Examining the Feasibility and Effects of a Pilot Online Physical Activity Intervention Targeting Social Cognitive Variables in Youth with Physical Disabilities

by

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A thesis submitted in conformity with the requirements for the degree of Master of Science

Exercise Sciences
University of Toronto

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Abstract

The purpose of this study was to evaluate the feasibility, and short- and longer-term effects of a four-week social cognitive theory-based online physical activity (PA) intervention on the social cognitions and PA behaviour of youth with physical disabilities. Intervention feasibility was supported by high implementation fidelity (100%), high compliance (95.32%), and positive ratings on indicators of acceptability. A series of one-way, repeated measures ANOVAs revealed significant: (a) small-to-medium-sized increases in participants’ task ($F[2, 11] = 5.89, \eta^2_p = .28$) and barrier ($F[2, 11] = 4.66, \eta^2_p = .24$) self-efficacy; (b) large-sized increases in the use of goal-setting ($F[2, 11] = 11.01, \eta^2_p = .42$), and scheduling and planning ($F[2, 11] = 10.66, \eta^2_p = .42$); and (c) a medium-sized increase in PA behaviour ($F[2, 11] = 5.32, \eta^2_p = .26$). Key study implications and contributions to a growing field of research on technology-based PA interventions for youth are discussed.
Acknowledgments

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Next, I would like to thank my wonderful participants and their families for taking the time to partake in my study. This would not have been possible without you and I am grateful for your trust in me.

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<td>EGS</td>
<td>Exercise Goal-Setting Scale</td>
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<tr>
<td>EPS</td>
<td>Exercise Planning and Scheduling Scale</td>
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<tr>
<td>LEAP</td>
<td>Lifestyle Education for Activity Program</td>
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<td>LTPA</td>
<td>Leisure-Time Physical Activity</td>
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<tr>
<td>LTPAQ-SCI</td>
<td>Leisure-Time Physical Activity Questionnaire for People with Spinal Cord Injury</td>
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<td>MVPA</td>
<td>Moderate-to-Vigorous Physical Activity</td>
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<tr>
<td>NIHR</td>
<td>National Institute of Health Research</td>
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<td>NPAM</td>
<td>National Physical Activity Monitoring</td>
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<td>PA</td>
<td>Physical Activity</td>
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Chapter 1
Introduction

1 Introduction

1.1 Background on Physical Disability

Disability is a complex term used to describe “impairments, activity limitations, and participation restrictions” (World Health Organization, 2011, p. 4). The term disability includes those that are physical, sensory, cognitive, or intellectual in nature, mental illnesses, and/or other types of chronic disease (United Nations, 2012). A physical disability is often characterized by varying degrees of neuromuscular dysfunction that can impair a range of motor activities, such as walking or moving heavy objects (Jette & Branch, 1981). Individuals with physical disabilities may have compromised upper and/or lower limb function, depending on the nature and severity of their disability. Types of physical disability include: cerebral palsy, spinal cord injury, multiple sclerosis, spina bifida, rheumatoid arthritis, muscular dystrophy, and amputation.

According to the International Classification of Functioning, Disability and Health, the presence of impairments, in interaction with various attitudinal and environmental barriers, can hinder individuals’ level of functioning and overall participation in society (World Health Organization, 2013).

Approximately 4.4 million – or one in seven – Canadians (>15 years of age) have a disability, of which 7.2% are physical in nature (Statistics Canada, 2006). Furthermore, the 2012 Canadian Survey on Disability found that approximately 3.8 million (13.7%) Canadians over the age of 15 years reported having a disability that limited their daily activities (Statistics Canada, 2012). Disabilities related to pain, flexibility, and mobility are the most commonly reported, with 12% of Canadians over the age of 15 years reporting having at least one of these types of disabilities. Meanwhile, 1.3% of Canadian children and youth between the ages of 0 and 14 years have a physical disability (Statistics Canada, 2006, 2012). Co-occurring disabilities are also prevalent among individuals with physical disabilities. For example, 83% of Canadians over the age of 15 years who are living with mobility impairments also experience a pain-related disability, and
approximately 25% experience a co-occurring visual or hearing impairment (Statistics Canada, 2012).

Although advances in medicine have increased the lifespan of individuals with physical disabilities (Bowman, McLone, Grant, Tomita, & Ito, 2001; Oakshott & Hunt, 2003; Strauss, Shavelle, & Anderson, 1998), they remain at increased risk for developing secondary health conditions (Kalnins et al., 1999). Mobility limitations faced by individuals with physical disabilities may result in fewer opportunities to participate in physical activity (PA), and consequently an increased risk of developing lifestyle-related diseases such as diabetes mellitus, cardiovascular disease, obesity, metabolic syndrome, and chronic pain (Kalnins et al., 1999; Shields, Synnot, & Barr, 2012). Other secondary health conditions that commonly affect persons with physical disabilities include: osteoporosis, hypertension, increased spasticity, reduced muscular strength and endurance, reduced aerobic fitness, and depression (Buffart, Westendorp, van den Berg-Emons, Stam, & Roebroeck, 2009).

The presence of such secondary health conditions contributes to the compromised health, functional capacity, and quality of life of individuals with physical disabilities (Buffart et al., 2009). The development of these secondary health conditions among persons with physical disabilities is largely related to the presence of health risk behaviours, such as poor nutrition, sedentary lifestyle, and insufficient PA (Bauman, 2009; Rogozinski et al., 2007). Considering that PA has positive effects on both the prevention and management of secondary health conditions, it is critical to promote PA among individuals with physical disabilities.

