Identity Crisis: A mixed methods examination of exercise identity development using qualitative interviews and a feasibility randomized trial

by

Cassandra Julia Husband
Bachelor of Science, University of Alberta, 2015

A Thesis Submitted in Partial Fulfillment
of the Requirement for the Degree of

MASTER OF SCIENCE

in the School of Exercise Science, Physical, and Health Education

Supervisory Committee

Identity Crisis: A mixed methods examination of exercise identity development using qualitative interviews and a feasibility randomized trial

by

Cassandra Julia Husband
Bachelor of Science, University of Alberta, 2015

Supervisory Committee

Dr. Ryan Rhodes, Supervisor

School of Exercise Science, Physical & Health Education

Dr. Joan Wharf-Higgins, Departmental Member

School of Exercise Science, Physical & Health Education

Abstract

Supervisory Committee:

Dr. Ryan Rhodes, Supervisor

School of Exercise Science, Physical and Health Education

Dr. Joan Wharf-Higgins, Departmental Member

School of Exercise Science, Physical and Health Education

Background: While the physical and mental health benefits of regular participation in physical activity (PA) are well-known, accelerometer data indicates up to 68% of adult Canadians are not meeting PA guidelines. Thus promoting PA is a priority. Clearly, regular exercise is an important means to acquire PA for many of the population. Much of the exercise promotion research in this area is conducted under the guide of a social cognitive framework, and does not take into consideration reflexive, sub-conscious processes of behaviour change such as identity. Exercise identity has been linked to increased frequency, duration, and intensity of PA participation. However, there is limited work exploring the antecedents of developing an exercise identity, or ways in which an intervention could target antecedent themes in order to aid in the development of an exercise identity.

Objective: The purpose of this research was two-fold. Firstly, in Study 1, I explored the lived PA experience and how experiences in youth relate to exercise identity in adulthood. Secondly, in Study 2, I explored the feasibility of an identity-based intervention, using theory and emergent themes from Study 1 to guide my intervention targets.

Methods: In Study 1 and Study 2, I recruited male and female participants from the undergraduate population at the University of Victoria. I used mixed methods throughout.

Study 1 – I conducted semi-structured interviews to collect data on participants' PA experiences, using a pragmatic qualitative framework to guide my research process. I was interested in both past and present experiences which may have contributed to the development of participants' current exercise identities. I used thematic analysis and open coding to determine core themes.

Study 2 – I conducted a six week, randomized feasibility trial in order to explore the feasibility of an intervention designed to increase a person's exercise identity. Participants were randomly assigned to a standard social cognitive intervention group (education materials, goal-setting skills) or an augmented identity formation group (receiving the same information as the standard group in addition to educational and applied strategies for increasing identity). At the conclusion of the study, I conducted exit interviews with members of both groups to get more detailed information about the acceptability and enjoyment of the interventions.

Results:

Study 1 – I recruited 10 participants with varying exercise identity strengths (4 high, 3 medium, 3 low). Five themes emerged as related to the development of an exercise identity, including skill, enjoyment, variety, extracurricular activity participation, and sport ownership. Passion also emerged as a theme in high and medium identifiers, but not low identifiers.

Study 2 – I recruited 20 participants and randomized them to either the standard or augmented intervention group with a 1:1 ratio. The recruitment rate was 26%, retention was 90%, and the mean satisfaction score for the standard intervention group was 2.69 (SD = 0.62), and the augmented intervention group was 2.83 (SD = 0.40). Both the augmented intervention and

standard intervention groups increased their PA levels (η^2 = 0.25), and exercise identity levels (η^2 = 0.43), however interaction effect sizes were small (η^2 ~ 0.02), indicating no greater change in the augmented intervention group compared to standard intervention group.

Discussion:

Study 1 – The emergent themes both reflect existing literature (social cognitive models, self-definition model, and multi-process action control) in terms of relationship to PA and antecedents to identity development. Recommended future intervention targets include emphasizing enjoyment, focusing on feelings of skill/competence, and increased exposure to a variety of PAs. Additionally, passion as an indicator for an exercise identity may be a goal of future identity-based research.

Study 2 – Both control and intervention group participants ranked the study highly in terms of feasibility and acceptability. Intervention group participants felt more connected to the researcher and engaged more with materials, indicating satisfaction with the content covered over and above that of the control group. Both intervention and control groups saw increases in PA levels and exercise identity scores, however the effect sizes for between group differences were low. Based on strong feasibility ratings, a full-scale randomized controlled trial is recommended.

Table of Contents

List of Tables

List of Figures

Acknowledgements

First and foremost, I would like to acknowledge and thank my supervisor, Dr. Ryan Rhodes, for his support and mentorship throughout my master's degree. I feel lucky to have had his guidance over the past two years, and know that I am a better researcher for it. Secondly, I would like to acknowledge Dr. Joan Wharf Higgins, whom without I am sure I would still be lost in qualitative analysis. Third, I must extend my thanks to the members of the Behavioural Medicine Lab, who have become a huge source of social and emotional support for me during my time at the University of Victoria. Finally, I am enormously grateful for the support of my friends and family from Edmonton, who have been unwavering in their long-distance support of my journey here in Victoria. I would not have reached this point in my academic career without all these wonderful people surrounding, supporting, and caring for me.

Additionally, I would like to extend huge thanks to the Canadian Institutes of Health Research (CIHR) – Frederick Banting and Charles Best Canada Graduate Scholarships for partially funding my graduate work. Receiving this funding for my research not only instilled great confidence in my own abilities as a researcher, but also allowed me to focus exclusively on my research and thus produce a high quality thesis.

Dedication

I would like to dedicate this research to my amazing parents. I owe so much of my personal and academic successes to their parenting skills and unbelievable amounts of love and support they show me every day.

Chapter 1: Review of Literature

1.1 Physical and Mental Health Benefits of Physical Activity

Increased physical activity (PA) levels are associated with a wide range of health benefits, both physical and mental. In a 2006 narrative review, Warburton, Nicol, and Bredin (2006) confirmed that "there is irrefutable evidence of the effectiveness of regular PA in the primary and secondary prevention of several chronic diseases (e.g., cardiovascular disease (CVD), diabetes, cancer, hypertension, obesity, depression and osteoporosis) and premature death" (p. 801). These authors wrote a follow up review article to determine the efficacy of the current Canadian PA guidelines on the prevention or reduction of seven specific chronic health conditions (CVD, stroke, hypertension, colon cancer, breast cancer, type 2 diabetes, and osteoporosis). Results from this study confirmed the efficacy of the current guidelines and support the dose response relationship between PA and these chronic conditions (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). In addition, Warburton and colleagues (2010) found further supporting evidence that increased PA levels are also associated with decreased all-cause mortality. These statistics are applicable world-wide. The PA problem exists globally and some experts have gone so far as to call it a pandemic – with physical inactivity being the fourth leading cause of death worldwide (Kohl et al., 2012). In support of this idea, Lee and colleagues (2012) examined global PA trends, and determined that 9% of premature deaths are caused by physical inactivity, translating to 5.3 million deaths in 2008. Increasing PA levels would have a huge impact on the health of the global population.

In addition to the physical health benefits of PA, there is supporting literature for mental health benefits as well, such as the reduction of depressive symptoms, stress, and anxiety (Colley et al., 2011; Rebar et al., 2015). PA also impacts health related quality of life (HRQol), which

encompasses both physical and mental health, and is comprised of factors such as mobility, self-care, pain/discomfort, and anxiety/depression. Narrative description on results from eight cross-sectional studies shows a positive correlation between self-reported PA and HRQol (Bize, Johnson, & Plotnikoff, 2007). Kettunen, Vuorimaa, and Vasankari (2015) also present evidence in support of psychological benefits of PA. They found that over the course of a 12 month exercise intervention, participants' overall stress levels decreased, and mental resources increased. After a 12 month follow up, overall mental well-being remained enhanced compared to baseline levels. Additionally, daily satisfaction with life (encompassing things like fatigue, mental health, and self-esteem) has been found to be positively and significantly correlated to daily PA levels (Maher et al., 2013). This study postulates that daily satisfaction with life is more related to daily levels of PA than average PA participation over time. This supports the short term positive effects of PA in addition to the long term benefits that are already heavily supported in the literature.

1.2 Overall Low Levels of Physical Activity Participation

As evidenced above, there are known benefits to PA participation, both in the physiological and psychological health domains. However, according to objective measures of MVPA minutes, the majority of adults do not meet PA guidelines and therefore are not receiving the associated health benefits (Colley et al., 2011). Canadian accelerometer data indicates that up to 68% of Canadians aged 18-39 are not meeting PA guidelines (Colley et al., 2011; Statistics Canada, 2015) of 150 minutes of MVPA per week in 10 minute bouts or more. Thus, a majority of Canadian adults are missing out on the many health benefits, both physical and mental, of regular PA. Interestingly, self-report data in this domain is markedly different from accelerometer data. According to global self-report data assembled by the World Health Organization, only 23% of adults are insufficiently active (Rhodes, Janssen, Bredin, Warburton,

& Bauman, 2017), while recent Canadian self-report data indicates 68% of adults ages 18-34 are meeting PA guidelines (Statistics Canada, 2018). It is therefore important to interpret these numbers with care, and take into consideration the factors that could be skewing the statistics in either direction. For example, accelerometers may not be picking up on all types of activities, which would increase the prevalence of those not meeting guidelines. Conversely, people may fall prey to social desirability biases or recall bias when filling out self-report measures of PA, which may falsely increase MVPA minutes. In either case, PA participation is concerning, and deserves continued attention in the scientific community.

1.3 Transition Period PA Patterns

While it is difficult to determine the pattern of PA over the lifespan due to the changing PA guidelines across toddler, school-aged, and adult years, there appears to be a pattern of PA decline over the course of the lifespan. Troiano and colleagues (2008) examined 2003-2004 accelerometer data from the United States to search for patterns of physical inactivity across the lifespan. The authors found that 42% of children aged 6-11 met PA guidelines; while only 7.6% of children aged 16-19 met the guidelines. Although these numbers may be skewed by differing guidelines across these age points, there are continued decreases in PA across adulthood, during which the guidelines are kept consistent. According to accelerometer data, the prevalence of adults who are insufficiently active is 68% within 18–39-year olds, to 82% within 40–59-year olds, to 88% within 60–79-year olds (Rhodes et al., 2017). It is also useful to examine accelerometer data against self-report data in order to look for overall trends, despite potentially different statistics. Indeed, according to self-report data collected by the World Health Organization, “19% of the youngest age group did not meet PA recommendations while 55% of the oldest age group did not meet PA recommendations” (Rhodes et al., p. 952). Although self-

report statistics are more optimistic than those gleaned from accelerometer data, the overall pattern of PA decline is still present.

Overall, we see a combination of low levels of PA and decreasing levels of PA across the lifespan. Research targeting age groups where PA decline is rampant is crucial because these time periods provide a window of opportunity for research to try to understand and change patterns of inactivity. In addition, lifestyle behaviours that are practiced and habituated during adolescence carry over to, and are difficult to change in adulthood (Pietiläinen et al., 2008; Trudeau, Laurencelle, & Shephard, 2004).

1.4 Focus on University Students

Although PA declines across many stages of the lifespan, I will be focusing on PA decreases during the transition from adolescence to adulthood. Bray and Born (2004) indicate a 20% drop in PA levels from the last two months of high school to the first eight weeks of university (66.2% to 44.1% of students reporting adequate levels of vigorous activity).

University students make an excellent priority group for PA research for a number of reasons. Firstly, for many people, this time period encompasses graduating from high school and moving on to university. The first year of university often coincides with the adolescent to adulthood transition, where statistics show marked decline in PA levels (Bray & Born, 2004). Secondly, post-secondary students make up a large portion of Canada's population. In the 2013/2014 school year, statistics Canada reported that just over two million people (2,048,019) were enrolled in a post-secondary institution (Statistics Canada, 2015). This makes for not only a group that is easily accessible, but also large in number, and important as an intervention audience.

It is thought that increased stresses due to changing scholastic demands are partially responsible for declines in PA levels (Gyurcsik, Bray, & Brittain, 2004). As a result of enrolling in a post-secondary institution, students are required to navigate changing expectations, workload, and potential living arrangements. Cultural expectations may have changed for international students, and social support networks are often changing as well. Apart from the stress associated with striving for academic success, there are many other stressors and environmental changes that a first year student must navigate. It may be difficult in an increased stress environment to continue PA participation, especially when there are so many other priorities a student must navigate. A systematic review of 168 studies on stress and PA levels found that 79.8% of articles supported the inverse relationship between stress and PA (Stults-Kolehmainen & Sinha, 2014). The authors agree that increased perceived stress levels impair a person's ability to be physically active.

As outlined in Bray and Born (2004), due to increased stress and time demands, another potential factor impacting decreased activity levels in university students is the prioritizing of other activities over exercise. For many people, university represents first time freedom from parents, and priorities may shift to areas that previously did not exist. Such areas could include cooking, cleaning, grocery shopping, or running errands. In addition, many people experience a sense of release from the restrictive boundaries of home, and may allot their time to social activities such as spending time with friends, or spending nights out at the bar. In addition to all these new demands, school work must also take priority, and academic demands and expectations are significantly increased from high school (Bray & Born, 2004). As a priority, PA may fall far down on a new university student's list of things to accomplish.

Considering the substantial decrease in PA participation during university years (Bray & Born, 2004), and the negative implications this has for future PA levels (Pietiläinen et al., 2008; Trudeau et al., 2004), the health of our population relies on continued research in this area. Interestingly, despite overall decreases in PA levels, some students continue to participate in PA and meet PA guidelines during their university years. What makes those students different? The need for further understanding of motivations and barriers to PA participation is imperative.

1.5 Existing Research on Physical Activity Motivation

Currently, much of what researchers know about PA patterns comes from work done within the social cognitive framework. Popular theories within this approach include Social Cognitive Theory (Bandura, 1998), Theory of Planned Behaviour (Ajzen, 1991), and the Transtheoretical Model (Prochaska & Diclemente, 1992). Although these theories have nuanced differences, they share the belief that behaviour change comes from a combination of expectations of utility, norms, and perceptions of capability, and target similar behaviour change techniques (BCTs) (Michie et al., 2013) in their interventions.

A 2012 systematic review of review papers (Bauman, Reis, Sallis, Wells, Loos, & Martin, 2012) found supporting evidence for health status and self-efficacy as the clearest correlates of PA in adults, with consistent evidence for a direct role in four of seven reviews examined. Personal history of PA during adulthood and intention to exercise were also found to be clear supporters of PA behaviour. Expectations of pleasure/enjoyment of PA have also been established as critical (Rhodes, Fiala, & Conner, 2009), but expectations of utility or social norms have been less predictive of PA (Robin et al., 2011; Williams, Anderson, & Winett, 2005; Young, Plotnikoff, Collins, Callister, & Morgan, 2014). Some social cognitive models also highlight the importance of behavioural self-regulation skills/techniques (Bandura, 1986;

Prochaska & DiClemente, 1982). These constructs that are reliably linked to PA behaviour through intervention, include goal setting (d = 0.55) (McEwan et al., 2016) and self-monitoring (ES ~ 0.30) (Samdal, Eide, Barth, Williams, & Meland, 2017). As evidenced above, research done under the guide of a social cognitive framework has provided researchers and the public with valuable information on the motivations and barriers to PA, and should not be discounted. Rather, there is a need to add ideas to this framework in order to branch out from the classic social cognitive constructs.

1.6 Identity

Although much research in the area of behaviour change is based in social cognitive approaches, there are other processes that contribute to PA behaviour. It is worthwhile to consider new approaches to behaviour change research, since current PA interventions show only modest success, with effect sizes in the small to moderate range (Bauman et al., 2012; Conn, Hafdahl, & Mehr, 2011), and most interventions focus on the same BCTs (Michie et al., 2013). Exercise identity, the self-categorization of oneself in a role as an exerciser, is one example of a reflexive, self-regulating mechanism of motivation (Rhodes et al., 2016; Stets & Burke, 2000) which has received considerably less attention in the literature, but shows links to frequency, intensity, and duration of PA (Strachan, Woodgate, Brawley, & Tse, 2005). Identity is also a promising construct due to its reflexive composition – that is, it is enacted due to a stimulus – as opposed to reflective social cognitive approaches, its maintenance level capacity and its capacity to moderate intentions into behaviour (Rhodes, 2017).

1.6.1 History

Identity theory originated in the late 1900's, and came from multiple streams of research, each differing slightly in their definition of identity and identity related concepts. Sociology discussed identity in the context of social structure and refers to identity within 'social identity

theory'. One of the criticisms of Stryker (1980) – the originator of this idea – is that identity is solely examined through the lens of social structure and completely neglects internal dynamics. Stryker's theory focused on identity in the context of others, including in-groups and out-groups, and who one is in relationship to the larger group (Stets & Burke, 2000). Conversely, another stream of thinking focused on a more generalized 'identity theory'. As noted previously, identity theory defines identity as a categorization of the self into a role, and the meanings and expectations associated with that role. These expectations are thought to be put onto the individual by the individual (Stets & Burke). In opposition to Stryker's original writings about identity, Burke (1991) discusses identity as the internal process of self-verification, and neglects the way external social structures impinge on internal processes. Overall, Stryker and Burke (2000) summarize the history of identity theories in the following way. Stryker was primarily responsible for the linkage of social structures and identity, while Burke focused on identity as the internal process of self-verification. Since the development of these two separate streams of thinking surrounding identity, Stets and Burke (2000) have since come together and said these concepts are related, and should be merged into one comprehensive model of identity.

Additionally, psychology research has discussed identity through self-schema (Markus, 1977), in which identity aids the organization and processing of identity consistent information. This is different from how one categorizes themselves and instead focuses on the way an identity shapes a person's interpretation of their environment. Self-schema research focuses on information processing, while identity research focuses on perceptions of self. Berry, Strachan and Verkooijen (2014) have shown there is no significant difference in the way identity and self-schema research addresses PA processes, and recommends these two streams be merged into

one. Additionally, based on meta-analytic findings, Rhodes and colleagues (2016) also concluded that the discipline would benefit from merging these literatures.

Today, identity is known as a self-categorization of who one is and what is important to that person. Burke (2006) defines it as a component of a multi-dimensional self-concept, hierarchically organized by how one views themselves in a given role. The identity a person holds serves as a personal standard of behaviour (Stryker & Burke, 2000). These priorities can be around social clusters (as seen in sociology or social identity theory (Tajfel & Turner, 2001)), or hobbies and behaviours. Due to the merging of individual and social ideas about identity, identity can be defined at the individual or the group level.

1.6.2 Hierarchical structure

The hierarchical organization of identity works as follows: Personal standards of behaviour act as comparators to actual behaviour, and are activated in relevant situations where identities are either aligned or mismatched with one's behaviour. Identity standards can be thought of as the ideal self, while behaviour is the actual self (Figure 1). When the behaviour matches the identity standard, one has an alignment experience, which serves to strengthen their identity priority. If the behaviour does not match the identity standard, a person will experience negative affect in order to motivate identity consistent behaviour (Rhodes, Quinlan, & Kaushal, 2017). Additionally, repeated behaviour-identity standard discrepancies will challenge the overarching identity priority.

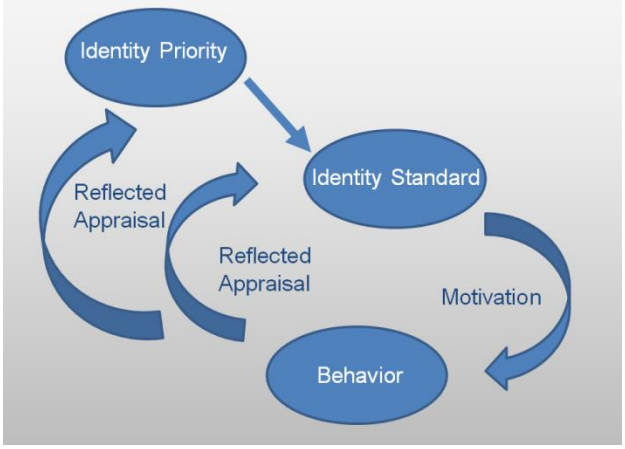


Figure 1. Hierarchical organization of identity (Rhodes, Quinlan, & Kaushal, 2017)

1.6.3 Identity affecting behaviour

A person's identities affect their behavioural choices. Oyserman and Destin (2010) discuss the mechanism by which identity acts to motivate people. These authors argue that when something is hard but fits with your identity, you interpret it as "important and meaningful". When something is hard and it does not fit your identity, you interpret it as "pointless and not for people like me". This is coined as "identity-based motivation" by the authors. Although this article discusses identity-based motivation in an academic context, the same principles can be applied to PA and exercise. In this way, people are able to justify putting effort into a task that may be unrewarding or difficult, so long as it fits with their identity profile. Conversely, this also makes it more difficult for people to adhere to tasks that are unrewarding or difficult when they do not fit their identity profile.

To elaborate on the negative affect experienced during identity discrepant behaviours, role relevant situations activate the identity and provide affective motivation when one is behaving discrepantly with that identity (Festinger, 1957). This mechanism is known as cognitive dissonance – which is a state of mental discomfort over identity discrepant stimuli

(Stets & Burke, 2000). For example, if a person believes themselves to be a runner but they have not gone on a run in some time, they will start to feel negative affect over the prospect that who they think they are is not being supported by their actions. This negative feeling is what motivates a person to behave consistently with their perception of their identities. Additionally, identity can affect the processing of information (known more through schema theories) (Berry, Strachan, & Verkooijen, 2014). Identity can create a lens or schema through which one sees the world, which serves to filter out irrelevant stimuli in order to aid with faster and more efficient processing of information (Markus, 1977). Schemas for exercise yield increased sensitivity to exercise related information, as well as easier recall and recognition of relevant cues and behaviours (Kendzierski & Morganstein, 2009).

1.6.4 Relationship between identity and PA

The relationship between exercise identity and PA participation is well researched. Rhodes and colleagues (2016) performed a meta-analysis of 32 studies on the relationship between exercise identity and PA behaviour and found r =0.44 – a medium effect size. Additionally, five out of six studies that looked at translating intention into behaviour showed that people are more likely to follow through with their intentions if they have a higher exercise identity (Rhodes et al., 2016). PA identity increases confidence in engaging in self-regulatory processes (Strachan, Fortier, Perras, & Lugg, 2013), and self-regulatory processes in turn increase exercise behaviour (Stadler, Oettingen, & Gollwitzer, 2009). In addition, exercise identity correlates with frequency, intensity, and duration of exercise (Strachan, Woodgate, Brawley, & Tse, 2005).

As evidenced above, exercise identity has well-established links to PA outcomes. Unfortunately, although identity is mentioned in many theories, these theories do not focus on

identity as a central construct or capture the way identity is formed. The literature only shows a preliminary understanding of the factors that may shape the development and maintenance of a person's exercise identity, and thus potential targets for intervention.

1.7 Current Theories that Discuss Identity

Rhodes and colleagues (2016) conducted a thematic narrative review of identity correlates and found that identity was associated with high quality motivation (affective judgements, perceived ability/self-efficacy, identified/integrated regulation, commitment) and social activation (social comparison, feelings of belonging). Motivational correlates are similar to popular theories (social cognitive theories) and offer little specific guidance for building an identity, however Rhodes and colleagues offer some possible unique intervention targets based on schematics. They are: prioritization, rules, allocation, sacrifice, coherence with other behaviours/values, and external triggers (material symbols, social/environmental comparators). Many of these targets come from theories that include identity as a construct. These theories include the Self Definition Model (SDM) (Kendzierski, Furr, & Schiavoni, 1998; Kendzierski & Morganstein, 2009), PRIME Theory (West, 2009), Identity Control Theory (ICT) (Burke, 2006), and Multi-Process Action Control (M-PAC) (Rhodes, 2017).

1.7.1 SDM

The SDM (Kendzierski, Furr, & Schiavoni, 1998; Kendzierski & Morganstein, 2009) discusses identity in a PA context, and states that a person's identity self-definition depends on the following three variables: 1) Perceptions about their behaviour, or the effort they put into doing the activity and the extent to which they made it a priority over other activities. 2) Variables such as perceived competence, perceived competence relative to others, perceived improvement, and enjoyment of the activity (these are motivational variables). 3) The extent to

which others in their social world acknowledge the self-definition and mention their engagement in the activity.

In terms of identity formation specifically, this model states that identity formation is first triggered by reflection from the social environment, or due to choices pertaining to the allocation of time, effort, or money (commitment). Then, identity is predicted based on how important the behaviour is to the person and their ability to successfully execute the behaviour. The ability needed for execution of the behaviour is reliant on the skill-level required for the behaviour. Different levels of skill are required for throwing a ball compared to performing gymnastics, for example. Overall, this model focuses on a combination of commitment and ability to create an identity (Kendzierski & Morganstein, 2009), which is evidenced in Figure 2.

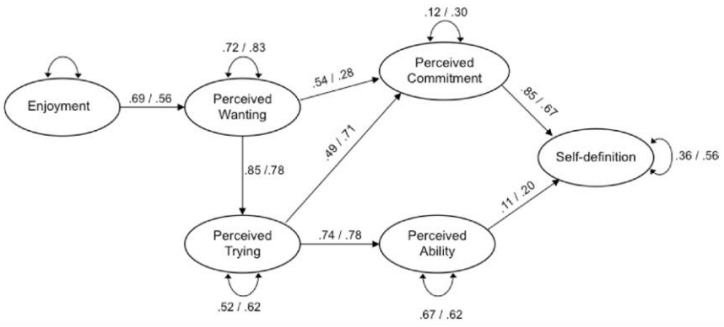


Figure 2 — Parameter estimates for the revised model of physical activity self-definition: Runners/joggers and cyclists samples. *Note.* Only parameter estimates among latent variables are shown here. All parameters are significant at $p < .05$.

Figure 2. Self-definition model of identity **(**Kendzierski & Morganstein, 2009)

1.7.2 PRIME

PRIME theory is based on addiction and smoking cessation. West (2009) discusses that the best way to change behaviour is to invoke a set of rules (type of plan) which can generate motives (wants and needs) from evaluations of what is good or bad. Although this theory

discusses ceasing rather than adopting new behaviours, it touches on identity development and change regardless. In order to cease to identify with one behaviour (such as smoking), one has to begin to identify with something else (such as not smoking). Plans with clear rules help form identities to which a person can match their behaviour. Additionally, PRIME theory states that identity is strengthened by coherence with other related attributes (e.g., a healthy person) and the positive sense of self from this coherence. This means that if someone is trying to develop an exercise identity, and already also identifies as a 'healthy' person, it will be easier for them to adopt an exercise identity than if they identified as a 'lazy' person. Overall, PRIME Theory dictates that coherence with related attributes and firm rules for participation help form a strong identity (West, 2009), although these assertions still require more supporting research.

