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SELF-EFFICACY IN ADULTS THROUGHOUT A SIX-MONTH PHYSICAL ACTIVITY INTERVENTION

BY

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Abstract

Self-efficacy is considered a correlate for physical activity; previous research offers contradictory findings regarding this relationship in adults with obesity. This thesis consists of a manuscript examining how task, coping, and scheduling self-efficacy change with physical activity participation and the effectiveness of each self-efficacy type in predicting physical activity among adults with normal BMI values (< 25 kg/m^2) and adults with overweight and obese BMI values (≥ 25 kg/m^2). A convenience sample of N=84 healthy adults participated in a six-month community-based physical activity program. A Fitbit Flex measured daily step counts and monthly surveys assessed self-efficacy. Self-reported weight and height were used to calculate BMI. Time had a significant effect within subjects but only for the scheduling component; differences between BMI groups were not significant. Coping and scheduling components were most related to step count. Findings could assist in developing more successful physical activity interventions.

Keywords: physical activity, self-efficacy, obesity

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Chapter 1. Introduction

Background

Inadequate amounts of physical activity are associated with several chronic conditions including obesity (Gray et al., 2018; Prentice & Jebb, 2004; Warburton et al., 2008; Wiklund, 2016), coronary artery disease, stroke, hypertension, colon and breast cancers, type 2 diabetes, and osteoporosis (Janssen, 2012). Given low levels of physical activity in the population, it is essential to understand why some people engage in physical activity and others do not despite the many benefits of doing so (Bauman et al., 2012). Therefore, understanding the factors that affect the initiation and maintenance of physical activity is important (McAuley, Motl, White, & Wójcicki, 2010). Self-efficacy is of particular interest because research consistently associates it with partaking in physical activity (Bauman et al., 2012; Olander et al., 2013; Schutzer & Graves, 2004).

Self-efficacy towards physical activity can be considered multidimensionally, incorporating task, coping, and scheduling components (Rodgers & Sullivan, 2001; Rodgers, Wilson, Hall, Fraser, & Murray, 2008). Research by Rodgers, Murray, Courneya, Bell, and Harber (2009) suggest that these multidimensional components of physical activity self-efficacy may be more important at different times as individuals increase their physical activity levels. Overall though, more research is needed to better understand how levels of task, coping, and scheduling physical activity self-efficacy change over time as individuals participate in physical activity.

There is also a lack of research to examine which components of physical activity self-efficacy are more or less effective in predicting behaviour among different weight groups. Researching this area is important because there could be characteristics among a population of adults having obesity that render self-efficacy less effective for modifying physical activity behaviour (Olander et al., 2013). Among the characteristics unique to adult populations having obesity are increased barriers towards physical activity (Napolitano, Papandonatos, Borradaile, Whiteley, & Marcus, 2012). This may in turn lower levels of coping self-efficacy towards physical activity, suggesting that the coping component may be more important to consider when aiming to increase physical activity levels among individuals who have obesity. Understanding these aspects of physical activity self-efficacy may help in the development of more effective physical activity interventions.

Key Terms

Obesity

Conceptually, obesity refers to a body fat accumulation in excess of an individual's biological needs (Wiklund, 2016) which can increase morbidity and affect longevity (Allison et al., 2012; Rosen, 2014). Rising obesity rates have become a public health challenge globally (Caballero, 2007; Tran, Nair, Kuhle, Ohinmaa, & Veugelers, 2013). According to Twells, Gregory, Reddigan, and Midodzi (2014), estimates suggest that by 2019, 34.2% of Canadian adults will be categorized as overweight, with an additional 21.2% categorized as obese (Twells, Gregory, Reddigan, & Midodzi, 2014). The estimates provided by Twells et al. (2014) are worrisome because individuals who are overweight and have obesity are at a greater risk for various health conditions including hypertension, cardiovascular disease, type 2 diabetes, osteoarthritis, and certain cancers (Chin, Kahathuduwa, & Binks, 2016; Pysarenko & Yu, 2015). Simplistically, obesity is the result of an energy imbalance, specifically a positive energy balance over a prolonged period of time (Bray, 2004, Hruby & Hu, 2016; Wiklund, 2016). Despite all of the research on the topic of obesity, effective treatments and even its exact causes are not well understood, though the research that has been done indicates that obesity is a complicated condition (Rosen, 2014) with the Canadian Medical Association recently recognizing it as its own disease (Sharma & Campbell-Scherer, 2017; The Lancet, 2017).

Rosen (2014) explains that there is no universally accepted method to operationally define obesity. This makes monitoring and treating obesity challenging (Duren et al., 2008), as findings can be dependent on the method used for the assessment (O’Neill, 2015). Still, recent research suggests that attempts are being made to change this. In 2020, the Canadian Medical Association Journal published an article by Wharton et al. (2020) that outlined a set of clinical practice guidelines for healthcare providers to use when working with adults with obesity. These guidelines suggest that the Edmonton Obesity Staging System be used to guide clinical decision making; the Edmonton obesity staging system consists of five stages of obesity classification and outlines metabolic, physical, and psychological aspects to guide the treatment of obesity (Wharton et al., 2020).

Still, a variety of different methods exist for estimating the amount of adipose or fat tissue in individuals (Duren et al., 2008; O’Neill, 2015). Each method has limitations; the most popular method used is body mass index (BMI) (O'Neill, 2015).

BMI. BMI is the method used to measure obesity in the study discussed in the following chapter. BMI is calculated by dividing an individual’s body mass in kilograms by the square of the individual’s height in meters and is often used to categorize individuals in the general population as underweight, normal weight, overweight or having obesity (Duren et al, 2008; World Health Organization, 2018). According to the World Health Organization (2018), individuals with a BMI of 25 kg/m^2 or greater are considered to have overweight, meanwhile individuals with a BMI of 30 kg/m^2 or greater are considered to have obesity. BMI values provide more information than a measure of body weight alone. Though a higher body weight is often indicative of greater amounts of body fat, an issue is that body weight is also closely related to a person's height; therefore, an approach that not only considers weight but also height as well is advantageous (Duren et al., 2008). For the study presented in the following chapter, BMI is practical as it easily provides a measure for a larger number of participants, without the need for specialized equipment.

Though convenient and easy to calculate, BMI provides a crude measurement of body fat (World Health Organization, 2018). Specifically, BMI considers an individual's overall weight and does not distinguish between the amount of weight that is comprised of fat free mass and actual body fat (Johansson, Bockerman, Kiiskinen, & Heliovaara, 2009; O'Neill, 2015). Fat free mass includes muscle, bone, and fluid (Burkhauser & Cawley, 2008). Those who have higher amounts of fat free mass from muscle tissue and bone may be misclassified as overweight or obese based on BMI (Burkhauser & Cawley, 2008). Furthermore, BMI provides no indication of how fat mass is distributed throughout the body (Burkhauser & Cawley, 2008; Johansson et al., 2009). Sharma and Kuschner (2009) explain that when BMI is used to describe individuals, it may not provide an accurate reflection on the health risks, comorbidities, or reduced quality of life associated with obesity. BMI is typically more useful at a population level and less useful when applied to specific individuals (Sharma & Kuschner, 2009).

While how to appropriately operationalize obesity is debated, the fact that rates have become epidemic is not. Bancej et al. (2015) explain that obesity rates have increased over time and are projected to increase further throughout the next two decades. Since obesity is caused by maintaining a positive energy balance over a long period of time, the behaviors that have been identified as modifiable risk factors for obesity look to address the imbalance between energy intake and energy expenditure (Wiklund, 2016). Overall energy expenditure is comprised of various components, with physical activity being the only component over which an individual has discretionary control (Prentice & Jebb, 2004; Wiklund, 2016). Thus, physical activity is one modifiable risk factor for obesity that affects energy expenditure and has received much attention (Gray et al., 2018; Prentice & Jebb, 2004; Warburton, Nicol, & Bredin, 2008; Wiklund, 2016).

Physical Activity

Physical activity refers to any movement generated by skeletal muscles that leads to increased energy expenditure and includes exercise, which is a subtype of physical activity that is planned, structured, and purposely performed with the objective of maintaining or improving physical fitness (Caspersen, Powell, & Christenson, 1985; Colberg et al., 2016). The Canadian 24-Hour Movement Guidelines recommend that adults aged 18-64 engage in moderate to vigorous intensity aerobic physical activity for a minimum of 150 minutes each week (Canadian Society for Exercise Physiology, 2021). The Alberta Survey on Physical Activity, which has reported physical activity trends every two years since 1993, found that overall, physical activity levels have stayed relatively stable throughout the past decade (Centre for Active Living, 2019). The surveys found that over the past decade, only about 60% of adults have been meeting physical activity recommendations (Centre for Active Living, 2019). Based on this data from the Centre for Active Living (2019), it can therefore be inferred that throughout the past decade, approximately 40% of adults in the province have not been meeting the guidelines for physical activity.

This is concerning, as many sources indicate that inadequate physical activity is a risk factor for obesity (Gray et al., 2018; Prentice & Jebb, 2004; Warburton et al., 2008; Wiklund, 2016, World Health Organization, 2019), which in itself is implicated with a variety of chronic health conditions (Chin, Kahathuduwa, & Binks, 2016; Pysarenko & Yu, 2015). Aside from obesity, individuals who are physically inactive also face an increased risk of coronary artery disease, stroke, hypertension, colon and breast cancers, type 2 diabetes, and osteoporosis (Janssen, 2012). Janssen (2012) estimates that in 2009, the total cost of physical inactivity in Canada was $6.8 billion. Given low levels of physical activity in the population, it is essential to understand why some people engage in physical activity and others do not despite the many benefits of doing so (Bauman et al., 2012). Therefore, understanding the factors that affect the initiation and maintenance of physical activity is important (McAuley et al., 2010).

Physical Activity Self-Efficacy

Self-efficacy is one construct outlined in Social Cognitive Theory (Bandura, 1977) and is defined as “people’s judgements of their capabilities to organize and execute courses of action required to attain designated types of performances” (Bandura, 1986). Specific to physical activity, self-efficacy is the confidence an individual has in his ability to be physically active in a particular situation (Bauman et al., 2012). Overall, successful task completion involves not only the knowledge and skills required for an individual to complete the task successfully, but also the belief that the behaviour can be performed in a given situation (Artino, 2012; Gangloff & Mazilescu, 2017). Self-efficacy impacts behaviour, thoughts, feelings, and motivation; individuals with high self-efficacy accept difficult tasks as challenges rather than threats, and since they are convinced that they can perform the task successfully, they invest the time and effort in an attempt to do so (Bandura, 1977; Bandura & Adams, 1977; Gangloff & Mazilsecu, 2017).

Self-efficacy towards physical activity can be considered multidimensional, incorporating task, coping, and scheduling components (Rodgers & Sullivan, 2001). Task self-efficacy involves confidence in the ability to perform the specific task, coping self-efficacy involves the confidence to perform a task despite hardship, while scheduling self-efficacy refers to the confidence in being able to schedule time for the activity (Rodgers & Sullivan, 2001).

When investigating physical inactivity, self-efficacy is a construct of particular interest because research consistently associates it with partaking in physical activity (Bauman et al., 2012; Olander et al., 2013; Schutzer & Graves, 2004). Still, Buckley (2016) explains that is uncertain as to whether this same relationship applies to adults who have obesity.

Purpose

The purpose of this research is to measure the multidimensional components of physical activity self-efficacy throughout a six-month community based physical activity intervention to understand how the components of self-efficacy change over time, and if the relationships between task, coping, and scheduling physical activity self-efficacy and physical activity levels differ between adults with normal weight, overweight and obesity. This study will answer the research questions: how do the task, coping, and scheduling components of physical activity self-efficacy change throughout a six-month physical activity program and do the relationships between task, coping, and scheduling self-efficacy and physical activity levels differ between individuals of different weight groups throughout the six months?

The Manuscript

Manuscript: Examining Physical Activity and Physical Activity Self-Efficacy in Adults With Normal and Overweight BMI Values Throughout a Six-Month Physical Activity Intervention

This manuscript outlines the background and procedures for a community-based study that monitored participants as they engaged in a six-month physical activity intervention. Data were collected on participants' physical activity levels and corresponding physical activity self-efficacy levels over a six-month period with the aim of understanding how physical activity self-efficacy levels changed over time and whether the relationships between physical activity self-efficacy and physical activity levels differed between individuals based on their body weight. A summary of the results followed by a discussion of their significance is provided.

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Chapter 2. Examining Physical Activity and Physical Activity Self-Efficacy in Adults With Normal and Overweight BMI Values Throughout a Six-Month Physical Activity Intervention

Abstract

Background: Research is needed to explore how components of self-efficacy change with physical activity participation and whether self-efficacy is associated with physical activity in adults having obesity.

Objectives: To examine how task, coping, and scheduling self-efficacy change with physical activity and the effectiveness of self-efficacy in predicting behaviour in adults with normal BMI values (< 25 kg/m^2) and adults with overweight and obese BMI values (≥ 25 kg/m^2).

Methods: A convenience sample of N=84 healthy adults participated in a six-month community-based physical activity program. Participants wore Fitbits to measure step count; monthly surveys assessed self-efficacy. Self-reported weight and height were used to calculate BMI.

Results: MANOVA found that time had a significant effect on self-efficacy though only for the scheduling component. Differences between groups were insignificant. Coping and scheduling self-efficacy were most related to step count.

Conclusions: Teaching participants to cope with challenges and schedule physical activity may improve participation.

Keywords: physical activity, self-efficacy, obesity

Introduction

Physical inactivity is associated with several chronic conditions including obesity (Gray et al., 2018; Prentice & Jebb, 2004; Warburton et al., 2008; Wiklund, 2016), coronary artery disease, stroke, hypertension, colon and breast cancers, type 2 diabetes, and osteoporosis (Janssen, 2012). Given low levels of physical activity in the population, it is essential to understand why some people engage in physical activity and others do not despite the many benefits of doing so (Bauman et al., 2012). Therefore, understanding the factors that affect the initiation and maintenance of physical activity is important (McAuley, Motl, White, & Wójcicki, 2010).

The construct of self-efficacy is of particular interest because research consistently associates it with partaking in physical activity (Bauman et al., 2012; Olander et al., 2013; Schutzer & Graves, 2004). Self-efficacy towards physical activity can be considered multidimensionally, incorporating task, coping, and scheduling components (Rodgers & Sullivan, 2001; Rodgers, Wilson, Hall, Fraser, & Murray, 2008).