1.2 The Need to Focus on Physical Activity in Youth with Physical Disabilities

The most recently established 24-Hour Movement Guidelines for Children and Youth recommend that youth ages 14 to 17 years accumulate at least 60-minutes of moderate-to-vigorous PA (MVPA), plus several hours of structured or unstructured light PA, low levels of sedentary behaviour (≤ 2 hours of recreational screen time), and sufficient sleep (8 to 10 hours per night) on a daily basis to achieve optimal health (Canadian Society for Exercise Physiology, 2016). However, youth with physical disabilities are not meeting these recommended guidelines, particularly in the domains of PA and sedentary behaviour (Arbour-Nicitoopoulou et al., 2017; Brunton & Barlett, 2010; Lai, Young, Bickel, Motl, & Rimmer, 2017; Law et al., 2004; Maher,
Williams, Olds, & Lane, 2007). Previous reports have shown that youth with physical disabilities are 4.5-times more physically inactive compared to typically developing youth and twice as likely to engage in more screen-time (e.g., watching television for more than four hours a day; Steele et al., 2004). Furthermore, secondary analyses of the 2005 Youth Risk Behaviour Survey revealed that youth with physical disabilities engage in more sedentary behaviour overall per school day than those without disabilities (26.6% versus 20.4%, respectively), and are less likely to participate in team sports (Grunbaum et al., 2002). Moreover, evidence from a systematic review found that children with cerebral palsy participate in 13% to 53% less PA than their typically developing peers (Carlon, Taylor, Dodd, & Shields, 2013). These rates of inactivity are similar, and in some cases much lower, than youth with other chronic medical conditions (Longmuir & Bar-Or, 2000; Mâsse, Miller, Shen, Schiariiti, & Roxborough, 2013). Overall, youth with physical disabilities spend less time participating in PA (Arim, Findlay, & Kohen, 2012; Imms, 2008; Westendorp, Hartman, Houwen, Smith, & Visscher, 2011), and spend more of their leisure time engaging in sedentary behaviours (Arbour-Nicitipoulos et al., 2017; Law et al., 2006; Maher et al., 2007). Evidently, there is a need to focus on youth with physical disabilities and their PA needs, as the current literature demonstrates that this population is highly inactive, and more so than other clinical populations (Longmuir & Bar-Or, 2000; Mâsse et al., 2013).

Focusing on PA promotion during adolescence is important, as this is a critical time when youth, regardless of ability, develop self-perceptions, attitudes, and behaviours which carry forward into adulthood (Zick, Smith, Brown, Fan, & Kowaleski-Jones, 2007). Patterns of health behaviours during adolescence, such as PA, typically persist into adulthood (Foxhall, 2006). Thus, it is important to focus on promoting and facilitating PA during adolescence, as such efforts can establish and/or solidify the long-term maintenance of that behaviour into adulthood, and ultimately reduce the risk of developing secondary health complications and improve overall quality of life. PA promotion may also be particularly important during adolescence, as this is typically when PA increasingly becomes a leisurely choice, thus making it a behaviour less likely to be engaged in (Dishman et al., 2005).
1.2.1 Benefits of Physical Activity for Youth with Physical Disabilities

Low levels of PA and increased time spent in sedentary activities among youth with physical disabilities is concerning, as these movement patterns increase this population’s risk for developing secondary health conditions. In particular, participating in PA is associated with improvements in the overall health of individuals with physical disabilities (Taylor, Dodd, & Larkin, 2004; Van der Slot et al., 2007), and has profound impact on positive growth, development, and social skills for all youth, regardless of ability (Kemper, 1995; King, King, Rosenbaum, Kertoy, & Young, 2003; Law et al., 2006). It is important to acknowledge that the evidence supporting the improved overall health of youth with physical disabilities lies largely in the promotion of PA rather than reducing sedentary behaviour. Although individuals with physical disabilities face unique challenges related to engaging in PA (see Section 1.2.2. for further discussion on the barriers to PA), the benefits that PA has to offer for all youth, regardless of ability (Janssen & LeBlanc, 2010; Paffenbarger, Hyde, Wing, & Hsieh, 1986), emphasize the need to focus on strategies to promote, facilitate, and enhance levels of PA in this population. The following sections will provide further details on the psychosocial and physiological benefits of PA for youth, and where available, the benefits of PA specific to youth with disabilities.

1.2.1.1 Psychosocial Benefits Associated with Physical Activity for Youth

The psychological and social benefits of regular PA have been studied extensively. PA has a protective effect against depressive symptoms (Biddle & Asare, 2011; Larun, Nordheim, Ekeland, Hagen, & Heian, 2006; McPhie & Rawana, 2015), and is associated with reduced anxiety (Biddle & Asare, 2011; Strong et al., 2005) in youth. PA also has a positive effect on self-concept (Liu, Wu, & Ming, 2015; Strong et al., 2005), which is defined as, “the organized configuration of perceptions about one’s attributes and qualities that are within conscious awareness” (Trost, 2005, p. 14). Furthermore, PA has been shown to be effective in promoting self-esteem (Ekeland, Heian, Hagen, Abbott, & Nordeim, 2004), which is defined as, “the evaluation of one’s self-concept and feelings associated with that evaluation” (Trost, 2005, p. 14). The effects of PA on self-esteem have been shown to have larger effects for youth with perceptual, emotional, and learning disabilities ($ES = 0.57$) compared to typically developing youth ($ES = 0.41$; Gruber, 1986). Self-perceptions, such as self-concept and self-esteem, are important indicators of motivation and psychological well-being (Fox, 1997a, 1997b). Self-
concept and self-esteem are also associated with positive perceptions of body attractiveness, sport competence, strength, and physical condition (Whitehead, 1995). Providing youth, particularly those with disabilities, with opportunities to enhance their self-concept and self-esteem through participating in PA could create a cyclical effect that makes future and continued PA participation more likely (Wang & Biddle, 2001).