1.7.3 ICT

ICT (Burke, 2006) discusses identity in a general sense, and does not specifically touch on PA. ICT identifies two ways in which a person's identity may begin to slowly change. The first, if one does not behave consistently with their identity, and the second, if one has two identities that share meanings but require different actions. ICT postulates that people are constantly trying to reduce their brain's 'error' signal – the discrepancy between belief and actions. A person feels distress when the discrepancy is large or increasing (cognitive dissonance), but feels better if the discrepancy is small or decreasing (Burke, 2006). In this way, if a person is consistently behaving in a way that creates an 'error' signal, it becomes clear that the behaviour itself is not going to change to match the identity, and thus in order to reduce discrepancy, the identity must change to match the behaviour. For example, if a person is unable to find an activity that supports their identity (such as membership on a sports team upon transition into university), that person's identity will slowly begin to change in order to reduce discrepancy between beliefs and actions (Stryker & Burke, 2000). Burke (2006) agrees that

identities have the capability to change, although the process is slow. He stated "the fact that identities act so as to resist change does not mean that they do not change over time. Change occurs slowly and only with persistent pressure" (p. 92). The implications of this for PA research is that it is easier to develop an identity than it is to change an existing identity, thus research should be focusing on the antecedents to developing an exercise identity in order to create such identity from a young age.

1.7.4 M-PAC

The last model that discusses identity is the M-PAC schematic (Rhodes, 2017). It suggests that identity is formed by a combination of high motivation (strong enjoyment, feelings of capability) for and successful self-regulation of behaviour. According to M-PAC, repeated prioritization of one's behaviour in the face of alternatives increases one's identification with the behaviour through feelings of sacrifice. Thus, the appraisal of ones' repeated actions of a behaviour over another prompts the process of self-categorization with the behaviour. It is important to note that behaviours where no sacrifices are made, or that have a lower motivational base of enjoyment and sense of capability, are also considered less likely to be self-categorized. Symbolic representations of an identity (such as dress or social media presence) are also theorized to increase formation and maintenance of an identity in M-PAC. After PA adoption and intention formation, identity is used as a *reflexive* regulation process for PA maintenance, meaning it activates in certain situations to self-regulate motivation and turn intentions into actual behaviour.

1.8 Emphasizing Identity

Although there is some existing research regarding exercise identity formation (Cardinal, 1997; Hardcastle & Taylor, 2005; Sallis, Prochaska, & Taylor, 2000; Strachan, Woodgate, Brawley, & Tse, 2005; Strachan & Brawley, 2008; Strachan, Brawley, Spink, Sweet, & Perras,

2015; Verkooijen & de Bruijn, 2013; Vlachopoulos, Kaperoni, & Moustaka, 2011; Whaley & Schroyer, 2010; Wright, Macdonald, & Groom, 2003), most explore potential antecedents through quantitative means, and are missing the depth and breadth of human experience. Because exercise identity antecedents are an emerging concept, there is a need for more preliminary qualitative understanding in order to contextualize and advance future quantitative research in this area. According to Crosby and Noar's (2010) commentary on theory development in health promotion, "ignoring the basic point that theory without practical utility in practice-based settings has little value to public health" (p. 261). Quantitative research, including intervention studies should be informed by theory in order to increase validity of the study; yet exercise identity lacks a well-established theoretical model. In line with my recommendations to integrate identity into current social cognitive models, it should be noted that some researchers are already working to integrate identity into the Theory of Planned Behaviour (de Bruijn & van den Putte, 2012; de Bruijn, Verkooijen, de Vries, & van den Putte, 2012; Rise & Sheeran, 2010).

Increased emphasis on identity research for PA behaviour change would be beneficial to the state of existing literature. There are both theoretical and practical implications to a greater understanding of exercise identity. For theory, further research in this area would not only contribute to a somewhat lacking state of literature on exercise identity, it would also augment the current social cognitive approaches, and therefore target different BCTs. Since existing models of PA behaviour change do not emphasize identity, it would be logical to combine information from the models in section 1.7 in order to gain a comprehensive understanding of identity as it relates to PA. Practically, if researchers can understand the antecedents for developing an exercise identity, they can design interventions based on these antecedents, which will target PA behaviour change from an angle that has not yet been explored. Despite extensive

PA promotion campaigns and interventions, the majority of Canadians continue to remain below PA guidelines (Colley et al., 2011; Statistics Canada, 2015). The literature supports the relationship between an exercise identity and increased PA behaviours; however research has not fully explored antecedents to developing an exercise identity. This aspect of identity warrants further research.

1.9 Conclusion

In summary, low levels of PA across Canada and the world are a cause for concern. Up to 68% of Canadians aged 18-39 are not meeting PA guidelines and thus not reaping the benefits of regular PA (Colley et al., 2011; Statistics Canada, 2015). Such benefits span both the physical and psychological domains, and include decreased rates of cancer, CVD, diabetes, obesity, as well as relief from minor depressive and anxiety disorders (Warburton et al., 2006). Early adulthood is a phase of life where PA declines are experienced, particularly in the early years of university (Bray & Born, 2004). This decline is thought to be partially due to increased stress from scholastic demands, as well as shifted priorities due to new and increased responsibilities (Gyurcsik et al., 2004). However, despite these difficulties, there are some students who remain physically active through and beyond the transition to university. One possible explanation for this is the presence of an exercise identity – the idea that PA is a central part of one's self-concept (Burke, 2006). In order to avoid feelings of cognitive dissonance, people with strong exercise identities are internally motivated to behave in a manner that is consistent with their perception of their identity (Burke, 2006; Stets & Burke, 2000). Unfortunately, exercise identity does not have a well-established theoretical model, and is missing known antecedents to its development. Descriptive and correlation studies have found evidence for commitment, perceived capability, affective judgements, integrated/identified regulation, and social activation (Rhodes, Kaushal, & Quinlan, 2016), as well as past behavioural experience (Bem, 1972; Burke,

2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017) to be positively related to the development of an exercise identity. However, there is room for exploratory work through qualitative research to expand upon these preliminary findings.

1.10 Overview of Research Objectives

The purpose of this research is two-fold, and was explored through two related studies. Firstly, I sought to explore and understand the lived PA experience and how these experiences in youth relate to exercise identity in adulthood. I used what is known in the literature from the SDM, ICT, PRIME Theory and the M-PAC schemata to guide my findings. Secondly, I explored the feasibility of an augmented identity-based intervention in comparison to a standard social-cognitive intervention, using emergent themes from my first study (Study 1) to guide my intervention targets.

Chapter 2: A Mixed Methods Examination of Antecedents to the Development of Exercise Identity among University Students

2.1 Abstract

Background: Exercise identity is when a person considers exercise to be a central part of their self-concept, and is related to frequency, intensity, and duration of exercise. However, there is limited research on the antecedents to forming an exercise identity. **Purpose:** The purpose of this research was to examine the lived physical activity (PA) experience of people self-reporting low, medium, and high identities in order to develop themes related to the development of an exercise identity, and inform a future feasibility trial. **Methods**: Using previously gathered exercise identity questionnaire scores from undergraduate students at the University of Victoria, I split the range of possible scores into tertiles, corresponding to 'low', 'medium', and 'high' exercise identities. I randomly selected 30 potential participants from a possible 496, 10 from each identity group, and invited them to participate in my research. Ten participants discussed their life-long experiences with PA through semi-structured interviews. The interviews were transcribed and themed using open coding and thematic analysis. **Results:** Five emergent themes resulted from this research. They were: enjoyment, skill, extracurricular activity participation, variety, and sport ownership, which cumulated to the larger, overarching notion of passion as an indicator for exercise identity. These five themes appeared to contribute to the development of an exercise identity among the participants. **Discussion:** High identifiers alone discussed passion for exercise, indicating that the presence of multiple emergent themes may relate not only to identity but also to passion. Thus, passion as an indicator for exercise identity may be a goal of future identity-based research, with other emergent themes as intervention targets. The emergent themes both reflect existing literature (social cognitive models, self-definition model, and multi-process action control) in terms of relationship to PA and antecedents to identity development.

Recommended future intervention targets include emphasizing enjoyment, focusing on feelings of skill/competence, and increased exposure to a variety of PAs. Recommended behaviour change techniques are addressed for each theme. **Funding:** This study was funded by the Canadian Institutes of Health Research (CIHR).

2.2 Introduction

2.2.1 Literature Review

Despite strong evidence supporting the many health benefits of physical activity (PA) (Rebar, Stanton, Geard, Short, & Duncan, 2015; Rhodes et al., 2017), Canadian accelerometer data from 2013 suggests that 68% of the population aged 18-39 (Colley et al., 2011; Statistics Canada, 2015) are not meeting PA guidelines, while 2017 Canadian self-report data indicates that 68% of people are, in fact, meeting PA guidelines (Statistics Canada, 2018). These statistics are markedly different due to the method of data collection, and it is important to interpret these numbers with caution. While there have been numerous interventions to address overall low levels of PA found through accelerometer data, meta-analysis of effect sizes for RCTs yield only modest results (d = 0.19) (Conn et al., 2011). These interventions focus primarily on social cognitive constructs, emphasizing the expectations of utility, norms, and perceptions of capability (Rhodes, 2017). While these methods are reliably able to make small changes to PA, there is room to explore alternate routes to PA behaviour change.

Exercise identity is not included in traditional social cognitive frameworks, and is a reflexive, self-regulating mechanism of motivation (Rhodes et al., 2016; Stets & Burke, 2000). Reflexive processes are those that occur quickly, on impulse, and are often triggered by environmental cues (Deutsch & Strack, 2006; Gardner, 2015; Sheeran, Gollwitzer, Bargh, Gollwitzer, & Bargh, 2013; Stryker & Burke, 2000). Although exercise identity has received

considerably less attention in the literature than social cognitive constructs, it shows links to frequency, intensity, and duration of PA (Rhodes, Kaushal, & Quinlan, 2016; Strachan, Woodgate, Brawley, & Tse, 2005). In fact, "people with a strong exercise self-identities are not only more likely to intend to exercise but also more likely to act upon these intentions and to maintain their exercise behaviour" (Verkooijen & de Bruijn, 2013, p. 490). The addition of exercise identity to the existing social cognitive literature would be beneficial for both the state of knowledge and practical application (Strachan & Whaley, 2013).

The relationship between exercise identity and PA participation is well researched. Rhodes and colleagues (2016) performed a meta-analysis containing 32 independent datasets on the relationship between exercise identity and PA behaviour and found a medium effect size (r =0.44). While research has linked exercise identity to PA outcomes, there has been less attention placed on integration of identity into extant theory in PA and health behaviour more generally. My literature review identified four theoretical frameworks that have focused on the purported antecedents of exercise identity, which include the Self Definition Model (SDM) (Kendzierski & Morganstein, 2009), Identity Control Theory (ICT) (Burke, 2006), PRIME Theory (West 2009), and the Multi-Process Action Control (M-PAC) schematic (Rhodes, 2017). SDM states that commitment, ability, and social activation are central to the development of an exercise identity. Identity development is thought to be first triggered by a reflection from the social environment, and then can be predicted based on how important the behaviour is to a person and their ability to successfully execute the behaviour (Kendzierski, Furr, & Schiavoni, 1998; Kendzierski & Morganstein, 2009). ICT suggests that a person's identity may begin to slowly change when one does not behave consistently with their current identity, via motivation to reduce the 'error' signal when there is a discrepancy between beliefs and actions (Burke, 2006). PRIME Theory

posits that identity is strengthened by coherence with related attributes as well as having firm rules for participation (West, 2009). The M-PAC model (Rhodes, 2017) suggests that the formation of an identity is based on repeated behavioural performance from a combination of high motivation and successful self-regulation of behaviour. Furthermore, Rhodes (2017) suggests that identity is strengthened when behaviour is performed at the sacrifice of other priorities and through symbolic representations that support the identity (e.g., clothing, pictures).

Rhodes et al. (2016) explored the existing literature on the antecedents to identity formation, and found that identity was associated with high quality motivation (affective judgements, perceived ability/self-efficacy, identified/integrated regulation, commitment) and social activation (social comparison, feelings of belonging). Rhodes and colleagues found strong support for SDM antecedents including commitment, ability, and social activation as described above. The other theories/schematics are partially supported by existing literature; however in general, more research is required on ICT, PRIME Theory, and the M-PAC model to support their assertions. Additionally, it is important to note the correlations found by Rhodes, Kaushal, and Quinlan (2016) are largely from cross-sectional and quantitative research, which do not encompass the lived experience of physical activity and how that relates to identity development.

While the current evidence shows some support for these theoretical models, particularly SDM, an increased emphasis on identity research for PA behaviour change would be beneficial to the state of existing literature and for applied population health promotion. Focusing on identity may expand the breadth of knowledge on PA behaviour, and complement the classic social cognitive approach (Rhodes, Kaushal, & Quinlan, 2016). Practically, if researchers can understand the antecedents for developing an exercise identity, they can design interventions

based on these antecedents, which can address PA behaviour change from a perspective that has not yet been explored.

2.2.2 Purpose

The purpose of this research was to use mixed methodology (both semi-structured interviews and scores on a quantitative questionnaire) to examine people's lived experiences with PA, both in their past and present. I sought to gain understanding of how these experiences may or may not be antecedents for the development of an exercise identity through comparing them to low, medium, or high scores on the exercise identity questionnaire (Anderson & Cychosz, 1994). I wanted to gain rich, thick description of concepts previously studied through quantitative means, as well as potentially reveal new patterns involved in exercise identity development. If the existing antecedents found in theory are supported by the findings of my study, this research could lead to new intervention targets and strategies for behaviour change in the future. Furthermore, a greater understanding of the factors that shape an exercise identity may result in greater long term effects of interventions. In addition, I intend to use themes that arise, both pre-existing in literature and novel, to inform a controlled feasibility trial study targeting identity formation or change. See Appendix 1 for a detailed dissemination plan.

2.2.3 Researcher statement

Because I will be conducting qualitative research, I myself am the primary research instrument, and my biases and opinions may impact the results of my research. I am a physically active person with a history of positive feelings towards PA. I value PA for its health benefits, in addition to PA being an integral part of my identity. I recognize these biases and have taken appropriate measures to ensure minimal impact on my study results. Please see Appendix 1 for a detailed researcher statement and assumptions that have been made to conduct this research.

2.3 Methods

This study will be used to inform later intervention targets in a follow up study (Study 2). I have, therefore, used a pragmatic qualitative framework to guide my research process, which assumes "knowledge has been constructed in particular circumstances and for particular ends" (Hammond, 2013, p. 613). I have used semi-structured interviews to collect data on participants PA experiences, both past and present that have contributed to the development of a strong, medium, or weak exercise identity. Interview methodology allows for a more in depth understanding of the lived experienced than does quantitative research. While most research in this area is done through purely quantitative measures (Rhodes, Kaushal, & Quinlan, 2016), I obtained rich, thick descriptions of experiences that shaped people's exercise identities. I used the scores from the exercise identity questionnaire to recruit interview participants, as well as group participants by their identity strength. I compared emergent themes between high, medium, and low identifiers. This research followed sequential explanatory analysis: quantitative (exercise identity questionnaires) – qualitative (interviews) (Pluye & Hong, 2014), with quantitative results informing the qualitative method; and the qualitative findings used to interpret quantitative results. The priority of this study was the qualitative findings – used to add detail and description to both existing antecedents to exercise identity, as well as create novel antecedent themes.

2.3.1 Participants

I recruited undergraduate students from the University of Victoria to participate in my study (Table 1). I contacted students who had previously participated in research and expressed interest in future studies. The previous study in which they were participants included demographic measures of age, year in university, and gender with options "male", "female", and "other", as well as an exercise identity questionnaire (Anderson & Cychosz, 1994). The participants ranged

from high to low exercise identifiers on the exercise identity questionnaire. Procedure for categorizing participants into low, medium, and high exercise identities is detailed in section 2.3.2 Procedure. No monetary incentives for participation in this research were offered.

2.3.2 Procedure

This study was approved by the Human Research Ethics Board at the University of Victoria (protocol number: 17-049, see Appendix 3), and took place at the University of Victoria and surrounding area in the summer of 2017. See Appendix 1 for a detailed timeline.

Similar to work by Strachan and Brawley (2008) I used a tertile split to group potential participants into low, medium, and high identities based on their exercise identity questionnaire scores obtained from previous research. However, because I did not have enough participants to create statistically significantly different groups, I instead split the range of possible mean scores on the exercise identity questionnaire into three equal portions. Low identity corresponded to a mean score of 1.0 to 2.3, medium identity corresponded to a mean score of 2.4 to 3.6, and high identity corresponded to a mean score of 3.7 to 5. The exercise identity scale has 9 items measured on a five point scale of 1*(strongly disagree)* to 5*(strongly agree)* with 3 being *(neutral).*

I used purposive sampling to contact 10 participants from each of the identity strength categories (low, medium, and high). I created sub-categories of low, medium, and high identifiers, and randomly selected ten participants to contact from each category using a random number generator. Out of 496 eligible, I contacted 30 potential participants assuming some would not be interested in participating, and my target sample size was $n = 15$.

At the time of the interview, I reviewed the letter of information and obtained consent from the participant. I used two audio recording devices; one primary and one as a backup. In addition, I took occasional notes on my laptop during the interview. The semi structured interview questions are included in Appendix 2.

Once I completed transcription, I sent the transcripts and a transcript summary back to participants via email for member checking (Lincoln & Guba, 1985). The participants were invited to change, add, or clarify any information at this time; however no participants made any changes to either document. Following member checking, I completed coding and analysis. After analysis was complete, I removed all identifying information and used a number system to ensure participant confidentiality. The number system key is kept on a locked computer for reference, but was not used again after analysis was complete.

2.3.3 Data analysis

After member checking was completed, I inputted the transcripts into NVivo 11 (QSR International) software. I began data analysis using open coding (Patton, 2002), with an overall framework of orientational qualitative inquiry (Patton, 1990). Such a framework "eschews any pretence of open-mindedness in the search for grounded or emergent theory" and instead "begins with an explicit theoretical or ideological perspective that determines what conceptual framework will direct fieldwork and the interpretation of findings" (Patton, 2012, p. 586-587). In this way, I fit my data into initial categories, informed by existing constructs from the literature. This served to reduce and organize the data. Then, I used thematic analysis to identify, code, and categorize primary patterns in the data (Grbich 1999), using the six phase guidelines as outlined by Nowell, Norris, White, and Moules (2017). These phases are: 1) familiarizing yourself with your data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining

and naming themes, and 6) producing the report. Finally, I used axial coding to put my data 'back together' in new ways, by making connections between categories (Strauss & Corbin, 1990). This served to collapse my data into larger emergent themes. Axial coding is one analytical strategy of Grounded Theory methodology, which is used to develop theory or explain phenomenon (Glaser & Strauss, 1967). I compared the emergent themes both within and between participants. I was interested in obvious patterns between emergent themes and the participant's exercise identity scores.

2.4 Results

2.4.1 Participants

Of the 30 potential participants contacted, I recruited 10 undergraduate participants from the University of Victoria. Twenty potential participants did not respond to the initial recruitment email. The participant sample was 40% male, with a mean age of 20.1 (SD = 2.28) years. 40% of the participants were in their first year of university. See Table 1 for participant information.

Table 1

Participant Characteristics

Participant Number	Gender	Age	Year in University	Exercise Identity Ranking
1	Male	19	1	High
2	Female	18	1	High
3	Male	18	1	High
4	Female	18	1	Medium
5	Male	20	3	Medium
6	Female	21	4	Low
7	Female	19	5	Medium
8	Female	20	3	High
9	Female	24	6	Low
10	Male	24	6	Low

In this section, I am presenting the five pertinent themes that emerged from my dataset. Although additional topics were brought up throughout the interviews, the following five themes were consistently discussed across low, medium, and high identifiers, and therefore are included in the results section. Overall, these themes resonated across the low, medium, and high strength narratives; however the positive, negative, or neutral relationships between the thematic constructs and identity development ranged along a spectrum or continuum from positive to negative experiences. The five themes are 1) enjoyment of physical activity, 2) skill, 3) participation in extracurricular activities, 4) variety of physical activity exposure, and 5) sport ownership. The themes, their definitions, and their relationships with PA are included in Table 2.

Table 2

Definitions of Themes and Positive, Negative, or Neutral Relationships with PA

	Definition	High Identifiers	Medium Identifiers	Low Identifiers
Enjoyment	Finding physical activity pleasing to participate in – through PE class or extracurricular activities	+	o	-
Skill	Perceived abilities at physical activity – compared to peers in PE class or extracurricular activities	+	+	o
Extracurricular sports	Participation in activities outside of school-based PA	o	o	-
Variety	Exposure to multiple sport/activity types throughout youth	o	o	o
Sport ownership	Identifying a sport/activity as "my own", possession over the sport/activity	o	o	-

Note: PA = physical activity; PE = physical education; + = positive experience; o = mixed experience; - = negative experience

2.4.2 Enjoyment

Enjoyment of PA was referenced positively by high identifiers (4/4 participants), mixed by medium identifiers (3/3 enjoying it at some point, but 1/3 growing to dislike it with age), and negatively by low identifiers (3/3 disliking gym class and only 1/3 enjoying their extracurricular activity).

Participant 1 (a high identifier) stated, “Once I got into it [hockey] I never really looked back or had to get pushed again type thing. It was my own initiative after that first push.” He is describing intrinsic motivation for the sport, which is shared by all high identifiers in some form or another. While all high identifiers did not necessarily enjoy PE class in school, they did all report enjoying some aspect of PA, particularly “their” sport of choice. In fact, participant 3 stated that he strongly disliked his gym class experience, saying “so back to school [gym class]… I hated it. Basically every single moment, I hate every single sport”, but had a much higher opinion regarding “his” sport, karate. He stated “I participated in karate from ages 9-17, and that was a great experience”, detailing his enjoyment of karate over gym class later in the interview.

Medium identifiers tended to enjoy PA in gym class, as well as through extracurricular activity. The exception is participant 7, who initially enjoyed PA, but grew to dislike it in her junior high years because she started to feel like she was not skilled anymore. She stated, “I always liked PE classes... all my friends would be like “no it’s PE time” and I’d be like “yes it’s PE time!” cause I preferred that to a physics class you know? So it was fun for a little while [cross country] but then I got bored of it cause it didn’t really feel like I was anything special when I was doing it”. While enjoyment and skill are closely related, skill is discussed in further detail in the “skill” sub-section.

Despite participant 7, many of the quotations from the medium identifiers mimic the way high identifiers reported feeling. For example, participant 5 stated:

> Oh yeah, loved it [physical activity]. Definitely, I've never disliked physical activity; I've always just disliked *getting* to physical activity. And complaining about the 6am practices but once I'm there I'm having fun. Complain about going to the gym but once I'm in the gym I love it.

Conversely, low identifiers disliked gym class for a variety of reasons. Participant 10 felt threatened by gym class due to his sexual orientation, while participant 9 disliked the judgement associated with PE. Participant 9 stated: "I absolutely hated it in junior high. It was my least favorite class. I felt like I was bad at it and I felt like other people were judging. I felt like I was part of the 'loser kids' at that point."

In addition to disliking gym class, participant 9 also disliked extracurricular sports, stating "soccer was just boring". Participant 6 did not give a specific reason for her distaste for PA, however when prompted said "no, I hated gym class except for the dance unit". Participant 10 was an exception to the overall dislike of school-based PA only when discussing his participation in his extracurricular activities, water polo. Regarding high school participation in water polo, he said "And that [water polo] I really liked cause it was a somewhat accepting group, and I've never really identified with the "athletic" type of person yet I found myself in that situation where I actually felt like I belonged, so for me it wasn't like... I didn't think of it like "oh I'm doing this cause of exercise" it was just something I enjoyed just for the fun aspect of it".

Overall, enjoyment of PA was rated most positively among the high identifiers, quite positively although mixed among medium identifiers, and quite negatively among the low identifiers.

2.4.3 Skill

Skill in the PA domain was referenced positively by high identifiers (4/4 participants), positively by medium identifiers (3/3 self-reporting skill average or above), and mixed by low identifiers (2/3 self-reporting above average at their extracurricular activity, but 3/3 reporting lack of skill in a PE setting).

Similar to the patterns emerging in the theme "enjoyment", high identifiers self-reported being skilled in at least one aspect of PA throughout their lives. However, they did not necessarily classify themselves as "the best" because they tended to compare themselves more often to their teammates from more advanced extracurricular sports than to their peers in PE class. Participant 8 remembered: "I was one of those athletes, I don't have a lot of skill, but I have a lot of passion and I work really hard. So I didn't do super well in the more intense leagues, but I definitely gave it my all." Participant 1 stated "I'm good to a degree. Obviously I played competitive I played quadrant hockey for five years so that's kind of top of the city for my age group which was kind of nice but I never excelled further than that". Similarly, despite not feeling skilled at PE class, participant 3 remembers: "that's why I liked karate, cause I was... I felt like I was good at it".

Interestingly, the overall dialogue used by medium identifiers implied a higher skill level than the high identifiers, primarily due to the population group to which these participants compared themselves. While high identifiers used their athletic peers as reference points for skill, medium identifiers used school friends and people in gym class as comparators. Participant

7 stated “There were definitely students in the class that were full athletes - like I would even categorize them into jocks. I don’t like categorizing very much but picture a stereotypical jock… I was not quite there, but I was close.” It is important to note however, that participant 5, an avid participant in extracurricular and higher level sport, compared himself to his more athletic peers in a similar way to the high identifiers. He stated “I’ve never excelled at it, at physical activity, I’ve either been average or bad”, however when pressed further, he clarified “so there [in the elite physical activity program] I was on the bottom half of that curve, and then once I left that class I went back up into kinda upper half of the population for gym class”. This indicates skills in the PA domain, especially when compared to an average sample (gym class). However when comparing himself to an elite sample, he did not feel as skilled. It is clear there is a baseline level of skill for this participant, even though he remembers being “average or bad”.

Low identifiers presented mixed results in terms of skill; however they agreed that their defining experiences in gym class were that of feeling generally unskilled. For example, even though participant 9 felt skilled in her elementary years, her self-perception changed with age and her overall narrative reflected this negative self-perception regarding PA skill. She said:

> I thought I was [good] in elementary school, I was always picked first for the teams, and I always did well on all of the things…[in junior high] the pressure got to me of being good and then I wasn’t good like you know when someone is watching you and then you mess it up because they’re watching you. So I felt like I was good until junior high when I felt like I was the worst. I feel like I went from the best to the worst very quickly.

Participant 6 had a similar narrative, feeling skilled at her preferred sport up until junior high years when she experienced body changes due to puberty. She said “[It was just] not being

able to do what I used to be able to do in dance and skiing. So it was another thing where it was like “I used to be able to do these things and now I feel super gangly and awkward”... Sports, I suck at sports”.

Overall, high and medium identifiers tended to self-report more skill at PA than did low identifiers, whether that be in gym class or in an extracurricular activity.