Literature Review

A review of the literature was performed, examining current research related to the area of physical inactivity and physical activity self-efficacy and identifying areas in which further study is needed. The Athabasca University Library database as well as Google and Google Scholar were used to obtain relevant sources.

Physical Activity. Physical activity refers to any movement generated by skeletal muscles that leads to increased energy expenditure and includes exercise, which is a subtype of physical activity that is planned, structured, and purposely performed with the objective of maintaining or improving physical fitness (Caspersen, Powell, & Christenson, 1985; Colberg et al., 2016). Meanwhile, Tremblay et al. (2017) explain that physical inactivity refers to a level of physical activity that fails to meet physical activity guidelines. The Canadian 24-Hour Movement Guidelines recommend that adults aged 18-64 engage in moderate to vigorous intensity aerobic physical activity for a minimum of 150 minutes each week (Canadian Society for Exercise Physiology, 2021). The Alberta Survey on Physical Activity, which has reported physical activity trends every two years since 1993, found that overall, physical activity levels have stayed relatively stable throughout the past decade (Centre for Active Living, 2019). The surveys found that over the past decade, only about 60% of adults have been meeting physical activity recommendations (Centre for Active Living, 2019). Based on this data from the Centre for Active Living (2019), it can therefore be inferred that throughout the past decade, approximately 40% of adults in the province have not been meeting the guidelines for physical activity and are therefore, considered physically inactive. Still, it is possible that the rate of physical inactivity is actually much higher than 40%. The Alberta Survey on Physical Activity obtained its physical activity data through self-reported questionnaires (Centre for Active Living, 2019). Findings from the 2007-2009 Canadian Health Measures Survey, which used accelerometers to objectively measure physical activity levels, determined that 85% of the Canadian adults sampled failed to meet physical activity recommendations (Colley et al., 2011). This is significantly different than the findings from the Centre for Active Living (2019). While using accelerometers is costly, the results tend to be more accurate than self-reports which are easy to administer but are subjected to inaccuracies- such as respondents overestimating activity levels (Sallis, 2010).

Regardless of the exact figure, these high levels of physical inactivity are concerning. Many sources indicate that inadequate physical activity is a risk factor for obesity (Gray et al., 2018; Prentice & Jebb, 2004; Warburton et al., 2008; Wiklund, 2016, World Health Organization, 2019), which in itself is implicated with a variety of chronic health conditions (Chin, Kahathuduwa, & Binks, 2016; Pysarenko & Yu, 2015). Aside from obesity, individuals who are physically inactive also face an increased risk of coronary artery disease, stroke, hypertension, colon and breast cancers, type 2 diabetes, and osteoporosis (Janssen, 2012). Janssen (2012) estimates that in 2009, the total cost of physical inactivity in Canada was $6.8 billion. Given low levels of physical activity in the population, it is essential to understand why some people engage in physical activity and others do not despite the many benefits of doing so (Bauman et al., 2012). Therefore, understanding the factors that affect the initiation and maintenance of physical activity is important (McAuley et al., 2010).

Physical Activity Self-Efficacy. Self-efficacy is one construct outlined in Social Cognitive Theory (Bandura, 1977) and is defined as “people’s judgements of their capabilities to organize and execute courses of action required to attain designated types of performances” (Bandura, 1986). Specific to physical activity, self-efficacy is the confidence an individual has in his ability to be physically active in a particular situation (Bauman et al., 2012). Overall, successful task completion involves not only the knowledge and skills required for an individual to complete the task successfully, but also the belief that the behaviour can be performed in a given situation (Artino, 2012; Gangloff & Mazilescu, 2017). Self-efficacy impacts behaviour, thoughts, feelings, and motivation; individuals with high self-efficacy accept difficult tasks as challenges rather than threats, and since they are convinced that they can perform the task successfully, they invest the time and effort in an attempt to do so (Bandura, 1977; Bandura & Adams, 1977; Gangloff & Mazilsecu, 2017). Several authors explain that self-efficacy beliefs are impacted by four main sources: mastery experiences based upon previous performance accomplishments, vicarious experiences derived from watching others perform a task successfully, verbal persuasion by convincing an individual that he is ability to cope, and physiological and affective states where an individual appraises his overall condition in connection to completing a task (Bandura, 1977; Bandura & Adams, 1977; Warner et al., 2014). Overall, mastery experience is thought to be the most influential source of self-efficacy beliefs because it is based upon an individual's past performance accomplishments (Bandura, 1977; Bandura & Adams, 1977; Warner et al., 2014). Bandura (1977) explains that with regards to mastery experience, repeated successes can increase efficacy expectations and help a person overcome occasional failure.

Self-efficacy is of particular interest when considering physical inactivity because research consistently associates it with partaking in physical activity (Bauman et al., 2012; Olander et al., 2013; Schutzer & Graves, 2004). Self-efficacy towards physical activity can be considered multidimensionally, incorporating task, coping, and scheduling components (Rodgers & Sullivan, 2001). Task physical activity self-efficacy involves confidence in the ability to perform the specific task, coping physical activity self-efficacy involves the confidence to perform a task despite hardship, while scheduling physical activity self-efficacy refers to the confidence in being able to schedule time for the activity (Rodgers & Sullivan, 2001). Rodgers and Sullivan (2001) developed and piloted a multidimensional exercise self-efficacy scale (MSES) to measure and distinguish between task, coping, and scheduling components and found that task self-efficacy was not a good indicator of exercise participation as both non-exercisers and individuals who participated in it avidly presented high levels; instead, coping and scheduling self-efficacy were better predictors of exercise frequency, as those who exercised frequently presented the highest levels. The researchers concluded that when individuals do not partake in exercise, it may not be due to a lack of confidence in performing the activity, and it may instead be due to a decreased ability to schedule time for exercise or cope with other challenges (Rodgers & Sullivan, 2001). Findings from Rodgers, Wilson, Hall, Fraser, and Murray (2008) provide further support for exercise self-efficacy as a multidimensional construct, again suggesting that task self-efficacy may not be an important predictor of exercise behaviour.

Changes to Physical Activity Self-Efficacy With Physical Activity Participation. When considering physical activity self-efficacy multidimensionally, Rodgers, Murray, Courneya, Bell, and Harber (2009) explain that while all subtypes are important, some may be more important at different times in the process of increasing physical activity. Rodgers et al. (2009) randomly assigned participants to either a traditional fitness program or walking program, both of which increased in intensity and duration over 24 weeks. Task, coping, and scheduling self-efficacy towards the traditional fitness program and walking program were measured to determine any patterns of change (Rodgers et al., 2009). Rodgers et al. (2009) found that the three types of physical activity self-efficacy did not progress linearly and instead formed a quadratic pattern.

A different study by Rodgers, Murray, Selzler, and Norman (2013) examined task, coping, and scheduling self-efficacy to determine which types of self-efficacy were most associated with exercise participation both throughout a cardio rehabilitation program and after its completion. The cardiac rehabilitation program in this study was six to eight weeks in length and focused on exercise prescription, training, and monitoring symptoms in addition to education sessions on various topics such as stress management or nutrition. Self-efficacy was measured before participants began their program and upon completion; one month after the program ended, participants provided a self-report of their exercise behaviour since the program's completion (Rodgers et al., 2013). The researchers found that task self-efficacy changed throughout the program and was highly correlated with exercise participation at the program's completion, but there was less change observed for coping and scheduling self-efficacy throughout the program. Task, coping, and scheduling self-efficacy were all correlated with continued exercise participation in the weeks after the program had ended, but scheduling self-efficacy was most strongly correlated (Rodgers et al., 2013). The results from Rodgers et al. (2013) suggest that task self-efficacy may be more important when individuals begin participating in an exercise regimen, but scheduling self-efficacy in particular became more important for continued exercise participation after the program's completion. In contrast to Rodgers et al. (2009), the exercise regimen was not necessarily progressive, though participants were studied for a shorter period of time. It is also unclear whether these findings would apply to individuals who are not patients participating in cardiac rehabilitation.

Buckley (2016) studied both active and inactive women who were overweight or had obesity over a 12-week period to determine the effectiveness of an intervention aimed at increasing exercise self-efficacy and subsequently, energy expenditure. Buckley (2016) examined exercise self-efficacy multidimensionally in terms of physical, exercise-worries, and scheduling components which appear to correspond respectively to the task, coping, and scheduling components studied in Rodgers et al. (2009) and Rodgers et al. (2013). Previously inactive participants in the intervention group showed the most significant increases in physical self-efficacy throughout the first half of the study; during the last six weeks of the study, the increases in scheduling and exercise worries efficacy stabilized while increases were still seen in physical efficacy levels (Buckley, 2016). Buckley (2016) suggests that when individuals first begin to modify their behaviour, cognitive guidance systems are particularly important, though individuals do not necessarily consider their efficacy each time they perform an activity and instead act habitually as long as they are confident in their abilities. Therefore, it is possible that participants who had been inactive at baseline began acting automatically on their enhanced beliefs, thus explaining why scheduling and exercise-worries self-efficacy stabilized between weeks six to 12 (Buckley, 2016). For previously inactive individuals who participated in the control condition, Buckley (2016) found that all components of exercise self-efficacy decreased throughout the first half of the study. Scheduling and exercise-worries self-efficacy remained lower through the second half of the study, while physical efficacy levels increased again to match baseline values (Buckley, 2016). Buckley (2016) suggests that since these participants had been inactive, they lacked the exercise experience needed to properly form self-efficacy beliefs and as a result, overestimated their capabilities. Buckley (2016) found that participants who were previously active showed no significant changes in physical self-efficacy throughout the entire 12 weeks, regardless of whether they were in the control or intervention condition. Active participants in both groups also showed decreases in scheduling efficacy throughout the first half of the study, though levels increased throughout the second half of the study but still remained below baseline values (Buckley, 2016). Buckley (2016) suggests that as participants gained experience at successfully scheduling exercise into their routine throughout the first half of the study, they began to assess their scheduling efficacy more positively throughout the second half of the study.

Considering the findings of Rodgers et al. (2009), Rodgers et al. (2013) and Buckley (2016), it seems that levels of task, coping, and scheduling self-efficacy vary throughout physical activity interventions and do not necessarily progress in a linear fashion. Findings from Rodgers et al. (2009) suggest that it is not unexpected for coping and scheduling self-efficacy to initially decrease as participants learn to adjust to an exercise program. Scheduling self-efficacy in particular may be more important later in the process of increasing physical activity, as Rodgers et al. (2013) found this type of self-efficacy most related to continued participation after a structured exercise program's completion.

More research is needed to better understand how levels of task, coping, and scheduling self-efficacy change over time as individuals participate in physical activity. The studies by Rodgers et al. (2009) and Rodgers et al. (2013) were either progressive in nature, short-term using a specific sample, or were focused on testing an intervention aimed specifically at altering levels of physical activity self-efficacy. Therefore, future research could examine how levels of task, coping, and scheduling physical activity self-efficacy vary over a longer period of time in a non-progressive physical activity regimen.

Physical Activity Self-Efficacy in Populations of Adults Who Have Obesity. Buckley (2016) explains that while self-efficacy is correlated with physical activity participation in individuals who have normal body weights, it is not clear if the same relationship exists in individuals who are overweight or have obesity. Individuals who have obesity experience more barriers towards physical activity when compared to their leaner counterparts (Napolitano, Papandonatos, Borradaile, Whiteley, & Marcus, 2012). In women with obesity, for example, these barriers include feeling too overweight for physical activity, feeling self-conscious, experiencing minor aches, fearing injury, and having low self-discipline (Napolitano et al., 2012). Napolitano et al. (2012), found that overall, these barriers had a detrimental effect on physical activity levels and did not affect normal weight or overweight participants to the same degree (Napolitano et al., 2012). Faghri, Simon, Huedo-Medina, and Gorin (2016) note that stress, anxiety, and body image can negatively impact self-efficacy and deter attempts to make lifestyle changes and increase physical activity. Thus, when examining the relationship between self-efficacy and physical activity, it seems possible that findings may differ between individuals who are of normal weight and those who have obesity.

Indeed, findings from Olander et al. (2013) suggest that self-efficacy may not be related to physical activity participation in adults who have obesity. Olander et al. (2013) completed a meta-analysis and systematic review that only included studies in which the sample had an average body mass index (BMI) of 30 kg/m^2 or greater; the researchers found a non-significant association between self-efficacy and physical activity. Their findings contrast those from a previous review by Williams and French (2011), which found an association between increases in self-efficacy and physical activity level. Williams and French (2011), however, excluded studies that dealt with clinical populations, and this included populations that had obesity. Consequently, Olander et al. (2013) concluded that the techniques considered effective at increasing physical activity may differ between individuals who have obesity and those who do not, suggesting that there could be characteristics about an adult population having obesity that render self-efficacy ineffective for modifying physical activity behaviour. Olander et al. (2013) explain that the majority of the studies included in their review mentioned Bandura’s Social Cognitive Theory as the theoretical basis, yet Social Cognitive Theory does not actually propose that only self-efficacy is involved in behaviour change; outcome expectancies, which are the perceptions that a given behaviour will generate a particular outcome, moderate the effects of self-efficacy on behaviour. Thus, in order for self-efficacy to motivate behaviour change, the individual has to believe that the change in behaviour will lead to a valued outcome (Olander, et al., 2013). Olander et al. (2013) note that approximately half of the studies included in their review contained interventions that were focused on weight loss or weight maintenance, and the relationship between physical activity and weight loss is not necessarily straightforward. The researchers suggest that when considering adult populations having obesity, it may be believed that a particular intervention, such as one designed to increase self-efficacy will increase physical activity, yet the outcome participants may actually value is weight loss; thus, if participants are doubtful that increases in physical activity will lead to achieving this goal, then it is possible that self-efficacy may not motivate individuals to increase their physical activity (Olander et al., 2013).