Specifically for youth with disabilities, participating in PA provides the opportunity to form high quality friendships and positive self-perceptions of physical ability (Groff & Kleiber, 2001; Martin, 2008; Martin & Smith, 2002). PA also provides the opportunity for youth with physical disabilities to develop a strong athletic identity (Martin & Shapiro, 2010), which has been associated with better quality of life among youth with cerebral palsy (Groff, Lundberg, & Zabriskie, 2009), and has a positive influence on life satisfaction (Maiano, Ninot, & Errais, 2001). Among children and youth with disabilities, participating in PA is associated with reduced maladaptive behaviours, and improved self-esteem and social competence (Dykens, Rosner, & Buttarnaugh, 1998; Martin, 2010; Shapiro & Martin, 2010). Given that youth with disabilities often experience less peer acceptance and fewer quality friendships (Asch, 1986; Fitzgerald, 2005; Mulderji, 1997), participating in PA becomes increasingly important, as it provides opportunities to be surrounded by peers and foster quality friendships (Martin & Smith, 2002; Shikako-Thomas et al., 2009).

Specific to physical disability, there is limited research examining the psychosocial benefits of PA, with the majority of this research focusing on adults or solely sport participation. For example, participating in adapted sport has been found to enhance and maintain psychological functioning, enhance life satisfaction and perceptions of well-being, and reduce negative affect, psychological distress, and feelings of depression and anxiety among persons with disabilities across the lifespan (Cox, Thomas, & Davis, 2001; Dunn & McAuley, 2000; Groff et al., 2009; Yazicioglu, Yavuz, Goktepe, & Tan, 2012). Reduced symptoms of depression and anxiety, as a result of engaging in PA, can lead to improvements in mood, the development of positive perceptions of physical competence and athletic identity, and the confidence to increase and expand social support networks and peer interactions (Blinde & McLaughlin, 2001; Groff et al., 2009; Martin & Smith, 2002; Shapiro & Martin, 2010a; Shapiro & Martin, 2010b). In addition, participating in adapted sport has been found to enhance feelings of empowerment, as being physically active often leads to feelings of accomplishment and confidence in one’s ability to
perform PA (Hutzler & Sherrill, 2007). Feelings of empowerment typically manifest as increased self-efficacy, self-confidence, and improved physical self-concept and self-esteem (Groff et al., 2009). Not specific to sport, Patel and Greydanus (2002) highlight that PA participation allows youth with physical disabilities to foster independence, coping abilities, competitiveness, and teamwork. However, King et al. (2009) emphasize that PA participation must be meaningful in order to elicit the competency-related or psychosocial benefits of structured or leisure PA. Such meaningful PA experiences are associated with enjoyment and psychological engagement (i.e., experiences characterized by vigour, dedication, and initiative) that facilitate the accrual of the associated psychosocial and competency-related benefits for youth with physical disabilities (King et al., 2009). Together, these positive self-appraisals of health perceptions gained through participating in PA may mitigate the adverse impacts of disability on quality of life (Edwards, Patrick, & Topolski, 2003), further supporting the importance of PA for youth with physical disabilities.

1.2.1.2 Physiological Benefits Associated with Physical Activity for Youth

In addition to the aforementioned psychosocial benefits, youth with physical disabilities can experience many physiological benefits from engaging in regular PA. These benefits include: increased bone density, lean muscle tissue, muscular strength, endurance, and aerobic capacity, and a lowered risk of high blood pressure and obesity (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Janssen & LeBlanc, 2010). Regular PA also contributes to the maintenance of muscular strength, flexibility, and joint structure and function (Durstine et al., 2000; Janssen & LeBlanc, 2010). There is consistent evidence that PA substantially increases the life expectancy of youth with disabilities (Fernhall & Unnithan, 2002), and reduces the presence and severity of secondary health conditions (Council on Sports Medicine and Fitness & Council on School Health, 2006; King et al., 2003). Furthermore, PA has been found to improve muscular strength and function, and aerobic and anaerobic capacity in children and youth with cerebral palsy (Blundell, Shepherd, Dean, Adams, & Cahill, 2003; Dodd, Taylor, & Graham, 2004; Verschuren et al., 2007). PA may also be a safe and effective way to improve cardiorespiratory endurance in individuals with physical disabilities, such as cerebral palsy (Dodd, Taylor, & Damiano, 2002; Verschuren, Takken, Ketaloor, Gorter, & Helders, 2006) and spina bifida (Oliveira, Jacome, & Marcques, 2014). While most research examining the effects of PA on physical functioning in youth with disabilities has focused on youth with cerebral palsy, evidence consistently
demonstrates that muscle strengthening PA interventions have the capacity to improve physical function in this population, as measured by gait speed, gross motor abilities, and wheelchair propulsion (Ayalon, Ben-Sira, Hutzler, & Gilad, 2000; Dodd et al., 2004; Morton, Brownlee, & McFayden, 2005; Thorpe, Reilly, & Case, 2005). Evidently, participating in PA offers a variety of physiological benefits to youth with physical disabilities that can improve their overall health and quality of life.