2.4.4 Extracurricular activities

Extracurricular activities include primarily organized sports, but also encompass things such as dance or skiing lessons – activities that are less clearly defined as “sport”. Participation in extracurricular activities was mixed in high identifiers (3/4 participants playing an extracurricular activity at a competitive level), mixed in medium identifiers (2/3 participants reporting extracurricular activity participation), and negative among low identifiers (1/3 participants reporting participation).

The majority of the high identifiers participated in extracurricular sport at a competitive level. The exception is participant 2, who declared, “I got into sports kind of late, and because of that I was kind of like not into it”. However, overall these participants enjoyed their extracurricular activities and found value in participating beyond simply being physically active. Participant 1 exemplified this nicely with his quote: “I was kind of just into competitive team sports cause being in a team environment is kind of a learning thing right? You learn how to function within a group of people and work together which is a great life skill when you get older obviously.”

Similarly, the majority of medium identifiers also participated in extracurricular activities. Participant 7 was an exception, and did not pursue sports outside of gym class for the

following reason: “once we started learning the actual rules of the game it took the fun out of it for me. I liked dodgeball more, I liked handball, and once we start being like “okay let’s play tennis the right way” and actually work on technique I was like “this sucks””. For her, learning the rules of the game, and being expected to follow them took the fun out of PA, and discouraged her from continuing to participate. However, participant 4 was highly involved in rowing (“[in] grade 10 I found rowing so I started doing rowing and that’s when I really got into sport and physical activity. I ended up going to nationals for two years in a row for rowing, yeah, so it was a huge part of my life.”), and participant 5 was involved with hockey (“[I was] playing hockey, and then once I got into the goal that was my stuff. And then I kept that up until grade ten and then in grade 10 I was in the hockey academy as well.”). Both participant 4 and 5 pursued an extracurricular sport to a somewhat competitive level and to an older age (high school years), which is similar to the overall narrative of the high identifiers.

For low identifiers, the narrative was less clear. All participants dabbled in extracurricular sport; however for participant 6 and 9, the experience was short lived. Participant 10 told a slightly different story. Participant 10 was on his high school swim team. He stated, “In high school I was on the swim team, and so I swam every day after school and then that was like for half the year and then I did water polo for the other half of the year so I was in the pool literally every day pretty much.” However, this participant discussed that his motivations for joining the sport were both socially based (his best friend was also on the team), as well as convenience based (he did not continue participation once he graduated from high school), and not necessarily due to being drawn to any specific features of the sport itself. Participant 9 recalled that she never chose to participate in any sport outside of PE class once she was at an age where she had a choice in the matter. Her parents did enrol her in soccer, for example, when she was young, but

she reported quitting all team sports after a short period. She said, “I don’t like team sports, but I don’t like team anything. I’ve never been a sharer and I don’t like anything competitive”. Participant 6 participated in extracurricular activities when she was quite young, citing both dance and skiing, but did not continue participation into her teen years and early adulthood, citing that she felt “bad” at the sports after she hit puberty and did not want to continue.

Overall, there was a mix of participation in extracurricular activities among the three identity levels. However, low identifiers tended to stop participation at a younger age than did medium and high identifiers. Additionally, more medium and high identifiers pursued their sports to a competitive level (i.e., hockey academy, competitive rowing) compared to the majority of the low identifiers who did not (i.e., recreational dance or skiing as a child, soccer as a child).

2.4.5 Variety

High, medium, and low identifiers reported mixed results of variety of sport/activity exposure, with 3/4 high identifiers self-reporting variety, 2/3 medium identifiers reporting the same, and 2/3 low identifiers reporting some variety as well.

The only high identifier who did not participate in a variety of sports/activities was participant 3. He focused solely on karate once he discovered it in his elementary school years. During his interview he did not mention any other sport or activity participation. Conversely however, and more typically of high identifiers, participants 1, 2, and 8 were all exposed to a variety of activities throughout their youth. Participant 8 remembers, “I think it would have been early elementary school when I realized ‘I’m on soccer teams and ringette teams’”, and similarly participant 1 recalls playing “hockey, baseball, lacrosse a little bit”.

In a similar vein, medium identifiers typically were exposed to a variety of sports/activities, with the exception of participant 7. Participant 7 did not make mention of a variety of sport participation in an organized sport setting, rather participated in a broad range of activities with her father as a child. She said “he would play with me. And usually we’d do stuff like badminton, Frisbee, it was always stuff outdoors”. Other than her participation with her father, she was only exposed to PE in gym class and dabbled briefly in the cross-country team at school. However, participants 4 and 5 both spoke about a range of activities that they took part in as children, which is more similar to the high identifiers. For example, participant 4 said, “I did do dance for 7 years... I did dance and I did soccer... and then through elementary I did kind of all the school sports, volleyball, dodge ball, and everything else that there is so I kind of was always active”.

Finally, low identifiers also experienced a mixture of variety of sport exposure. Outside of school PE class, participant 6 experienced skiing and dance, participant 9 had a brief stint with soccer but did not pursue it, and participant 10 remembers:

> I would have done soccer, my family and I went skiing all the time up until I was in like grade 8 or 9, and then I did volleyball in junior high and I did track and field outside of school which was actually quite weird... it was like the St. Albert track and field club**.** I mean like a decent variety. And swimming, I was in swimming lessons from like 3 years old and like 13 so, a good variety I’d say.

Overall, variety of sport/activity exposure did not present a clear pattern in terms of relationship with exercise identity. Most participants experienced some variety of activity exposure in their lives, both in extracurricular activity and through mandated physical education

classes. This emergent theme is not clearly related to exercise identity, however may be a mediating mechanism through which identity development is supported.

2.4.6 Sport ownership

The final emergent theme was sport ownership. Both high and medium identifiers reported mixed results, with 3/4 high identifiers self-reporting sport ownership, and 2/3 medium identifiers reporting the same. Interestingly, all low identifiers (3/3) did not report feeling a sense of sport ownership at any point throughout their lives.

The high identifiers were able to pick a sport that was "theirs". Participant 1 stated that "I do my physical activity and I love doing it". In this quote, the emphasis on the word "my" indicated a sense of personal ownership/identification with the sport he was referring to (hockey). Additionally, high identifiers discussed the importance of making sport a priority. This was exemplified in a quote by participant 8 "I like to think it would be ringette cause I started that, not the first, but I started it super early, and like that was the most tight knit group of people that I was a part of and that was kind of like my priority when I was a kid".

For medium identifiers, finding the specific sport that "called to them" was reported as the main factor that caused them to become more involved, and identify more strongly with PA. In this vein, participant 4 – a medium identifier – stated that

> I think it was just basically finding the sport like, *the* sport for me, and I think a huge part of it was the people as well. I really could identify with the people and I think finding the sport that's why it's so important, because you can find, you find like-minded people, so it's people that you can truly identify with.

This quote supported the idea that a person has claimed a sport as their own. Similarly, participant 5 stated, “But hockey I ended up playing for 9 years, and it was once I became like a hockey goalie that I was like ‘damn, this is my thing;”. For this participant, it was the specific position and responsibilities on a team that pushed him to identify with hockey. This is similar to participant 4’s experience in finding “the sport, the thing”.

Low identifiers did not speak about participating in a sport that they thought of as their own. Even participant 10, who played competitive sports in high school stated: “I was not passionate about it. I didn’t live or breathe it. I never was watching it outside of school and I mean as soon as high school ended I didn’t pursue it anymore”.

For this theme, participants with high and medium exercise identities had more similar narratives to each other than to those with low exercise identities. High and medium identifiers were able to pick out a sport or activity that they considered “theirs” and they identified with, while low identifiers could not. Even the low identifier who did pursue sports to a higher level and older age specifically said he was not passionate about the sport.

2.5 Discussion

The purpose of this study was to explore themes of the lived PA experiences among a sample of undergraduate students at the University of Victoria. This study separated participants by their scores on the exercise identity questionnaire (Anderson & Cychosz, 1994) in order to note whether the emergent themes corresponded to participants’ scores of high, medium and low identity. Furthermore, the results are discussed in terms of whether the emergent themes correspond with present identity theories, as well as whether there are any intervention strategies that could be derived from these findings. The emergent themes that will be discussed are

enjoyment, skill, extracurricular activity participation, variety, and sport ownership. These themes are additionally presented in a Venn diagram for clarity (Figure 3).

Enjoyment

Among the participants of this study, enjoyment appeared to be extremely important – more so than skill – for prolonged engagement. If a person is "alright" at an activity but highly enjoys it, the enjoyment seemed to be enough to keep them engaged and participating. One of the common reasons cited for quitting sports or decreasing PA participation was "I didn't enjoy it anymore", including numerous examples of growing to dislike PE class in school. This follows with previous research regarding the detestation of gym class among those who do not identify as exercisers (Davison, 2000; Mitchell, Gray, & Inchley, 2015). The data from this study showed a clear pattern among different levels of enjoyment of PA among exercise identifiers. Enjoyment of PA was rated most positively among high identifiers, and quite negatively among low identifiers, with medium identifiers reporting mixed levels of enjoyment.

While there were a variety of reasons cited for not enjoying a sport or activity (including poor PE class experiences or social rejection), enjoyment has been identified as an important correlate of exercise identity (Rhodes et al., 2016). Further, meta-analytic results indicate a medium-large effect size relationship between affective judgements and PA (r = 0.42) in an adult population (Rhodes, Fiala, & Conner, 2009). Note that affective judgements are an umbrella term that encompasses core affect, emotion, and moods (Williams, Rhodes, & Connor, 2018) , and are judgements about the overall feeling states expected from completing a bout of PA, including pleasure/displeasure and enjoyment (Kimiecik & Harris, 1996; Lowe, Eves, & Carroll, 2002).

Thematic review of identity literature also provides evidence for the association between affective judgements/enjoyment and exercise identity (Rhodes, Kaushal, & Quinlan, 2016). Additionally, the SDM shows enjoyment having an indirect effect on the development of an exercise identity (Kendzierski & Morganstein, 2009). In line with this model, when examining the relationship of self-determination theory variables to exercise identity, researchers have also found that intrinsically motivated exercise is associated with a strong exercise self-identity (Vlachopoulos et al., 2011), and recommendations for finding one's exercise identity include emphasis on enjoyment (Whaley & Schroyer, 2010).

Although different theories and models have different labels for enjoyment (i.e., affective judgements, intrinsic motivation), when examining the actual content, these researchers are all essentially discussing the same concept, and recommending similar target areas for behaviour change (Rhodes, Williams, & Conner, 2018). Thus, when discussing future intervention targets, it would be useful to examine both recommendations from theory as well as behaviour change techniques (Michie et al., 2013). Behaviour change techniques such as "social support (unspecified)", "remove aversive stimulus", "associative learning", "graded tasks", "reward (outcome)", and "distraction" could all be made to target enjoyment of PA. For example, in terms of graded tasks, one is more likely to adhere to a new exercise program when intensity begins low and gradually increases as the program progresses (Dishman & Buckworth, 1996; Ekkekakis, Hall, & Petruzzello, 2008; Rhodes, Warburton, & Murray, 2009). Additionally, interventions could focus on distracting participants from their negative affect ("distraction"), for example by pairing the activity with something that is inherently enjoyable (Rhodes, 2017b) such as socializing or listening to music. A full list of recommended behaviour change techniques is available in Table 3.

Skill

The second emergent theme was skill. Feeling skilled at PA, in at least one of its forms, was unanimously discussed among high and medium identifiers, while lacking in low identifiers. Although all participants experienced some success at PA at some point in their lives, there was a much stronger, overall feeling of being "good" or "bad" at PA with which participants identified. For example, although participant 9 was "picked first for teams" in elementary school, her overall self-reported skill for PA at the time of the interview was quite low. Despite at one point feeling quite capable at PA, today she does not identify as skilled. In addition, the gym class experience seemed to play a large role in a person's self-perception of their PA skill. Each low identifier discussed being "bad" at gym class, despite experiencing minor successes in extracurricular activities while interestingly, one high identifier classified himself as "bad" at gym class yet "good" at PA. This begs the question: what other PA experiences allowed participant 3 to see himself as skilled, despite having a negative experience with PE?

The necessity for feelings of skill aligns with the importance of self-efficacy as indicated by social cognitive models such as social cognitive theory (Bandura, 2004; Bandura, 1982), perceived behavioural control in the theory of planned behaviour (Ajzen, 1991) or the need for competence in self-determination theory (Ryan & Deci, 2000; Teixeira, Carraça, Markland, Silva, & Ryan, 2012; Wehmeyer, Shogren, Little, & Lopez, 2017). Self-efficacy has been demonstrated to predict PA behaviour in healthy adults – in both adoption and maintenance of behaviour. A systematic review and meta-analysis reported that self-efficacy was "consistently and positively associated with PA" (p. 990) with 40/67 (60%) direct effects estimated from self-efficacy to PA yielding significant results (Young et al., 2014).

Although theory and meta-analytic work has linked self-efficacy and PA behaviour, less research exists regarding the association between self-efficacy and exercise identity. However, self-efficacy has been found to mediate the relationship between exercise identity and PA behaviour (Strachan et al., 2015). Additionally, thematic review indicated support for the association between ability and exercise identity (Rhodes, Kaushal, & Quinlan, 2016). This research also supported the idea that people determine their skill level by comparing themselves to others, which is supported both by Social Comparison Theory (Festinger, 1957), and the social comparison aspect of the SDM (Kendzierski, 1998). People learn about themselves through social comparison, and are constantly changing their self-perception based on new information gathered (Festinger, 1957). This data supports the notion that if a person's most recent social feedback is that they are "bad" at PA, then this is how they will perceive themselves, even if there were exceptions in childhood or with specific sports. Self-efficacy is also discussed in the M-PAC model (Rhodes, 2017), in which perceived capability is an aspect of the basis for a strong motivational foundation leading eventually to the reflexive processes of both habit and identity.

Additionally, qualitative research further supports skill as an important component of PA participation. Among students in late high school (grades 10-12), heightened feelings of competence were related to leisure time PA (Bélanger et al., 2011). Children who have higher skills in sports are more likely to exhibit sustained PA behaviour (Barnett, van Beurden, Morgan, Brooks, & Beard, 2009; Figueiredo, Gonçalves, Coelho e Silva, & Malina, 2009), with perceptions of competence cited as a major barrier for not participating in PA (Martins, Marques, Sarmento, & Carreiro da Costa, 2015). Lastly, commensurate with my findings, qualitative literature tells us that girls often do not enjoy gym class because it is "embarrassing" to be bad at

it, especially given that most gym classes are mixed gender, and the emphasis on the competitive nature of sport (Dwyer et al., 2006; Mitchell et al., 2015).

In order to enhance self-efficacy in future interventions, certain behaviour change techniques should be targeted. Meta-analytic work of 27 studies has linked the BCTs: "action planning", "instructions on how to perform behaviour", and "material incentive (behaviour)" to increased levels of self-efficacy (Williams & French, 2011). An additional meta-analysis of 27 studies suggests including "feedback on behaviour" (Ashford, Edmunds, & French, 2010) to target self-efficacy. Additionally, meta-analytic work examining PA interventions found that interventions had a significant effect on self-efficacy ($g = 0.21$) (Higgins, Middleton, Winner, & Janelle, 2014), meaning simply doing PA is enough to increase self-efficacy. Other suggestions from this study may include: "demonstration of the behaviour", "social comparison", "behavioural practice/rehearsal", "verbal persuasion about capability", "focus on past successes", or 15.4 "self-talk". For example, "social comparison" may be targeted by encouraging participants to compare themselves to similar others as opposed to those who are at a much higher skill level. There is also potential for downward social comparison to allow people to feel more skilled at their chosen activity (Verkooijen & de Bruijn, 2013). It is important to note however, that some BCTs have been found to correlate with decreased levels of self-efficacy, including "persuasion", "graded tasks", and "problem solving (barrier identification)" (Ashford et al., 2010), thus these BCTs are not recommended for future intervention targets.

Extracurricular Activities

The third emergent theme was extracurricular sport/activity participation. There was not a clear pattern of extracurricular activity participation when comparing high, medium, and low

identifiers in terms of a dichotomy (did vs. did not participate). However, low identifiers tended to stop participation at a younger age than did medium and high identifiers. Additionally, more medium and high identifiers pursued their sports to a competitive level (i.e., hockey academy, competitive rowing) compared to the majority of the low identifiers who did not.

Through qualitative research among secondary students, participation in organized PA leisure activities has been previously related to overall levels of PA (Thompson, Rehman, & Humbert, 2005). Extracurricular activity participation often occurs earlier in a person's life than structured PA classes, thus exposing children to PA at a young age and allowing for early skill development and physical literacy skills (Edwards, Bryant, Keegan, Morgan, & Jones, 2017) including competence, confidence, and cognitive knowledge. Early development of PA skills is imperative for a person's prolonged PA participation in adulthood (Edwards et al., 2017). Furthermore, prolonged participation in extracurricular sport/activities not only develops a person's physical literacy skills, but also seems to protect against negative gym class experiences, as evidenced by participant 3. This participant self-identified as skilled in his specific sport, karate, and thus despite feeling un-skilled at gym class activities, he still scored high on the exercise identity questionnaire. Given that the low identifiers did not have prolonged experiences in extracurricular activities through which they could offset their negative PE experiences, one potential explanation is that extracurricular activity participation is an important component of developing a sense of skill for PA, which is a mediator of exercise identity (Strachan, Brawley, Spink, Sweet, & Perras, 2015).

Additionally, participation in extracurricular activities could enhance a person's sense of cohesion and belonging (Pescosolido & Saavedra, 2012), which also relates to the self-determination theory construct of relatedness (Ryan & Deci, 2000; Teixeira et al., 2012;

Wehmeyer et al., 2017). According to self-determination theory, people must feel a sense of belonging in order to fulfil their basic human needs and achieve autonomous motivation.

The term identity refers to both role and group basis of identity. Social identity theory (Tajfel & Turner, 2001) and role theory have been combined to allow discussion that includes both the social environment and the self (Stets & Burke, 2000). Extracurricular activity participation may trigger the social side of identity formation. This has been demonstrated in an older adult population, in which social interaction contributed to the development of an exercise identity (Hardcastle & Taylor, 2005), and is also discussed in the SDM in that identity is triggered by your social environment and how you allocate your time, money, and effort (Kendzierski, 1998). The M-PAC model builds off the notion of allocation of resources and postulates that identity is formed through sacrifice for the sake of participating in the identity-concordant activity (Rhodes, 2017). Extracurricular activity participation, specifically at an older age or to a higher level (as seen in the high and medium identifiers) requires large allocation of time, money, and effort, and other social outlets or experiences may be sacrificed as a result. Alternatively, perhaps the mechanism through which an identity is formed begins at the specific sport level, with clear rules (West, 2009), as indicated by PRIME theory, and then is able to become generalized to activity as a whole once people grow older and no longer specialize in one specific area. This is one possible explanation; however this speculation requires more research.

Because participation in extracurricular sports/activities encompasses so many experiences, it is difficult to draw specific intervention targets from this theme. The behaviour change technique “social support (unspecified)” (Michie et al., 2013) may be targeted in terms of encouraging group based PA to increase social cohesion and relatedness/belonging. Additionally,

sport/activity participation may also represent the behavioural aspect of identity formation in that people identify with what they do (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017). This notion is supported by self-perception theory which states that people observe their own behaviour and then come to conclusions as to what attitudes must have driven that behaviour (Bem, 1972). In this research, extracurricular activity participation was discussed solely in youth/adolescence, and not explored in adulthood. Therefore, I would recommend involving children in sport from a young age in order to develop PA skills and social supports. Early childhood involvement will also develop the motivation and confidence elements of physical literacy (Edwards et al., 2017), which is an antecedent of PA participation. In terms of adult populations, creating a group environment for PA could be helpful, as was shown in Hardcastle and Taylor (2005); however more research is required in this area.

Variety

In addition to potentially allowing a person to form a more well-rounded opinion of their PA skill, extracurricular activity participation also contributes to increased variety of PA exposure. Variety was discussed by participants across the three identity strengths, and overall, did not present a clear pattern in terms of relationship with exercise identity. However, variety may be a mediating mechanism through which identity development is supported.

The mere exposure effect (Fang, Singh, & Ahluwalia, 2007) states that the more a person is exposed to a stimuli, the more they will like it. This applies in both human sexual attraction (Reis, Maniaci, Caprariello, Eastwick, & Finkel, 2011) as well as food preferences. In fact, the more frequently a person tastes an edible substance, the higher it was rated in terms of likability (Pliner, 1982). While this theory has not been formally applied to PA, I am postulating that

variety, and thus quantity of exposure to PA in youth is related to the development of not only skill, but also enjoyment. This mirrors work done to augment the Self-Determination Theory with a fourth construct – perceived exercise variety (Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage, Dowd, et al., 2014). Perceived exercise variety has been shown to be both empirically different from SDT variables in terms of its ability to predict unique variance in PA behaviour (Sylvester, Standage, Dowd, et al., 2014), as well as indirectly predict future PA behaviour through complimenting SDT variables (Sylvester, Standage, Ark, et al., 2014). While variety on its own is not clearly related to the development of an exercise identity, the presence of variety in PA participation, coupled with other factors such as skill or extracurricular activity participation, could be a contributing factor to the development of an exercise identity through skill development or increased enjoyment (Rhodes, Kaushal, & Quinlan, 2016). It is also not clear from this research the different roles variety of exposure, length of exposure, or the two combined play in the development of exercise identity.

Variety of exposure to PA does not appear in social cognitive models or current identity theories, although the importance of providing children with access to a variety of forms of PA has also been cited in other qualitative and physical literacy literatures (Thompson et al., 2005; Timken, McNamee, & Coste, 2017). More research surrounding the effect of variety of sport/activity exposure is needed.

In terms of intervention targets, I recommend encouraging participants to try a variety of sports/activities before giving up on PA. For many people, it may take some time to find the sport that "calls" to them. The behaviour change technique that approximates this notion is "exposure", in which the researcher provides systematic confrontation with a feared stimulus to reduce the response to a later encounter (Michie et al., 2013). This recommendation is supported

by Sylvester and colleagues' (2016) finding that PA variety support "indirectly explained higher levels of exercise-related positive affect" (p. 1), indicating that perceived variety is related to positive exercise-related outcomes. These researchers also suggest providing variety support to "promote exercise-related well-being in people who are physically inactive" (p. 1) (Sylvester et al., 2016). Additionally, this recommendation also matches with the mere exposure effect (Fang et al., 2007), which states that the more a person is exposed to something, the less negative affect will be associated with it.

Sport Ownership

When a person internalizes a sport to the point that it becomes "theirs", they have achieved sport ownership. Sport ownership is distinct from sport identity in that the person stakes a claim to the sport, as opposed to the sport being a part of their self-concept. In this research, high and medium identifiers were able to name a sport or activity that they considered "theirs", while low identifiers could not. The idea of sport ownership relates to a combination of the above themes – skill, enjoyment, extracurricular activity participation, and variety. The dialogue around sport ownership indicates that it is more than simply enjoying a sport/activity; instead it is an activity that is a key aspect of one's identity. High skill, high enjoyment, doing extracurricular activities, and experiencing a variety of sport may all contribute to the development of sport ownership, however sport ownership may motivate a person to practice more thus increasing their skill, or try other related sports thus increasing variety. It is likely that all these variables have reciprocal relationships.

The notion of sport ownership does not appear in the PA behaviour change literature or the identity literature. Perhaps this is because sport ownership has been previously thought of a

one *aspect* of, or as a consequence of having an exercise identity, as opposed to an antecedent to its development. However, this research suggests that presence of sport ownership in youth may be a contributor to maintaining an exercise identity in adulthood – although more research is required to back this assertion.

Based on this preliminary evidence, in order to access feelings of sport ownership, behaviour change techniques 13.5 identity associated with changed behaviour, and 15.4 self-talk may be applied. For example, there is potential that researchers could falsely mimic feelings of sport ownership in order to expedite the identity creation process through positive self-talk.

Table 3

Recommended Behaviour Change Techniques

Theme	Behaviour Change Technique
Enjoyment	
	3.1 Social support (unspecified)
	7.5 Remove aversive stimulus
	7.8 Associative learning
	8.7 Graded tasks
	10.10 Reward (outcome)
	12.4 Distraction
Skill	
	1.4 Action planning
	2.2 Feedback on behaviour
	4.1 Instructions on how to perform the behaviour
	6.1 Demonstration of the behaviour
	6.2 Social comparison
	8.1 Behavioural practice/rehearsal
	10.1 Material incentive (behaviour)
	15.1 Verbal persuasion about capability
	15.3 Focus on past successes
	15.4 Self-talk
Extracurricular Sport Participation	
	3.1 Social support (unspecified)
Variety	
	7.7 Exposure
Sport Ownership	
	13.5 Identity associated with changed behaviour
	15.4 Self-talk

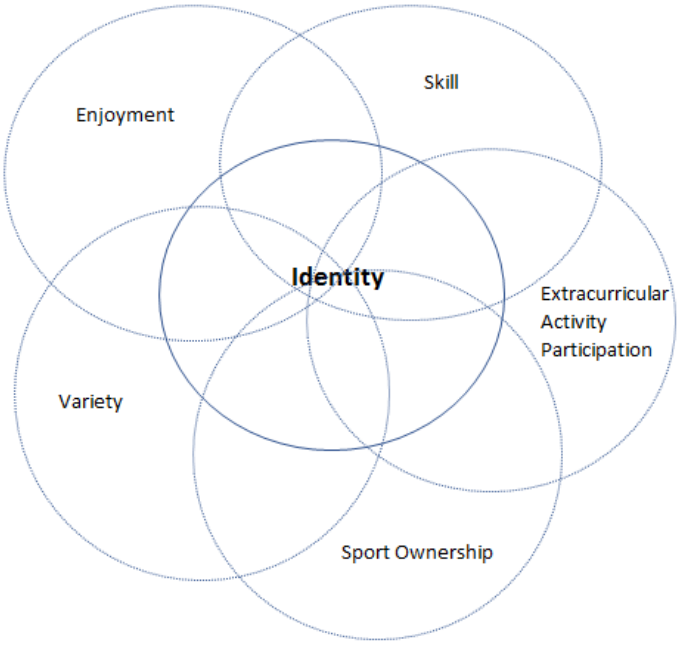


Figure 3. Venn diagram of emergent themes and relationship to identity

Passion and Identity

A combination and accumulation of the above factors may help to create an identity for PA. According to this research, one of the indicators (though not necessarily an antecedent) of an exercise identity is the presence of passion. High and medium identifiers used terms like “love”, “this is my thing”, and “*the* sport for me” to describe their relationship to sport. These highly charged words and phrases indicate something more than enjoyment of PA. Passion has been defined as “an engagement toward an activity, an emotional component attached to the activity, and some kind of valuing of the activity” (Mageau et al., 2009, p. 602), which goes above and beyond simply enjoying an activity.

