
- Caring for family/managing household
- Unemployed
- Recovering from illness/on disability
- Retired
- Other (please specify): \_\_\_\_\_

8) What is your occupation? (Please check one)

- Sales and services
- Business, finance and administration
- Trades, transport and equipment operators
- Management
- Education, law and social (including Government positions)
- Other (please specify): \_\_\_\_\_

9) What was your total household income before taxes during the past 12 months?

- Less than \$25,000
- \$25,000 to \$34,999
- \$35,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 or more

10) How did you hear about HAT TRICK? (check one):

- On the radio
- In a print article (e.g., newspaper, magazine)
- On social media
- The HAT TRICK website
- Word of mouth
- Other (please specify): \_\_\_\_\_

11) How often do you watch and/or attend Kelowna Rockets Games?

- 1-5 per season
- 6-10 per season
- 11-15 per season
- 16-20
- 20+ games per season
- I never watch or attend

**Appendix C: Godin leisure time questionnaire**

**PHYSICAL ACTIVITY**

When answering these questions, please write the average number of times per week in the first column and the average minutes per session in the second column for strenuous, moderate and mild physical activity. Only count physical activity sessions that lasted 10 minutes or longer in duration.

DO NOT LEAVE ANY PART BLANK! If you did not participate in any of the following activities, please enter the number “0”.

- 1) During a typical week (7-day period), how many times on average do you do the following kinds of exercise during your free time, and for how long? Indicate in the space provided the number of times per week and the average duration:

	<b>Times Per Week</b>	<b>Average Duration Per Session</b>
<b>a) STRENUOUS EXERCISE</b> (HEART BEATS RAPIDLY) (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, vigorous swimming, vigorous bicycling)		
<b>b) MODERATE EXERCISE</b> (NOT EXHAUSTING) (e.g., fast walking, easy bicycling, easy swimming, downhill skiing)		
<b>c) MILD EXERCISE</b> (MINIMAL EFFORT) (e.g., yoga, taking the stairs, bowling, housework, easy walking)		
<b>d) SEDENTARY ACTIVITY</b> (NO EFFORT) (e.g., TV/video watching, video/computer games, computer use)		

- 2) During a typical 7-day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)? Check one answer.

- Often  
 Sometimes  
 Never/Rarely

**Appendix D: MDRS-22****MALE DEPRESSION RISK SCALE**

Please think back over the past month and respond to each item considering how often it applied to you. Please respond where 0= Not at all and 7= Almost Always.

<b>Questions</b>	<b>0 Not at all</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7 Almost Always</b>
1) I bottled up my negative feelings	0	1	2	3	4	5	6	7
2) I covered up my difficulties	0	1	2	3	4	5	6	7
3) I drank more alcohol than usual	0	1	2	3	4	5	6	7
4) I drove dangerously and aggressively	0	1	2	3	4	5	6	7
5) I had more heartburn than usual	0	1	2	3	4	5	6	7
6) I had regular headaches	0	1	2	3	4	5	6	7
7) I had stomach pains	0	1	2	3	4	5	6	7
8) I had to work things out by myself	0	1	2	3	4	5	6	7
9) I had unexplained aches and pains	0	1	2	3	4	5	6	7
10) I needed alcohol to help me unwind	0	1	2	3	4	5	6	7
11) I needed to have easy access to alcohol	0	1	2	3	4	5	6	7
12) I overreacted to situations with aggressive behaviour	0	1	2	3	4	5	6	7
13) I sought out drugs	0	1	2	3	4	5	6	7
14) I stopped caring about the consequences of my actions	0	1	2	3	4	5	6	7
15) I stopped feeling so bad while drinking	0	1	2	3	4	5	6	7
16) I took unnecessary risks	0	1	2	3	4	5	6	7
17) I tried to ignore feeling down	0	1	2	3	4	5	6	7

<b>18)</b> I used drugs to cope	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>19)</b> I verbally lashed out at others without being provoked	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>20)</b> I was verbally aggressive to others	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>21)</b> It was difficult to manage my anger	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>22)</b> Using drugs provided me temporary relief	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>

**Appendix E: SF-12**

**SF-12V2™ HEALTH SURVEY**

This survey asks for your views about your health. This information will help you keep track of how you feel and how well you are able to do your usual activities. Answer every question by selecting (check the box) the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1) In general, would you say your health is:

Excellent	Very Good	Good	Fair	Poor

2) The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a) <b>Moderate</b> activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf			
b) Climbing several flights of stairs			

3) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Accomplished less than you would like					
b) Were limited in the kind of work or other activities					

- 4) During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Accomplished less than you would like					
b) Did work or other activities less carefully than usual					

- 5) During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely

- 6) These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Have you felt calm and peaceful?					
b) Did you have lots of energy?					
c) Have you felt downhearted and depressed?					

- 7) During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	None of the time

## Appendix F: Measurement Card

Participant ID: \_\_\_\_\_

Please hand this card to the facilitator at each station.

### Baseline

Height: _____	Weight: _____
Waist Circumference: _____ in	Blood Pressure: _____ / _____
Heart Rate: _____ Bpm	BMI: _____ Kg/m <sup>2</sup>

### Time 1

Height: _____	Weight: _____
Waist Circumference: _____ in	Blood Pressure: _____ / _____
Heart Rate: _____ Bpm	BMI: _____ Kg/m <sup>2</sup>

### Time 2

Height: _____	Weight: _____
Waist Circumference: _____ in	Blood Pressure: _____ / _____
Heart Rate: _____ Bpm	BMI: _____ Kg/m <sup>2</sup>