Other research contradicts these conclusions, suggesting that self-efficacy may have some impact on physical behaviour among adults who have obesity. Buckley (2016), for example, studied a sample of women who were overweight or had obesity to determine the effects of a 12 -week intervention on self-efficacy beliefs and energy expended from exercise. The intervention aimed to improve participants' levels of exercise self-efficacy, which was considered in terms of scheduling, physical, and exercise-worries components (Buckley, 2016). Buckley (2016) found that the intervention led to increased self-efficacy towards overcoming worries or challenges associated with exercising; yet, only participants who were inactive before beginning the intervention showed increased scheduling and physical efficacy levels and increased energy expenditure from exercise when compared to baseline levels. These findings prompted Buckley (2016) to conclude that individuals who have higher than normal body weights should not be viewed as a uniform group; instead, when considering whether self-efficacy may impact exercise, consideration should be given towards participants' activity levels.

Findings from Nezami et al. (2016) further support the idea that self-efficacy can be related to physical activity participation in individuals who are overweight or have obesity. Nezami et al. (2016) measured physical activity self-efficacy and moderate to vigorous physical activity in a sample of sedentary adults who were overweight or had obesity over a one-year period. In contrast to Buckley (2016) who relied on self-report, physical activity was measured objectively using an armband. Participants were randomly assigned to one of two weight loss programs, though each program aimed to increase participants' self-efficacy towards physical activity. The researchers found that increases in physical activity self-efficacy during the first six months of the interventions were correlated with greater amounts of moderate to vigorous physical activity at 12 months, though baseline self-efficacy towards physical activity had no effect on average physical activity levels recorded at six and 12 months (Nezami et al., 2016). Nezami et al. (2016) concluded that in sedentary adults who are overweight or have obesity, focusing on raising physical activity self-efficacy can increase physical activity.

Meanwhile, Faghri et al. (2016) explored the impact of self-efficacy on health behaviour and BMI in a sample of adults who were overweight and had obesity. The study used a cross-sectional design, so unlike the studies by Buckley (2016) and Nezami et al. (2016), participants did not participate in any type of intervention or program. Trained educators measured the weight and height of each participant so that BMI could be calculated; self-reported engagement in light, moderate, and vigorous physical activity throughout a typical week and self-efficacy towards exercise were measured using questionnaires (Faghri et al., 2016). The researchers found that higher levels of exercise self-efficacy could be predicted by more frequent amounts of moderate and vigorous physical activity, while higher levels of physical activity were associated with lower BMI values (Faghri et al., 2016). Faghri et al. (2016) determined that exercise self-efficacy significantly mediated the relationship between vigorous physical activity and BMI, noting that while relatively few participants reported partaking in vigorous physical activity, those who did had experience and higher levels of motivation and confidence needed to exercise regularly and persevere with their exercise regimens. Self-efficacy also moderately mediated the relationship between moderate physical activity and BMI (Faghri et al., 2016). Thus, the researchers concluded that self-efficacy shows promise as a factor that can impact health behaviours and improve the effectiveness of obesity interventions (Faghri et al., 2016).

When considering the studies by Buckley (2016), Nezami et al. (2016) and Faghri et al., (2016), all three examined exercise or physical activity self-efficacy and exercise or physical activity using samples of adults who were of overweight or had obesity, and each study concluded that self-efficacy can still be an important correlate of physical activity even in adults who are overweight or have obesity. Still, Nezami et al. (2016) note that comparing results from different studies is challenging due to different methods of measuring self-efficacy, as well as different study designs and study populations.

There are a few possible ways to explain the contradictory findings between Olander et al. (2013), and Buckley (2016), Nezami et al. (2016) and Faghri et al., (2016). Buckley (2016) found that results could vary between active and sedentary individuals, so it is possible that other studies did not account for the activity level of its participants at baseline. Additionally, Olander et al. (2013) note that many studies examining self-efficacy and physical activity in adults who are overweight or have obesity deal with weight loss or weight maintenance. Indeed, a closer examination reveals that all three studies included participants who had in some way volunteered for a weight-loss program. While the study by Nezami et al. (2016) was the only one that presented its participants with interventions focused on weight loss, it appears that Buckley (2016) recruited his participants from a commercial weight loss program. Meanwhile, Faghri et al. (2016) noted that at the time of data collection for their study, participants were aware that they would be partaking in a weight loss intervention in the near future, suggesting that this sample would be used for future research purposes that focused on weight loss. This is perhaps significant, as it is possible that findings may not be generalizable to other samples of adults who are overweight or have obesity and lack the interest and motivation to participate in a weight loss program (Buckley, 2016). Similarly, since adults who are of a healthy weight would presumably be uninterested in weight-loss, this also suggests that these findings may not be generalizable to samples of adults who have a normal body weight**.** Clearly, more research is needed in this area. Overall, there is the need for studies that subject participants of different weight groups to the same set of conditions and measure physical activity self-efficacy multidimensionally. There is also a need for research that examines the relationship self-efficacy and physical activity in adults having obesity without focusing on physical activity as a means for achieving weight loss.

Purpose

After performing a review of the literature, it is clear that more research is needed to better understand how levels of task, coping, and scheduling self-efficacy change over time as individuals participate in physical activity. More research is also needed to understand whether the effectiveness of the three types of physical activity self-efficacy in predicting behaviour differs among between adults who have normal weights and those who have obesity. Therefore, the purpose of this research is to measure the multidimensional components of physical activity self-efficacy throughout a six-month community based physical activity intervention to understand how the components of physical activity self-efficacy change over time, and if the relationships between task, coping, and scheduling physical activity self-efficacy and physical activity levels differ between individuals with body weights normal weights and those considered overweight and having obesity This study answers the research questions: how do the task, coping, and scheduling components of physical activity self-efficacy change throughout a six-month physical activity program, and do the relationships between task, coping, and scheduling self-efficacy and physical activity levels differ between individuals of different weight groups?

Hypotheses. Considering the findings of Rodgers et al. (2009), it seems likely that all participants required time to adjust to scheduling physical activity into their routines and experienced challenges. Therefore, Hypothesis #1 is that levels of coping and scheduling physical activity self-efficacy would follow a similar pattern over time, initially decreasing from baseline to Time 4, but exceeding baseline values by Time 6.

Research by Rodgers and Sullivan (2001) and Rodgers et al. (2008) suggest that physical inactivity may be due to challenges related to scheduling time or coping with obstacles and may not necessarily be due to a lack of confidence in performing the activity. Therefore, Hypothesis #2 is that higher levels of coping and scheduling physical activity self-efficacy would be positively correlated with higher levels of physical activity. Meanwhile, Hypothesis #3 is that the task component will be least correlated with physical activity participation.

Napolitano et al. (2012) discuss the additional barriers that individuals having obesity experience towards physical activity. Therefore, Hypothesis #4 is that participants who were overweight or had obesity would have lower levels of coping physical activity self-efficacy throughout the six months, which would be correlated with lower levels of physical activity when compared to participants who were normal weight.

Methods

Data for this study were collected as part of a larger project. As part of this larger project, surveys were used to collect data on variables other than step count and physical activity self-efficacy levels. These variables will not be discussed, as they are not relevant to this thesis.

Setting, Recruitment, and Participants

This was a community-based study that took place in a naturalistic setting, specifically involving community dwelling adults from a particular Southwest Edmonton neighborhood. Advertisements in local community newsletters, a poster at a community hall, and word of mouth were used to recruit the desired sample size of 80 to 100 participants. The rationale for this sample size was based on calculations performed using GPower software, version 3.1.9.2, which found that a sample size of 92 participants was needed based on a power of .80. Convenience sampling was used to recruit participants, which is defined by Setia (2016) as a common, non-random sampling technique in which researchers recruit participants who are easily accessible. Participants- both male and female- were included if they were between the ages of 19 and 64 years of age and resided in a given neighborhood in Southwest Edmonton. Participants were included regardless of their current activity level and their prior physical activity experience. While prior experience with physical activity was not needed, participants had to be interested in increasing their current physical activity level and be willing to wear a Fitbit Flex activity monitor each day, ideally for the entire 24 hours, over a six-month period. Individuals who self-reported any unmanaged health conditions or conditions that could be worsened by physical activity were excluded.

Design and Procedure

This study used a prospective, pre-test – post-test repeated measures design. The researchers held an information session at a community hall, providing prospective participants with the opportunity to learn about the study, meet researchers, and ask questions. At the end of the information session, those interested in participating provided informed consent and completed a pencil and paper survey collecting basic demographic information (Appendix A).

Participants also completed a Physical Activity Readiness Questionnaire (Appendix B) and when appropriate, met with a qualified exercise professional to ensure it was safe for them to engage in physical activity.

Consistent with the pre-test - post-test repeated measures design, participants completed an initial survey to measure task, coping and scheduling physical activity self-efficacy (Appendix C) at the start of study to provide baseline measures; after initiating the physical activity program, participants completed an online version of the survey each month thereafter for the next six months. Therefore, by the end of this study, the components of physical activity self-efficacy were measured at seven different points in time.

A specific physical activity program was not set by the researchers. Instead, participants set their own based upon their needs and goals, though at any time they could change their goals. Therefore, the physical activity program used in this study was individualized and flexible with the aim of increasing current physical activity levels. A member of the research team was available to provide assistance to any participants who needed help creating their own physical activity program; a research assistant served as a primary point of contact for any participants who required help as the study progressed. Each participant wore a Fitbit Flex on their wrist, ideally for 24 hours each day, for the duration of the program and was allowed to keep the device when the study concluded.

Measures

Demographic Data. Basic demographic information was collected at baseline only, including age and sex, as well as self-reported weight and height. The form used to collect this data (Appendix A) did not actually specify which units participants should use to report their weight and height. As a result, participants were free to self-report this data using imperial or metric values, which ever they were most familiar with. Since, however, BMI was calculated from these two variables and is typically reported in metric units, values for self-reported weight and height were converted and reported to metric units for consistency.

BMI. Obtaining measures for self-reported weight and height provided the data necessary to calculate a measure of BMI. BMI is calculated by dividing an individual's body mass in kilograms by the square of the individual's height in meters and is often used to categorize individuals in the general population as underweight, normal weight, overweight or having obesity (Duren et al., 2008; World Health Organization, 2018). According to the World Health Organization (2018), individuals with a BMI of 25 kg/m^2 or greater are considered overweight, meanwhile individuals with a BMI of 30 kg/m^2 or greater are considered to have obesity.

Physical Activity. Physical activity in terms of step count was measured using a Fitbit Flex, a type of accelerometer worn at the wrist; this provided a way to objectively measure physical activity behaviour. Participants were asked to wear their Fitbits 24 hours a day for the duration of the study. Each month, participants exported the daily activities data collected by the Fitbit throughout the previous month as an Excel file. This file, which included step count data, was emailed to the research team.

Feehan et al. (2018) explain that a Fitbit also records other data such as energy expenditure and the amount of time spent in different intensity activities. Indeed, in addition to step count, this data was also included in the files emailed to the researchers. While these measures can also provide insight into physical activity levels, step count was the measure chosen for this study because the findings from Feehan et al. (2018) suggest that it is the one that a Fitbit records most accurately. From a systematic review, Feehan et al. (2018) concluded that when compared to research-grade accelerometers, Fitbits worn on the wrists of healthy adults in free-living situations provided reasonably accurate step counts approximately 50% of the time. While there was a tendency for the Fitbit to overestimate step counts, ambulation at slow speeds resulted in significant underestimations (Feehan et al., 2018). Sushames, Edwards, Thompson, McDermott, and Gebel (2016) found that when compared to Actigraph accelerometers and direct observation, the Fitbit Flex had moderate validity for measuring step counts though contrary to the findings of Freehan et al. (2018), the Fitbit Flex tended to underestimate the steps in free-living situations. In terms of test-retest reliability, results were dependent on the type of activity being performed; while the Fitbit Flex was moderately reliable in estimating step counts obtained when walking on a flat surface, it did not provide reliable measures for walking up stairs or on an incline (Sushames et al., 2016).

Physical Activity Self-Efficacy. Physical activity self-efficacy was assessed with a nine-item survey using a 0-100% confidence rating scale that measured the task, coping, and scheduling components of physical activity self-efficacy. This survey was developed by Rodgers and Sullivan (2001) and was further refined and tested by Rodgers et al. (2008). Rodgers et al. (2008) explain that since this survey found that task, coping, and scheduling self-efficacy were distinct from one another and that support for the multidimensional structure of self-efficacy could be replicated in different populations, that there is evidence pertaining to the validity and reliability of this survey.

Subsequent work by Murray, Rodgers, & Fraser (2009) further notes that the physical activity self-efficacy measure refined and tested by Rodgers et al. (2008) has discriminant and convergent validity (Murray et al, 2009; Rodgers et al., 2008) with discriminant validity referring to how different traits are from one a another and convergent validity involving the use of different approaches to measure the same trait (Carmines & Zeller, 1979; Hill & Hughes, 2007).

Cronbach’s alpha is commonly used to objectively assess the reliability of instruments, particularly those which use multiple items to measure a given construct; in particular, it measures a scale’s internal consistency, providing a value between 0 and 1 (Tavakol & Dennick, 2011). Murray et al. (2009) explain that Cronbach’s alphas for the task component of physical activity self-efficacy range from .69 to .82 and for the coping and scheduling components range from .84 to .87 and .74 and .93 respectively. According to Taber (2018), an instrument is typically considered to have adequate or acceptable reliability with an alpha value of at least .70, though this value is somewhat arbitrary. Therefore, based on the alpha values reported by Murray et al. (2009) it appears that the survey has an acceptable level of reliability for each of the three self-efficacy components.

Data Analysis

In the nine-item survey that measured physical activity self-efficacy with a confidence rating scale, participants were asked three questions that pertained to the task component, three that pertained to the coping component, and three that pertained to the scheduling component; to provide an overall score for the task, coping and scheduling components, the means of the three questions pertaining to each self-efficacy component were calculated (Murray et al., 2009; Rodgers & Sullivan, 2001; Rodgers et al., 2008). The step count data exported from each participant's Fitbit was used to calculate a daily average for each of the six months.

Step count was the variable that had the most missing data throughout the study. There were instances where participants submitted Excel files, but there were zeros recorded for daily step count throughout the month; these zeroes were included when calculating the average daily step count for the month. There were also cases where participants did not submit an Excel file with their activity data for the month. In these situations, there was no step count data to calculate, so the calculations for the daily step count means for the month did not include these participants.