The connection between sport/exercise passion and exercise identity does not exist in the exercise identity literature; however, the passion literature links these two concepts (Mageau, Vallerand, Charest, et al., 2009). According to Mageau and colleagues, “passion involves identity processes that are not necessarily present in other motivational constructs. For example, people with high levels of harmonious or obsessive passion tend to perceive the activity as self-defining, whereas people highly motivated toward an activity do not necessarily identify with the activity” (pp. 607-608).

The Dualistic Model of Passion (Vallerand et al., 2003) has similar motivation constructs to that of the M-PAC model. This model discusses four elements of passion: activity valuation (attitudes); liking of the activity (enjoyment); time spent on the activity (prioritization), and the internalization process (choice). The passion literature highlights many of the same constructs that I am examining in this research through identity. Mageau and colleagues (2009) state “people with a passion for swimming or for writing do not merely swim or write, they are ‘‘swimmers’’ or ‘‘writers.’’” (p. 609). Given these similarities, identity literature may benefit from expanding its understanding of identity to include passion.

Conversely however, passion has also been defined as follows: “a strong inclination toward an activity that individuals like (or even love), that they find important, and in which they invest time and energy. Another important characteristic of passion is that the activity has been internalized into one's identity. In the process of activity involvement, some activities come to be so self-defining that they represent central features of one's identity” (Vallerand et al., 2008, pp. 374-275). By this definition, passion and identity are so closely related that perhaps they should be considered the same construct. For now, it would be worthwhile to consider passion for a PA

as an indicator of a PA identity, though more research is required to ascertain where passion fits into existing identity-related theories and schemas.

2.5.1 Limitations

Due to the nature of qualitative research, the data from this research has some limitations. Firstly, the value of qualitative research depends heavily on my abilities and skills as a researcher, and is easily influenced by personal biases (Anderson, 2010). I have written an extensive researcher statement, and acknowledge my positive biases towards PA; however results must be interpreted bearing in mind that I am the primary research instrument. Secondly, given the purposively sampled and small number of participants, the results may not be transferable to other university settings or student populations. Thirdly, I have followed guidelines to ensure scientific trustworthiness in my research, including member checking, producing detailed transcriptions (available upon request), supporting generalization with content analysis, using computer programs to assist qualitative data analysis (thus ensuring systematic analysis of representative instances of data), peer debriefing, as well as recording data objectively and comprehensibly (including the use of audiotapes) (Seale, 1997). Nonetheless, rigor in qualitative research can be "difficult to maintain, assess, and demonstrate" (Anderson, 2010, p. 2).

In addition to limitations due to the nature of qualitative research, there are also limitations to using interviews and self-report for data. I am relying on participant's memories of their PA experiences starting at a very young age. Recall bias, as well as self-report bias are likely to be present in my data. Additionally, although I engaged in member checking with all the participants in this study, I only received responses from three participants (2, 6, & 7). These participants were satisfied with the way I had interpreted their interviews, and had no changes.

This shows promise for the accuracy in which I interpreted the other seven interviews; however there is no way to be certain of this due to lack of participant response. However, it is also important to note that Smith and McGannon (2017) declared that member checking "does not ensure that the results of qualitative research are valid or trustworthy" (p. 17), suggesting instead that "researchers may move to member reflections whereby findings are shared with participants, but with a different logic of justification, intention and outcome sought than as in member checking" (p. 17). This is valid commentary and will be taken into account in future research.

Lastly, because this was not a developmental study, it cannot be known for certain whether the emergent themes are truly antecedent themes, or perhaps identity symptoms or co-occurrences. Asking questions about the past and relating past experiences to present identity strength is an indicator of temporal precedence, however more research is required to determine causation in this area.

2.5.2 Future research

The preliminary development of antecedent themes begs future research in at least three directions. Firstly, now that antecedent themes have been identified, additional qualitative analysis of these factors is needed. The results from this study cannot be widely generalized without further interviews with diverse population groups. Additionally, in order to establish temporal precedence, it would be ideal to create a large scale study that tracks youth across time, while monitoring them for antecedents to developing an exercise identity. A longitudinal study of this nature would only be practical after further qualitative research to increase our understanding of the preliminary themes developed in this research.

In addition, it would be worthwhile to develop a study that explores the feasibility and acceptability of an exercise identity based intervention designed to expedite the process of

developing an identity among new exercisers. Such a study can use these emergent themes to target identity. Study 2 explores this idea through a feasibility controlled trial among University of Victoria undergraduate students.

2.5.3 Conclusion

The purpose of this study was to explore the antecedents to developing, or not developing a strong exercise identity through interviews of the lived PA experiences of a sample of undergraduate students who had mixed levels of identity. The data from this research supports previous review findings by Rhodes et al. (2016) in that high quality motivation and social activation were associated with high exercise identity. However, the findings from this study provide increased specificity to themes, as well as novel intervention targets for identity development. Enjoyment, skill, extracurricular activity participation, variety, and sport ownership were associated with a strong exercise identity, and passion emerged as an indicator for the presence of exercise identity.

Overall, high and medium identifiers had more similar experiences to each other than do low identifiers. In fact, there seemed few differences between the high and medium identifiers. It is also important to note that the emergent themes have some overlap. For example, in order to enjoy an activity, it was apparent that a person also had to feel like they were good at it, thus overlapping enjoyment and skill. Participants in this research often cited both feeling un-skilled, and not enjoying an activity any longer as reasons for quitting. PA is a complex process, and while five distinct themes emerged from this research, exercise identity must not be oversimplified. Being exposed to one or multiple of these factors does not guarantee a person will develop an exercise identity. Identity development is a complex process which may also

take into consideration factors which were not discussed in these interviews such as opportunities afforded, socio-economic status, or simply baseline personality.

Additionally, it is important to note that although there is potential for successful intervention work on exercise identity in adulthood, the results from this study indicate that identity development is critical during the formative years, and ultimately that is where the public health focus should be. Identity is a relatively stable construct over time (Burke, 2006; Markus & Wurf, 1987; Serpe, 1987), and it would be worthwhile to investigate ways in which educators, parents, and health care professionals can make a child's PA experience a positive one so that interventions to try to re-shape the way a person has framed PA are not necessary.

2.5.4 Funding

This research has been funded by the Canadian Institutes of Health Research (CIHR).

Chapter 3: A Feasibility Randomized Trial of an Identity-Based Physical Activity Intervention among University Students

3.1 Abstract

Background: Exercise identity is when a person considers exercise to be a central part of their self-concept, and is related to frequency, intensity, and duration of exercise. Although exercise and physical activity (PA) are distinct in their operational definition, exercise is considered an important component of being physically active, and therefore exercise identity and its relationship to general PA is the construct under examination. Given the health benefits of PA and overall low levels of participation, identity is a construct worthy of examination. However, there is limited research on the antecedents to forming an exercise identity. Suggestions from previous literature (including Study 1), are repeated PA behaviour, enjoyment, skill, rules, high quality motivation, and social activation; however the feasibility of intervening upon these antecedents is unknown. In terms of identity development, identity may simply be developed through repeated PA behaviour as targeted by standard social cognitive behaviour change interventions. These interventions tend to focus on giving information about the benefits of PA, instilling a sense of capability, and regulating the behaviour through goal setting, planning, and self-monitoring. Conversely, identity itself could be directly targeted via helping a person conceptually organize where PA may fit in their priority-hierarchy of their life, or practising identity-specific self-talk. Interventions directly targeting exercise identity has seen limited attention in the literature thus far. **Purpose:** The purpose of this research was to compare the feasibility (recruitment, retention, & satisfaction) of a standard social cognitive intervention to an augmented, identity-based social cognitive intervention for university students. Secondary outcomes were self-reported PA and exercise identity. **Methods:** Participants between the ages of 18-25 who were not meeting PA guidelines were recruited from the University of Victoria,

and randomized to a standard or augmented intervention group. Randomization was 1:1, using a random number sequence. Only the participants were blind to group assignment. The standard intervention group received information on the benefits of PA, as well as behaviour change techniques such as goal setting and planning. The augmented intervention group received the same information, with the addition of identity-specific information (the definition and an explanation of exercise identity, practicing identity-specific self-talk, an activity on the actual self vs the ideal self, cognitive restructuring of PA beliefs to match the participants identity profile, an activity designed to have the participant "up" their feelings of being an exerciser through changes to their social media, dress, etc., and the development of rules around PA participation). I delivered the intervention materials bi-weekly for 6 weeks, and assessed their feasibility at the study end-point using mixed methods. I conducted satisfaction and evaluation questionnaires and qualitative exit interviews, and integrated the results. Additionally, both PA change and exercise identity change were assessed via self-report using the Godin Leisure-Time Exercise Questionnaire (GLTEQ) and exercise identity scale respectively at baseline and 6 weeks. **Results:** Twenty participants were randomized to the standard or augmented intervention group (10 each), with 18 participants completing the full study protocol. The recruitment rate was 26%, retention was 90%, and the mean satisfaction score for the standard intervention group was 2.69 (SD = 0.62), and the augmented intervention group was 2.83 (SD = 0.40). Both the augmented intervention and standard intervention groups increased their PA levels ($\eta^2 = 0.25$), and exercise identity levels ($\eta^2 = 0.43$), however interaction effect sizes were small ($\eta^2 \sim 0.02$), indicating no greater change in the augmented intervention group compared to standard intervention group. No adverse events were reported. **Discussion:** High feasibility ratings, both through retention, and survey and interview data show that the study could be extended to a full-

scale RCT with modifications to recruitment including oversampling to account for low recruitment rates, as well as more targeted recruitment methods such as referrals from health care professionals. Initial trends in outcome data suggest that both the augmented intervention group and standard intervention group materials were effective in increasing PA levels and exercise identity scores, however, a large scale study is required to explore meaningful differences between the groups on PA and identity. A full-scale study is recommended yet some methodological changes outlined in detail throughout. **Funding:** This study was funded by the Canadian Institutes of Health Research (CIHR).

3.2 Introduction

3.2.1 Literature review

Regular physical activity (PA) has been reliably linked to both physical and mental health benefits (Lee et al., 2012; Rebar, Stanton, Geard, Short, & Duncan, 2015; Rhodes et al., 2017; Warburton, Nicol, & Bredin, 2006), including the primary prevention of more than 25 chronic diseases (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010) However, Canadian accelerometer data from 2013 suggests that 68% of Canadian households with adults ages 18-39 (Colley et al., 2011; Statistics Canada, 2013) are not meeting PA guidelines (World Health Organization, 2012) of 150 minutes of moderate to vigorous PA per week. Thus, a large proportion of Canadian adults are not reaping the many benefits of regular PA.

When examining trends in population level data of children vs adult PA levels, there is a general decline in PA at the onset of adulthood. This marked drop in PA levels, combined with a 20% drop in PA from the last two months of high school to the first eight weeks of university (66.2% to 44.1% of students reporting adequate levels of vigorous activity) (Bray & Born, 2004)

indicates that the transition from adolescence to early adulthood, specifically for those in university, is correlated with a decrease in PA. Many university students are inactive, and thus are a key target for PA intervention work.

Currently, the majority of interventions follow a social cognitive framework, following recommendations from theories such as the Social Cognitive Theory (Bandura, 1998), the Theory of Planned Behaviour (Ajzen, 1991), or the Transtheoretical model (Prochaska and DiClemente, 1982). Although these models/theories differ in their naming of key constructs, they all essentially focus on intervening upon expectations of utility, social norms, and perceptions of capability (Fishbein, Triandis, Kanfer, Becker, Middlestadt, & Eichler, 2001). As an extension of these models, self-regulation techniques such as goal setting or self-monitoring are often employed within PA interventions (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). Recent meta-analytic work indicates PA interventions overall yield a small effect size (d = 0.27) (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017), however current intervention content is generally limited to these social-cognitive constructs.

Given the modest impact of PA interventions in the social cognitive tradition, there have been calls to extend intervention approaches to other types of frameworks (Hagger & Chatzisarantis, 2014; Rebar, Stanton, Geard, Short, & Duncan, 2015; Rhodes, 2017; Williams & Evans, 2014). Some theorists have argued that the social cognitive tradition focuses almost exclusively upon reflective processes, which generate behavioural decisions that are based on knowledge about facts and values (Strack & Deutsch, 2004). These authors and others (Gardner, De Bruijn, & Lally, 2011; Rebar et al., 2016; Rhodes, 2017; Rhodes, Kaushal, & Quinlan, 2016; Stryker & Burke, 2000; Williams & Evans, 2014) suggest that reflexive processes, those that occur quickly or on impulse, may also impact PA. The inclusion of reflexive processes such as

implicit attitudes, automatic affective associations, habit, or identity may provide a more complete picture of PA performance and increase the effectiveness of interventions (Rebar et al., 2016; Ries, Hein, Pihu, & Armenta, 2012; Sheeran et al., 2013). The focus of the current study is on exercise identity.

Exercise identity is the self-categorization of oneself into a profile of a regular exerciser. This self-categorization is thought to act as its own reflexive, self-regulating mechanism of motivation, independent of other reasons for performing the behaviour such as outcome expectations (Berry, Strachan, & Verkooijen, 2014; Rhodes et al., 2016; Stets & Burke, 2000; Stryker & Burke, 2000). The reflexive aspect of identity refers to the premise that identity motivates behaviour mainly to reduce negative affect when there is misalignment between one's self-categorization and observed behaviour (Burke, 2006; Stryker & Burke, 2000). Thus, as one grows less concordant between identity and behaviour, the dissonance prompts motivation to reduce the discrepancy (Festinger, 1957; Stets & Burke, 2000). It is also important to note that identity is thought to be stable over time (Burke, 2006; Markus & Wurf, 1987; Serpe, 1987), though not entirely resistant to change, rather typically slow to change (Burke, 2006). Identity is a promising construct due to its reflexive composition as opposed to social cognitive approaches, its maintenance level capacity (maintenance mechanisms are thought to aid in the long term sustainability of a behaviour (Kwasnicka, Dombrowski, White, & Sniehotta, 2016)), and its capacity to moderate intentions into behaviour by acting on self-regulatory processes. Self-regulatory processes moderate intentions into behaviour (Stadler et al., 2009), and PA identity increases confidence in engaging in self-regulatory processes (Strachan et al., 2013), thus identity supports the intention-behaviour relationship.

Currently, identity development is postulated to be related to prioritizing behaviours, perceived competence, perceived improvement and enjoyment, as well as the extent to which others in a person's social world acknowledge their self-definition and mention their engagement in the activity (Kendzierski, Furr, & Schiavoni, 1998). Additionally, set rules and plans are thought to be related to the development of an exercise identity (West, 2009), as well as repeated behaviour (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017).

Meta-analytic data examining the relationship between exercise identity and PA participation found a medium effect size (r = 0.44) (Rhodes et al., 2016). Exercise identity has shown links to various properties of PA such as frequency, intensity, and duration (Strachan, Woodgate, Brawley, & Tse, 2005). Additionally, self-efficacy has been found to mediate the relationship between exercise identity and PA behaviour (Strachan et al., 2015), supporting the importance of the interplay of social cognitive and reflexive constructs. Overall, identity theories have been primarily developed and tested through cross-sectional and quantitative research (Cardinal, 1997; Hardcastle & Taylor, 2005; Rhodes, 2017; Sallis, Prochaska, & Taylor, 2000; Strachan, Woodgate, Brawley, & Tse, 2005; Strachan & Brawley, 2008; Strachan et al., 2015; Verkooijen & de Bruijn, 2013; Vlachopoulos, Kaperoni, & Moustaka, 2011; Whaley & Schroyer, 2010; Wright, Macdonald, & Groom, 2003); there is limited intervention work in this area.

In terms of creating or strengthening an exercise identity, there are two conceivable routes through which change may occur. In the first, exercise identity may develop as a natural consequence of 1) changed motivational characteristics (Kendzierski, Furr, & Schiavoni, 1998), 2) self-regulation abilities (Stadler, Oettingen, & Gollwitzer, 2009), and 3) changed PA

behaviour (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017). This 'natural' route is what is discussed in the identity and PA literature to date.

The second route through which identity change may occur is through direct targeting of identity-related concepts. In this route, the interventionist may accelerate the lengthy process of sustained motivational and behavioural change that lead to exercise identity development via behaviour, and instead expedite the identity formation process by also targeting identity directly. Direct targeting of identity does not appear in standard social cognitive style interventions, however there are some recommendations that can be adapted from the Self-Definition Model (SDM) (Kendzierski, Furr, & Schiavoni, 1998), PRIME Theory (West, 2009), and the M-PAC model (Rhodes, 2017), as well as behaviour change techniques from Michie and colleagues (2013) and Study 1 that will be implemented into this research.

Specifically, the SDM (Kendzierski, Furr, & Schiavoni, 1998) postulates that the extent to which others in someone's social world acknowledge the self-definition, and mention their engagement in the activity, will impact the development of an identity. Directly causing others to acknowledge one's participation in PA may fulfill this requirement. PRIME Theory (West, 2009) indicates that identity is strengthened by plans with clear rules. While plans are a common aspect of social cognitive interventions, clear rules may not be. Emphasis on rules may serve to enhance identity formation. The M-PAC model highlights the importance of prioritizing and expressing one's identity to others (Rhodes, 2017). Michie and colleagues (2013) identify the following behaviour change techniques associated with identity: identification of self as role model, framing/reframing, incompatible beliefs, valued self-identity, and identity associated with changed behaviour, while Study 1 suggests targeting social support to enhance feelings associated with extracurricular sport participation, exposure to partially explain the role of

variety in identity development, and identity associated with changed behaviour or self-talk to correspond with sport ownership.

The augmented intervention in this study tests the feasibility of these novel ideas and techniques designed to target identity development, over and above what is already established from the social cognitive tradition, to explore whether the intervention should move to a full scale RCT as per best practice guidelines (Craig et al., 2008).

3.2.2 Purpose

The purpose of this study was to examine the feasibility of an identity based intervention in comparison to a standard social cognitive intervention. The intervention was a six week-long randomized trial featuring two groups as described above.

The secondary purpose of this research is to examine preliminary trends in PA behaviour change as well as exercise identity change. Although significance testing is not possible, upwards trends in PA behaviour and exercise identity will serve to support the recommendation for a full-scale trial, should the study be rated as feasible. See Appendix 1 for a detailed dissemination plan.

3.2.3 Hypothesis

In terms of feasibility measures, I hypothesized that recruitment will be more difficult than studies of similar designs in different regions, due to the generally active population in British Columbia. 2017 self-report data (Statistics Canada, 2018) indicates that on average, 68% of Canadians aged 18-34 are meeting PA guidelines. British Columbia however, is above the national average for PA with 73.3% of adults aged 18-34 meeting guidelines. I anticipated that once participants have met with me at baseline, retention levels will be high due to the engaging nature of the materials and positive feedback I have previously received on my skills as a

counsellor. I also hypothesized that both the standard social cognitive intervention and the augmented identity intervention will receive high ratings of acceptability from participants. The novelty of the augmented intervention material may contribute to its acceptability ratings, however given this is the first time these techniques will be presented, there may yet be room for improvement in both the material's design and delivery.

In terms of the secondary outcome measure, PA behaviour change, I hypothesized that both intervention groups will show increased PA due to the efficacy of the social cognitive intervention targets present (Ashford, Edmunds, & French, 2010; Rhodes, Fiala, et al., 2009, etc). This result will demonstrate the viability of the interventions. In terms of exercise identity change, I also hypothesized that in both groups identity change will show upwards trends, given that behaviour is an antecedent of identity (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017). However, the identity-specific group may show increased change compared to the standard intervention group due to direct targeting and discussion of exercise identity (Rhodes, 2017; Study 1).

3.3 Methods

3.3.1 Trial design

I conducted a mixed method, single blind randomized trial feasibility study, in which I was aware of group assignment but the participants were not. I followed Consort guidelines for pilot and feasibility trials (Eldridge, Chan, Campbell, Bond, & Hopewell, 2016). See Appendix 4 for the Consort checklists. A feasibility study is done to establish whether an intervention is appropriate for further testing on a grander scale (Bowen et al., 2009).

I created two intervention groups: a standard social cognitive/self-regulatory intervention group and an augmented identity intervention group, and measured their progress across six

weeks. The standard intervention group received information on the benefits of PA and powerful self-regulatory techniques such as goal-setting and planning (McEwan et al., 2016; Schwarzer, 2008), while the augmented intervention group received the same information and techniques, as well as an identity-specific intervention. Details of intervention content can be found in section 3.2. I randomly allocated participants to the two groups using a 1:1 randomization sequence, which was stored in a locked filing cabinet. I recruited 20 participants, 10 in each group. This number is aligned with previous feasibility trials conducted over a six week period (Arigo, 2015; Canning, Allen, Dean, Goh, & Fung, 2012; Chansavang et al., 2015; Van Oort, Tupper, Rosenberg, Farthing, & Baxter-Jones, 2013). Measurement points were baseline and six weeks (intervention endpoint). At the intervention endpoint there was an additional program evaluation questionnaire for participants to complete. Qualitative data were collected at the six-week time-point via exit interviews.

The primary outcome measure of this study was feasibility. This included recruitment, retention, and satisfaction. The secondary outcomes were trends in PA behaviour and exercise identity change.

3.3.2 Eligibility criteria

Eligible participants for this feasibility trial were undergraduate students at the University of Victoria, ages 18-25. Participants were excluded if they were currently meeting PA guidelines, or were not seeking to increase their PA participation. Participants self-screened for this study using the above inclusion criteria. Further details regarding recruitment and eligibility are available in section 3.3.4.

3.3.3 Intervention content

All participants received individual, bi-weekly sessions with me, in which I delivered the intervention materials face to face. The details of the intervention materials were derived both from prior intervention literature in the social cognitive domain and from the themes that emerged from Study 1 (see Table 3). Standard group materials included information on the benefits of PA, goal setting, planning, and self-monitoring. These constructs were included because changes in self-regulation constructs have significant effects on changes in PA; for example goal setting yields an effect sizes of $d = 0.55$ (McEwan et al., 2016), and self-monitoring is a moderator in predicting the effect size of short (ES = 0.24) and long (ES = 0.37) term interventions (Samdal et al., 2017).

The augmented intervention group materials contained the same social cognitive information and techniques, as well as additional identity-specific content (see Table 4). At least one behaviour change technique (Michie et al., 2013) recommended from each relevant emergent theme in Study 1 was used in the augmented intervention, including: "distraction" (from the emergent theme: enjoyment), "self-talk" (from the emergent theme: skill), and "identity associated with changed behaviour" (from the emergent theme: sport ownership). The themes of extracurricular sport participation and variety are, in some ways, behaviour change techniques in of themselves; therefore, I did not include behaviour change techniques derived from these themes, and rather encouraged the participants to join extracurricular, organized PA, as well as try a variety of activities in order to find one that suited them. In terms of intervention content derived from existing theory and literature, I included discussion of rules, prioritizing, symbolism, investment of time, money, and resources, environmental cueing, and changing one's environment to support their goals. Session 1 brought awareness to the concept of identity, and emphasized the importance of skill, enjoyment, and variety of PA participation. Session 2

included an activity on prioritizing PA (including what the participant spends their money, time, and effort on), setting rules around PA participation, and developing positive self-talk related to exercise identity (i.e., "I am an exerciser, therefore I will…"). Session 3 discussed the environment, and asked the participants to use symbolic representation to "up" their feelings of being an exerciser. The verbal dialogue included discussion around sport participation (and by extension, trying a variety of activity types), and sport ownership throughout the six weeks. Full intervention and control group materials can be found in Appendix 2.

Table 4

Behaviour Change Techniques Utilized in Intervention Content

Group	BCT	Session Component
Standard Social Cognitive Intervention		
	1.1 Goal setting (behaviour)	Setting SMART goals
	1.2 Problem solving	Barrier identification
	1.4 Action planning	Creating a detailed PA plan
	1.5 Review behavioural goal(s)	Each week, goals were reviewed and revised
	2.3 Self-monitoring of behaviour	Self-monitoring explicitly discussed
	5.1 Information about health consequences	Physical health consequences explicitly discussed
	5.6 Information about emotional consequences	Emotional consequences explicitly discussed
	8.7 Graded tasks	SMART goals including reasonable goals for individual's current fitness level

Augmented Intervention		
	1.6 Discrepancy between current behaviour and goal	Activity on ideal self vs actual self
	7.1 Prompts/cues	Environmental cuing explicitly discussed
	8.3 Habit formation	Habit formation explicitly discussed
	12.1 Restructuring the physical environment	Changing one's environment explicitly discussed
	12.4 Distraction	Discussed when brainstorming ways to make physical activity fun
	12.5 Adding objects to the environment	Discussed during section on changing the environment
	13.2 Framing/reframing	Cognitive restructuring of physical activity beliefs
	13.3 Incompatible beliefs	Drawing attention to the fact that a participant exercises but does not consider themselves "an exerciser"
	13.5 Identity associated with changed behaviour	Discussion around creating a new identity surrounding exercise, including changing dress, social media presence, etc
	15.4 Self-talk	Positive self-talk regarding being an exerciser (ex "I am an exerciser therefore I will…")

Note: Augmented intervention group received the standard social cognitive intervention BCTs as well as the augmented BCTs; see Appendix 2 for full intervention materials

3.3.4 Procedure

This study was approved by the Human Research Ethics Board at the University of Victoria (protocol number: 17-309, see Appendix 3), and took place at the University of Victoria and surrounding area in the summer of 2017. See Appendix 1 for a detailed timeline.

I recruited using posters and telecaster advertisements across the UVic campus, as well as personal recruitment through classroom visits. During classroom visits, I explained my research

to large groups of undergraduate students and clearly stated they must be “between the ages of 18-25” and “under 150 minutes of moderate to vigorous PA per week” in order to be eligible for my study. I also emphasized the importance of participating in research for the success of my study. I informed classes of the $50 Grocery gift card draw at the end of the study to further entice people to participate in the study. I circulated a sign-up sheet (with fields for student names and email addresses) around the classroom and collected the sheets once they had passed by all students in the class. Approximately 24 hours after receiving students’ names and email addresses I emailed them from my personal account with detailed study information and the consent form. For each two week period in which a potential participant did not respond, I sent a follow-up email, with up to three follow-up emails per person (Dillman, 2007).

Once a person expressed interest in booking a baseline appointment, I used rolling recruitment to begin participants in the program within two weeks of their expressed interest. I held the baseline assessments in the Behavioural Medicine Lab on the University of Victoria campus, in which I explained the study trajectory and invited the participant to sign the consent form. After the participant gave consent, I randomized the participant to either the standard intervention or augmented intervention group. Once I had assigned the participant to an intervention arm, I presented the appropriate intervention materials one-on-one, and scheduled the next session.