1.2.2 Barriers to Physical Activity for Youth with Physical Disabilities

Despite the benefits of PA outlined in Section 1.2.1, youth with physical disabilities are less physically active than their typically developing peers (see Section 1.2 for further discussion). These higher rates of inactivity are attributable, in varying degrees, to the PA barriers youth with physical disabilities often encounter (Council on Sports Medicine and Fitness & Council on School Health, 2006). A systematic review by Shields et al. (2012) highlighted the personal, social, environmental, and policy- and program-related barriers that influence the PA behaviour of youth with physical disabilities. This section will outline examples of each of these four types of barriers.

Personal factors are defined as characteristics of the individual, and can include psychological factors, and body functions and structures (World Health Organization, 2013). For youth with physical disabilities, the most prominent personal factors that often act as barriers to PA include a lack of physical and social skills, preference for sedentary activities, fear, and a lack of knowledge about PA (e.g., unaware of how to use exercise equipment; Shields et al., 2012). Furthermore, youth with physical disabilities are often apprehensive about the possibility of facing stigma or attracting unwanted attention for having a disability (Anderson, Bedini, & Moreland, 2005; Hutzler, Fliess, Chacham, & van den Auweele, 2002).

Among youth with disabilities, the most commonly reported social barriers to PA include: parental attitudes and concerns about PA, a perceived lack of social support and/or friends to participate in PA with, and negative societal attitudes towards physical disability (Shields et al., 2012). For example, 21% of parents of youth with spina bifida reported that they believed recreation was more important for youth without disabilities (Field & Oates, 2001). In addition, youth with disabilities have reported not wanting to participate in PA because they believed their peers would perceive them as helpless (Anderson et al., 2005), or because parents of their
typically developing peers underestimated their ability to be physically active (Kang, Zhu, Ragan, & Frogley, 2007; Jones, 2003; Wilkinson, 1983). Many parents of typically developing youth often prioritize and focus on their child’s athletic achievement and ability to excel in sports, thereby dissuading the inclusion of youth with disabilities into community-based programming (Rimmer & Rowland, 2008). Because of the competitive nature of some sport and PA environments, parents of youth with disabilities often want to protect their child from participating in activities that may result in feelings of inadequacy or teasing by other children (Rimmer & Rowland, 2008).

With regard to the environment, inadequate and inaccessible facilities, and a lack of available transportation have been identified as the two major environmental barriers faced by youth with physical disabilities (Shields et al., 2012). Youth with disabilities often have substantially less access to the same opportunities as their typically developing peers (Kodish, Kulina, Martin, Pangrazi, & Darst, 2006), largely resulting from a lack of accessible facilities (Levinson & Reid, 1991). Common environmental barriers encountered by youth with physical disabilities in their communities include grass surfaces and play areas without ramps, making recreational areas inaccessible for youth who may use wheelchairs (Schreiber, Marchetti, & Crytzer, 2004).

Lastly, several policy- and program-related barriers have been identified in the literature as barriers to PA for youth with disabilities. For example, between 25% and 60% of parents of youth with physical disabilities have identified a lack of appropriate PA programming for their child (Field & Oates, 2001; Lieberman, Robinson, & Rollheiser, 2006; Levinson & Reid, 1991; Stuart, Lieberman, & Hand, 2006). Furthermore, 40% of a sample of youth with disabilities themselves have reported a lack of opportunity to be physically active (Stuart et al., 2006), and over one-third (35%) have reported feeling a lack of appropriate transitional programming from a rehabilitative to community setting (Kang et al., 2007). Even within adapted PA programs, there are rules and specifications that are exclusionary in nature. For example, one study reported that power wheelchairs were not permitted in a wheelchair basketball competition (Anderson et al., 2005).

In addition to these policy-related barriers, the way adapted PA programs are structured and led by staff within the community may be of concern to parents. For example, parents of youth with cerebral palsy reported that sports teams were often too large, waitlists were too long, and their
child’s abilities were being underestimated (Verschuren, Wiart, Hermans, & Ketelaar, 2012). A lack of necessary and knowledgeable staff who can accommodate and support those with physical disabilities during PA has been identified as another key program-based barrier to PA (Schreiber et al., 2004). In order to effectively promote inclusion and encourage youth with disabilities to participate in PA, it is necessary to have staff who understand how to adapt an activity to meet the needs of youth with a range of abilities (Schreiber et al., 2004). Despite the need to address the issue of providing accessible PA program opportunities for youth with physical disabilities, parents report a lack of administrative interest (e.g., applying for funding and leading after-school programs; Eriks-Brophy et al., 2007; Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004). Not only are opportunities to participate in adapted PA programs scarce, existing programs that do address the unique needs of youth with physical disabilities are often very costly and financially inaccessible for many families (Shields et al., 2012).