Participants self-reported their weights and heights; these values were later used to calculate BMI values. Originally, this study had intended to use the calculated BMI to compare results across three groups: BMI = 18.5 to 24.9 kg/m^2 (normal weight), BMI = 25 to 25.9 kg/m^2 (overweight) and BMI ≥ 30 kg/m^2 (obese). After the BMI values for all participants were calculated though, it was discovered that this approach resulted in the BMI ≥ 30 kg/m^2 group having too few participants, particularly towards the end of the study. It was also found that one participant had a BMI value slightly below 18.5 kg/m^2. Therefore, in order to include all participants in the analysis and have similar numbers of participants in each group, it was decided to only have two groups: BMI < 25 kg/m^2 and BMI ≥ 25 kg/m^2.

Data were analyzed using IBM SPSS Statistics version 26. Means and standard deviations were calculated for the sample's demographic characteristics, average daily step counts for each month, and each subtype of physical activity self-efficacy for the sample as a whole as well as for the BMI < 25 kg/m^2 or BMI ≥ 25 kg/m^2 groups. To investigate the effect of time on physical activity self-efficacy and differences between the BMI < 25 kg/m^2 and BM I≥ 25 kg/m^2 groups, a repeated measures MANOVA was performed to test between group differences and to determine changes to task, coping, and scheduling physical activity self-efficacy over time. The task, coping, and scheduling components of physical activity self-efficacy served as the dependent variables, BMI < 25 kg/m^2 or BMI ≥ 25 kg/m^2 group as the between subject factor, and time was the within-subject factor with seven levels representing baseline and Time 1 to Time 6. A repeated measures MANOVA was appropriate to use in this instance; O'Brien and Kaiser (1985) explain that repeated measures designs are used when throughout a study, the same dependent variable is measured a more than once. Furthermore, Warne (2014) explains that according to Stevens (2002), MANOVA is appropriate to use when there are at least two dependent variables. Though an alternative to MANOVA would be to perform separate ANOVA calculations for each dependent variable, performing a single MANOVA calculation reduces the risk of type 1 error from multiple ANOVA tests, as well as tests whether relationships exist between independent variables and any related dependent variables (Warne, 2014). A one-tailed Pearson correlation coefficient was used to test the hypothesis that higher levels of coping and scheduling physical activity self-efficacy would be related to higher step counts.

Data were screened for anomalies and potential outliers. During this process, it was discovered that two participants had self-reported values for weight that were noticeably high. Analysis was performed with and without their data to determine whether the inclusion would change the results. Since the overall findings were not impacted, it was decided to leave these two participants in the sample.

Results

Participants

The sample consisted of 84 adults. As Table 1 shows, approximately two thirds of the participants were female. Table 2 presents the basic demographic information from the sample. This table highlights that both groups were similar in terms of their mean demographic characteristics, with the exception of average weight and subsequently BMI.

Average Daily Step Count

Table 3 shows that while no baseline measures of step count were obtained, at Time 1, the mean daily step count for the BMI < 25 kg/m^2 group was 10676 (SD = 3428, n = 32) while the BMI ≥ 25 kg/m^2 group had a mean daily step count of 10015 (*SD* = 4082, *n* = 38). Table 3 shows that in both the BMI < 25 kg/m^2 group and the BMI ≥ 25 kg/m^2 group, the average step count per day at Time 6 was less than the average step count per day at Time 1. For the BMI < 25 kg/m^2 group, the step count was initially higher than the BMI ≥ 25 kg/m^2 group and gradually decreased at each time period. The BMI ≥ 25 kg/m^2 group showed a different pattern of mean steps over time; though the step counts decreased between Time 1 and Time 3, Time 4 had the highest step count. Between Time 4 and Time 6, the step counts decreased but were still higher than that of the BMI < 25 kg/m^2 group.

Table 3 also shows that for the BMI ≥ 25 kg/m^2 group, the number of participants submitting step count data to be used for analysis decreased by 12 between Time 1 and Time 6; meanwhile, the number of participants in the BMI < 25 kg/m^2 group submitting step count data only decreased by one between Time 1 and Time 6.

Physical Activity Self-Efficacy

Table 4 presents the means and standard deviations for the task, coping, and scheduling components of physical activity self-efficacy at baseline and from Month 1 to Month 6. For both groups, all three types of physical activity self-efficacy were lower at Month 6 than at their initial baseline values; furthermore, task physical activity self-efficacy had the least change from baseline values for both of the groups. Table 4 also shows that task physical activity self-efficacy was the type of physical activity self-efficacy that had the highest levels at each time of data collection; this was noted when examining the group as a whole, as well as both the BMI < 25 kg/m^2 and BMI ≥ 25 kg/m^2 groups. Meanwhile, coping physical activity self-efficacy was the component that had the lowest values at baseline, as well as throughout the six-month program for the group as a whole as well as each group individually.

Effect of Time on Physical Activity Self-Efficacy

To investigate the effect of time on physical activity self-efficacy and differences between the BMI< 25 kg/m^2 and BMI≥ 25 kg/m^2 groups, a repeated measures MANOVA was performed with the task, coping, and scheduling components of physical activity self-efficacy as the dependent variables, BMI < 25 kg/m^2 or BMI ≥ 25 kg/m^2 group as the between subject factor, and time as the within-subject factor with seven levels representing baseline and Time 1 to Time 6. There was a significant multivariate effect for time within subjects, F (18, 28) = 2.51, p = .01, partial η^2= .62, though there was no statistically significant between-subject effect for BMI group, F (3, 48) = .07, p = .98, partial η^2 = .01. The results also determined that the interaction between time and BMI group was not significant, F (18, 28) = .85, p = .63, partial η^2 = .35.

Univariate testing using repeated measures ANOVA was performed to determine which components of physical activity self-efficacy were most important. According to Mauchly's Test of Sphericity, the sphericity assumption for a repeated measures ANOVA was violated for task (W (20) = .001, p < .001), coping (W (20) = .23, p < .001) and scheduling (W (20) = .34, p = .001) components of physical activity self-efficacy and therefore Huynh-Feldt epsilons of .26, .64, .70 respectively were used to correct degrees of freedom. The results show that time only had a statistically significant effect for scheduling physical activity self-efficacy, F (4.75, 213.83) = 4.51, p = .001. partial η^2 = .09; meanwhile, the effect of time on the task (F (1.55, 69.66) = .58, p= .52, partial η^2 = .01) and coping (F (4.33, 194.78) = 1.48, p= .21. partial η^2 = .03) components was not statistically significant. There was no statistically significant interaction between BMI group and time for the task (F (1.55, 69.66) = 2.02, p = .15, partial η^2 = .04), coping (F (4.33, 194.78) = 1.58, p = .18, partial η^2 = .03), or scheduling (F (4.75, 213.83) = .99, p= .42. partial η^2 = .02) components of physical activity self-efficacy.

Figures 1 and 2 show that the estimated marginal means for task physical activity self-efficacy remained stable throughout the seven time points, with the exception of a noticeable increase at Time 4 for the BMI < 25 group. Table 6 summarizes the values shown in Figures 1 and 2 and indicates that between Time 3 and Time 4, values of task physical activity self-efficacy increased by approximately 13% for the BMI < 25 kg/m^2 group. The estimated marginal means for coping physical activity self-efficacy indicate that when considering the group as a whole, as shown in Figure 4, values increased and decreased throughout the six months but were below baseline values at Time 6. Figure 3 and Table 7 indicate that values for the coping component for the BMI < 25 kg/m^2 group were lower than baseline at Time 6; in contrast, values were above baseline values at Time 6 for the BMI ≥ 25 kg/m^2 group.

Figure 6 and Table 8 indicate for overall participants, scheduling physical activity self-efficacy was below baseline values at Time 6 and decreased sharply between baseline and Time 1. Figure 5 and Table 8 indicate that for the BMI < 25 kg/m^2 and BMI ≥ 25 kg/m^2 groups, values for the scheduling component followed a similar trend to that of the overall group, with values also decreasing sharply between baseline and Time 1 and ending below those at baseline.

Relationship Between Average Daily Step Count and Physical Activity Self-Efficacy

To determine whether higher levels of physical activity self-efficacy would be related to higher step counts, a one-tailed Pearson correlation coefficient was calculated. Table 5 shows the correlational data between the average daily step count and each type of physical activity self-efficacy for both groups and the sample as a whole for Time 1 to Time 6. The table shows that when compared to coping and scheduling physical activity self-efficacy, the task component had the least number of statistically significant correlations. At Time 3, coping physical activity self-efficacy was statistically significantly correlated with step count for the BMI < 25 kg/m^2 group, the BMI ≥ 25 kg/m^2 group, and the total sample; these significant correlations had moderate effect sizes. At Time 4, both coping and scheduling physical activity self-efficacy were significantly correlated with step count for the BMI < 25 kg/m^2 group, the BMI ≥ 25 kg/m^2 group, and the overall sample and in general, these significant correlations also had moderate effect sizes.

Discussion

The purpose of this study was to understand how the multidimensional components of physical activity self-efficacy change over time with physical activity participation, as well as to examine the relationships between each component and physical activity. The study also aimed to understand whether there were differences between participants who were of normal weight and those with higher body weights.

Support for Hypotheses

These findings do provide support for some of the previously mentioned hypothesises. Hypothesis #1 was that levels of coping and scheduling physical activity self-efficacy would follow a similar pattern over time, initially decreasing from baseline to Time 4, but exceeding baseline values by Time 6. This hypothesis was made based on the findings of Rodgers et al. (2009), which suggested that coping and scheduling physical activity self-efficacy may initially decrease as participants learn to adjust to the demands of a new physical activity program. The results partially support this hypothesis. When considering the estimated marginal means for both components overall and for individual groups, levels progressed in a non-linear fashion and there were some general similarities with regards to how levels progressed throughout the six months. Both components typically decreased from baseline values within the first month or two of the study before stabilizing for the middle portion. In contrast to the hypothesis however, levels generally decreased throughout the final months, typically finishing below baseline values. Levels of coping physical activity self-efficacy among participants in the BMI $\geq$ 25 kg/m^2 group appear to be the exception, with levels remaining slightly above baseline until Time 5 and finishing marginally above baseline levels at Time 6; as mentioned previously, this group was affected more by attrition then the BMI < 25 kg/m^2 group, which could have had some effect on the findings. Still, despite differences in levels of coping physical activity self-efficacy between groups, the statistical analysis showed that overall, these differences were not large enough to be considered statistically significant. Furthermore, despite levels fluctuating over time, the statistical analysis also found that in contrast to the scheduling physical activity self-efficacy, values of the coping component did not change enough throughout the six months to be considered statistically significant.

Previous research supports the overall finding that levels of coping and scheduling physical activity self-efficacy decreased initially. The decreases throughout the first months of the study may have been due to participants needing time to adjust to the new physical activity program, as suggested by Rodgers et al. (2009). Buckley (2016) also found that the components of physical activity self-efficacy decreased initially, particularly among individuals who were inactive prior to the physical activity intervention. Buckley (2016) suggests that initial decreases may be due to the lack of experience needed to properly form self-efficacy beliefs towards physical activity, leading to an overestimation of abilities. In the current study, no data was collected regarding participants' activity levels at baseline, so it is unknown what prior experience they had with physical activity. Still, it does provide another possible explanation for the situations in which levels of coping and scheduling physical activity self-efficacy initially decreased.

One aspect of Hypothesis #1 was not supported. Buckley (2016) found that while components of physical activity self-efficacy decreased throughout the first half of his study, levels increased throughout the second half but still remained below baseline values. Buckley (2016) had suggested that increases in physical activity self-efficacy components in the second half of his study may be due to participants gaining experience throughout the first half of the study. The physical activity regimen in Buckley (2016) was 12-weeks in length; since the physical activity program in the current study took place over a six-month period - nearly twice as long - it was thought that with participants engaging in physical activity over a longer time period, levels of the coping and scheduling components may actually exceed baseline levels towards the end of the study as there would have more time to adjust, learn how to overcome challenges, and gain confidence. The findings show that this typically was not the case. Still, for the coping component, even though the values fluctuated throughout the six months, there was a very small range. The statistical analysis found that time did not have a significant effect on this component. Therefore, while values at Time 6 were typically lower than those at baseline, the difference likely was not large enough to be meaningful. For the scheduling component, the statistical analysis found that time had a significant effect on values; therefore, it seems that the decrease in values between baseline and Time 6 was large enough to be meaningful. The results suggest that over the six months, participants lost confidence in their ability to schedule physical activity. In contrast to the findings from Buckley (2016), participants did not necessarily become more confident in their ability to schedule time for physical activity as they gained more experience. Perhaps the duration of the physical activity programs impacted results; perhaps participants found it more difficult to schedule physical activity consistently for a six-month period as opposed to only 12-weeks.

Hypotheses #2 and #3 were based on the findings of Rodgers and Sullivan (2001) and Rodgers et al. (2008). These researchers had found that the task component of physical activity self-efficacy may not be an important predictor of exercise behaviour, and that coping with challenges and scheduling time for the activity may be more important factors (Rodgers and Sullivan, 2001; Rodgers et al., 2008). Therefore, Hypothesis #2 stated that higher levels of coping and scheduling physical activity self-efficacy would be positively correlated with higher levels of physical activity. Meanwhile, Hypothesis #3 was that the task component would be least correlated with physical activity participation. Indeed, this is what can be concluded from the findings. Still, in a previously mentioned study, Rodgers et al., (2013) had found that task self-efficacy was highly correlated with exercise participation at the completion of a six to eight weight cardio rehabilitation program that incorporated exercise prescription and training; along with coping and scheduling self-efficacy, the task component was also related to continued exercise participation in the weeks after the program ended. This suggests that there may be situations where the task component could be an important predictor of physical activity behaviour. Still, in the current study, despite participants having high levels of task physical activity self-efficacy, it was determined that this was the component least correlated to physical activity participation even at the completion of the study. Nonetheless, the current study was significantly longer than the one by Rodgers et al. (2013), occurred in a naturalistic setting, and involved a sample of healthy adults as opposed to a sample of patients in a cardiac rehabilitation program, so perhaps these factors had an effect.

Furthermore, the findings for the task component could have been influenced by an aspect of the current study's design. In the current study, there was no fixed physical activity regimen. Instead, participants were allowed to create their own program based upon their goals.