3.3.5 Feasibility measures

I calculated the recruitment rate by dividing the participants scheduled for a baseline by the number of participants who signed up as “interested” in the study. I calculated participant retention at the six-week study endpoint by dividing number of completed participants by number of baseline participants. I evaluated intervention satisfaction via a 9-item satisfaction and

evaluation questionnaire, adapted from the satisfaction questionnaire from Forbes, Blanchard, Mummery, and Courneya (2015) and previous satisfaction questionnaires from the Behavioural Medicine Laboratory, which focused on both the intervention materials and the delivery of the materials (Quinlan, Rhodes, Blanchard, Naylor, & Warburton, 2015; Rhodes, Naylor, & McKay, 2010). Sample questions included "how interesting was the information provided in the workbooks?" and "how effective was the material delivered by the researcher?". The satisfaction and evaluation questionnaire was on a 4-point scale in which 1 was *least satisfied* and 4 was *most satisfied*. The exact wording of options 1 through 4 changed depending on the question. Similar to Forbes, Blanchard, Mummery, and Courneya (2015), participant satisfaction was additionally assessed through optional exit interviews at the end of the intervention period (six weeks). The questionnaire included open ended questions designed to understand satisfaction with the overall content and delivery of the intervention. Sample questions included "how did you feel about the study?" and "what would you change about the study?". Exit interview questions can be found in Appendix 2.

3.3.6 Secondary outcomes measures

At baseline and six weeks I assessed the participants' current levels of PA participation using the Godin Leisure-Time Exercise Questionnaire (GLTEQ) (Godin & Shephard, 1997). This questionnaire includes three open-ended questions regarding frequency of mild, moderate, and vigorous PA. It has been shown to be valid and reliable in different settings, populations and countries (Gionet & Godin, 1989; Godin & Shephard, 1997), with test-retest reliability among healthy adults recently demonstrated at $k = 0.65$, which the authors deemed satisfactory (Amireault & Godin, 2015).

I examined levels of exercise identity using the exercise identity scale (Anderson & Cychosz, 1994). The exercise identity scale has 9 items measured on a five point scale of 1*(strongly disagree)* to 5*(strongly agree)* with 3 being *(neutral)*, and contains questions such as: "I consider myself an exerciser" and "I need to exercise to feel good about myself". Anderson and Cychosz (1994) demonstrated test-retest reliability for this scale of 0.93 among healthy university students which is commensurate with this study at baseline ($\alpha = 0.92$) and six weeks ($\alpha = 0.90$).

3.3.7 Analysis plan

I analyzed the primary outcome measures as described above, using percentages to indicate recruitment and retention rates, and scores on an intervention satisfaction questionnaire and exit interviews to assess acceptability. Participant recruitment rate was compared to other studies of similar design to assess feasibility, and a 80-100% retention rate is indicative of a strong trial (Jackson & Waters, 2005).

For satisfaction ratings, mean and standard deviations were calculated for the quantitative satisfaction and evaluation questionnaire. Given that a score of 1 indicated dissatisfaction (ex. not helpful, did not use the tools), and 2 (ex. Somewhat helpful, used a little bit of the tools), 3 (ex. Quite helpful, used a bit of the tools), and 4 (ex. Extremely helpful, used a lot of the tools) indicated some sort of satisfaction, a mean score of 2.5 was deemed acceptable for recommendation for a full RCT. 2.5 is a conservative cut off point for moderate-high satisfaction with the intervention. I analyzed interview results using common themes or valences (i.e., similar recommendations for change, overall positive/negative comments). Full results can be found in Table 7. Both quantitative and qualitative satisfaction evaluations followed recommendations from previous literature (Linnan & Steckler, 2002; Moore et al., 2015), such as ensuring that

quantitative and qualitative analyses build on each other, as well as analysing process data before trial outcomes are known.

Collectively, if the augmented identity intervention has acceptable feasibility ratings including recruitment (comparable participation rates), retention (80-100% retention), and satisfaction (average of > 2.5 on the satisfaction and evaluation questionnaire, and generally positive qualitative feedback), a full-scale trial will be recommended.

I analyzed secondary outcome measures using SPSS version 23.0 for Windows. Missing data analysis was conducted, and missing data was eliminated from analysis as per best practice recommendations (Horton, Kleinman, Horton, & Kleinman, 2017; Raghunathan, 2004), in addition to interpreting the effect size difference of meaning data using hand calculations. Normality was not assessed because I am not conducting significance testing due to the small sample size per group (n = 9). The GLTEQ was scored as follows: first, I multiplied the number of bouts of vigorous PA by 9 and the number of bouts of moderate PA by 5 (Godin & Shephard, 1997). Then, to create the leisure score index (LSI), I added up the scores for moderate and vigorous PA, which is in accordance with Canadian PA guidelines (Canadian Society for Exercise Physiologists, 2018). According to Amireault and Godin (2015), a "sufficiently active" person has an LSI score greater than or equal to 24.

Means for the exercise identity scale were calculated by adding up the total score and dividing by the number of questions answered. Following with Study 1, low identity corresponded to a mean score of 1.0 to 2.3, medium identity corresponded to a mean score of 2.4 to 3.6, and high identity corresponded to a mean score of 3.7 to 5.

I calculated mean scores at baseline and 6 weeks for both exercise identity and PA data. Hand calculations were used to determine the magnitude of difference between the standard intervention group and the augmented intervention group scores at baseline, using Cohen's d (Cohen, 1992). Effect size d was calculated as follows: d = (group1 mean change score – group2 mean change score) / pooled standard deviation at baseline) (Eather, Morgan, & Lubans, 2013). Effect size conventions followed Cohen's (1992) recommendations: small (d = .41), moderate (d = .05), and strong (d = .08) effect sizes. I then used a mixed-design analysis of variance (ANOVA) to determine both the main effect and interaction effect of the augmented intervention compared to the standard intervention on both PA behaviour change and exercise identity scores using partial eta squared. Additionally, I calculated confidence intervals for mean difference scores for both PA and exercise identity data using a paired samples t-test. Confidence intervals that cross zero are considered not convincing of a meaningful difference in the data (Field, Field, & Miles, 2013). I generated visual representations of the change in PA behaviour and exercise identity scores using SPSS version 23.0.

3.4 Results

2.4.1 Participants

I began recruitment in September 2017, and initialized the final wave of participants in February 2018. A Consort flow diagram (Figure 4) is presented in section 2.4.2 with full details of participant trajectory through the study (Schulz, Altman, Moher, & Group, 2010). I recruited 20 participants, 10 in each group. Baseline participant characteristics are presented in Table 5. The mean age of participants was 21.33 (SD = 2.30) and they were predominantly female (13/18, 72.2%). Participants were well distributed across year in university (first to sixth year) as well as faculty membership (one participant in business (5.6%), one in fine arts (5.6%), and one in humanities (5.6%); two participants in education (11.1%); three participants in engineering

(16.7%); four participants in science (22.2%); and six participants in social science (33.3%). At baseline, participants had a mean LSI of 26.14 (SD = 19.33), indicating a "sufficiently active" sample (LSI score ≥ 24) (Amireault & Godin, 2015). As well, baseline exercise identity scores (M = 3.12, SD = 0.92) indicate a sample that is in the "medium" exercise identity range (M = 2.40 – 3.60) (Study 1).

Table 5

Baseline Characteristics of Participants: Mean (SD)

Characteristic	Overall (n=18)	Standard (n=9)	Augmented (n=9)
Age	21.33 (2.30)	22.11 (2.42)	20.56 (2.01)
Leisure Score Index	26.14 (19.33)	27.00 (18.21)	25.28 (21.47)
Exercise Identity Score	3.12 (0.92)	2.86 (0.59)	3.38 (1.14)
Year in University	3.22 (1.73)	3.33 (1.94)	3.11 (1.62)

2.4.2 Feasibility

Recruitment

Of the students who showed initial interest in my study, none were recruited via the posters or telecaster advertisements. Seventy-seven undergraduate students showed interest in participating in this study by signing up on a sheet circulated after classroom visits. I contacted these participants via email, using their first names in the body of the email to make it more personal to each potential participant. Of the seventy-seven people who expressed interest in the study, twenty-five replied to the email. Four participants were excluded due to not meeting inclusion criteria, and one participant declined to participate upon receiving more information about the study. I randomized twenty participants within the study, 10 to the standard intervention group, and 10 to the augmented intervention group, yielding a recruitment rate of 26% (20/77).

Retention

Of the 20 participants who were randomized to control or intervention groups, 18 completed the study protocols – a 90% retention rate. Two participants dropped out of the study after it had begun; one between 2 and 4 weeks, and one at 6 weeks. Full datasets were not obtained from these participants. Statistical analysis revealed that their data was missing at random (with both drop-outs being female, but no other significant patterns in terms of baseline PA, baseline exercise identity scores, year in university, or faculty membership(Horton et al., 2017; Raghunathan, 2004). Effect size analysis, however, showed that both participants were above average for PA at baseline (d ~ 1.77), as well as above average exercise identity scores (d ~ 0.62). Both these differences are in the large effect size range. While these participants contributed to the recruitment and retention rates, they did not provide the data to assess acceptability, and given that feasibility, not behaviour or exercise identity change, was the primary outcome of this work, these participants were excluded from the final analysis (Horton et al., 2017; Raghunathan, 2004).

Intervention Satisfaction and Evaluation

Quantitative process evaluation

Intervention satisfaction and evaluation was assessed using both quantitative and qualitative measures. For the standard intervention group, mean satisfaction was 2.69 (SD = 0.62), with workbook satisfaction (M = 2.69, SD = 0.87) ranking the same as counselling session satisfaction (M = 2.69, SD = 0.43). For the augmented intervention participants, mean satisfaction was 2.83 (SD = 0.40), with intervention materials satisfaction (M = 2.81, SD = 0.50)

ranking marginally lower than counselling session satisfaction (M = 2.86, SD = 0.44), though this difference is not likely statistically significant.

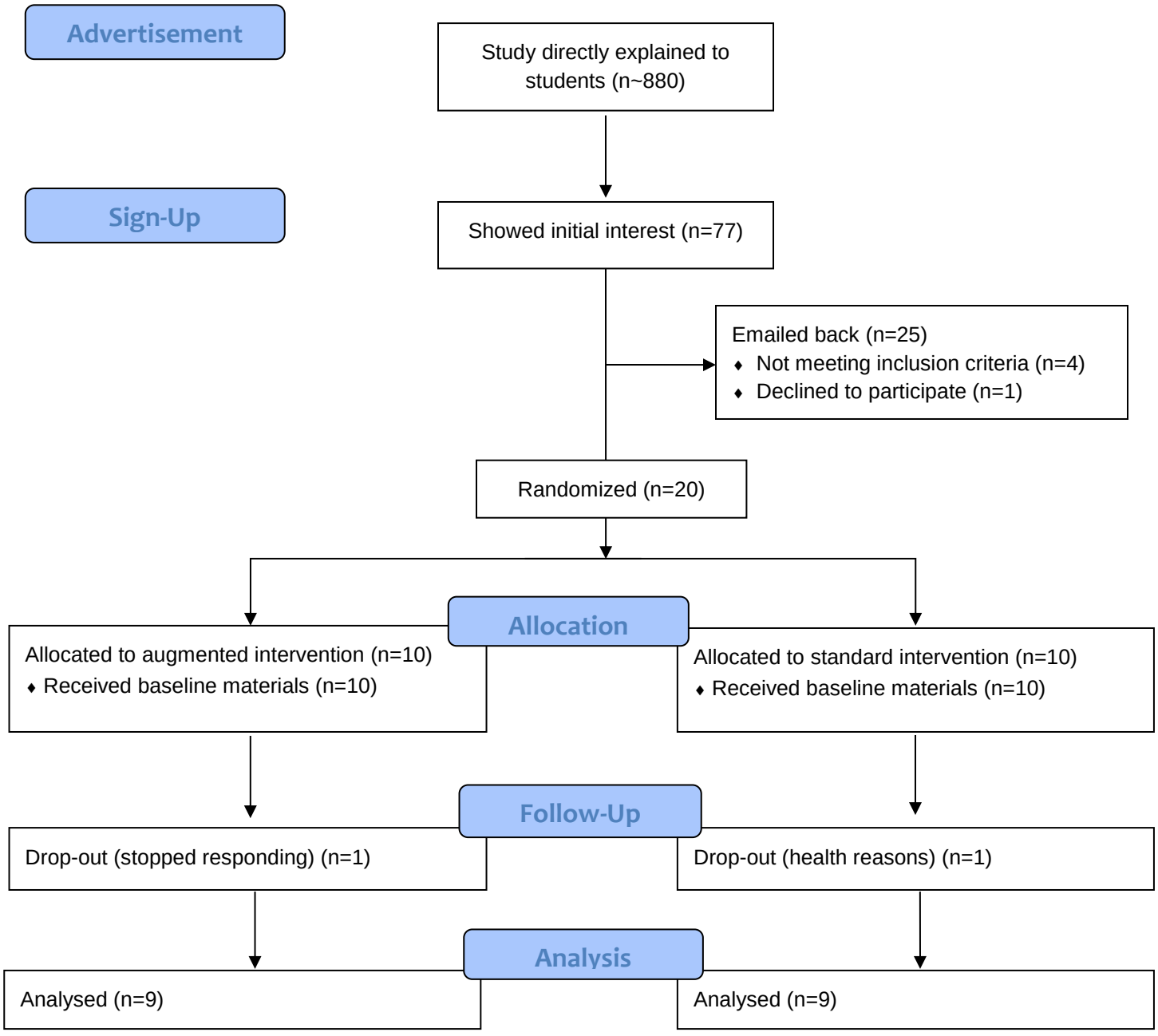


Figure 4. CONSORT flow diagram of sign-ups, allocation, participant progress, and analysis

Table 6 details the proportion of participants who ranked the intervention highly. To summarize, the augmented intervention group participants rated six of the nine questions in the satisfaction and evaluation questionnaire more positively than did standard intervention group participants, with effect size differences ranging from d = 0.15 – 0.48. Two of the questions yielded the same mean score (d = 0.00), however when examining the proportion of participants who rated the questions a 3 or 4 on the 4-point scale, one of the questions was in favor of the standard intervention group ("how much did the tools provided in the workbook help to increase your physical activity?"), and the other was in favor of the augmented intervention group ("how much did the counselling sessions help to increase your physical activity?"). Two questions were rated higher by the standard intervention group participants than the augmented intervention group participants, with effect size d ranging from -0.42 to -0.67.

The following highlights key questions in which the augmented intervention group scored higher than the standard intervention group: The mean score for the question "how interesting was the information provided in the workbooks?" was 2.67 (SD = 0.87) for the standard intervention group and 3.00 (SD = 0.50) for the augmented intervention group; with an effect size difference of d = 0.48. In the standard intervention group, 6/9 (66.7%) of participants rated the information as "quite or extremely interesting" compared to 8/9 (88.9%) participants in the augmented intervention group. Also, mean scores for the question "how much new information did you learn from the workbook" were 2.22 (SD = 0.97) for the standard intervention group and 2.67 (SD = 0.71) for the augmented intervention group with an effect size difference of d = 0.54. 3/9 (33.4%) participants in the standard intervention group reported "learning quite a bit or a lot", compared to 5/9 (55.6%) participants in the augmented intervention group. Additionally, the mean score for the question "how much did you use the

tools discussed during the counselling sessions?" is 3.00 (SD = 1.00) for the standard intervention group and 3.22 (SD = 0.67) for the augmented intervention group; with an effect size difference of d = 0.26. In the standard intervention group, 5/9 (55.6%) of participants reported using the tools "quite a bit or a lot" compared to 8/9 (88.9%) participants in the augmented intervention group.

The following highlights a key question with an effect size d = 0.00. Although the mean scores for the question "how helpful were the counselling sessions in increasing your physical activity?" were the same (standard intervention group mean = 3.22, SD = 0.83; augmented intervention group mean = 3.22, SD = 0.44), the proportion of participants who rated the counselling sessions as "quite or extremely helpful" were different. 7/9 (77.8%) participants in the standard intervention group had positive ratings of counselling session helpfulness, compared to 9/9 (100%) participants in the augmented intervention group.

Lastly, to examine a key question in which the standard intervention group scored higher than the augmented intervention group, the effect size difference for the question "how much did you use the tools and strategies provided in the workbook?" was d = -0.42. The standard intervention group mean score was 2.89 (SD = 1.05), and the augmented intervention group mean score was 2.56 (SD = 0.53). In the standard intervention group, 6/9 (66.7%) participants reported using the tools "quite a bit or a lot", while 5/9 (55.6%) participants in the augmented intervention group reported the same.

Qualitative Exit interviews

Eleven participants opted in for the exit interview: five from the standard intervention group and six from the augmented intervention group (See Table 7 for full breakdown and

sample quotations). For the standard intervention group participants, the intervention was described using positive words such as “good”, “loved”, or “liked” for 4/5 participants. The majority of participants (3/5 participants) cited study features such as the interactivity, or the focus on PA, as their favorite part of being in the study. Interestingly, 3/5 participants in the standard intervention group did not have a response when asked about their least favorite part of the study, although those who did respond (2/5 participants) agreed that their least favorite aspect was the guilt they felt when they failed to meet their goals. Two of the five participants did not have an answer for “what would you change about the study?” however, all three who answered gave constructive criticism, saying that the material was delivered well, but suggested changing study logistics such as increased use of technology including online check-ins or digital access to materials. One participant was not satisfied with the study overall, saying in his interview “So, what I was expecting was like “you should be doing this, this is like, let’s do exactly like step 1 step 2 step 3 if you want to up your activity level this much, these are the things you should be doing” you know, a lot more structured rather than set your own goals and see if you can follow through on those.” This participant recommended adding more structure to the intervention for people who are “not super determined to really get all the physical activity they can”.

For the augmented intervention group, the intervention was described using positive words such as “enjoyed”, “really liked” or “good” for 6/6 participants interviewed. The augmented intervention group differed from the standard intervention group in that overall (4/6 participants), they cited interactions and counselling sessions with me to be their favorite part of the study. However, similarly, 5/6 participants reported that their least favorite part of the study was goal related guilt or disappointment. Additionally, the dialogue around what the participants would change about the study was largely the same as the standard intervention group. One of

six participants did not have recommendations for change, while 5/6 participants referenced things like changing the take-home-materials to make them feel less "disconnected" as well as more "in your face". Additionally, the timing of the study was a recommended change for one participant who joined quite late in the school term, stating she would rather have started earlier to have more time to get into a routine.

Table 6

Satisfaction and Evaluation Questionnaire Results

Satisfaction and Evaluation Questions	Overall (n=18)	Standard Intervention (n=9)	Mean (SD)	Augmented Intervention (n=9)	Mean (SD)	Effect size d
Information provided in workbooks: *Quite or extremely interesting*	14/18 (77.8%)	6/9 (66.7%)	2.67 (0.87)	8/9 (88.9%)	3.00 (0.50)	0.48
Learned anything new from the workbooks: *Learned quite a bit or a lot*	8/18 (44.4%)	3/9 (33.3%)	2.22 (0.97)	5/9 (55.65)	2.67 (0.71)	0.54
Used the tools and strategies provided in the workbooks: *Used quite a bit or a lot*	11/18 (61.1%)	6/9 (66.7%)	2.89 (1.05)	5/9 (55.6%)	2.56 (0.53)	-0.42
Tools provided in workbooks helped increase physical activity: *Helped quite a bit or a lot*	11/18 (61.1%)	6/9 (66.7%)	3.00 (1.12)	5/9 (55.6%)	3.00 (0.87)	0.00
Learn any new information working with the researcher: *Learned quite a bit or a lot*	10/18 (55.6%)	4/9 (44.4 %)	2.44 (0.53)	6/9 (66.7%)	2.89 (0.78)	0.68
Used the tools discussed during counselling sessions: *Used quite a bit or a lot*	13/18 (72%)	5/9 (55.6%)	3.00 (1.00)	8/9 (88.9%)	3.22 (0.67)	0.26
Counselling sessions helped to increase PA: *Quite helpful or extremely helpful*	16/18 (88.9%)	7/9 (77.8%)	3.22 (0.83)	9/9 (100.0%)	3.22 (0.44)	0.00
Amount of exposure to counselling sessions: *Good amount*	17/18 (94.4%)	9/9 (100%)	2.00 (0.00)	8/9 (88.9%)	1.89 (0.33)	-0.67
Effectiveness of material delivery:	16/18 (88.9%)	8/9 (88.9%)	3.33 (0.71)	8/9 (88.9%)	3.44 (0.73)	0.15

Quite effectively or extremely well delivered						

Note: "Amount of exposure to counselling sessions" ranked from 1 *(not enough)* to 3 *(too much)*, with 2 being *good amount*

Table 7

Results from Satisfaction and Evaluation Exit Interviews

Satisfaction and Evaluation Questions	Standard Intervention	Sample Quote	Augmented Intervention	Sample Quote
How did you feel about the study?	1/5 neutral 4/5 positive	Oh my gosh I actually loved it. Like I, cause I actually like had an increase (in physical activity). And I liked that it wasn't focused around like performance	6/6 positive	I really enjoyed like the identity – exercise identity piece of it, like that was kind of what hit home the most
What was your favorite part?	1/5 N/A 1/5 liked increasing PA 3/5 liked study features	Just getting back into it and knowing that I could. Cause I think it can be a very mental thing sometimes where you sort of psych yourself out before you've even tried it, so yeah I think that I came into this feeling very, like it was going to be a huge challenge, and obviously it was in some aspects but I think that I made it to be more of a challenge in my head than it was in reality.	1/6 liked study features 1/6 liked increasing PA 4/6 liked interaction with researcher and counseling sessions	Definitely just like the personal interaction and talking about, just having somebody to talk to about all the things that are going on. I don't really get that anywhere else, so it's good to take off a little bit of weight there… emotional weight
What was your least favorite part?	3/5 N/A 2/5 goal related guilt	During the weeks when I didn't exercise I felt kind of like guilty or embarrassed to talk	1/6 N/A 5/6 goal related guilt	Probably just in the beginning when things weren't working before I had developed some

		about it. Because this is an exercise study and I felt really lazy and like couch potato, not because of you but just because, it was embarrassing to report on it that I hadn't been to the gym.		strategies I guess? Cause like it's nice to be able to check in with you and actually say "yes I did meet my goals" it's kind of disappointing to have to say no, it sucks, but it's part of the learning curve I guess.
What would you change?	2/5 N/A 3/5 intervention logistics, intervention structure, materials	Something more structured time wise would probably be more wide reaching in its effects, rather than… and probably apply to more people rather than letting people just sort of forget about it.	1/6 N/A 5/6 intervention logistics, intervention structure, materials	Maybe the timing, like when it was. It would have been easier at the beginning of the semester, it would have been good to get into the rhythm when the semester started instead of doing it at the end when all hell was breaking loose.

Adverse events

There were no adverse events reported due to participation in this study, however one of the participant drop-outs was due to personal health reasons.

2.4.3. Secondary outcome measures

Secondary outcomes measures include PA behaviour change as well as exercise identity change. Baseline and six week measures for standard intervention and augmented intervention groups can be found in Table 8.

Table 8

Secondary Outcome Measures at Baseline and 6 Week

Characteristic	Standard (n=9)			Augmented (n=9)			Main Effect		Interaction Effect	
	Baseline	6 weeks	Change score [95% CI]	Baseline	6 weeks	Change score [95% CI]	F-value	Partial Eta Squared	F-value	Partial Eta Squared
Mean Leisure Score Index (SD)	27.00 (18.21)	35.11 (14.76)	8.11 [-7.39 to 23.61]	25.28 (21.47)	37.89 (26.88)	12.61 [-1.39 to 26.61]	5.23	0.25	0.63	0.02
Mean Exercise Identity score (SD)	2.86 (0.59)	3.54 (0.69)	0.68 [0.23 to 1.13]	3.38 (1.14)	3.83 (0.80)	0.44 [-0.16 to 1.05]	11.90	0.43	0.52	0.03

LSI Scores

At baseline, the LSI scores between the standard intervention and augmented intervention groups were similar (d = 0.09). There was a large main effect (η^2 = 0.25) of intervention on LSI scores from baseline to 6 weeks, however the interaction effect size was small (η^2 = 0.02). The change score for the standard intervention group was 8.11 [95% CI -7.39 to 23.61], and the augmented intervention group was 12.61 [95% CI -1.39 to 26.61. The results are visualized in Figure 5.

Exercise identity scores

At baseline, the exercise identity scores between the standard intervention and augmented intervention groups were different (d = 0.60), with the augmented intervention group participants scoring higher. There was a large main effect (η^2 = 0.43) on exercise identity scores from baseline to 6 weeks, however, the interaction effect size was small (η^2 = 0.03). The change score for the standard intervention group was 0.68 [95% CI 0.23 to 1.13], and the augmented intervention group was 0.44 [95% CI -0.16 to 1.05]. The results are visualized in Figure 6.

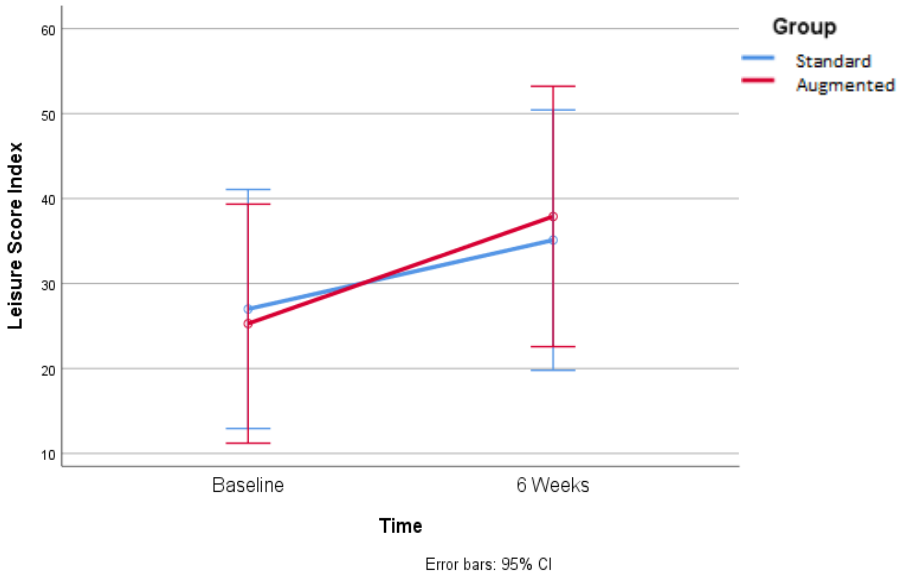


Figure 5. LSI change over time by group assignment

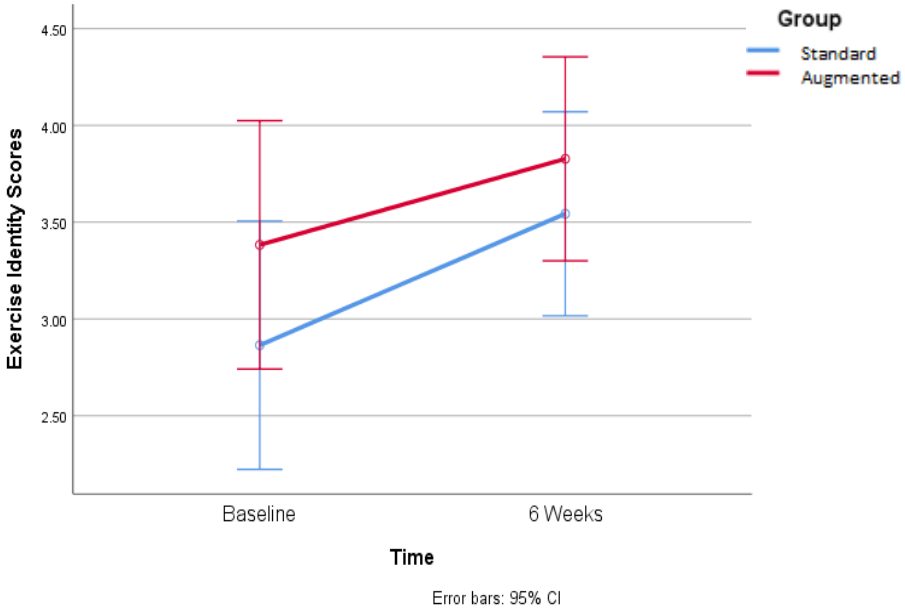


Figure 6. Exercise identity score over time by group assignment

3.5 Discussion

The purpose of this research was to test the feasibility of a 6-week long identity-specific intervention in comparison to a 6-week long standard social cognitive intervention, using a randomized trial. Secondarily, I examined preliminary changes in PA behaviour and exercise identity as a result of the intervention. Participants were 20 undergraduate students at the University of Victoria, 10 in the standard intervention group, and 10 in the augmented intervention group. Given the known relationship between exercise identity and PA (Strachan, Woodgate, Brawley, & Tse, 2005), this research sought to address the gaps in the literature in terms of intervening directly on identity and comparing the feasibility of this approach to a more standard social cognitive intervention.