In another systematic review by Martin Ginis, Ma, Latimer-Cheung, and Rimmer (2017), over 200 factors related to leisure-time PA (LTPA) participation were extracted from 22 review articles addressing barriers and facilitators to LTPA in youth and adults with physical disabilities. Factors were classified into five levels of the social ecological model (i.e., intrapersonal, interpersonal, institutional, community, and policy). At the intrapersonal level, the most frequently cited barriers related to LTPA participation included depression, anxiety, and fear and embarrassment related to participating in PA. Positive beliefs about being active (e.g., the opportunity to build new friendships and improve physical function) and about one-self (e.g., self-efficacy) were frequently cited as facilitators to LTPA. At the interpersonal level, there was consistent evidence across all reviews supporting the role of social support in facilitating PA. Conversely, others’ negative attitudes towards disability were frequently cited as another barrier to PA. At the institutional level, disability-specific knowledge of staff within institutions and organizations, the availability and quality of rehabilitative processes, facility accessibility, and the availability of ‘fun and enjoyable’ activities were commonly cited facilitators in the majority of reviews, and were positively associated with LTPA participation. At the community level, most reviews emphasized the importance of having access to opportunities for recreation and sport, including sport equipment, and information about those opportunities. Climate also emerged as a frequently cited community-level factor influencing PA behaviour. Lastly, at the policy level, the financial costs of participating in PA programs, and a lack of accessible
transportation services and support from trained staff/professionals within PA programs have been frequently identified as barriers to LTPA participation. By classifying barriers and facilitators into the five levels of the social ecological model, Martin Ginis et al. (2017) provided a framework to inform which variables may be valuable to target in interventions, and also provokes thought about the types of interventions needed to impact different factors at different levels (e.g., policy-level interventions to address financial and transportation barriers).

The barriers identified in the systematic reviews by Shields et al. (2012) and Martin Ginis et al. (2017) parallel one another, and account for the main challenges that are encountered by youth with physical disabilities that can limit their opportunities to participate in PA within their communities.

1.3 Community-based Physical Activity Interventions for Youth with Physical Disabilities

Evidently, there is a need to address the issue of insufficient PA among youth with physical disabilities, and to identify strategies to mitigate the many barriers to PA this population is often challenged with to successfully increase their levels of PA within the community. However, there exists a gap in designing effective community-based interventions for youth with physical disabilities (Murphy & Carbone, 2008; Rimmer & Rowland, 2008). The majority of studies implementing PA interventions among youth with physical disabilities have focused on improving fitness in clinical settings, where many of the common barriers to PA (e.g., transportation, lack of knowledgeable staff, and adaptation of programs and/or facilities) are minimized (Rimmer & Rowland, 2008). The lack of community-based PA programs (defined as within naturalistic settings outside of a hospital or clinical environment) for youth with physical disabilities is concerning, as it limits their opportunities to be physically active in a setting where PA can be perceived as a social rather than medical or therapeutic activity (Darrah, Wessel, Nearingburg, & O’Connor, 1999). To minimize the perceived medicalization and enhance enjoyment of participating in PA, it is important to provide community-based opportunities to youth with physical disabilities and to evaluate the effectiveness of such PA programs. There are only three studies that have been published on the effects of community-based PA interventions for youth with physical disabilities. The remainder of this section will provide an overview and critique of these studies.
The first study (Fragala-Pinkham, Haley, & Goodgold, 2006) involved a 16-week community-based fitness program that included 28 children and youth, ages 6 to 14 years, with neuromuscular and developmental disabilities. During this intervention, participants completed strengthening, aerobic, and flexibility exercises twice a week. By the end of the intervention, participants demonstrated significant improvements in functional mobility, muscular strength, and flexibility. The authors concluded that children and youth with physical disabilities could feasibly and safely participate in community-based PA programming with appropriate supervision and guidance from knowledgeable staff (Fragala-Pinkham et al., 2006). Despite these positive outcomes, this study did not investigate the PA behaviour of youth beyond their participation in the community-based fitness program, nor did it investigate the potential role of psychosocial factors. Exploring these topics further may have provided insight on whether youth were seeking, or had available to them, other community-based fitness or PA programs to sustain the positive effects they experienced, beyond their participation in the fitness intervention.

In another study, 14 children and youth with physical disabilities, ages 8 to 13 years, participated in a six-week fitness intervention, involving one hour of aerobic and strengthening exercises per week (Schreiber et al., 2004). Case study findings demonstrated that one of the participants (aged 11 years) showed decreased energy expenditure and ratings of perceived exertion, indicating improved fitness (Schreiber et al., 2004). Furthermore, this participant’s maximum running velocity and levels of parent-reported daily activity at home increased (Schreiber et al., 2004). A strength of this study was that the authors evaluated participants’ PA behaviour outside of the clinical setting, whereas Fragala et al. (2006) only considered fitness and its related outcomes (i.e., strength, aerobic capacity, and flexibility) in a clinical setting. Despite the advantage of examining the PA of youth beyond the clinical setting, this outcome was assessed based on parents’ observational reports of their children’s activity levels, which introduces the risk of response bias and is not always reflective of actual behaviour. Outcomes for the other children and youth participating in this intervention were not reported on, thus reducing the generalizability of these findings. The authors also emphasized the importance of assessing psychosocial factors, such as self-esteem, social competence, and knowledge relating to fitness and health, in future studies.

In the third community-based PA intervention, 23 children and youth with cerebral palsy, ages 11 to 20 years, completed a 10-week fitness intervention, involving one hour of strengthening,
aerobic, and flexibility exercises three times per week (Darrah et al., 1999). Although cardiovascular function remained unchanged, significant improvements were found in muscular strength (e.g., shoulder press, lateral pull-downs, leg press, bicep curls, and hip abduction; Darrah et al., 1999). In addition to these physiological improvements, it was found that completing the PA intervention improved participants’ perceptions of their physical appearance, as measured by the Self-Perception Profile for Adolescents and Children (Harter, 1985). However, their perceived competence to participate in sports and athletic activities remained unchanged (Darrah et al., 1999). These findings led the authors to conclude that resistance exercise is beneficial for youth with cerebral palsy. This study was unique from the two aforementioned community-based PA interventions discussed in this section, and PA interventions targeted towards this population overall, as the authors did not only focus on fitness-related outcomes, but also assessed social cognitive variables related to PA. Despite this strength, the authors highlighted a few methodological limitations. The authors were not able to achieve a stable baseline for measures of flexibility, and stated, based on previous evidence (Bar Or, Inbar, & Spira, 1976), that 10 weeks was likely too short of a period to have an effect on cardiovascular endurance in this population. Further, the authors indicated that there was a lack of sustained intensity during the aerobic exercises, and that wide range of ability and age (ranging from 11 to 20 years) may have confounded findings.