The only stipulation was that participants had to work on increasing their current physical activity levels. It seems reasonable to assume that participants likely chose to engage in a form of physical activity they were already familiar with and they were confident they could perform. This could explain why levels of the task component were consistently high throughout the six-month study and did not change significantly with time. It could also explain why it was the component least correlated with physical activity participation. Had there been a fixed exercise program, it is possible that results would have been different, as it is likely that at least some participants would have required time to learn how to perform the specific activity and become proficient in it. Still, providing participants with the flexibility to decide on the type of physical activity they wished to pursue was consistent with conducting this study in a naturalistic setting.

Lastly, Hypothesis #4 is that participants who were overweight or had obesity would have lower levels of coping physical activity self-efficacy throughout the six months, which would be correlated with lower levels of physical activity when compared to participants who were normal weight. This hypothesis was made after considering the findings from Napolitano et al. (2012) who found that individuals with higher body weights experience additional barriers towards physical activity. It was reasoned that participants in the current study would likely experience some of the same barriers mentioned by Napolitano et al. (2012) including feeling self-conscious, experiencing aches and pain, and fearing injury, and that these added barriers would be related to the coping component of physical activity self-efficacy. It was also reasoned that if the coping component is related to physical activity participation, as was suggested by Rodgers and Sullivan (2001) and Rodgers et al. (2008), that these participants would have lower levels of physical activity.

Unfortunately, the findings from this study do not necessarily support this Hypothesis #4. Coping physical activity self-efficacy was the component that was lowest at baseline as well as consistently throughout the six-month study. Still, statistical analysis found that for all of the physical activity self-efficacy components including the coping one, there were no significant differences in levels between participants in the BMI < 25 kg/m^2 group and BMI ≥ 25 kg/m^2 group. This suggests that the coping component was an aspect that participants in both groups struggled with. It seems that participants in both groups experienced challenges related to physical activity participation and were not necessarily confident in their ability to overcome them.

In terms of physical activity levels, step counts gradually decreased throughout the six months in both groups. For the first three months of the physical activity program, participants in the BMI ≥ 25 kg/m^2 group did have slightly lower step counts than the BMI < 25 kg/m^2 group. For the last three months of the study though, the findings show that the BMI ≥ 25 kg/m^2 group actually had higher step counts than the BMI < 25 kg/m^2 group. Therefore, contrary to what had been hypothesized, participants in the BMI ≥ 25 kg/m^2 group were not necessarily less active than the BMI < 25 kg/m^2 group.

There are some explanations pertaining to why the results did not support this hypothesis. The multidimensional components of self-efficacy were measured using an online survey which required participants to rate their confidence on a scale of 0 to 100%. While this enabled physical activity self-efficacy to be examined quantitatively, it also meant that there may have been other insights more qualitative in nature that may have been missed. The tool used to measure physical activity self-efficacy did not investigate the reasons participants were inclined to leave the ratings they did. Therefore, no data was collected on the specific challenges participants faced throughout the six-month physical activity program. While levels of coping physical activity self-efficacy were not different enough between groups to be considered significant, it does not necessarily mean that the coping component was the same for both groups; it is possible that the BMI < 25 kg/m^2 and BMI ≥ 25 kg/m^2 groups had to cope with challenges that were different from one another.

Furthermore, the design of the study could have impacted these findings. Participants developed their own physical activity program based on their goals, and they were allowed to modify the program at their leisure. Therefore, it is possible that participants who experienced too many challenges chose to modify their physical activity program to make it easier. Unfortunately, no data was collected to determine which participants adhered to their original goals and which ones modified them as the study progressed.

It is also possible that the participants with the lowest levels of coping physical activity self-efficacy and step counts stopped submitting their monthly surveys and quit the study, meaning that these participants' lower scores would not have been available to include in the statistical analysis. Attrition, or participants leaving a study, almost always happens in research studies (Nunan, Aronson, & Bankhead, 2018). Saiepoura, Najman, Warea, Baker, Clavarino, and Williams (2019) explain that incomplete data can affect research findings and lead to bias, as often, there are systematic differences between participants who are retained for the duration of a study and those who are "lost" before the end.

Examining the results, it appears that missing data and attrition did, in fact, affect the two groups unequally. Therefore, it seems possible that attrition bias may have impacted the results and may have contributed to the hypothesis being refuted. Tables 3 and 4 inadvertently provide insight into missing data and attrition throughout the study and indicate that the BMI ≥ 25 kg/m^2

group was affected by missing data and attrition far more than the BMI < 25 kg/m^2 group. Table 3, for example, shows that for the BMI < 25 kg/m^2 group, step count at Time 1 was calculated with 32 participants; between Time 2 and 6, it was calculated with 31 participants. Meanwhile, in the BMI ≥ 25 kg/m^2, group, step count was initially calculated with 38 participants, but by Time 6, this decreased to 26. Therefore, while the raw means for each group show that the BMI ≥ 25 kg/m^2, group had higher step counts at Time 6, it is possible that this group was actually not more physically active than the BMI < 25 kg/m^2 group. Among the participants who remained in the study and kept submitting their monthly step counts, the BMI < 25 kg/m^2 group had the lower step counts but in contrast to the BMI ≥ 25 kg/m^2, at least it retained almost all of its participants for the six months.

Similarly, Table 4 shows that for calculating the raw means for the physical activity self-efficacy components, there were six less participants at Time 6 than there were at baseline for BMI < 25 kg/m^2 group; for the BMI ≥ 25 kg/m^2 group, there was a difference of seventeen participants between baseline and Time 6 calculations. This raises questions as to how the data missing from participants in the BMI ≥ 25 kg/m^2 group impacted the results. It is possible that had data from these missing participants been included, the differences in physical activity self-efficacy between groups may have been large enough to be considered statistically significant.

Furthermore, convenience sampling was used to recruit participants. Unfortunately, this sampling method did not result in the sample recruited having enough participants with higher BMI values to properly examine physical activity self-efficacy in a sample of adults having obesity. There were eight participants with BMI values above 30 kg/m^2 at the beginning of the study with only three remaining by the end; thus, the BMI ≥ 25 kg/m^2 group primarily consisted of participants categorized as overweight based on their self-reported weights and heights. The research from Napolitano et al. (2012) that had been considered when making the hypothesis suggested that it was individuals who had obesity that experienced more barriers towards physical activity participation and that those who were normal weight and overweight were not necessarily affected to the same extent. Given the composition of the sample, perhaps it is not surprising then that there was no statistically significant difference in coping physical activity self-efficacy between BMI < 25 kg/m^2 and BMI ≥ 25 kg/m^2 groups. BMI has limitations. While a BMI of 25 kg/m^2 was used as the threshold to determine groups in this study, it seems reasonable to expect that participants in the BMI < 25 kg/m^2 group with BMI values slightly less than 25 kg/m^2 and participants in the BMI ≥ 25 kg/m^2 group with BMI values slightly higher than 25 kg/m^2 would produce similar results, despite being in separate groups. Therefore, perhaps a different sampling approach, such as stratified sampling, could have produced a more appropriate sample, ensuring a greater number of participants with higher BMI values are recruited.

Strengths and Limitations

This study had a number of strengths, though there also were some limitations. There were a number of ways in which this study addressed the limitations of previous research pertaining to physical activity self-efficacy, thus contributing knowledge to this area. This study, for example, was longer in duration than most others found on the topic. Therefore, this research provides insight on how physical activity self-efficacy changes over a several month period and how it may relate to physical activity participation over a longer period of time. In contrast to other studies, this one examined physical activity self-efficacy multidimensionally in terms of task, coping, and scheduling components. Therefore, these results provide a more in-depth understanding of the specific aspects that participants were most and least confident in as they partook in physical activity. Also, in contrast to other research examining physical activity participation and physical activity self-efficacy in samples of adults who were overweight and had obesity, this study did not focus on increasing physical activity for weight loss purposes. This is significant since Olander et al. (2013) notes that many studies examining physical activity self-efficacy and physical activity in obese and overweight adults actually deal with weight loss or weight maintenance which, as Buckley (2016) explains, means that findings may not be generalizable to other samples consisting of individuals uninterested in participating in a weight loss program.

As noted by Nezami et al. (2016), comparing results from different studies is challenging due to different methods of measuring self-efficacy, as well as different study designs, interventions, and study populations. Indeed, other studies that examined the relationship between physical activity participation and physical activity self-efficacy in samples of adults with who were overweight or had obesity only included participants matching these characteristics- they did not include participants with normal weights for comparison purposes to determine if the results might differ in any way. Therefore, a strength of the study is that it included participants with a range of BMI values and all participants, regardless of their BMI values, were subjected to the same conditions. This made it possible to actually compare the results between participants of different weight groups.

Another strength is that this study's design and procedure aid in increasing its external validity. External validity refers to how generalizable the results are to the population of interest that the sample represents as well as to other settings, including real-life situations (Khorsan & Crawford, 2014). External validity is important in research because it increases the likelihood of findings being applied successfully in the field under real-life circumstances (Khorsan &

Crawford, 2014). External validity can be increased by having few exclusion criteria when selecting a sample and by providing freedom to make choices throughout the intervention (Godwin et al., 2003), both of which were done in this study. Conducting the study in a naturalistic setting also aided in creating conditions that more closely mirror the real-life scenario of how healthy adults engage in physical activity on their own accord. As a result, the findings obtained from the sample in this study would likely be applicable to the population of interest outside of study conditions, providing valuable information on physical activity participation and physical activity self-efficacy levels in adults aiming to incorporate physical activity into their lifestyle.

This study also has some limitations, most of which pertain to the topic of internal validity. Internal validity focuses on causality (Khorsan & Crawford, 2014); it means that steps have been taken to control variables outside of the treatment regimen to increase the likelihood that the observed effects are due to the intervention itself and are not a result of other factors (Godwin et al., 2003, Khorsan & Crawford, 2014). Overall, this study has low internal validity. Therefore, it is difficult to ascertain that the changes to the dependent variables- step count and physical activity self-efficacy levels- were actually due to participation in the six-month community based physical activity program. This is in part due to the study prioritizing external validity and the generalizability of its findings. Nonetheless, the study's procedure and design made it difficult to control variables throughout its duration. Therefore, it is possible that other factors could have impacted the findings.

The setting, for example, was difficult to control because the study took place in a naturalistic environment. It is possible that the setting in which the participant chose to be physically active had an impact on the findings; exercising in a fitness facility in front of others, for example, could be a markedly different experience than engaging in physical activity in a private home or outdoors. Furthermore, this meant that researchers could not directly observe and monitor adherence. Therefore, it is assumed that participants actually set goals related to increasing physical activity levels and worked towards achieving them over the six months.

There was also a lack of control regarding the physical activity program. It is likely that each physical activity program was unique to the participant and among other things, differed in terms of physical activity type. It seems reasonable to expect that the type of physical activity could have influenced levels of physical activity self-efficacy, as some activities require less skill than others. Some forms of physical activity also might be easier to schedule into an individual's routine.

Lack of control over the specific type of physical activity could have also created issues in terms of how it was measured in this study. Levels of physical activity were measured objectively using the step count data recorded from the Fitbit Flex worn on each participant's wrist. This study assumes then that step count equates to physical activity participation, yet this assumption could be problematic. It is unknown which types of physical activities participants performed as part of their program. It is possible that they may have chosen activities besides walking or running that would not have been reflected properly by the step count data recorded by a device worn at the wrist. An activity such as cycling, for example, presumably would not have been measured accurately in this study. The activity involves pedaling, not stepping. Furthermore, Mannini, Intile, Rosenberger, Sabatini, and Haskell (2014) note that devices worn at the wrist usually cannot measure cycling properly because the wrist maintains a constant position on the handlebars during the activity and usually does not move.

Furthermore, since participants wore the Fitbit on their wrist all day every day, it not only recorded the step count associated with structured exercise, but it also recorded data as participants were at work and engaged in activities of daily living. This study did not take into account the occupations of its participants, nor did it collect a baseline value for step count to determine levels before participation in the physical activity program. Therefore, the step count data perhaps should be interpreted with caution. While it is likely that higher step counts are associated with individuals who are more physically active, participants with higher step counts may not have necessarily been more dedicated to engaging in their physical activity program. Other factors, such as occupation, could have led to the accumulation of more steps throughout the day. Likewise, participants with lower step counts may have engaged in high amounts of structured exercise and may have adhered to the physical activity program, but perhaps their activity of choice was not one that could be properly measured by the Fitbit.

Internal validity was also impacted by the use of a one group pre-test post-test repeated measures design. Since there was no control group, Kviz (2019) explains that it was not possible to determine how the dependent variables would have changed over the six-months study period without participation in the physical activity intervention. The addition of a pre-test measure helped overcome this limitation to some extent; participants acted as their own controls since the pre-test measures taken before initiating the physical activity program could provide insight regarding the program's effect (Kviz, 2019). Still, a pre-test measure was only obtained for one of the dependent variables- physical activity self-efficacy. Since participants only started wearing their Fitbits as they began participating in their physical activity programs, baseline values for step count were not taken.

Kviz (2019) explains that a number of factors, including attrition and history, can serve as internal validity threats for this type of design. As was mentioned previously when discussing the hypotheses for the study, it is likely that attrition did affect the results. A number of participants left the study. It is unknown why they stopped submitting data and left. It is possible that at least some were among those with the lowest levels of physical activity self-efficacy. Meanwhile, history is often a threat in studies that are longer in duration, though it is sometimes difficult to identify; it refers to other events that occurred simultaneously to the study that may have impacted at least some of the participants enough to impact their results (Brossart, Clay, & Wilson, 2002). It is possible that history did have an impact on the results. This study, for example, began in July and concluded in December. Therefore, the first few months of the study coincided with warmer weather, school ending for the year, and possibly vacation time or time away from work. It is possible that even without engaging in a physical activity program, at least some participants would have been more physically active during this time period anyway, when physical activities such as walking or cycling would be a way to enjoy the summer weather.

Another limitation pertains to relying on self-reported data for BMI calculations. It is unknown how accurately participants reported their weight and height. Merrill and Richardson (2009) suggest that with regards to self-report, males tend to overreport their weights while women typically underreport their weight; in terms of self-reported height, both males and females tend to overreport values. Consequently, BMI values obtained using self-reported data are underestimated, particularly among females (Merrill & Richardson, 2009). This was potentially problematic as it could have led to some participants’ results being placed in the wrong BMI group during data analysis.