Primary Outcome Measures - Feasibility

I hypothesized that recruitment would be difficult for this study; however recruitment rates were 26% - comparable to other studies with similar designs. Such studies include a 35% recruitment rate for a home-based resistance program in youth with juvenile idiopathic arthritis (Van Oort et al., 2013), a 23% recruitment rate for a home-based treadmill program for older adults with Parkinson's disease (Canning et al., 2012), and a 48% recruitment rate for a PA promotion feasibility study among older women (Arigo, 2015).While these comparator studies did not target healthy, university students, they did employ a similar six week long design to my research. It was difficult to find six week long feasibility studies targeting university students; therefore I have compared my recruitment number to both studies of similar design, and studies with similar populations. In terms of comparing recruitment to other university samples, Bray and colleagues (2011) had a 61% recruitment rate from five Canadian universities for their print-mediated PA intervention, although they did not include eligibility criteria of not meeting PA

guidelines (<150 minutes of moderate to vigorous PA per week). Another university-based study (Kwan, Faulkner, & Bray, 2013) evaluating a website-delivered PA intervention recruited 91 of 198 students living in an on-campus residence (46% recruitment rate). Finally, using mass email recruitment for their study examining an online planning intervention designed to increase PA levels, Skår, Sniehotta, Molloy, Prestwich, and Araújo-Soares (2011) yielded a 10% recruitment rate (1273/13000 students). When comparing the 26% recruitment rate in this study to other literature, it is also important to consider the highly active sample that participated in this study (Statistics Canada, 2018). With stricter guidelines for inclusion (including screening out participants using the GLTEQ instead of self-report only), this recruitment rate may decrease, given that extra screening measures would reject additional participants who volunteered for the study.

The above comparisons indicate that recruitment was acceptable in comparison to other six-week designs, but low in comparison to other studies targeting university samples. One possible explanation is that people were not interested in adding to their already busy schedules due to high scholastic demands (Gyurcsik et al., 2004). Additionally, given that university students make up a large portion of research participants (Peterson & Merunka, 2014), students in general may be fatigued from previous research advertising and participation. This style of controlled trial, or randomized controlled trials in general have limitations in that they represent a small subset of interested volunteers and thus may not fully represent the population of interest (Ernest, Jandrain, & Scheen, 2015). Although RCTs are considered the gold standard for experimental design (Spieth et al., 2016), they can also fall prey to threats to generalizability due to the artificial conditions in which a concept is being tested, as well as arbitrary endpoints that may not be clinically relevant (Stang, 2011). Additionally, RCTs require considerable resources

and time to execute. Alternative designs include quasi-experimental methodology such as an observational study. Although an observational study may occur in a more 'natural' environment with increased generalizability, the "selection of participants into each treatment condition may be associated with confounding factors" (West et al., 2008, p. 1362), which an RCT would account for via randomization. Despite the drawbacks of RCT methodology, randomization is a great strength of this style of research (Stang, 2011), as well as the ability to compare results to a control group. Taking into account the strengths and weaknesses of a RCT design, I am recommending the future trial utilize RCT methodology.

In the future, I recommend over-sampling in order to obtain the desired number of participants. Mass email recruitment is one viable option, given that 26% of the University of Victoria undergraduate population is approximately 5460 people – targeting the entire undergraduate population via mass emails would recruit more than a sufficient sample size. A more focused recruitment strategy is an additional recruitment avenue to consider. Targeting locations where less active students may gather is an option. One-on-one referrals such as from campus health services may also serve to bolster recruitment rates. Media blasts from graduate secretaries, as well as though social media outlets may be helpful, especially at the beginning of university semesters (September and January). With a larger budget, increased monetary compensation could be offered for participation (over and above the $50 Grocery gift card draw used in this research). A list of all recommended modifications to the study design can be found in Figure 7.

I hypothesized that retention rates would be high for this study. Retention rates of 80-100% are indicative of a strong trial (Jackson & Waters, 2005). This study yielded a 90% retention rate, which is commensurate with feasibility studies with 6-week designs, including

100% (Van Oort et al., 2013), 90% (Canning et al., 2012), and 100% (Arigo, 2015). In comparison to other studies with university samples, a 90% retention rate is high. Bray and colleagues (2011) reported a 27% retention rate in a six week study, Kwan, Faulkner, and Bray (2013) reported a 33% retention rate in an eight week study, and Skår, Sniehotta, Molloy, Prestwich, and Araújo-Soares (2011) reported a 53% retention rate in a two month study However, the lower retention rates seen for larger scale trials with university students may indicate a need to over-sample in order to mitigate potential drop-outs.

I hypothesized that satisfaction scores would be high overall. Scores from the satisfaction and evaluation questionnaire were within the pre-determined acceptability range of 2.5. I observed that the standard intervention group satisfaction appeared to be lower than augmented intervention group satisfaction, with a small effect size difference (d = 0.27). This may support the notion that novel material was more satisfactory for participants than standard social cognitive information. Furthermore, in the satisfaction and evaluation questionnaire, six of nine questions yielded higher responses for the augmented group, either in mean score or percentage of participants rating it highly. This suggests that the augmented group participants were more satisfied with the intervention than were the standard group participants.

The satisfaction and evaluation questionnaire can be broken into questions pertaining to learning new information, and applying new skills and tools. In terms of information, on all accounts, the augmented intervention group scored higher than the standard intervention group. The topics discussed in the augmented intervention covered a wider breadth of information compared to the standard intervention, and perhaps the opportunity to discuss not only the benefits of PA, but also how PA relates to the participant through identity-specific topics,

allowed the participants to make a stronger connection to the material. The implications for this are potential increased engagement in the augmented group participants.

In terms of application, the augmented intervention group reported less use of the tools provided in the workbook, and found the tools provided in the workbooks less helpful to increase PA than did the standard intervention group. This does not follow logic, given that the augmented group received the same basic information as the standard group. The additional material presented to the augmented group included both education components (i.e., "what is identity?") as well as activities and tools and techniques for behaviour change. Among the augmented group participants, perhaps the increased interest and engagement with the topics presented orally by me caused the workbook topics to pale in comparison, thus accounting for the lower rating in comparison to the standard intervention group. Alternatively, the increased amount of information and activities may have felt monotonous to the augmented group participants, thus causing them to not connect with the material and use it less than the standard group participants. Lastly, the identity-specific tools and strategies simply may have not been adopted by the participants in the augmented group. The strategies presented in the workbook required a certain amount of "buy in" from the participants, which on paper is perhaps quite difficult to achieve. The tools suggested were not typical goal-setting or self-monitoring strategies, rather exercises in self-reflection, self-concept, and identity formation. Intervening directly on identity is a new area of exploration and this result suggests the need for further testing and exploration of the efficacy and usefulness of identity-specific material.

Interestingly, however, the tools orally discussed in the augmented counselling sessions were reported to be used more, and to be more helpful in increasing PA than the tools provided in the standard counselling sessions. This result provides support for the importance of additional

avenues for affecting behaviour change over and above simply providing written information. The interactive and personalized components of this intervention were rated higher than the information alone (ex. a higher proportion of participants in both groups reported learning "quite a bit or a lot" from the researcher (4/9 participants standard intervention group, 6/9 participants augmented intervention group), as well as results supporting the use of augmented intervention group tools to increase PA (8/9 augmented intervention group participants used "quite a bit or a lot" vs 5/9 standard intervention group participants)). The personal touch and individual delivery of material may be an integral aspect of evoking behaviour change among this population.

Both groups had high ratings of amount of exposure to counselling sessions, supporting the two-week check in periods. In addition, both groups rated the effectiveness of material delivery as extremely high, supporting the equal care and attention I gave to all my participants in all groups.

The exit interview results were largely the same between standard and augmented groups, with the exception of "favorite aspects" of the study. Standard intervention group participants cited specific study features, or their increased PA participation as favorite parts, while augmented intervention group participants spoke instead about aspects involving meeting and spending time with me. This speaks to two important points. Firstly, the personal touch that an individual brings to the delivery of intervention material can be considered a social threat to internal validity (Horner, Rew, & Torres, 2006). Intervention fidelity (that the interventions were delivered as designed) must be addressed, as infidelity "can result in findings that are not due to the study design but rather to elements that affected the intervention delivery"(Horner et al., 2006, p. 80). This is also known as 'provider characteristics' in the implementation literature, and is a critical aspect to consider when designing and implementing PA interventions (Naylor et

al., 2015). Although I delivered both groups' materials, my personal interests in the identity-specific material may have served to increase my engagement with the augmented group participants over and above the standard group.

Additionally, although both groups expressed satisfaction, anecdotal evidence suggests that the participants in the augmented intervention group may have felt a closer connection to me (for example, two of the participants asked for my phone number after the study and wanted to "become friends", while another stated that her favorite part of the study was getting to "meet a grad student"), and therefore showed increased engagement in the bi-weekly sessions. I speculate that through discussion of the identity-specific material, the participant was able to talk about other aspects of their lives than simply PA, and the subsequent discussion around these 'life' topics served to strengthen the bond between myself and the participant. The standard intervention group materials did not allow for discussion of life beyond PA. This increased connection when discussing identity-related topics could have secondary benefits of developing a therapeutic alliance, thus increasing feelings of social support from, and connectedness to the researcher. While both augmented intervention and standard intervention groups had one drop-out, in a study of larger magnitude and with longer follow-up periods, increased engagement among augmented intervention group participants (potentially through a strengthened therapeutic alliance) will prove to be valuable for retention and measures of dose received (Linnan & Steckler, 2002).

Overall, participants rated satisfaction highly, via both the quantitative satisfaction and evaluation questionnaire and the exit interviews, indicating that a full-scale RCT would be well received by university students in Victoria. Given the positive responses to the delivery of material and usefulness of counselling sessions as opposed to the workbook itself, ideally future

studies should emphasize the counselling portion of this intervention and use the workbook only as supplementary material. This, however, would be time consuming and expensive in a trial of larger magnitude. Alternative suggestions include shorter counselling sessions, a buddy system with another participant to maximize feelings of social support, or automated check-ins from the researcher to enhance feelings of connectedness and support the face-to-face sessions. Emphasizing the counselling portion should target the BCT "social support" (Michie et al., 2013), in which the participants feel supported and encouraged by the researcher (or each other) to meet their goals. A validated measure of social support should also be included to determine the effect of the presence of the researcher on feelings of social support, in addition to a provider care process evaluation to insure all participants are receiving the intervention in the same way. Additionally, participants were satisfied with the two-week check in points and the amount of time spent with me (94.4% satisfaction across the two groups). The two-week period between check-ins should be retained in the large-scale RCT study protocol. If the budget is limited, a two-week automated or internet based check in could be utilized, with face-to-face meetings once per month to cut resource costs.

Additional changes to consider come from the exit interviews, including making the intervention materials available online to increase participant access to their goals and plans, as well as increasing accountability by using phone reminders to trigger adherence to PA plans. Although the first change recommended by participants does not have a BCT associated with it, it is certainly in keeping with the way they engage in other, course-related tasks. The second recommendation follows with the behaviour change technique "prompts/cues" (Michie et al., 2013) and could be easily added to the study protocol. Another change recommended by participants was to consider the addition of a group component to the study to increase social

connectedness and peer-support. This is a valid suggestion, given that a recent systematic review of 75 studies indicated that social support is positively and consistently associated with PA levels (Mendonça, Cheng, Mélo, & De Farias Júnior, 2014). However, I hesitate to suggest implementation due to the added logistical complexity of incorporating group sessions, specifically with scheduling and participant recruitment. Recruitment rates were already low (26%), and I suspect adding a specific time where a group of people need to meet may serve to further decrease recruitment.

Taking into consideration the results and future recommendations from recruitment, retention, and satisfaction measures, I feel confident moving this research to a full-scale RCT in the future. Overall, recruitment rates were comparable to other feasibility studies with similar designs, but low compared to other studies with a university sample. Taking this into consideration, I have made recommendations to address recruitment difficulties. Retention rates were excellent. The satisfaction and evaluation questionnaire mean score met pre-determined criteria for acceptability, with some very good suggestions for change coming from the qualitative interviews, including adding a phone-based element to the study to increase accountability, and increased emphasis on counselling sessions and interpersonal connection over print material.

Secondary Outcome Measures – PA and Exercise Identity

The secondary outcome measure of PA behaviour change showed promising directional trends, as hypothesized. The main effect was large ($\eta^2 = 0.25$) for the comparison of LSI scores from baseline to six weeks. This suggests that both the augmented intervention and the standard intervention materials were effective in increasing overall PA levels, although the augmented

intervention materials were no more effective than the standard intervention group materials (interaction effect $\eta^2 = 0.02$). This finding supports the efficacy of the SCT constructs used in both groups' intervention materials; including emphasis on perceived competence, perceived enjoyment and BCTs including planning, goal-setting, problem solving, and self-monitoring. Bray and colleagues (2011), and Kwan, Faulkner, and Bray (2013) both saw a decrease in overall PA levels of their participants at six and eight weeks respectively, yet still recommended their interventions for full-scale trials based on their feasibility data. Therefore, positive trends in PA data in this research strongly support the recommendation for a full-scale RCT, in addition to high feasibility ratings. It is important to consider however, that in meta-analytic work, Plotnikoff and colleagues (2015) found that "interventions spanning a university semester or less (≤12 weeks) generally resulted in a greater number of significant outcomes in comparison to interventions with a duration of more than a semester" (p. 7). This finding indicates potentially inflated results due to the short-term nature of this intervention.

For the full-scale RCT, in addition to a larger participant pool, a longer intervention period is needed in order to accurately determine the effect of this study on PA levels. I recommend implementing this intervention over a period of time that is longer than one university semester, in order to avoid inflated results due to a short term intervention (Plotnikoff et al., 2015). Additionally, I recommend the addition of a follow-up period in order to assess the efficacy of the intervention once participants are no longer meeting with the researcher. I also advise the inclusion of a third arm – a true control group who only completes measures but receives no intervention. Once PA behaviour change becomes a primary outcome in a full-scale RCT, a control group will be required for accurate statistical analysis of results. It is impossible to determine the efficacy of an intervention without a true control group to which the results can

be compared, since both the augmented and standard groups had contact with me. The presence of a true control group allows for comparison between no intervention, the standard intervention, and the augmented intervention. Lastly, given the differences between self-report and objective measure of PA (correlations of -0.71 to 0.96) (Prince et al., 2008), I recommend that PA data be collected both through self-report (GLTEQ) (Godin & Shephard, 1997), as well as via accelerometer data. Self-report data falls prey to human biases in reporting, while accelerometer data measures PA directly. Although there are complications with interpreting and analyzing accelerometer data, the objectivity of the data within each participant will give an accurate measure of the change in PA behaviour across time, even if the data cannot be reliably interpreted in terms of MVPA minutes per week. Using both self-report and accelerometer data will give the most accurate representation of PA behaviour and behaviour change.

Given that behaviour is an antecedent of identity (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017), I also hypothesized that in both groups, identity change will show upwards trends, with larger changes observed in the augmented intervention group. The overall effect size for differences in exercise identity from baseline to 6 weeks was $\eta^2 = 0.43$, a large effect size, meaning both groups combined changed their exercise identity scores. This is promising for a larger trial and supports the malleability of the identity construct, as well as the efficacy of social cognitive constructs utilized in both interventions to change identity. Although "identities act so as to resist change, [this] does not mean that they do not change over time" (Burke, 2006, p. 92), and perhaps this change may occur faster than anticipated if researcher's can provide necessary resources and tools. However, the interaction effect was small ($\eta^2 = 0.03$), meaning the effect of the augmented intervention materials on exercise identity scores was negligible in comparison to the standard intervention group. From this data, I cannot speculate if

the intervention was successful due to limitations in randomization and low power. A fully powered RCT is needed to determine if the participants in all groups changed their identity due to the social cognitive constructs, and changed PA behaviour (which is a known antecedent to identity change) (Bem, 1972; Burke, 2006), or if the additional identity-specific information in the augmented group served to enhance identity formation. While the dual pathway model to changing identity as suggested in the introduction may still hold, it is not clear which path was more successful due to the nature of a feasibility study, the fact that identity change was not a primary outcome, and low power preventing accurate statistical analysis of outcomes.

3.5.1 Limitations

This study is not without its limitations. First and foremost, the participant sample, although self-selected as being under PA guidelines (150 minutes MVPA per week), was already quite active at baseline. Both the standard (LSI = 27.00, SD = 18.21) and augmented intervention (LSI = 25.28, SD = 21.47) groups were above the "sufficiently active" cut off (Amireault & Godin, 2015b) on the GLTEQ (Godin, 2011). Overall, this sample was already participating at PA levels sufficient for health benefits. Challenges arise when intervening upon sufficiently active samples due to the law of initial value (Wilder, 1962). This law states that the direction of response of a body function to any agent depends to a large degree on the initial level of that function. In other words, when one is already active, there is less room for improvement than for those who are more sedentary, thus decreasing the potential effect of an intervention. Additionally, in a critical review of the literature on PA and health, Warburton and Bredin (2016) found that 75 minutes of moderate to vigorous activity per week may lead to marked health benefits, as opposed to the accepted 150 minutes. Thus, the people in this study are not those in the most need of help, and the practical value of this research is therefore lowered by an active sample. In 2017, the self-reported Canadian national average for percentage of people who

are meeting PA guidelines was 68%, which is lower than the average for British Columbia, 73.3% (Statistics Canada, 2018). It was therefore difficult to recruit people who are representative of overall levels of PA among Canadian adults. Additionally, commensurate with an active sample, the mean exercise identity scores at baseline (M = 3.12, SD = 0.92) were in the "medium" range, as defined by Study 1. I used my own data in Study 1 to calculate high and low cut-off scores, but this gives a general context for the exercise identity scores. The participants in this study were both quite active and also already moderately identifying with exercise. In addition participants were overwhelmingly (72.2%) female.

It is also important to note that in terms of exercise identity scores at baseline, the comparison of standard and augmented intervention groups showed a medium-large effect size (d = 0.60). This indicates a difference between the two groups at baseline, with augmented intervention group participants scoring higher overall (3.38, SD = 1.14) than the standard intervention group (2.86, SD = 0.59). The ANOVA controls for this difference statistically, however practically an active sample may respond differently to intervention material than an inactive sample. Additionally, un-equal groups at baseline may also have impacted the acceptability ratings between augmented and standard intervention group participants.

Additionally, only 11/18 participants opted in for the exit interviews. It is possible the other 7/18 participants may have had largely different responses to my questions and overall satisfaction levels. However, 18/18 participants completed the satisfaction and evaluation questionnaire which also yielded high scores. Furthermore, I conducted the exit interviews, which may have discouraged participants from speaking negatively about the study.

Lastly, the 6-week time frame in this study is shorter than the recommended >6 months for a full-scale RCT. This short time frame may be partially responsible for the high retention rates, and it is unclear if a longer study presenting the same materials would have the same high retention. The accuracy of the retention rate in this study is uncertain when situated in terms of a longer trial.

3.5.2 Conclusion

In conclusion, there is a need to expand standard social-cognitive interventions to include other processes such as identity. Despite the known relationship between identity and PA, there has been little research on the feasibility of intervening upon identity as a means to increase PA. The current study examined the feasibility of an augmented, identity-specific intervention compared to a standard social cognitive intervention among undergraduate students at the University of Victoria. Feasibility results indicated high retention and satisfaction rates, but difficulties with recruitment, as well as promising preliminary results in terms of increased PA and increased exercise identity scores in both groups. These results support recommendations for a full-scale RCT, with modifications to handle recruitment difficulties, as well as minor changes to study design including increased accountability through phone reminders and increased emphasis on counselling sessions over print materials. Although this study does not aim to justify sample sizes using feasibility data (Kraemer, Mintz, Noda, Tinklenberg, & Yesavage, 2006), 450 participants is an approximate estimate of the number of participants required to detect a small-medium effect size in a future, six month long, full-scale RCT (Faul, Erdfelder, Buchner, & Lang, 2009) with the three representative groups.

- Increase intervention length to six months
- Add a follow-up period
- Include a true control group
- Measure PA using both accelerometers and self-report
- Participant sample size: 450
- Additional recruitment strategies
    - Targeting captive audience (i.e., students in residence)
    - One-on-one methods (i.e., health care professional recommendations)
- Increased accountability through technology use
    - Phone reminders
    - Adding plans to phone calendar
    - Using phone reminders
- Increased emphasis on counselling sessions over print materials
    - Bi-weekly automated check-in to increase feelings of social support
    - Buddy system meant to discuss the sessions between researcher check-ins
- Provider care process evaluation
- Full M-PAC battery
    - Reflective processes
    - Regulation processes
    - Reflexive processes

F

3.5.3 Funding

This research has been funded by the Canadian Institutes of Health Research (CIHR).

Chapter 4: General Conclusion

The main objectives of this thesis were: 1) to qualitatively explore the lived experience of PA in order to gain insight regarding the antecedents to developing an exercise identity; and 2) to test the feasibility of an augmented, identity-based intervention compared to a standard social cognitive intervention. This section is a summary of the main findings of the thesis and the ways in which they are situated in the current literature, as well as including recommendations for future research, both in direct follow-up from this research, as well as for the future of PA and identity research in general.

4.1 Situating the Thesis

Despite the well-known benefits of regular PA (Lee et al., 2012; Rebar, Stanton, Geard, Short, & Duncan, 2015; Rhodes et al., 2017; Warburton, Nicol, & Bredin, 2006), including the prevention of up to 25 chronic conditions (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010) and enhanced mental well-being (Colley et al., 2011; Rebar et al., 2015), the majority of Canadian adults are not meeting PA guidelines (Colley et al., 2011; Statistics Canada, 2015). University students, in particular, show a marked decline in PA participation (Bray & Born, 2004) , and thus represent a target population for examination and intervention. Current PA interventions yield small effect sizes (d = 0.27) (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). Thus, there is room for improvement via expansion on the theories that inform the majority of interventions – social cognitive theories (Hagger & Chatzisarantis, 2014; Rebar, Stanton, Geard, Short, & Duncan, 2015; Rhodes, 2017; Williams & Evans, 2014). In this vein, this thesis examined exercise identity, one of the recommended additions to social cognitive models of PA behaviour (Rebar et al., 2016). Exercise identity is the self-categorization of oneself into a profile of a regular exerciser, and shows links to frequency, duration, and intensity of exercise (Strachan, Woodgate, Brawley, & Tse, 2005). In fact, meta-analytic work found a

medium effect size (r = 0.44) (Rhodes et al., 2016) between exercise identity and PA behaviour. This thesis explored both the antecedents of developing an exercise identity, and the feasibility of intervening upon it.

4.2 Study 1

The following five themes emerged from Study 1 as antecedents to developing an exercise identity: enjoyment, skill, extracurricular sport participation, variety, and sport ownership. High and medium identifiers were more similar to each other in terms of their PA experiences than they were to low identifiers. PA is a complex process, and while five distinct themes emerged from this research, exercise identity must not be oversimplified. Being exposed to one or multiple of these factors does not guarantee a person will develop an exercise identity. The idea of passion for a sport or activity also emerged as a potential indicator of an exercise identity. The emergent themes and related behaviour change techniques from this study were used to inform intervention targets in Study 2.

4.3 Study 2

This study found high feasibility ratings for the implementation of an identity-specific intervention. Recruitment was 26%, retention was 90%, satisfaction scores were within the predetermined acceptability range, and exit interviews yielded overwhelmingly positive feedback. Notable changes to the study design before recommendation for a full scale RCT include: additional recruitment strategies to combat low recruitment rates (including targeting a more captive audience (i.e., students in residence) or one-on-one methods of recruitment (i.e., health care professional recommendations)), adding a phone-based element to the study (i.e., text message reminders, or self-reminders via setting alarms or scheduling directly in the phone) to increase accountability, and increased emphasis on counselling sessions over print material. In addition, the future RCT should exceed one semester in length, be fully powered to detect a

small-moderate effect size, include a third arm (a true control group), and include a follow-up period. Additional measurement recommendations include using both self-report and accelerometry to measure PA behaviour, a provider care process evaluation, as well as testing social cognitive constructs using for example, the full M-PAC battery (including measures of reflective processes, regulation processes, and reflexive processes) (Rhodes, 2017). Both PA behaviour change and exercise identity change were in the upward direction, showing promise for the efficacy of a full scale trial.

4.4 Situating the Results in the Literature

Many of the emergent themes from Study 1 can be found in existing identity literature. Enjoyment, skill, and extracurricular activity participation are similar to SDM constructs (Kendzierski, 1998) of enjoyment, competence, and social comparison, respectively. The M-PAC model (Rhodes, 2017) also includes affective judgements (enjoyment) and ability as part of the basis for identity development. Extracurricular activity participation is also related to past behavioural experience, which is highlighted in the SDM (Kendzierski, 1998), M-PAC (Rhodes, 2017), PRIME theory (West, 2009), and ICT (Burke, 2006), though other PRIME Theory and ICT constructs are less supported by the results of Study 1.