While the aforementioned community-based PA interventions contribute to a body of knowledge on translating outcomes from clinical- or hospital-based programs to community-based PA settings and demonstrate high internal validity, the controlled nature of these interventions poses a threat to their external validity. The discrepancy between internal and external validity is one of the major challenges associated with health behaviour intervention research (Swanson-Fisher, Bonevski, Green, & D’Este, 2007). For example, the controlled nature and minimal presence of barriers (e.g., knowledgeable staff, access to facilities, adapted activities) in PA interventions that are typically conducted may not reflect the current climate of PA opportunities that youth with physical disabilities have access to within their communities (Magill-Evas, Darrah, & Adkins, 2003; Shields & Synnot, 2016).

Moreover, PA interventions with a focus on exercise or fitness training have not been found to be effective in facilitating long-term PA behaviour change (Verschuren et al., 2007). Although the abovementioned interventions successfully enhanced markers of physical fitness (e.g.,
muscle strength and heart rate during submaximal exercise) among youth with physical disabilities, PA is a complex health behaviour that can be difficult to maintain. Adopting and maintaining consistent levels of PA can be challenging, and often requires substantial effort and continued perseverance on the part of the individual and their families (McAuley & Blissmer, 2000). Currently, there exists a gap in understanding how to facilitate longer-term behaviour change among youth with physical disabilities to enhance their PA participation beyond their experience in a controlled PA intervention. Evoking longer-term behaviour change requires the development of interventions that target theoretical correlates that have demonstrated strong associations with the PA behaviour of youth with physical disabilities (Baranowski, Anderson, & Camarack, 1998; Lubans, Foster, & Biddle, 2008). The following section will discuss correlates of PA in youth with physical disabilities that can be targeted in PA interventions to enhance the longevity of behavioural changes that may occur versus those observed in interventions only targeting fitness outcomes.

### 1.4 Correlates of Physical Activity Behaviour in Youth with Physical Disabilities

In order to design effective PA interventions for this population, it is important to identify correlates of PA that are specific to youth with physical disabilities (Baranowski et al., 1998; Lubans et al., 2008). Correlates can be categorized as modifiable (i.e., can be targeted through intervention; e.g., self-efficacy), or non-modifiable (i.e., cannot be changed by intervention; e.g., gender and age; Biddle & Fuchs, 2009). A systematic review by Shields et al. (2012) found that the most commonly identified correlates of PA among children and youth, under the age of 18 years, with disabilities included: physical skills, motivation, enjoyment, support or acceptance from others, and accessibility to opportunities or facilities to be physically active. These correlates are generalizable to youth with disabilities, but are not specific to those with physical disabilities.

In a recent systematic review by Li et al. (2016), several modifiable psychological (e.g., preference for PA, mastery motivation, and perceived athletic competence), behavioural (e.g., involvement in daily activities), physical (e.g., gross motor function), and social (e.g., families’ attitudes towards PA) correlates were identified as being consistently and positively associated with PA in children and youth with physical disabilities between the ages of 6 and 18 years. Of
these domains, psychological and behavioural correlates were identified as the most prevalent and consistent. Some non-modifiable correlates (e.g., intellectual ability and parents’ ethnicity) were also found to be consistently but negatively associated with PA (Li et al., 2016). Given that non-modifiable correlates cannot be changed, it is important to focus on modifiable, theory-based correlates of PA among youth with physical disabilities as potential targets to intervene upon. Considering that psychological correlates are most consistently and positively associated with PA in typically developing youth (Lubans et al., 2008), the following sections will briefly review PA interventions targeting psychological correlates in typically developing youth.

1.5 A Brief Review of Physical Activity Interventions Targeting Psychological Correlates in Typically Developing Youth

Although Li et al. (2016) found that psychological and behavioural correlates are consistently and positively associated with the PA behaviour of youth with physical disabilities, there is limited intervention work targeting these correlates in this population. However, there is evidence supporting the utility of targeting psychological correlates in PA interventions among typically developing youth (Lubans et al., 2008). For example, a systematic review conducted by Craggs, Corder, Van Sluijs, and Griffin (2011) found consistent and positive associations between self-efficacy and changes in PA behaviour among children and youth (ages 10 to 18 years). In another systematic review, Lubans et al. (2008) found that self-efficacy mediated increases in the PA behaviour of youth. In addition to self-efficacy, Lubans et al. (2008) found that, although limited, there was some evidence for the utility of behavioural strategies (e.g., planning) as mediators of change in PA behaviour among youth. Despite the identification and synthesis of findings from mediation studies examining the role of psychological correlates on the PA behaviour of youth, specifically self-efficacy and behavioural strategies, there were only seven studies included in Luban et al.’s (2008) systematic review. Not all seven studies met the criteria for mediation analyses, thus limiting the authors from forming strong conclusions regarding which factors were most strongly associated with or mediated changes in PA behaviour.