Lastly, given the repeated measures design used in this study, it is possible that regression to the mean could have impacted the overall findings. Barnett, van der Pols, and Dobson (2004) explain that regression to the mean can take place when the same subjects are measured repeatedly and explain that this statistical phenomenon is due to random error in the values obtained. Regression towards the mean is a common issue because obtaining data that does not contain random error is rare; still, this means that it can be difficult to determine whether changes in a variable are actually meaningful, or whether they are simply due to natural variation (Barnett et al., 2004). Therefore, it is possible that some of the changes in step count and physical activity self-efficacy levels throughout the six-months were actually due to random error. Barnett et al., (2004) suggest that improvements to the design can reduce regression to the mean; these improvements include incorporating a randomly assigned control group, as well as taking several baseline measurements. Unfortunately, the current study did not incorporate either of these elements.

Future Directions

Given the high external validity of this study, it is likely that the findings could be applied to develop physical activity interventions that are more successful in encouraging adherence over a longer time period. The results suggest that physical activity programs should not solely focus on teaching participants how to perform specific exercises; they should also focus on teaching participants how to cope with challenges that arise from engaging in physical activity and provide support in terms of scheduling it into their routine, as these are the aspects in which participants lack confidence but are most related to physical activity participation. Incorporating these additional aspects into a physical activity program might increase its success and encourage prolonged adherence.

While the results suggest that physical activity self-efficacy is related to physical activity regardless of weight class, more research is needed to explore this area further. This study attempted to determine if there were differences in results between individuals who are normal weight, overweight, and obese but given the sample obtained, not enough participants with higher BMI values were recruited to properly examine physical activity participation and physical activity self -efficacy in relation to obesity. Therefore, future research studies could use stratified sampling methods to ensure that the appropriate numbers of participants are recruited.

Additionally, future research could evaluate the hypotheses outlined in this thesis using an improved design. Since there was no control group, it is assumed that changes in step count and physical activity self-efficacy levels were actually due to participants engaging in their individualized physical activity program rather than other reasons. Therefore, the design could be improved by incorporating a control group. As noted by Barnett et al. (2004), the incorporation of a control group- particularly one that is randomly allocated- may also assist in reducing regression towards the mean.

Likewise, it was previously noted that that the majority of participants in this study were female. Still, data analysis did not actually examine whether there were any differences between males and females. Therefore, future research could also examine whether the results differ based on sex.

Furthermore, this study was quantitative in nature. Still, there are aspects related to physical activity participation and physical activity self-efficacy that cannot be addressed through quantitative research. Throughout this study, there would have been a number of opportunities to complement the quantitative data with qualitative data to, for example, gain insight into why participants left the confidence ratings that they did for the task, coping, and scheduling components of physical activity self-efficacy or to understand why participants may have stopped participating in the study before its completion. Therefore, future studies on this topic could involve mixed methods research.

Conclusion

Physical inactivity is associated with a number of health conditions. Therefore, high levels of it among adults in the population are concerning and understanding factors related to physical activity participation is important. Previous research had suggested that the factors related to physical activity participation might be different when considering adult populations having obesity.

Examining physical activity self-efficacy multidimensionally throughout this study provided insight into the specific aspects of physical activity participants found most challenging, as well as which components were most related to physical activity participation. Due to limitations related to the sample’s composition, it is somewhat challenging to draw conclusions related to physical activity self-efficacy and physical activity in adults who have obesity.

Still, this research addressed some of the limitations in previous studies related to this topic, and provides an understanding of why adults may not be meeting the recommended levels of physical activity in naturalistic conditions. The findings suggest that physical activity interventions would be more successful if they prioritized increasing levels of coping and scheduling physical activity self-efficacy.

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Table 1

Gender of Participants in the BMI < 25 kg/m² and BMI ≥ 25 kg/m² Groups and the Total Sample

	BMI < 25		BMI ≥ 25		Total	
Gender	*n*	%	*n*	%	*n*	%
Male	12	30.8	16	35.6	28	33.7
Female	27	69.2	29	64.4	56	66.7
Total	39	100	45	100	84	100

Note. Regarding abbreviations, BMI refers to body mass index in kg/m^2, and *n* refers to sample size.

Table 2

Descriptive Statistics for BMI < 25 kg/m² Participants, BMI ≥ 25 kg/m² Participants, and Total Participants

	BMI < 25			BMI ≥ 25			Total		
Variable	M	*SD*	*n*	M	*SD*	*n*	M	*SD*	*n*
Age	43.8	8.11	38	43.1	9.28	45	43.5	8.72	83
Height (meters)	1.71	.10	39	1.71	.11	45	1.71	.10	84
Weight (kg)	66.5	9.9	39	84.3	14.09	45	76.0	15.16	84
BMI	22.6	1.81	39	28.7	3.87	45	25.9	4.35	84

Note. Regarding abbreviations, kg refers to kilograms, BMI refers to body mass index in kg/m^2, *n* refers to sample size, M refers to mean, and *SD* refers to standard deviation.

Table 3

Average Daily Step Count Descriptive Statistics for BMI < 25 kg/m² Participants, BMI ≥ 25 kg/m² Participants, and Total Participants

Average Daily Step Count	BMI < 25			BMI ≥ 25			Total		
	n	M	*SD*	*n*	M	*SD*	*n*	M	*SD*
Time 1	32	10676	3428	38	10015	4082	70	10317	3785
Time 2	31	10555	3092	33	10347	3493	64	10448	3281
Time 3	31	10364	3799	31	9878	4129	62	10121	3942
Time 4	31	9529	2568	29	10232	3445	60	9869	3018
Time 5	31	8798	3599	30	9012	3972	62	8902	3754
Time 6	31	7203	4113	26	8276	5105	57	7693	4581

Note. Regarding abbreviations, BMI refers to body mass index in kg/m^2, *n* refers to sample size, M refers to mean, and *SD* refers to standard deviation.

Table 4

Physical Activity Self-Efficacy Descriptive Statistics for BMI < 25 kg/m² Participants, BMI ≥ 25 kg/m² Participants, and Total Participants

	BMI < 25			BMI ≥ 25			Total		
Type of PA SE	M	*SD*	*n*	M	*SD*	*n*	M	*SD*	*n*
Baseline									
Task	87.5	9.72	39	86.6	12.27	45	87.0	11.11	84
Coping	63.8	16.68	39	63.2	22.33	45	63.5	19.79	84
Scheduling	76.2	16.41	39	75.4	17.56	45	75.7	16.94	84
Month 1									
Task	82.7	15.98	39	87.7	8.71	44	85.4	12.81	83
Coping	61.8	20.42	39	65.2	20.58	44	63.6	20.45	83
Scheduling	68.3	21.62	39	68.1	20.72	44	68.2	21.02	83
Month 2									
Task	84.7	11.85	38	84.0	12.78	39	84.3	12.25	77
Coping	60.1	20.62	38	57.0	22.24	39	58.5	21.37	77
Scheduling	71.8	16.97	38	65.6	22.31	39	68.6	19.96	77
Month 3									
Task	84.9	11.57	37	84.1	12.51	37	84.5	11.97	74
Coping	58.0	20.11	37	60.54	22.79	37	59.3	21.38	74
Scheduling	70.5	19.57	37	68.51	17.46	37	69.5	18.44	74
Month 4									
Task	94.8	56.28	32	81.9	12.69	30	88.6	41.57	62
Coping	60.8	20.67	32	58.7	21.19	30	59.8	20.78	62
Scheduling	68.9	21.89	32	64.7	21.77	30	66.9	21.75	62
Month 5									
Task	81.2	15.31	33	84.4	9.84	34	82.8	12.83	67
Coping	59.9	22.84	33	53.2	22.85	34	56.5	22.92	67
Scheduling	65.5	20.22	33	57.9	23.78	34	61.6	22.25	67
Month 6									
Task	81.0	16.92	32	83.7	14.54	28	82.3	15.78	60
Coping	53.7	22.32	32	55.5	25.80	28	54.5	23.81	60
Scheduling	59.3	20.69	32	60.4	24.37	28	59.8	22.30	60

Note. Regarding abbreviations, PA SE refers to physical activity self-efficacy, BMI refers to body mass index in kg/m², *n* refers to sample size, M refers to mean, and *SD* refers to standard deviation.

Table 5

Correlations Between Average Daily Step Count and Physical Activity Self-Efficacy for BMI < 25 kg/m² Participants, BMI ≥ 25 kg/m² Participants, and Total Participants

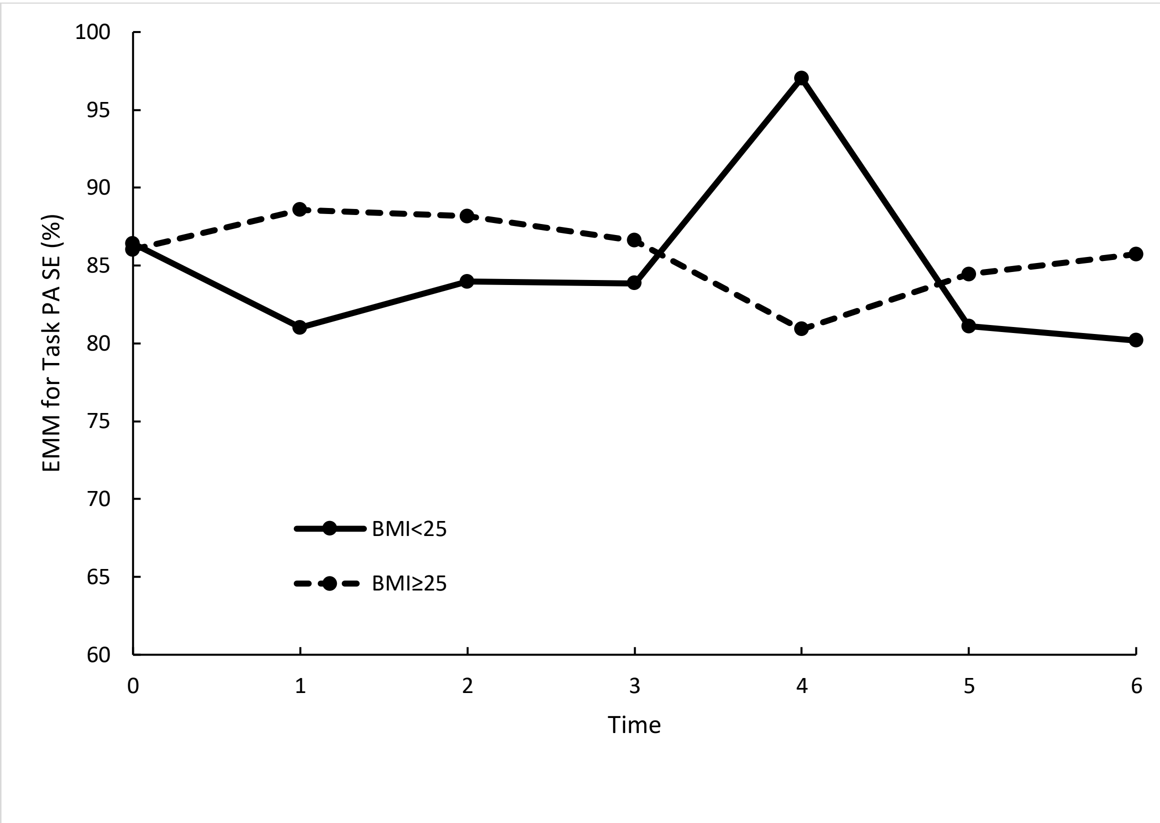
	BMI < 25			BMI ≥ 25			Total		
Type of physical activity self-efficacy	*r*	p	*n*	*r*	p	*n*	*r*	p	*n*
Time 1	Correlation with average daily step count using month 1 data								
Task	.26	.076	32	.15	.190	38	.17	.077	70
Coping	.30*	.049	32	.44**	.003	38	.36**	.001	70
Scheduling	.28	.064	32	.39**	.008	38	.34**	.002	70
Time 2	Correlation with average daily step count using month 2 data								
Task	.22	.117	31	-.07	.364	30	.10	.225	61
Coping	.52**	.001	31	.52**	.001	30	.52**	<.001	61
Scheduling	.38*	.019	31	.25	.095	30	.31**	.008	61
Time 3	Correlation with average daily step count using month 3 data								
Task	.38*	.020	30	.01	.485	28	.19	.076	58
Coping	.48**	.003	30	.53**	.002	28	.50**	<.001	58
Scheduling	.38*	.019	30	.25	.099	28	.32**	.007	58
Time 4	Correlation with average daily step count using month 4 data								
Task	.18	.189	27	.15	.235	25	.11	.223	52
Coping	.57**	.001	27	.67**	<.001	25	.61**	<.001	52
Scheduling	.53**	.002	27	.59**	.001	25	.55**	<.001	52
Time 5	Correlation with average daily step count using month 5 data								
Task	.34*	.034	30	.26	.088	28	.29*	.013	58
Coping	.44**	.008	30	.34*	.039	28	.39**	.001	58
Scheduling	.23	.116	30	.24	.112	28	.23*	.040	58
Time 6	Correlation with average daily step count using month 6 data								
Task	.11	.287	29	.33	.063	23	.21	.066	52
Coping	.32*	.044	29	.12	.291	23	.21	.064	52
Scheduling	.15	.218	29	.03	.455	23	.08	.279	52

Note. Regarding abbreviations, BMI refers to body mass index in kg/m², *r* refers to Pearson correlation coefficient, and *n* refers to sample size.