Emergent themes also mirror social cognitive constructs. Enjoyment is also called affective judgements, and skill is known in the literature as self-efficacy; both of which are highly related to PA behaviour (Rhodes, Fiala, & Conner, 2009; Young, Plotnikoff, Collins, Callister, & Morgan, 2014). The importance of social cohesion and relatedness emerged through extracurricular sport participation, which is also correlated with PA (Pescosolido & Saavedra, 2012). Some authors have suggested the inclusion of variety as a fourth psychological need in the Self-Determination Theory (Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage,

Dowd, et al., 2014), which is supported by this research. Sport ownership is less easily tied to identity theories or social cognitive constructs. Of note, Study 1 may be one of the only qualitative studies to examine the antecedents to developing an exercise identity (Rhodes, Kaushal, & Quinlan, 2016), which adds depth and breadth to the knowledge currently gained primarily through cross-sectional, predictive studies.

In Study 2, the augmented intervention focused on repeated PA behaviour, ability, and social activiation (SDM) (Kendzierski, 1998), plans and rules (PRIME) (West, 2009), and affective judgements, symbolic representation, and prioitization (M-PAC) (Rhodes, 2017). Full statistical analysis of the results would inform us if targeting these constructs was a viable way to target identity change (and thus PA behaviour), however this feasibiliity study does not have the necessary statistical power to do so. Theoretically, there are two potential avenues for changing exercise identity. The first, to allow identity to change naturally through changed motivational characteristics (Kendzierski, Furr, & Schiavoni, 1998), self-regulation abilities (Stadler, Oettingen, & Gollwitzer, 2009), and subsequently changed PA behaviour (Bem, 1972; Burke, 2006; Kendzierski, Furr, & Schiavoni, 1998; Rhodes, 2017). This was explored through the standard intervention group. The second avenue, to expedite the natural, lengthy process of self-reflection and target identity directly – was explored in the augemented intervention group. Recommendations for direct targeting were adapted from SDM (Kendzierski, Furr, & Schiavoni, 1998), PRIME Theory (West, 2009), M-PAC (Rhodes, 2017), Michie and colleagues (2013), and Study 1. Although the upward trends show promise for the malleability of exercise identity, it is not clear from Study 2 which path to identity change is most effective.

Additionally to Study 1 employing a novel, qualitative approach to understand identity development, Study 2 may also be one of the only experimental studies on this matter (Rhodes,

Kaushal, & Quinlan, 2016). Exercise identity research is lacking both qualitative and experimental methodology, both of which my thesis has utilized.

4.5 Strengths and Weaknesses

Besides the novelty of the approaches noted above, the mixed methodology employed by this thesis is one of its strengths. This work combines the strengths of qualitative and quantitative analysis in both Study 1 and Study 2 in order to gain a well-rounded understanding (Sparkes, 2015) of the research questions at hand. The linear nature of this thesis is another one of its strengths. Results from Study 1 were used to inform intervention targets in Study 2. Thus, the feasibility study is based not only on published identity literature, but also previous work completed by the same author, in the same location, with the same population. The recommendation for a full-scale RCT from Study 2 is therefore backed by existing literature, qualitative interview data, and a feasibility trial.

This thesis is not without its weaknesses. The nature of recruitment for both Study 1 and Study 2 means the results falls prey to self-selection bias. This is a limitation present not only in my research, but in much of the research that relies on volunteer samples. Those who volunteer to participate in research may be systematically different from those who do not. Additionally, recall bias is present in Study 1 because I asked the participants to comment on experiences from up to ~25 years in their past, and social desirability bias is likely also present due to the nature of the topic of discussion. The interview results from Study 2 may also be biased because I was the person who conducted them. This may have discouraged people from speaking negatively about the study as to not offend me.

All studies and methodologies have certain limitations. My results nevertheless contribute to the current literature despite some limitations and help to produce future recommendations.

4.6 Future Directions

As a direct extension of this research, a full-scale RCT is recommended to ascertain the efficacy of an identity-specific intervention on PA behaviour and exercise identity levels. The future RCT must take into consideration the study design changes recommended by Study 2.

In general, identity is one of several possible extensions to our base of understanding of PA, and we should continue to test whether it is applicable and can augment PA behaviour change. This is a process similar to many expanding concepts such as habit (Gardner, De Bruijn, & Lally, 2011), that have been suggested in prior reviews. It is only through this intensive testing and experimental procedures that we can ascertain a more complete understanding of PA, and ultimately aid in the mission for increased public health through PA behaviour change.

Chapter 6: References

Anderson, D. & Cychosz, C. (1994). Development of an Exercise Identity Scale. *Perceptual & Motor Skills, 78*. 747-751.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Amireault, S., & Godin, G. (2015). The godin-shephard leisure-time physical activity questionnaire: validity evidence supporting its use for classifying healthy adults into active and insufficiently active categories. *Perceptual and Motor Skills*, *120*(2), 604–622.

Anderson, C. (2010). Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education*, *74*(8).

Arigo, D. (2015). Promoting physical activity among women using wearable technology and online social connectivity: a feasibility study. *Health Psychology and Behavioral Medicine*, *3*(1), 391–409.

Ashford, S., Edmunds, J., & French, D. P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology*, *15*(2), 265–288.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychology*, *37*(2), 122–147.

Bandura, A. (1986). *Social foundations of thought and action: A social-cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health, 13,* 623–649.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143–164.

Barnett, L. M., van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2009). Childhood motor skill proficiency as a predictor of adolescent physical activity. *Journal of Adolescent Health*, *44*(3), 252–259.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, *380*, 258–271.

Bélanger, M., Casey, M., Cormier, M., Laflamme Filion, A., Martin, G., Aubut, S., … Beauchamp, J. (2011). Maintenance and decline of physical activity during adolescence: Insights from a qualitative study. *International Journal of Behavioural Nutrition and Physical Activity*, *8*, 1–9.

Bem, D. J. (1972). Self-perception theory. Advances in experimental social psychology, 6, 1-62.

Berry, T. R., Strachan, S. M., & Verkooijen, K. T. (2014). The relationship between exercise schema and identity. *International Journal of Sport and Exercise Psychology*, *12*(1), 49–63.

Bray, S. R., Beauchamp, M. R., Latimer, A. E., Hoar, S. D., Shields, C. A., & Bruner, M. W. (2011). Effects of a print-mediated intervention on physical activity during transition to the first year of university. *Behavioural Medicine, 37*(2), 60–69.

Bray, S. R., & Born, H. A. (2004). Transition to University and Vigorous Physical Activity:

Implications for Health and Psychological Well-Being. *Journal of American College Health, 52*.

Burke, P. J. (1991). Identity processes and social stress. *American Sociological Review, 56,* 836-849.

Burke, P. J. (2006). Identity Change. *Social Psychology Quarterly*, *69*(1), 81–96.

Canadian Society for Exercise Physiologists. (2018). Canadian Physical Activity Guidelines - for adults. Retrieved from www.csep.ga/guidelines.

Canning, C. G., Allen, N. E., Dean, C. M., Goh, L., & Fung, V. S. C. (2012). Home-based treadmill training for individuals with Parkinson's disease: A randomized controlled pilot trial. *Clinical Rehabilitation*, *26*(9), 817–826.

Cardinal, B. J. (1997). Changes in exercise behaviour and exercise identity associated with a 14-week aeorbic exercise class. *Journal of Sport Behaviour, 20*(4), 377.

Chansavang, Y., Elley, C. R., McCaffrey, B., Davidson, C., Dewes, O., & Dalleck, L. (2015). Feasibility of an after-school group-based exercise and lifestyle programme to improve cardiorespiratory fitness and health in less-active pacific and māori adolescents. *Journal of Primary Health Care*, *7*(1), 57–64.

Cohen J. A power primer. Psychol Bull 1992; 112: 155-9.

Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian Health Measures SurveyPhysical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Health Reports*, *22*(82), 7–15.

Retrieved from http://www.statcan.gc.ca/pub/82-003-x/2011001/article/11396-eng.htm.

Conn, V. S., Hafdahl, A. R., & Mehr, D. R. (2011). Interventions to increase physical activity among healthy adults: meta-analysis of outcomes. *American Journal of Public Health*, *101*(4), 751–758.

Craig, P., Dieppe, P., Macintyre, S., Mitchie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: The new Medical Research Council guidance. *Bmj*, *337*(7676), 979–983.

Crosby, R., & Noar, S. M. (2010). Theory development in health promotion: Are we there yet? *Journal of Behavioral Medicine*, *33*(4), 259–263.

Davison, K. (2000). Boys' bodies in school: Physical education. *The Journal of Men's Studies*, *8*(2), 255–266.

de Bruijn, G. J., & van den Putte, B. (2012). Exercise promotion: An integration of exercise self-identity, beliefs, intention, and behaviour. *European Journal of Sport Science*, *12*(4), 354–366.

De Bruijn, G. J., Verkooijen, K., de Vries, N. K., & van den Putte, B. (2012). Antecedents of self identity and consequences for action control: An application of the theory of planned behaviour in the exercise domain. *Psychology of Sport and Exercise*, *13*(6), 771–778.

Deutsch, R., & Strack, F. (2006). Duality Models in Social Psychology: From Dual Processes to Interacting Systems. *Psychological Inquiry*. Taylor & Francis, Ltd.

Dillman, D. A. (2007). *Mail and internet surveys : the tailored design method*. Wiley. Retrieved from http://voyager.library.uvic.ca/vwebv/holdingsInfo?bibId=1503524

Dishman, R.K., & Buckworth, J. (1996). Increasing physical activity: A qualitative synthesis. *Medicine & Sciences in Sports & Exercise. 28*(6), 706-719.

Dwyer, J., Allison, K. R., Goldenberg, E. R., Fein, A. J., Yoshida, K. K., & Boutilier, M. A. (2006). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence*, *41*(161), 75–89.

Eather, N., Morgan, P. J., & Lubans, D. R. (2013). Feasibility and preliminary efficacy of the Fit4Fun intervention for improving physical fitness in a sample of primary school children: a pilot study. *Physical Education and Sport Pedagogy*, *18*(4), 389–411.

Edwards, L. C., Bryant, A. S., Keegan, R. J., Morgan, K., & Jones, A. M. (2017). Definitions, foundations and associations of physical literacy: a systematic review. *Sports Medicine*, *47*(1), 113–126.

Ekkekakis, P., Hall, E. E., & Petruzzello, S. J. (2008). The relationship between exercise intensity and affective responses demystified: To crack the 40-year-old nut, replace the 40-year-old nutcracker! *Annals of Behavioral Medicine*, *35*(2), 136–149.

Eldridge, S. M., Chan, C. L., Campbell, M. J., Bond, C. M., & Hopewell, S. (2016). CONSORT 2010 statement: extension to randomised pilot and feasibility trials. *BMJ: British Medical Journal*, *355*, 1–29.

Ernest, P., Jandrain, B., & Scheen, A. J. (2015). Strengths and weaknesses of randomized clinical trials: evolving changes according to personalized medicine. *Revue Medicale de Liege*, *70*(5–6), 232–6.

Fang, X., Singh, S., & Ahluwalia, R. (2007). An examination of different explanations for the

mere exposure effect. *Journal of Consumer Research*, *34*(1), 97–103.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160.

Field, A. P., Field, Z., & Miles, J. (2013). *Discovering statistics using R.* Los Angeles: Sage.

Figueiredo, A. J., Gonçalves, C. E., Coelho e Silva, M. J., & Malina, R. M. (2009). Characteristics of youth soccer players who drop out, persist or move up. *Journal of Sports Sciences*, *27*(9), 883–891.

Fishbein, M., Triandis, H. C., Kanfer, F. H., Becker, M., Middlestadt, S. E., & Eichler, A. (2001). Factors influencing behavior and behavior change. In A. Baum & T. A. Revenson (Eds.), *Handbook of health psychology* (pp. 3-17). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Festinger, L. (1957). A theory of social comparison processes. *Human Relations, 7* (2), 117-140.

Forbes, C. C., Blanchard, C. M., Mummery, W. K., & Courneya, K. S. (2015). Feasibility and preliminary efficacy of an online intervention to increase physical activity in Nova Scotian cancer survivors: a randomized controlled trial. *JMIR Cancer*, *1*(2), e12.

Gardner, B. (2015). A review and analysis of the use of "habit" in understanding, predicting and influencing health-related behaviour. *Health Psychology Review*, *9*(3), 277–295.

Gardner, B., De Bruijn, G. J., & Lally, P. (2011). A systematic review and meta-analysis of applications of the self-report habit index to nutrition and physical activity behaviours. *Annals of Behavioral Medicine*, *42*(2), 174–187.

Gionet, N. J., & Godin, G. (1989). Self-reported exercise behaviour of employees: a validity study. *Journal of Occupational Medicine, 31*, 969-973.

Glaser, BG. & Strauss, AL. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. New York: Aldine De Gruyter.

Godin, G., Shephard, R. J. (1997). Godin Leisure-Time Exercise Questionnaire. *Medicine and Science in Sports and Exercise.* 29 June Supplement: S36-S38.

Gyurcsik, N. C., Bray, S. R., & Brittain, D. R. (2004). Coping with barriers to vigorous physical activity during transition to university. *Family & Community Health*, *27*(2), 130–142.

Hagger, M. S., & Chatzisarantis, N. L. D. (2014). An integrated behavior change model for physical activity. *Exerc. Sport Sci. Rev*, *42*(2), 62–69.

Hammond, M. (2013). The contribution of pragmatism to understanding educational action research: value and consequences. *Educational Action Research*, *21*(4), 603–618.

Hardcastle, S., & Taylor, A. H. (2005). Finding an exercise identity in an older body: "It's redefining yourself and working out who you are." *Psychology of Sport and Exercise*, *6*(2), 173–188.

Higgins, T. J., Middleton, K. R., Winner, L., & Janelle, C. M. (2014). Physical activity interventions differentially affect exercise task and barrier self-efficacy: A meta-analysis. *Health Psychology*, *33*(8), 891–903.

Horner, S., Rew, L., & Torres, R. (2006). Enhancing intervention fidelity: A means of strengthening study impact. *Journal for Specialists in Pediatric Nursing*, *11*(2), 80–89.

Horton, N. J., Kleinman, K. P., Horton, N. J., & Kleinman, K. P. (2017). Much a do about nothing: a comparison of missing data methods and software to fit incomplete data regression models. *The American Statistician*, *61*(1), 79–90.

Jackson, N., & Waters, E. (2005). Criteria for the systematic review of health promotion and public health interventions. *Health Promotion International*, *20*(4), 367–374.

Kendzierski, D., Furr, R. M., & Schiavoni, J. (1998). Physical activity self-definitions: Correlates and perceived criteria. *Journal of Sport & Exercise Psychology, 20*, 176-193

Kendzierski, D., & Morganstein, M. S. (2009). Test, revision, and cross-validation of the physical activity self-definition model. *Journal of Sport & Exercise Psychology*, *31*(4), 484–504.

Kettunen, O., Vuorimaa, T., & Vasankari, T. (2015). A 12-month exercise intervention decreased stress symptoms and increased mental resources among working adults - Results perceived after a 12-month follow-up. *International Journal of Occupational Medicine and Environmental Health*, *28*(1), 157–168.

Kimiecik, J. C., & Harris, A. T. (1996). What is enjoyment ? A conceptual v definitional analysis with implications for sport and exercise psychology. *Journal of Sport & Exercise Psychology*, *18*, 247–263.

Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., … Wells, J. C. (2012). The pandemic of physical inactivity: Global action for public health. *The Lancet*, *380*(9838), 294–305.

Kraemer, H. C., Mintz, J., Noda, A., Tinklenberg, J., & Yesavage, J. A. (2006). Caution

regarding the use of pilot studies to guide power calculations for study proposals. *Archives of General Psychiatry*, *63*(5), 484–489.

Kwan, M., Faulkner, G., & Bray, S. (2013). Evaluation of active transition, a website-delivered physical activity intervention for university students: Pilot study. *Journal of Medical Internet Research*, *15*(5), 1–9.

Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, F. (2016). Theoretical explanations for maintenance of behaviour change: a systematic review of behaviour theories. *Health Psychology Review*, *10*(3), 277–296.

Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., Katzmarzyk, P. T., … Wells, J. C. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *The Lancet*, *380*(9838), 219–229.

Lincoln, Y., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage.

Linnan, L., & Steckler, A. (2002). *An Overview*. (A. Steckler & L. Linnan, Eds.), *Process evaluation for public health interventions and research*. San Francisco: Jossey-Bass.

Lowe, R., Eves, F., & Carroll, D. (2002). The influence of affective and instrumental beliefs on exercise intentions and behavior: A longitudinal analysis. *Journal of Applied Social Psychology*, *32*(6), 1241–1252.

Mageau, G. A., Vallerand, R. J., Charest, J., Salvy, S.-J., Lacaille, N., Bouffard, T., & Koestner, R. (2009). On the development of harmonious and obsessive passion: the role of autonomy support, activity specialization, and identification with the activity. *Journal of Personality*, *77*(3), 601–46.

Maher, J. P., Doerksen, S. E., Elavsky, S., Hyde, A. L., Pincus, A. L., Ram, N., & Conroy, D. E. (2013). A daily analysis of physical activity and satisfaction with life in emerging adults. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, *32*(6), 647–56.

Marks, D. F., & Bandura, A. (2002). The Health Psychology Reader: Social Foundations of Thought and Action, 388. Retrieved from https://books.google.com/books?hl=en&lr=&id=EY0MsG8ZHZUC&pgis=1

Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology, 42*, 38-50.

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology*, *38*, 299–337.

Martins, J., Marques, A., Sarmento, H., & Carreiro da Costa, F. (2015). Adolescents' perspectives on the barriers and facilitators of physical activity: a systematic review of qualitative studies. *Health Education Research*, *30*(5), 742–755.

McEwan, D., Harden, S. M., Zumbo, B. D., Sylvester, B. D., Kaulius, M., Ruissen, G. R., … Beauchamp, M. R. (2016). The effectiveness of multi-component goal setting interventions for changing physical activity behaviour: a systematic review and meta-analysis. *Health Psychology Review*, *10*(1), 67–88.

McGannon, K. R., & Schweinbenz, A. N. (2011). Traversing the qualitative-quantitative divide using mixed methods: Some reflections and reconciliations for sport and exercise psychology. *Qualitative Research in Sport, Exercise and Health*, *3*(3), 370–384.

Mendonça, G., Cheng, L. A., Mélo, E. N., & De Farias Júnior, J. C. (2014). Physical activity and social support in adolescents: A systematic review. *Health Education Research*, *29*(5), 822–839.

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective Techniques in Healthy Eating and Physical Activity Interventions: A Meta-Regression. *Health Psychology*, *28*(6), 690–701.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., … Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine*, *46*(1), 81–95.

Mitchell, F., Gray, S., & Inchley, J. (2015). "This choice thing really works … " Changes in experiences and engagement of adolescent girls in physical education classes, during a school-based physical activity programme. *Physical Education and Sport Pedagogy*, *20*(6), 593–611.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., … Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *BMJ*, *350*(h1258), 1–7.

Naylor, P. J., Nettlefold, L., Race, D., Hoy, C., Ashe, M. C., Wharf Higgins, J., & McKay, H. A. (2015). Implementation of school based physical activity interventions: A systematic review. *Preventative Medicine, 77,* 95-115.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to

meet the trustworthiness criteria. *International Journal of Qualitative Methods*, *16*(1), 1–13.

Oyserman, D., & Destin, M. (2010). Identity-based motivation: Implications for intervention. *Counseling Psychologist*, *38*(7), 1001–1043.

Patton, M. (2012). The SAGE Encyclopedia of Qualitative Research Methods. In *The SAGE Encyclopedia of Qualitative Research Methods* (pp. 1–4). SAGE PublicationsSage CA: Los Angeles, CA.

Pescosolido, A. T., & Saavedra, R. (2012). Cohesion and sports teams: A review. *Small Group Research*, *43*(6), 744–758.

Peterson, R. A., & Merunka, D. R. (2014). Convenience samples of college students and research reproducibility. *Journal of Business Research*, *67*(5), 1035–1041.

Pietiläinen, K. H., Kaprio, J., Borg, P., Plasqui, G., Yki-Järvinen, H., Kujala, U. M., … Rissanen, A. (2008). Physical inactivity and obesity: A vicious circle. *Obesity*, *16*(2), 409–414.

Pliner, P. (1982). *The Effects of Mere Exposure on Liking for Edible Substances*. *Appetite* (Vol. 3).

Plotnikoff, R. C., Costigan, S. A., Williams, R. L., Hutchesson, M. J., Kennedy, S. G., Robards, S. L., … Germov, J. (2015). Effectiveness of interventions targeting physical activity, nutrition and healthy weight for university and college students: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(1), 1–10.

Pluye, P., & Hong, Q. N. (2014). Combining the power of stories and the power of numbers: Mixed methods research and mixed studies reviews. *Annual Review of Public Health*, *35*(1),

29–45.

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Connor Gorber, S., & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *5*.

Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice*, *19*(3), 276–288.

Quinlan, A., Rhodes, R. E., Blanchard, C. M., Naylor, P.-J., & Warburton, D. E. R. (2015). Family planning to promote physical activity: a randomized controlled trial protocol. *BMC Public Health*, *15*(1), 1011.

Raghunathan, T. E. (2004). What do we do with missing data? Some option for analysis of imcomplete data. *Annual Review of Public Health*, *25*(1), 99–117.

Rebar, A. L., Dimmock, J. A., Jackson, B., Rhodes, R. E., Kates, A., Starling, J., & Vandelanotte, C. (2016). A systematic review of the effects of non-conscious regulatory processes in physical activity. *Health Psychology Review*, 1–13.

Rebar, A. L., Stanton, R., Geard, D., Short, C., & Duncan, M. J. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychology Review*, *9*(3), 366–378.

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A Meta-Meta-Analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychology Review*, *7199*(March), 1–78.

Reis, H. T., Maniaci, M. R., Caprariello, P. A., Eastwick, P. W., & Finkel, E. J. (2011). Familiarity does indeed promote attraction in live interaction. *Journal of Personality and Social Psychology*, *101*(3), 557–570.

Rhodes, R. (2017). *The Evolving Understanding of Physical Activity Behavior: A Multi-process Action Control Approach*. *Advances in Motivation Science* (Vol. 4). Elsevier Ltd.

Rhodes, R. E. (2017b). Physical activity and affect. Powerpoint presentation.

Rhodes, R. E., Fiala, B., & Conner, M. (2009). A review and meta-analysis of affective judgments and physical activity in adult populations. *Annals of Behavioral Medicine*, *38*(3), 180–204.

Rhodes, R. E., Janssen, I., Bredin, S. S. D., Warburton, D. E. R., & Bauman, A. E. (2017). Physical activity : Health impact, prevalence, correlates and interventions. *Psychology & Health*, *32*(8), 942–975.

Rhodes, R. E., Kaushal, N., & Quinlan, A. (2016). Is physical activity a part of who I am? A review and meta-analysis of identity, schema and physical activity. *Health Psychology Review*, *10*(2), 204–225.

Rhodes, R. E., Naylor, P. J., & McKay, H. A. (2010). Pilot study of a family physical activity planning intervention among parents and their children. *Journal of Behavioral Medicine*, *33*(2), 91–100.

Rhodes, R. E., Warburton, D. E. R., & Murray, H. (2009). Characteristics of physical activity guidelines and their effect on adherence: A review of randomized trials. *Sports Medicine*, *39*(5), 355–375.

Rhodes, R.E., Williams, D.M., & Conner M. (2018). Affective determinants of health behaviour: Common themes, future directions, and implications for health behaviour change. In D.W. Williams, M. Conner & R.E. Rhodes (Eds.), Affective Determinants of Health Behaviour (pp.485-498). New York, NY: Oxford Press.

Ries, F., Hein, V., Pihu, M., & Armenta, J. M. S. (2012). Self-identity as a component of the Theory of Planned Behaviour in predicting physical activity. *European Physical Education Review*, *18*(3), 322–334.

Rise, J., & Sheeran, P. (2010). The Role of Self-identity in the Theory of Planned Behavior : A Meta-Analysis. *Journal of Applied Social Psychology*, *40*(5), 1085–1105, Q4.

Robin, R., Mceachan, C., Conner, M., Taylor, N. J., Robin, R., Mceachan, C., … Taylor, N. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour : a meta-analysis, *7199*.

Ryan, R., & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation. *American Psychologist*, *55*(1), 68–78.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise*, *32*(5), 963–975.

Samdal, G. B., Eide, G. E., Barth, T., Williams, G., & Meland, E. (2017). Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 1–14.

Schulz, K. F., Altman, D. G., Moher, D., & Group, C. (2010). Academia and Clinic Annals of

Internal Medicine CONSORT 2010 Statement : Updated Guidelines for Reporting Parallel Group Randomized Trials OF TO. *Annals of Internal Medicine*, *1996*(14), 727–732.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology*, *57*(1), 1–29.

Seale, C. (1997). Ensuring rigour in qualitative research. *The European Journal of Public Health*, *7*(4), 379–384.

Sheeran, P., Gollwitzer, P. M., Bargh, J. A., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health. *Health Psychology*, *32*(5), 460–473.

Serpe, R.T. (1987). Stability and change in self: A structural symbolic interactionist explanation. *Social Psychology Quarterly*, *50*, 44–55

Skår, S., Sniehotta, F. F., Molloy, G. J., Prestwich, A., & Araújo-Soares, V. (2011). Do brief online planning interventions increase physical activity amongst university students? A randomised controlled trial. *Psychology and Health*, *26*(4), 399–417.

Smith, B., & McGannon, K. R. (2017). Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*, 1–21.

Sparkes, A. C. (2015). Developing mixed methods research in sport and exercise psychology: Critical reflections on five points of controversy. *Psychology of Sport and Exercise*, *16*(P3), 49–59.

Spieth, P. M., Kubasch, A. S., Penzlin, A. I., Illigens, B. M.-W., Barlinn, K., & Siepmann, T. (2016). Randomized controlled trials - a matter of design. *Neuropsychiatric Disease and*

Treatment, *12*, 1341.

Stadler, G., Oettingen, G., & Gollwitzer, P. M. (2009). Physical activity in women. Effects of a self-regulation intervention. *American Journal of Preventive Medicine, 36*(1), 29–34.

Stang, A. (2011). Randomized Controlled Trials - an indispensible part of clinical research. *Medicine, 108*(39), 661–662.

Statistics Canada. (2015). CANSIM table 117–0019: Distribution of the household population meeting/not meeting the Canadian physical activity guidelines, by sex and age group. Ottawa, ON: Statistics Canada.

Statistics Canada. (2016). Physical activity during leisure time, by sex, provinces and territories (Percent). Statistics Canada catalogue number 82-221-X. Ottawa. Version updated March 2016. Retrieved from: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/health78b-eng.htm

Statistics Canada. (2018). Physical activity, self-reported, adult, by age group. Table 13-10-0096-13. Ottawa. Retrieved from https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310009613

Stets, J. E., & Burke, P. J. (2000). Identity theory and social identity theory. *Social Psychology Quarterly*, *63*(3), 224–237.