There is a lack of research examining PA interventions targeting psychological correlates of PA in youth with physical disabilities. However, evidence from the literature focusing on typically developing youth provides insight on which correlates have the strongest relationships with PA
behaviour, and can provide some rationale for factors that may be worthwhile to target in PA interventions for youth with physical disabilities. Identifying factors that are consistently associated with or mediate behaviour change allows for the consideration of which psychological theories best align with those factors that have demonstrated the strongest relationships with PA behaviour, and would be most effective as targets of PA interventions for youth. Theory-based interventions are important, as they allow for the identification of the active ingredients of an intervention to better understand intervention effects, which can then be targeted in the future (Bartholomew, Parcel, Kok, & Gottlieb, 2006; Michie et al., 2013). Generally, previous PA interventions delivered to youth that were not guided by theory or did not target theory-based constructs have shown little success in facilitating behaviour change (Dishman & Buckworth, 1996; Baranowski et al., 1998; Lewis, Marcus, Pate, & Dunn, 2002). The following section will discuss how the aforementioned psychological correlates align with Social Cognitive Theory (SCT), and the use of SCT in youth PA research.

1.6 The Use of Social Cognitive Theory as Guiding Framework in Youth Physical Activity Research

The psychological correlates that are associated with or have been found to predict the PA behaviour of youth (i.e., self-efficacy, self-monitoring, goal-setting, and planning) are rooted in the basic principles of self-regulation (Hynenen et al., 2016). Many psychological theories focus on self-regulation, including SCT (Bandura, 1991; 1997). SCT is one of the most widely used theoretical frameworks for the study and promotion of PA (Young, Plotnikoff, Collins, Callister, & Morgan, 2014), as well as other health behaviours (Webb, Joseph, Yardley, & Michie, 2010) within the general population. SCT holds that behaviours are influenced by personal, behavioural, and environmental factors, and that these factors are dynamic and have a reciprocal relationship with each other. Key SCT constructs that aid in our understanding of behaviour include: outcome expectations, self-efficacy, social support, and self-regulation (e.g., goal-setting, self-monitoring, and planning; Bandura, 1997). Outcome expectations relate to the belief about the likelihood of a behaviour leading to a specific outcome, and the value placed on that outcome (Maddux, Sherer, & Rogers, 1982). Self-efficacy can be defined as the belief in one’s own capabilities to successfully complete a course of action (Bandura, 1997). Social support relates to the perceived and actual encouragement from a trusted network or source, and aids in the long-term maintenance of behaviour change by enhancing self-efficacy (Bandura, 2004).
Lastly, *self-regulation* can be defined as a set of psychological processes aimed at the attainment and maintenance of personal goals (Maes & Karoly, 2005). Self-regulation is goal-directed, and by taking an active rather than passive role in the management of behaviour, it is postulated that individuals develop personal and sustainable ways to achieve goals (Maes & Karoly, 2005). Setting goals, planning the actions necessary to achieve them, monitoring progress, and solving problems that arise during the pursuit of goals are all fundamental processes that lead to behaviour change (Maes & Karoly, 2005). SCT can be used to understand health behaviour change in a variety of domains, including PA (Bandura, 2004; Martin Ginis et al., 2011; Nahas, Goldfine, & Collis, 2003; Plotnikoff et al., 2013).

There is a lack of research examining SCT-based predictors of PA behaviour among youth with physical disabilities. However, there is evidence suggesting that certain variables aligning with SCT are associated with and influence the PA behaviour of typically developing youth. For example, self-efficacy and outcome expectations have been found to be direct predictors of PA behaviour in typically developing children and youth, explaining 9% to 15% of the variance in PA behaviour (Harmon et al., 2014; Martin, McCaughtry, & Shen, 2008). In another study, significant associations were found between SCT constructs (i.e., outcome expectations, self-efficacy, and self-regulation) and self-reported moderate and vigorous LTPA of high school students, with SCT constructs together accounting for 29% of the variance observed in vigorous LTPA (Winters, Petosa, & Charlton, 2003).

Despite evidence demonstrating that SCT constructs are associated with or predict the PA behaviour of typically developing youth, the relationships between these SCT variables and the PA behaviour of youth with physical disabilities remains unexplored. However, there is evidence that SCT is a useful framework for predicting the PA behaviour of adults with spinal cord injury. Martin Ginis et al. (2011) conducted a comprehensive examination of each of the SCT constructs (i.e., self-efficacy, outcome expectations, social support, and self-regulation; see Figure 1 for a model that conceptualizes these SCT-based determinants of PA) among adults with spinal cord injury. This model suggests that higher levels of self-efficacy and expectations of positive outcomes lead to increased use of self-regulatory skills (i.e., planning, self-monitoring, problem solving, and goal-setting), which are essential to create and maintain behaviour change (Bandura, 1997, 2004). Overall, the four SCT constructs predicted 39% of the variance in PA behaviour, with self-regulation being the only significant direct predictor. Self-regulatory efficacy and
outcome expectations had indirect effects mediated through self-regulation (Martin Ginis et al., 2011). Although further work is needed to understand the specific role of each of the SCT constructs on the PA behaviour of individuals with physical disabilities, Martin Ginis et al.’s (2011) work demonstrated that SCT is a useful framework for predicting the PA behaviour of adults with spinal cord injury. Taken together, research focusing on typically developing youth (Winters et al., 2003) and adults with spinal cord injury (Martin Ginis et al., 2011) suggests that SCT may be a useful theoretical framework for developing an intervention to promote PA among youth with physical disabilities, particularly when targeting self-regulation. The following section will provide a brief review of studies that have targeted SCT variables in PA interventions targeted towards typically developing youth and youth with disabilities.
Figure 1. Model Conceptualizing SCT-Based Determinants of Physical Activity
1.7 A Brief Review of Physical Activity Interventions Targeting Social Cognitive Variables in Youth