**denotes significance at the p < .05 level; *denotes significance at the p < .01 level; tests are one-tailed

Figure 1

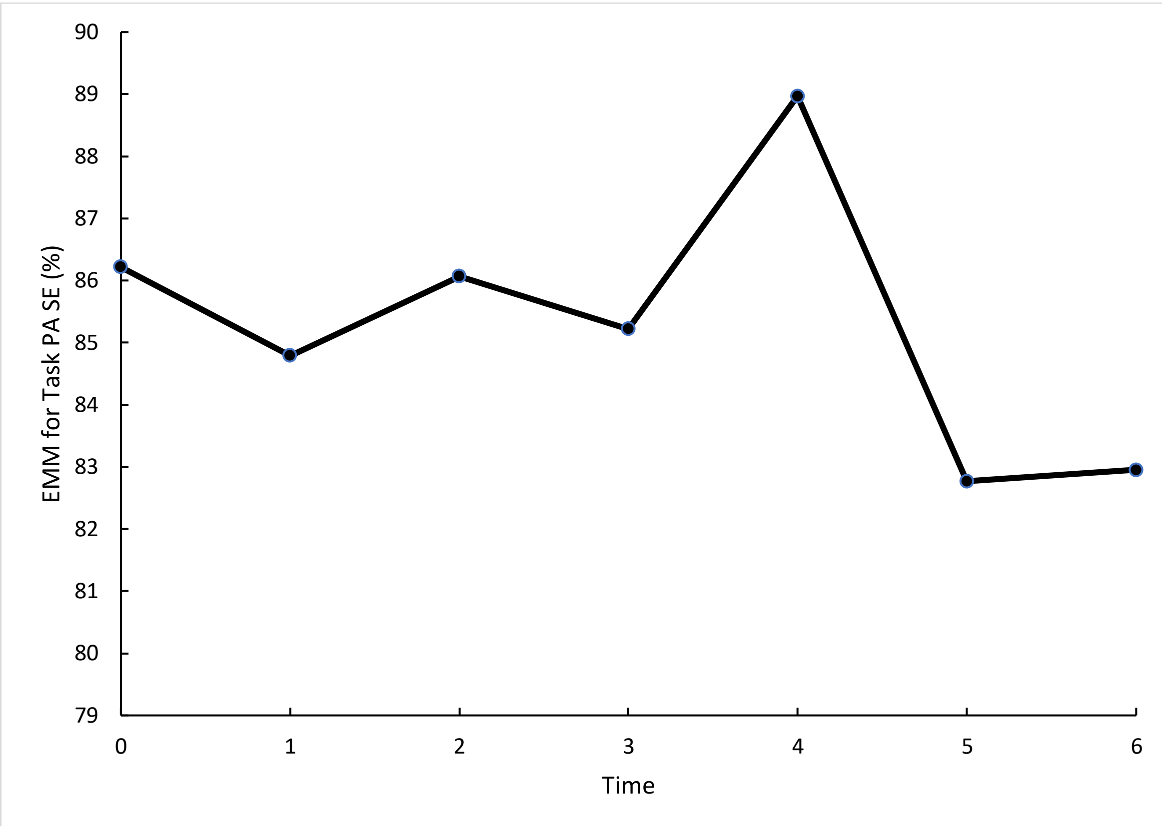
Comparing the Estimated Marginal Means for Task Physical Activity Self-Efficacy in BMI < 25 kg/m² Participants and BMI≥ 25 kg/m² Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, BMI refers to body mass index in kg/m², EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Figure 2

Estimated Marginal Means for Task Physical Activity Self-Efficacy in Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Table 6

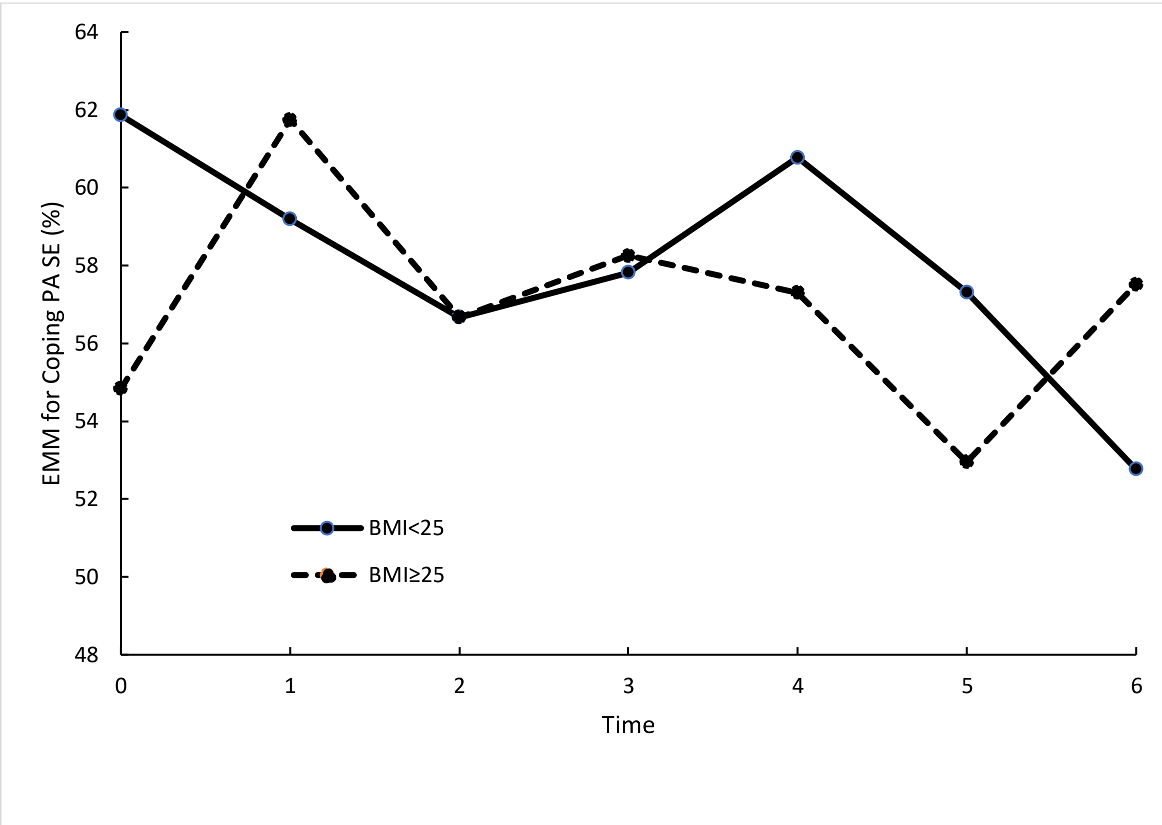
Comparing Estimated Marginal Means for Task Physical Activity Self-Efficacy in BMI < 25 kg/m^2 Participants, BMI ≥ 25 kg/m^2 Participants, and Total Participants at Baseline and Throughout a Six-Month Physical Activity Program

Time	BMI < 25		BMI ≥ 25		Total	
	EMM (%)	SE	EMM (%)	SE	EMM (%)	SE
Baseline	86.4	2.00	86.0	2.23	86.2	1.50
1	81.0	2.81	88.6	3.13	84.8	2.10
2	84.0	2.13	88.2	2.38	86.1	1.60
3	83.9	2.47	86.6	2.74	85.2	1.84
4	97.0	9.28	80.9	10.32	89.0	6.94
5	81.1	2.60	88.4	2.89	82.8	1.94
6	80.2	3.21	85.7	3.57	83.0	2.40

Note. Regarding abbreviations, BMI refers to body mass index in kg/m^2, EMM refers to estimated marginal mean, and SE refers to standard error.

Figure 3

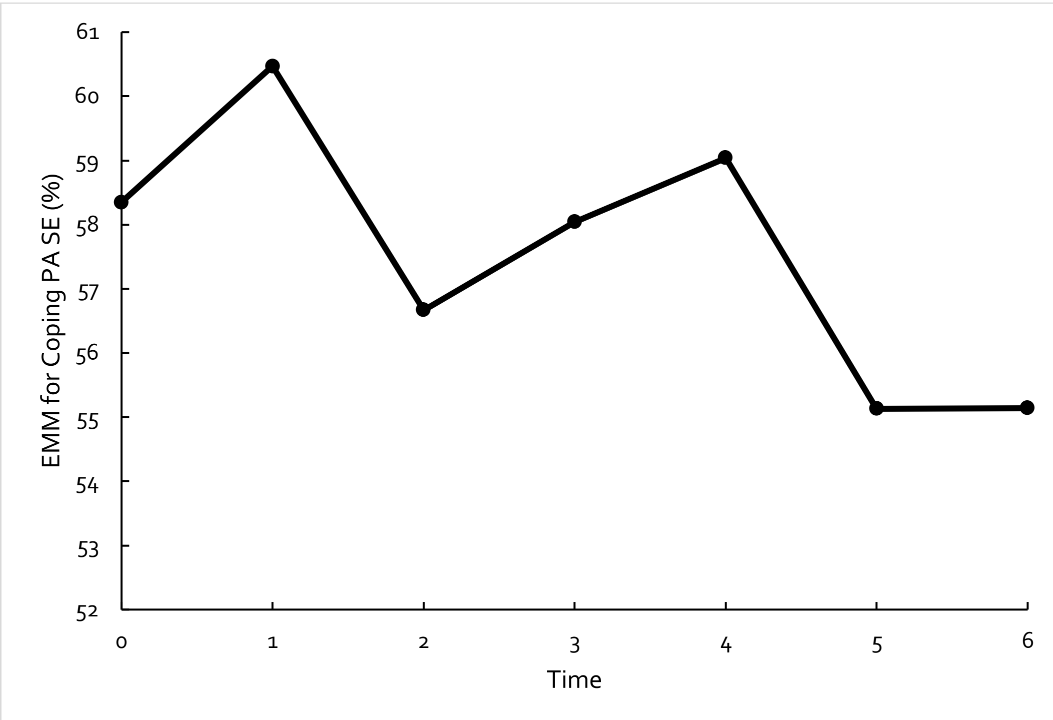
Comparing the Estimated Marginal Means for Coping Physical Activity Self-Efficacy in BMI < 25 kg/m² Participants and BMI ≥ 25 kg/m² Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, BMI refers to body mass index in kg/m², EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Figure 4

Estimated Marginal Means for Coping Physical Activity Self-Efficacy in Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Table 7

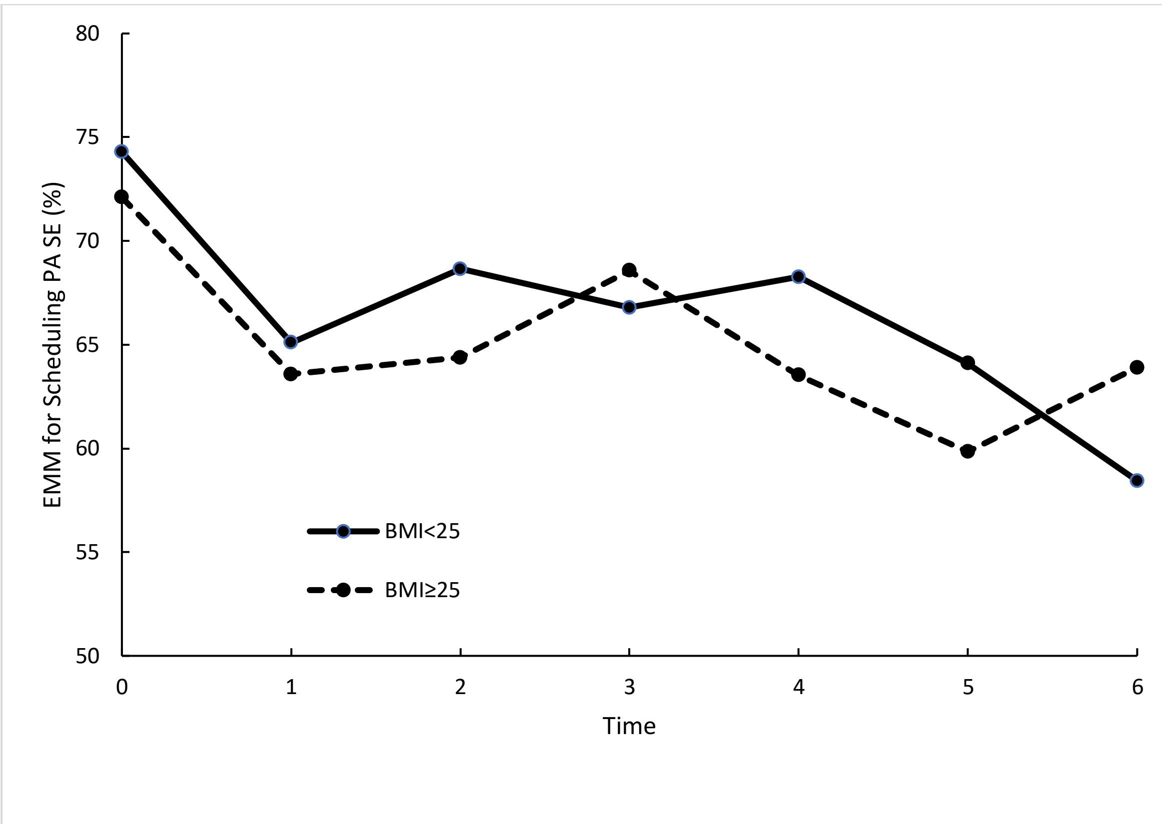
Comparing Estimated Marginal Means for Coping Physical Activity Self-Efficacy in BMI < 25 kg/m² Participants, BMI ≥ 25 kg/m² Participants, and Total Participants at Baseline and Throughout a Six-Month Physical Activity Program

Time	BMI < 25		BMI ≥ 25		Total	
	EMM (%)	SE	EMM (%)	SE	EMM (%)	SE
Baseline	61.9	3.78	54.9	4.21	58.4	2.83
1	59.2	4.23	61.7	4.71	60.5	3.16
2	56.7	4.33	56.7	4.82	56.7	3.24
3	57.8	4.07	58.3	4.53	58.0	3.05
4	60.8	4.13	57.3	4.59	59.0	3.09
5	57.3	4.47	53.0	4.97	55.1	3.34
6	52.8	4.77	57.5	5.30	55.1	3.57

Note. Regarding abbreviations, BMI refers to body mass index in kg/m², EMM refers to estimated marginal mean, and SE refers to standard error.