Strachan, S M., Woodgate, J., Brawley, L., & Tse, A. (2005). The relationship of self-efficacy and self-identity to long-term maintenance of vigorous physical activity. *Journal of Applied Biobehavioral Research, 10*(2), 98–112.

Strachan, S. M., & Brawley, L. R. (2008). Reactions to a perceived challenge to identity: A focus

on exercise and healthy eating. *Journal of Health Psychology*, *13*(5), 575–588.

Strachan, S. M., Brawley, L. R., Spink, K. S., Sweet, S. N., & Perras, M. G. M. (2015). Self-regulatory efficacy's role in the relationship between exercise identity and perceptions of and actual exercise behaviour. *Psychology of Sport and Exercise*, *18*, 53–59.

Strachan, S. M., Fortier, M. S., Perras, M. G. M., & Lugg, C. (2013). Understanding variations in exercise-identity strength through identity theory and self-determination theory. *International Journal of Sport & Exercise Psychology*, *11*(3), 273–285.

Strachan, S. M., & Whaley, D. E. (2013). Identities, schemas, and definitions: How aspects of the self influence exercise behaviour. In P. Ekkekakis (Ed.), Handbook of physical activity and mental health (pp. 212–223). New York, NY: Routledge.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, *8*(3), 220–47.

Stryker, S. (1980). Symbolic Interactionism: A Social Structural Version. Menlo Park, CA: Benjamin Cummings.

Stryker, S., & Burke, P. (2000). The Past, Present, and Future of an Identity Theory. *Social Psychology*, *63*(4), 284–297.

Stults-Kolehmainen, M. A., & Sinha, R. (2014). The effects of stress on physical activity and exercise. *Sports Medicine* (Vol. 44).

Sylvester, B. D., Lubans, D. R., Eather, N., Standage, M., Wolf, S. A., McEwan, D., … Beauchamp, M. R. (2016). Effects of variety support on exercise-related well-being. *Applied Psychology. Health and Well-Being*, *8*(2), 213–231.

Sylvester, B. D., Standage, M., Ark, T. K., Sweet, S. N., Crocker, P. R. E., Zumbo, B. D., & Beauchamp, M. R. (2014). Is variety a spice of (an active) life?: Perceived variety, exercise behaviour, and the mediating role of autonomous motivation. *Journal of Sport and Exercise Psychology*, *36*(5), 516–527.

Sylvester, B. D., Standage, M., Dowd, A. J., Martin, L. J., Sweet, S. N., & Beauchamp, M. R. (2014). Perceived variety, psychological needs satisfaction and exercise-related well-being. *Psychology and Health*, *29*(9), 1044–1061.

Tajfel, H., & Turner, J. (2001). An integrative theory of intergroup conflict. In M. A. Hogg & D. Abrams (Eds.), Key readings in social psychology. Intergroup relations: Essential readings (pp. 94-109). New York, NY, US: Psychology Press.Teixeira, P. J., Carraça, E. V, Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 78.

Thompson, A. M., Rehman, L. A., & Humbert, M. L. (2005). Factors influencing the physically active leisure of children and youth: A qualitative study. *Leisure Sciences*, *27*(5), 421–438.

Timken, G., McNamee, J., & Coste, S. (2017). "It doesn"t seem like PE and I love it'. *European Physical Education Review*, 1-16.

Troiano, R. P., Berrigan, D., Dodd, K. W., Mâsse, L. C., Tilert, T., & Mcdowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise*, *40*(1), 181–188.

Trudeau, F., Laurencelle, L., & Shephard, R. J. (2004). Tracking of physical activity from

childhood to adulthood. *Medicine and Science in Sports and Exercise*, *36*(11), 1937–1943.

Vallerand, R., Mageau, G. A., Elliot, A., Dumais, A., Demers, M.-A., & Rousseau, F. L. (2008). Passion and performance attainment in sport. *Psychology of Sport and Exercise*, *9*(3), 373–392.

Van Oort, C., Tupper, S. M., Rosenberg, A. M., Farthing, J. P., & Baxter-Jones, A. D. (2013). Safety and feasibility of a home-based six week resistance training program in juvenile idiopathic arthritis. *Pediatric Rheumatology*, *11*(1).

Verkooijen, K. T., & de Bruijn, G.-J. (2013). Exercise self-identity: interactions with social comparison and exercise behaviour. *Psychology, Health & Medicine*, *18*(4), 490–9.

Vlachopoulos, S. P., Kaperoni, M., & Moustaka, F. C. (2011). The relationship of self-determination theory variables to exercise identity. *Psychology of Sport and Exercise*, *12*(3), 265–272.

Warburton, D. E., Charlesworth, S., Ivey, A., Nettlefold, L., & Bredin, S. S. (2010). A systematic review of the evidence for Canada ’s: Physical Activity Guidelines for Adults. *International Journal of Behavioural Nutrition and Physical Activity*, *7:39*, 1–220.

Warburton, D. E. R., & Bredin, S. S. D. (2016). Reflections on physical activity and health: What should we recommend? *Canadian Journal of Cardiology*, *32*(4), 495–504.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*, *174*(6), 801–9.

Wehmeyer, M., Shogren, K., Little, T., & Lopez, S. (2017). *A self-determination perspective on self-regulation across the life span*. *Development of Self-Determination Through the Life-*

Course. Springer.

West, R. (2009). The multiple facets of cigarette addiction and what they mean for encouraging and helping smokers to stop. *Journal of Chronic Obstructive Pulmonary Disease*, *6*(4), 277–283.

West, S. G., Duan, N., Pequegnat, W., Gaist, P., Des Jarlais, D. C., Holtgrave, D., … Mullen, P. D. (2008). Alternatives to the randomized controlled trial. *American Journal of Public Health*, *98*(8), 1359–1366.

Whaley, D. E., & Schroyer, R. (2010). "I Yam what I Yam"... The power of the self in exercise behaviour. *Journal of Sport Psychology in Action*, *1*(1), 25–32.

Wilder, J. (1962). Basimetric Approach (Law of Initial Value) To Biological Rhythms. *Annals of the New York Academy of Sciences*, *98*(4), 1211–1220.

Williams, D. M., Anderson, E. S., & Winett, R. A. (2005). A review of the outcome expectancy construct in physical activity research. *Annals of Behavioural Medicine*, *29*(1), 70–79.

Williams, D. M., & Evans, D. R. (2014). Current emotion research in health behaviour science. *Emotion Review*, *6*(3), 277–287.

Williams, S. L., & French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour - And are they the same? *Health Education Research*, *26*(2), 308–322.

Williams, D.M., Rhodes, R.E. & Conner M. (2018). Overview of affective determinants of health behaviour. In D.W. Williams, M. Conner & R.E. Rhodes (Eds.), Affective Determinants of Health Behaviour (pp.1-18). New York, NY: Oxford Press.

World Health Organization. (2012). Recommended levels of physical activity for adults aged 18 – 64 years. Retrieved from http://www.who.int/dietphysicalactivity/factsheet_adults/en/index.html

Wright, J., Macdonald, D., & Groom, L. (2003). Physical Activity and Young People: Beyond Participation. *Sport, Education and Society*, *8*(1), 17–33.

Young, M. D., Plotnikoff, R. C., Collins, C. E., Callister, R., & Morgan, P. J. (2014). Social cognitive theory and physical activity: A systematic review and meta-analysis. *Obesity Reviews*, *15*(12), 983–995.

Chapter 7: Appendix 1

7.1 Assumptions

The assumptions I made about my research are as follows. Firstly, I assumed the research supporting the relationship between exercise identity and PA participation holds true. If this relationship does not exist, it is not likely I will find results. Secondly, I assumed that the participants are being honest during the interview, recruitment process, and while they fill out the questionnaires. There is no feasible way to verify participant honesty, so I must be satisfied to assume good willed participants. Thirdly, I assumed that I will be able to develop rapport with the participants in order to bring them to a certain comfort level, in order to feel open to sharing their PA experiences with me, and open to critique the feasibility of Study 2. I believe that everyone has an experience with PA, and some might be embarrassing, or paint the person in a negative light. In order to obtain rich, thick description, it is important that the participant feels comfortable sharing this information with me. Lastly, I assumed that my biases towards exercise and exercise identity did not skew the direction of my interviews, my delivery of intervention material, or the way I interpreted my results. In order to ensure that I am as impartial as possible, I have included an extensive researcher statement in order to make the reader aware of potential biases I might have, as well as bring them to my own attention.

7.2 Researcher statement

Because I am conducting blurred genres research (McGannon & Schweinbenz, 2011), including a mixed methodology approach informed by a post-positivist paradigm, my biases and opinions may impact the results of my qualitative research. As such, I am going to outline my personal interest and opinions about exercise identity in order to provide the reader with background information on the way I might be skewing the research process.

I have always been involved and interested in PA from a young age. I excelled more at individual sports such as dance, gymnastics, tennis, skiing, and horseback riding, but also actively participated in soccer and volleyball. As I grew older, I pursued dance further than any other sport. The people I danced with were my family, and I spent countless hours at the studio. We would go on dance trips, and have sleepovers at the studio with our peers, both older and younger, as well as teachers and staff. Teachers and administrative staff knew my name and made me feel important. One year, I received the HipHop award for excellence in performance– which was extremely important at the time. I experienced a sense of belonging, mastery, and enjoyed myself immensely at the dance studio.

For years, I described myself as a dancer, and I still include my participation in dance as part of my central description, even though I have now ceased to participate competitively. I believe that having an identity outside of being a student (which was my other main priority through adolescence) gave me a sense of balance to my life. Being good at dance increased my self-confidence and I was proud to be able to call myself a dancer.

I acknowledge that my experience with dance has given me a positive view of PA in general. Because I had such a positive experience, I have the implicit belief that every person would benefit from youth sport participation – physically, but primarily psychologically. I know however, that not all people have positive experiences with PA in their youth, and for some, PA may be a sensitive topic. I conducted extensive pilot interviews with trusted friends and family, as well as strangers who do not know my personal opinions on PA in order to get honest feedback on my interview questions and non-verbal presentation. Unfortunately, based solely on the fact that I am doing research on PA, participants may assume that I have a positive view of it, and therefore my efforts to mask my biases may be for not.

7.3 Dissemination

I will disseminate my results through publications and academic presentations. The results of Study 1 have informed intervention targets for Study 2. The results of Study 2 will inform future, larger scale interventions of a similar design.

7.4 Timeline

Study 1

I received ethical approval for Study 1 from the University of Victoria Ethics Board on February 9, 2017, protocol number 17-049. Pilot interviews ran from February 2017, until May 2017. I began data collection in May 2017, and completed in July 2017. I analysed data from July 2017 – August 2017, and began writing results and discussion in September 2017.

Study 2

I began writing the ethics for Study 2 in July 2017 and received ethical approval on August 29, 2017, protocol number 17-309. Recruitment ran from September 2017 to February 2018. Data analysis began in April 2018, with results and discussion completed by July 2018.

Chapter 8: Appendix 2

8.1 Study 1 Interview Questions

1. In your own words, can you describe what it means to say that someone has an exercise/PA identity?

2. For you, what is the importance of PA participation in comparison to other things in your life? (prompt behaviours, not traits)

3. Can you pinpoint when in time you became aware of exercise/PA as something you did or did not identify with?

4. Describe your PA experiences during this time?

5. Were you good at PA?

6. From what you remember, was your PA participation your choice?

    - Can you describe how much control you had over your PA participation?

7. As a child, what did you do in your free time?

    - Did it include physically active things like riding a bike, playing with neighborhood children?

8. At the time you began to become aware of PA as something you did or did not identify with, would you say you had a certain style of dress? Did it reflect your identity?

    - If someone saw you from across the street do you think they could interpret your feelings towards PA?

9. At the time you began to become aware of PA as something you did or did not identify with, do you think your use of social media platforms allowed others to interpret your feelings towards PA?
    - Pages you like or follow
    - Pictures posted
10. Can you explain how you first became involved in PA?
11. Tell me about your PA experiences since that time?
    - Have you developed any firm rules or structure surrounding your PA participation? (for high identifiers only)
12. PA experiences can spam home, school, teacher, social, extracurricular... any of those we haven't touched on that are relevant for you?
13. Do you have anything else to add? Anything that has contributed to the development of your PA identity that we haven't talked about?
14. If you were in charge and could go back and change anything to do with PA in your youth that would have made it a more positive experience, what would you do?

8.2 Study 2 Interview Questions

1. Tell me about how you felt about the study?
2. Did you find the meeting sessions with the research investigator useful?
3. Have you been able to incorporate the strategies provided in the workbooks and the ones you brainstormed during the one-on-one sessions? If so, how? If not, how come?
4. Did you find the check-in sessions helpful?

5. What was your favorite part?
6. What was your least favorite part?
7. What would you change?
8. Do you feel like your participation in the study helped you with your physical activity participation?
9. Do you feel like your participation in the study helped you create an identity for physical activity?
10. Do you feel passionate about your physical activity?
11. Do you have any other comments?

8.3 Study 2 Intervention Materials

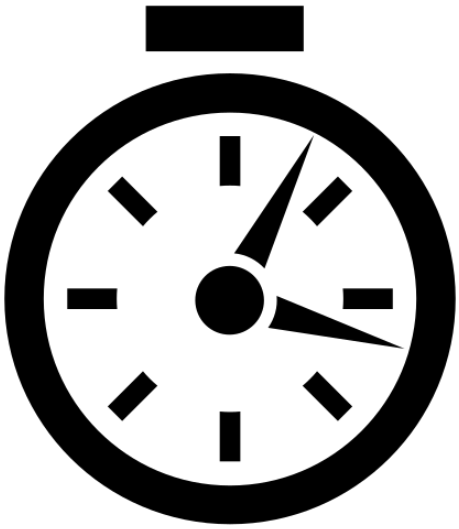
Standard Intervention Group

Session 1

Physical Activity Benefits and Goal Setting

Physical Activity Guidelines

The Canadian Society for Exercise Physiology has physical activity guidelines for people of all ages. Adults aged 18-64 years should be getting **150 minutes of moderate to vigorous physical activity per week**.



Physical Benefits of Regular Physical Activity

150 minutes per week of activity can help reduce your risk of:

- Cardiovascular disease
- Heart disease
- Diabetes
- Certain types of cancer
- Stroke
- Hypertension
- Obesity
- Osteoporosis

Other Benefits of Regular Physical Activity

- Increased strength
- Improved quality of life
- Reduction of depressive symptoms
- Reduced stress

Session 1

Activities

Activity 1:

In the space to the right, **brainstorm** at least 3 ideas of physical activity you could see yourself doing.

Activity 2:

In the space to the right, **set a physical activity goal** for the coming two weeks, using the activities you have brainstormed above.

Activity 3:

In the space to the right, **plan how** you will achieve your physical activity goal in the coming two weeks.

Session 2

Check In and Re-set Goals

Check in

Did you meet your goals?

In the space to the right, record your physical activity participation in the past two weeks.

Barriers

Barriers are things that prevented, or made it more difficult for you to reach your physical activity goals.

In the space below, list some barriers you encountered over the past two weeks.

Self-Monitoring

Being aware of your behaviour and adjusting as necessary. Anytime you reflect on what you have done you are self-monitoring.

Example: Journal, calendar, apps

Session 2

Activities

Activity 1:

In the space to the right, re-set your physical activity **goals** based on what you experienced in the past two weeks.

Activity 2:

In the space to the right, re-vamp your physical activity **plan** based on what you experienced in the past two weeks.

Session 3

Check In and Re-set Goals

Check in

Did you meet your goals?

In the space to the right, record your physical activity participation in the past two weeks.

Activity 1:

In the space to the right, re-set your physical activity **goals** based on what you experienced in the past two weeks.

Activity 2:

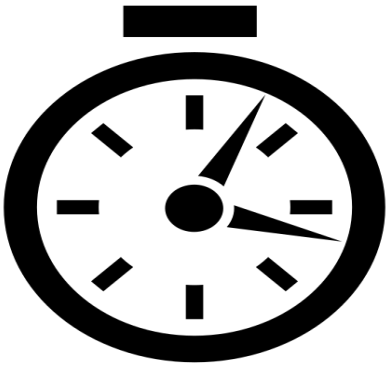
In the space to the right, re-vamp your physical activity **plan** based on what you experienced in the past two weeks.

Session 1

Physical Activity Benefits and Goal Setting

Physical Activity Guidelines

The Canadian Society for Exercise Physiology has physical activity guidelines for people of all ages. Adults aged 18-64 years should be getting **150 minutes of moderate to vigorous physical activity per week**.



Physical Benefits of Regular Physical Activity

150 minutes per week of activity can help reduce your risk of:

- Cardiovascular disease
- Heart disease
- Diabetes
- Certain types of cancer
- Stroke
- Hypertension
- Obesity
- Osteoporosis

Other Benefits of Regular Physical Activity

- Increased strength
- Improved quality of life
- Reduction of depressive symptoms
- Reduced stress

Session 1

Activities and Exercise Identity

Activity 1:

In the space to the right, **brainstorm** at least 3 ideas of physical activity you could see yourself doing.

It is important to pick activities that are *fun* and you think you will be *good at*.

Exercise Identity

Having an exercise identity is when physical activity participation is part of who you are as a person. Exercise identity is correlated with the following:

- Frequency of exercise
- Duration of exercise
- Intensity of exercise

Activity 2:

In the space to the right, create a physical activity **goal** for the coming two weeks, using the activities you have brainstormed above.

Session 1

Activities

Activity 3:

In the space to the right, **plan how** you will achieve your physical activity goal in the coming two weeks.

Activity 4:

In the space to the right, **brainstorm** how you will make your physical activity participation fun. If you are having fun, it will be easier to motivate yourself to achieve your physical activity goals.

Session 2

Check In and Re-set Goals

Check in

Did you meet your goals?

In the space to the right, record your physical activity participation in the past two weeks.

Barriers

Barriers are things that prevented, or made it more difficult for you to reach your physical activity goals.

In the space below, list some barriers you encountered over the past two weeks.

Self-Monitoring

Being aware of your behaviour and adjusting as necessary. Anytime you reflect on what you have done you are self-monitoring.

Example: Journal, calendar, app

Session 2

Priorities and Self-Talk

Priorities

You hold multiple identities, and therefore have competing priorities when it comes to allocating your time, money, and effort.

In theory, the things you spend the most time, money, and effort on should correlate with what you identify most strongly.

Activity 1:

In the space below, list your top 5 priorities in order.

Activity 2:

In the space below, list the top 5 things you spend time, money, and effort on.

Self-Talk

In the face of a barrier, it can be helpful to remind yourself that participating in physical activity is a part of who you are. In the space to the right, create a phrase to say to yourself when you are facing a barrier.

Session 2

Activities and Rules

Activity 3:

Considering your priorities, re-set your physical activity **goals** based on what you experienced in the past two weeks.

Activity 4:

In the space to the right, re-vamp your physical activity **plan** based on what you experienced in the past two weeks.

Also, consider the barriers you have faced these past two weeks when creating your plan.

Sacrifice and Rules

One of the ways to build an exercise identity is to create **rules** around your physical activity participation.

For example: when you go to yoga there are rules of the studio and un-written rules about the attire.

Activity 5:

In the space to the right, create a rule around your physical activity participation.

Session 3

Check In and Re-set Goals

Check in

Did you meet your goals?

In the space to the right, record your physical activity participation in the past two weeks.

Activity 1:

In the space to the right, re-set your physical activity **goals** based on what you experienced in the past two weeks.

Activity 2:

In the space to the right, re-vamp your physical activity **plan** based on what you experienced in the past two weeks.

Session 3

Environment and Cues

Environment

Your environment can help you participate in physical activity.

- Habits are attached to environmental cues
- Creating an environment that is conducive to physical activity participation

Activity 3:

In the space to the right, brainstorm some cues in your environment that you could attach physical activity to.

Example: going to the gym on your drive home from school.

Activity 4:

In the space to the left, brainstorm ways you could change your environment to make it easier to do physical activity.

Example: runners and athletic clothes laid out the night before a morning run.

Session 3

Symbolic Representation

Symbolism

The way you represent yourself to others will impact how you perceive yourself as well. Having an identity means showing it off in some way.

- Clothes
- Hairstyle
- Social media presence
- Decoration of your personal space

Activity 5:

In the space below, record how you think others perceive you.

Activity 6:

In the space below, pick one way you can "amp up" your physical activity identification.

Chapter 9: Appendix 3

9.1 Study 1 Ethical Approval

University of Victoria | Office of Research Services | Human Research Ethics Board
Administrative Services Building Rm B202 PO Box 1700 STN CSC Victoria BC V8W 2Y2 Canada
T 250-472-4545 | F 250-721-8960 | uvic.ca/research | ethics@uvic.ca

Certificate of Approval

PRINCIPAL INVESTIGATOR:	**Cassandra Husband**	**ETHICS PROTOCOL NUMBER** Minimal Risk Review - Delegated	**17-049**
UVic STATUS:	**Master's Student**	ORIGINAL APPROVAL DATE:	09-Feb-17
UVic DEPARTMENT:	**EPHE**	APPROVED ON:	09-Feb-17
SUPERVISOR:	**Ryan Rhodes**	APPROVAL EXPIRY DATE:	08-Feb-18

PROJECT TITLE: **Origins of Exercise Identity Formation**

RESEARCH TEAM MEMBER Cassandra Husband (PI, UVic), Ryan Rhodes (Supervisor, UVic)

DECLARED PROJECT FUNDING: **None**

CONDITIONS OF APPROVAL

This Certificate of Approval is valid for the above term provided there is no change in the protocol.

Modifications
To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.

Renewals
Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.

Project Closures
When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

Rachael Scarth

Dr. Rachael Scarth
Associate Vice-President Research Operations

Certificate Issued On: 09-Feb-17

17-049 Husband, Cassandra

9.2 Study 2 Ethical Approval

University of Victoria | Office of Research Services | Human Research Ethics Board
Administrative Services Building Rm B202 PO Box 1700 STN CSC Victoria BC V8W 2Y2 Canada
T 250-472-4545 | F 250-721-8960 | uvic.ca/research | ethics@uvic.ca

Certificate of Approval

PRINCIPAL INVESTIGATOR:	**Cassandra Husband**	**ETHICS PROTOCOL NUMBER:** Minimal Risk Review - Delegated	**17-309**
UVic STATUS:	**Master's Student**	ORIGINAL APPROVAL DATE:	29-Aug-17
UVic DEPARTMENT:	**EPHE**	APPROVED ON:	29-Aug-17
SUPERVISOR:	**Dr. Ryan Rhodes**	APPROVAL EXPIRY DATE:	28-Aug-18

PROJECT TITLE: **Exercise Identity Modification and/or Enhancement in University Students, a RCT Feasibility Trial**

RESEARCH TEAM MEMBER Committee Member: Joan Wharf-Higgins, UVic

DECLARED PROJECT FUNDING: CIHR

CONDITIONS OF APPROVAL

This Certificate of Approval is valid for the above term provided there is no change in the protocol.

Modifications
To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.

Renewals
Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.

Project Closures
When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

Rachael Scarth

Dr. Rachael Scarth
Associate Vice-President Research Operations

Certificate Issued On: 29-Aug-17

17-309 Husband, Cassandra

Chapter 10: Appendix 4

10.1 CONSORT 2010 checklist of information to include when reporting a pilot or feasibility trial

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a pilot or feasibility randomised trial in the title	
	1b	Structured summary of pilot trial design, methods, results, and conclusions (for specific guidance see CONSORT abstract extension for pilot trials)	
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale for future definitive trial, and reasons for randomised pilot trial	
	2b	Specific objectives or research questions for pilot trial	
Methods			
Trial design	3a	Description of pilot trial design (such as parallel, factorial) including allocation ratio	
	3b	Important changes to methods after pilot trial commencement (such as eligibility criteria), with reasons	
Participants	4a	Eligibility criteria for participants	
	4b	Settings and locations where the data were collected	
	4c	How participants were identified and consented	
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	

Outcomes	6a	Completely defined prespecified assessments or measurements to address each pilot trial objective specified in 2b, including how and when they were assessed	
	6b	Any changes to pilot trial assessments or measurements after the pilot trial commenced, with reasons	
	6c	If applicable, prespecified criteria used to judge whether, or how, to proceed with future definitive trial	
Sample size	7a	Rationale for numbers in the pilot trial	
	7b	When applicable, explanation of any interim analyses and stopping guidelines	
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	
	8b	Type of randomisation(s); details of any restriction (such as blocking and block size)	
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	
	11b	If relevant, description of the similarity of interventions	
Statistical methods	12	Methods used to address each pilot trial objective whether qualitative or quantitative	
Results			

Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were approached and/or assessed for eligibility, randomly assigned, received intended treatment, and were assessed for each objective	
	13b	For each group, losses and exclusions after randomisation, together with reasons	
Recruitment	14a	Dates defining the periods of recruitment and follow-up	
	14b	Why the pilot trial ended or was stopped	
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	
Numbers analysed	16	For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group	
Outcomes and estimation	17	For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates. If relevant, these results should be by randomised group	
Ancillary analyses	18	Results of any other analyses performed that could be used to inform the future definitive trial	
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	
	19a	If relevant, other important unintended consequences	
Discussion			
Limitations	20	Pilot trial limitations, addressing sources of potential bias and remaining uncertainty about feasibility	
Generalisability	21	Generalisability (applicability) of pilot trial methods and findings to future definitive trial and other studies	
Interpretation	22	Interpretation consistent with pilot trial objectives and findings, balancing potential benefits and harms, and considering other relevant evidence	
	22a	Implications for progression from pilot to future definitive trial, including any proposed amendments	

Other information			
Registration	23	Registration number for pilot trial and name of trial registry	
Protocol	24	Where the pilot trial protocol can be accessed, if available	
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	
	26	Ethical approval or approval by research review committee, confirmed with reference number	

10.2 CONSORT 2010 checklist of information to include when reporting a pilot or feasibility randomized trial in a journal or conference abstract

Item	Description	Reported on line number
Title	Identification of study as randomised pilot or feasibility trial	
Authors *	Contact details for the corresponding author	
Trial design	Description of pilot trial design (eg, parallel, cluster)	
Methods		
Participants	Eligibility criteria for participants and the settings where the pilot trial was conducted	
Interventions	Interventions intended for each group	
Objective	Specific objectives of the pilot trial	
Outcome	Prespecified assessment or measurement to address the pilot trial objectives**	
Randomization	How participants were allocated to interventions	
Blinding (masking)	Whether or not participants, care givers, and those assessing the outcomes were blinded to group assignment	
Results		
Numbers randomized	Number of participants screened and randomised to each group for the pilot trial objectives**	
Recruitment	Trial status†	
Numbers analysed	Number of participants analysed in each group for the pilot objectives**	
Outcome	Results for the pilot objectives, including any expressions of uncertainty**	
Harms	Important adverse events or side effects	
Conclusions	General interpretation of the results of pilot trial and their implications for the future definitive trial	
Trial registration	Registration number for pilot trial and name of trial register	
Funding	Source of funding for pilot trial	