Figure 5

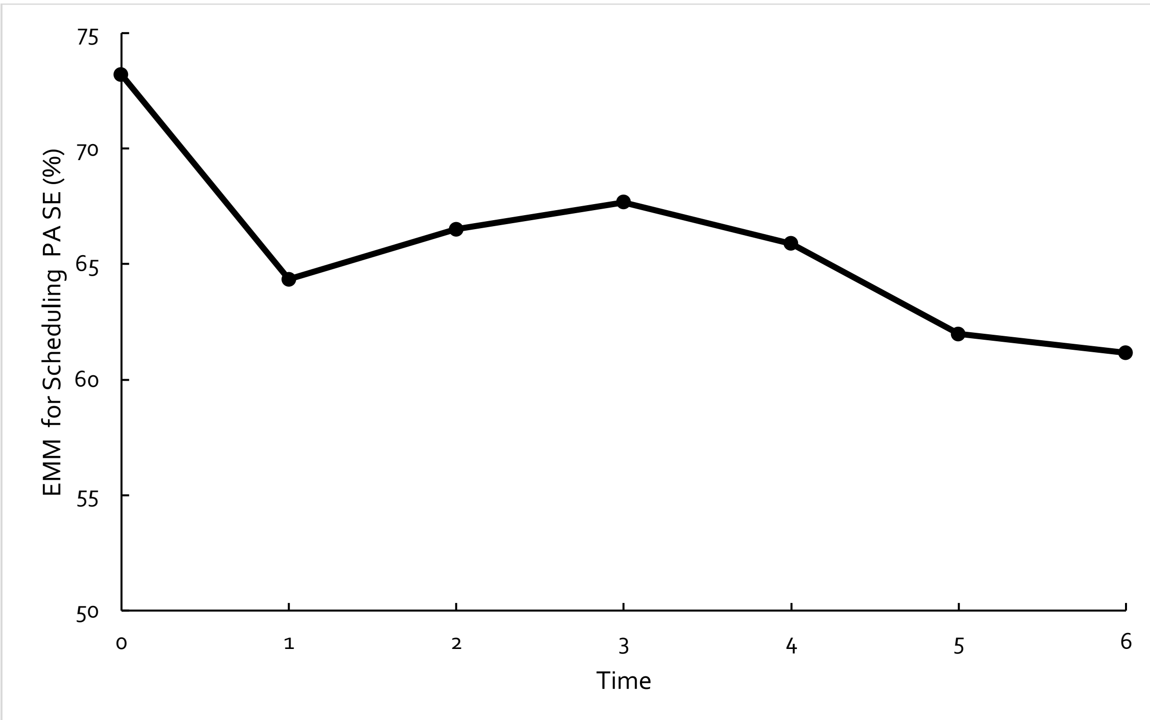
Comparing the Estimated Marginal Means for Scheduling Physical Activity Self-Efficacy in BMI < 25 kg/m² Participants and BM ≥ 25 kg/m² Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, BMI refers to body mass index in kg/m², EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Figure 6

Estimated Marginal Means for Scheduling Physical Activity Self-Efficacy in Participants at Baseline and Throughout a Six-Month Physical Activity Program



Note. Regarding abbreviations, EMM refers to estimated marginal mean, and PA SE refers to physical activity self-efficacy.

Table 8

Comparing Estimated Marginal Means for Scheduling Physical Activity Self-Efficacy in BMI < 25 kg/m² *Participants, BMI ≥ 25* kg/m² *Participants, and Total Participants at Baseline and Throughout a Six-Month Physical Activity Program*

Time	BMI < 25		BMI ≥ 25		Total	
	EMM (%)	SE	EMM (%)	SE	EMM (%)	SE
Baseline	74.3	3.34	72.1	3.72	73.2	2.50
1	65.1	4.46	63.6	4.96	64.3	3.34
2	68.7	3.99	64.4	4.44	66.5	2.98
3	66.8	3.68	68.6	4.10	67.7	2.75
4	68.3	4.46	63.5	4.96	65.9	3.33
5	64.1	4.36	59.8	4.85	62.0	3.26
6	58.4	4.43	63.9	4.92	61.2	3.31

Note. Regarding abbreviations, BMI refers to body mass index in kg/m^2, EMM refers to estimated marginal mean, and SE refers to standard error.

Appendix A. Demographic Information Questionnaire

Contact Information:

- In order to participate in the study, we will need your email address to send you surveys, and in order to "friend" you on the Fitbit website. Please provide here the email address you want all study information sent to.
  ____
- Please provide a phone number for additional contact information:
  ____
- Age_____
- Male_____ Female_____
- Approximate Height______
- Approximate Weight______
- How did you hear about the study? ________________________________
- Are you joining the study with anyone? _____Yes _____No
  - If yes, what is your relationship to this person? (spouse; friend; neighbour; coworker etc.)
    ____
- Have you previously used any technology (e.g., physical activity APPS or websites or a pedometer) to help you be more active?

  _____Yes _____No

  - If yes: what kind (e.g., a pedometer; my Fitness Pal etc):
    ____
    ____

Appendix B. PAR-Q

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The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

GENERAL HEALTH QUESTIONS

Please read the 7 questions below carefully and answer each one honestly: check YES or NO.	YES	NO
1) Has your doctor ever said that you have a heart condition ☐ OR high blood pressure ☐?	☐	☐
2) Do you feel pain in your chest at rest, during your daily activities of living, **OR** when you do physical activity?	☐	☐
3) Do you lose balance because of dizziness **OR** have you lost consciousness in the last 12 months? Please answer **NO** if your dizziness was associated with over-breathing (including during vigorous exercise).	☐	☐
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? **PLEASE LIST CONDITION(S) HERE:** ______	☐	☐
5) Are you currently taking prescribed medications for a chronic medical condition? **PLEASE LIST CONDITION(S) AND MEDICATIONS HERE:** ______	☐	☐
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer **NO** if you had a problem in the past, but it **does not limit your current ability** to be physically active. **PLEASE LIST CONDITION(S) HERE:** ______	☐	☐
7) Has your doctor ever said that you should only do medically supervised physical activity?	☐	☐

If you answered NO to all of the questions above, you are cleared for physical activity.
Please sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.

- Start becoming much more physically active – start slowly and build up gradually.
- Follow International Physical Activity Guidelines for your age (www.who.int/dietphysicalactivity/en/).
- You may take part in a health and fitness appraisal.
- If you are over the age of 45 yr and NOT accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.
- If you have any further questions, contact a qualified exercise professional.

PARTICIPANT DECLARATION

If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for its records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME ______ DATE ______

SIGNATURE ______ WITNESS ______

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER ______

If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at **www.eparmedx.com** before becoming more physically active.
- Your health changes - answer the questions on Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

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FOLLOW-UP QUESTIONS ABOUT YOUR MEDICAL CONDITION(S)

1.	**Do you have Arthritis, Osteoporosis, or Back Problems?**	
	If the above condition(s) is/are present, answer questions 1a-1c — If **NO** ☐ go to question 2	
1a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
1b.	Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)?	YES ☐ NO ☐
1c.	Have you had steroid injections or taken steroid tablets regularly for more than 3 months?	YES ☐ NO ☐
2.	**Do you currently have Cancer of any kind?**	
	If the above condition(s) is/are present, answer questions 2a-2b — If **NO** ☐ go to question 3	
2a.	Does your cancer diagnosis include any of the following types: lung/bronchogenic, multiple myeloma (cancer of plasma cells), head, and/or neck?	YES ☐ NO ☐
2b.	Are you currently receiving cancer therapy (such as chemotheraphy or radiotherapy)?	YES ☐ NO ☐
3.	**Do you have a Heart or Cardiovascular Condition? This includes Coronary Artery Disease, Heart Failure, Diagnosed Abnormality of Heart Rhythm**	
	If the above condition(s) is/are present, answer questions 3a-3d — If **NO** ☐ go to question 4	
3a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
3b.	Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction)	YES ☐ NO ☐
3c.	Do you have chronic heart failure?	YES ☐ NO ☐
3d.	Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity in the last 2 months?	YES ☐ NO ☐
4.	**Do you have High Blood Pressure?**	
	If the above condition(s) is/are present, answer questions 4a-4b — If **NO** ☐ go to question 5	
4a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
4b.	Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? (Answer **YES** if you do not know your resting blood pressure)	YES ☐ NO ☐
5.	**Do you have any Metabolic Conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes**	
	If the above condition(s) is/are present, answer questions 5a-5e — If **NO** ☐ go to question 6	
5a.	Do you often have difficulty controlling your blood sugar levels with foods, medications, or other physician-prescribed therapies?	YES ☐ NO ☐
5b.	Do you often suffer from signs and symptoms of low blood sugar (hypoglycemia) following exercise and/or during activities of daily living? Signs of hypoglycemia may include shakiness, nervousness, unusual irritability, abnormal sweating, dizziness or light-headedness, mental confusion, difficulty speaking, weakness, or sleepiness.	YES ☐ NO ☐
5c.	Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, **OR** the sensation in your toes and feet?	YES ☐ NO ☐
5d.	Do you have other metabolic conditions (such as current pregnancy-related diabetes, chronic kidney disease, or liver problems)?	YES ☐ NO ☐
5e.	Are you planning to engage in what for you is unusually high (or vigorous) intensity exercise in the near future?	YES ☐ NO ☐

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6.	**Do you have any Mental Health Problems or Learning Difficulties?** This includes Alzheimer's, Dementia, Depression, Anxiety Disorder, Eating Disorder, Psychotic Disorder, Intellectual Disability, Down Syndrome If the above condition(s) is/are present, answer questions 6a-6b If **NO** ☐ go to question 7	
6a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
6b.	Do you have Down Syndrome **AND** back problems affecting nerves or muscles?	YES ☐ NO ☐
7.	**Do you have a Respiratory Disease?** This includes Chronic Obstructive Pulmonary Disease, Asthma, Pulmonary High Blood Pressure If the above condition(s) is/are present, answer questions 7a-7d If **NO** ☐ go to question 8	
7a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
7b.	Has your doctor ever said your blood oxygen level is low at rest or during exercise and/or that you require supplemental oxygen therapy?	YES ☐ NO ☐
7c.	If asthmatic, do you currently have symptoms of chest tightness, wheezing, laboured breathing, consistent cough (more than 2 days/week), or have you used your rescue medication more than twice in the last week?	YES ☐ NO ☐
7d.	Has your doctor ever said you have high blood pressure in the blood vessels of your lungs?	YES ☐ NO ☐
8.	**Do you have a Spinal Cord Injury?** This includes Tetraplegia and Paraplegia If the above condition(s) is/are present, answer questions 8a-8c If **NO** ☐ go to question 9	
8a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
8b.	Do you commonly exhibit low resting blood pressure significant enough to cause dizziness, light-headedness, and/or fainting?	YES ☐ NO ☐
8c.	Has your physician indicated that you exhibit sudden bouts of high blood pressure (known as Autonomic Dysreflexia)?	YES ☐ NO ☐
9.	**Have you had a Stroke?** This includes Transient Ischemic Attack (TIA) or Cerebrovascular Event If the above condition(s) is/are present, answer questions 9a-9c If **NO** ☐ go to question 10	
9a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer NO if you are not currently taking medications or other treatments)	YES ☐ NO ☐
9b.	Do you have any impairment in walking or mobility?	YES ☐ NO ☐
9c.	Have you experienced a stroke or impairment in nerves or muscles in the past 6 months?	YES ☐ NO ☐
10.	**Do you have any other medical condition not listed above or do you have two or more medical conditions?** If you have other medical conditions, answer questions 10a-10c If **NO** ☐ read the Page 4 recommendations	
10a.	Have you experienced a blackout, fainted, or lost consciousness as a result of a head injury within the last 12 months **OR** have you had a diagnosed concussion within the last 12 months?	YES ☐ NO ☐
10b.	Do you have a medical condition that is not listed (such as epilepsy, neurological conditions, kidney problems)?	YES ☐ NO ☐
10c.	Do you currently live with two or more medical conditions?	YES ☐ NO ☐

PLEASE LIST YOUR MEDICAL CONDITION(S) AND ANY RELATED MEDICATIONS HERE: ______________________

GO to Page 4 for recommendations about your current medical condition(s) and sign the PARTICIPANT DECLARATION.

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If you answered NO to all of the FOLLOW-UP questions (pgs. 2-3) about your medical condition, you are ready to become more physically active - sign the PARTICIPANT DECLARATION below:

- It is advised that you consult a qualified exercise professional to help you develop a safe and effective physical activity plan to meet your health needs.
- You are encouraged to start slowly and build up gradually - 20 to 60 minutes of low to moderate intensity exercise, 3-5 days per week including aerobic and muscle strengthening exercises.
- As you progress, you should aim to accumulate 150 minutes or more of moderate intensity physical activity per week.
- If you are over the age of 45 yr and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.

If you answered **YES** to **one or more of the follow-up questions** about your medical condition:

You should seek further information before becoming more physically active or engaging in a fitness appraisal. You should complete the specially designed online screening and exercise recommendations program - the **ePARmed-X+ at www.eparmedx.com** and/or visit a qualified exercise professional to work through the ePARmed-X+ and for further information.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ **at www.eparmedx.com** before becoming more physically active.
- Your health changes - talk to your doctor or qualified exercise professional before continuing with any physical activity program.

- You are encouraged to photocopy the PAR-Q+. You must use the entire questionnaire and NO changes are permitted.
- The authors, the PAR-Q+ Collaboration, partner organizations, and their agents assume no liability for persons who undertake physical activity and/or make use of the PAR-Q+ or ePARmed-X+. If in doubt after completing the questionnaire, consult your doctor prior to physical activity.

PARTICIPANT DECLARATION

- All persons who have completed the PAR-Q+ please read and sign the declaration below.
- If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME ______________________________ DATE ______________________________

SIGNATURE ______________________________ WITNESS ______________________________

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER ______________________________

For more information, please contact
www.eparmedx.com
Email: eparmedx@gmail.com

Citation for PAR-Q+
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The PAR-Q+ was created using the evidence-based AGREE process (1) by the PAR-Q+ Collaboration chaired by Dr. Darren E. R. Warburton with Dr. Norman Gledhill, Dr. Veronica Jamnik, and Dr. Donald C. McKenzie (2). Production of this document has been made possible through financial contributions from the Public Health Agency of Canada and the BC Ministry of Health Services. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada or the BC Ministry of Health Services.

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Appendix C. Physical Activity Self-Efficacy Questionnaire

Activity/Exercise Related Questions

Please indicate HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM each of the physical activity/exercise related tasks below.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No confidence								Complete confidence		

How confident are you that you can…

	Complete your exercise/activity using proper technique	%
	Follow directions to complete the exercise/activity	%
	Perform all of the movements required for your exercise/activity	%
	Be active/exercise when you feel discomfort from the activity	%
	Be active/exercise when you lack energy	%
	Include exercise/activity in your daily routine	%
	Consistently be active/exercise every day of the week	%
	Be active/exercise when you don’t feel well	%
	Arrange your schedule to include regular activity/exercise	%