This section will discuss a few key studies within the literature that have examined the effects of SCT-based PA interventions among typically developing youth. In one study, a quasi-experimental, non-equivalent comparison group research design was used to examine the effects of an SCT-based intervention among 240 rural high school students \((M_{age} = 15.23\) years\) enrolled in physical education classes (Hortz & Petosa, 2006). The objective of this intervention was to increase moderate and vigorous LTPA by targeting self-efficacy, outcome expectations, and self-regulation. In addition to the regular physical education curriculum that both the experimental and control groups were exposed to, the experimental group also participated in the “Planning to be Active” intervention, in which they were taught an SCT-based behavioural skill-building curriculum. This intervention was delivered once a week during physical education classes for eight weeks, with the purpose of promoting the use of self-regulation skills (e.g., goal-setting, self-monitoring, and planning) to foster regular PA outside of the classroom. Students were also taught how to identify and overcome barriers to PA to enhance self-efficacy for PA, and discussed outcome expectations with regard to experiencing physical, social, and self-evaluative outcomes. The intervention led to enhanced self-regulation, which mediated increases in self-reported moderate-intensity PA behaviour outside of the classroom (Hortz & Petosa, 2008), as measured using the Previous Day Physical Activity Recall (Weston, Petosa, & Pate, 1997). These results demonstrated that an SCT-based intervention can enhance self-regulation in youth, and subsequently mediate increases in PA behaviour, thus providing evidence for future youth-focused interventions to target self-regulation (Hortz & Petosa, 2008). Notably, the intervention was more effective for students who were previously sedentary, who increased their mean days of moderate-intensity PA by 2.88 days, compared to an increase of 1.32 days reported by their more active peers (Hortz & Petosa, 2006). Given the intervention’s primary focus on self-regulation, this impact observed among previously sedentary students suggests that utilizing self-regulatory skills may be particularly useful for sedentary youth to become more physically active. This finding is particularly relevant for youth with physical disabilities, who tend to be less active and prefer sedentary activities more than their typically developing peers (King et al., 2003; Law et al., 2006; Rimmer & Rowland, 2008), and provides the rationale to incorporate SCT constructs, specifically self-regulation, in PA interventions targeted towards youth with physical disabilities.
In a separate SCT-based intervention, a randomized controlled trial was conducted to examine the effects of the Lifestyle Education for Activity Program (LEAP), a two-year school-based intervention intended to increase PA among 2,087 female youth ($M_{age} = 13.6$ years; Dishman et al., 2004). This intervention adopted a social ecological model that emphasized key features of SCT to enhance self-efficacy for PA through: facilitating successful PA experiences both inside and outside of the school environment, and developing the physical (e.g., aerobic and weight training) and self-regulatory skills (e.g., goal-setting, time management, and self-reinforcement) skills necessary to adopt and maintain a physically active lifestyle. Latent variable structural equation modeling indicated that the intervention had small, but statistically significant direct effects on self-efficacy, goal-setting, and PA behaviour, and that self-efficacy partially mediated the effects of the intervention on PA behaviour. Findings from this study demonstrated the value of targeting self-efficacy as a mediator variable in PA interventions for youth.

In a separate SCT-based intervention, another randomized controlled trial was conducted to examine the effects of Project GRAD (Graduate Ready for Activity Daily), which was a 16-week intervention intended to increase the PA behaviour of university students ($M_{age} = 24.0$ years; Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). Participants in the intervention arm were provided with information on behaviour change strategies and PA principles during weekly 50-minute lectures, and then had the opportunity to discuss and apply those strategies and principles during weekly 110-minute peer-led discussions. Similar to the findings by Dishman et al. (2004), self-efficacy was enhanced and found to mediate changes in PA from pre- to post-intervention (Sallis et al., 1999). Although in an older cohort of youth, these findings demonstrate that shorter interventions can also be successful by targeting social cognitive mechanisms of behaviour change (Sallis et al., 1999). Taken together, the findings by Dishman et al. (2004) and Sallis et al. (1999) demonstrate that self-efficacy mediates increases in the PA behaviour of youth, and that shorter interventions targeting self-efficacy can successfully mediate changes in PA behaviour.

The evidence discussed in this section provides further support for targeting SCT constructs in interventions designed to increase PA among youth. The following section will review and discuss SCT-based PA interventions targeted towards youth with disabilities.
1.8 A Review of Physical Activity Interventions Targeting Social Cognitive Variables in Youth with Disabilities

Only two studies thus far have examined the effects of SCT-based PA interventions among youth with disabilities. In one such study, four youth with visual impairments (ages 14 to 19 years) participated in an after-school, SCT-based PA intervention, which consisted of nine lessons over a span of five weeks (Cervantes & Porretta, 2013). The purpose of the intervention was to increase LTPA duration and intensity, which was measured using accelerometry. Lessons were intended to address self-efficacy (e.g., overcoming barriers), self-regulation (e.g., goal-setting), outcome expectations (e.g., health risks associated with inactivity and the social benefits of PA), and social support. Throughout the intervention, participants’ time spent engaging in 10-minute bouts of light-, moderate-, or vigorous-intensity LTPA increased, but was not maintained at the one- and three-week post-intervention assessments. Total time spent engaging in bouts of light to vigorous PA was summed for each day of the intervention, and therefore, the authors did not specify which specific intensities of LTPA increased. Nonetheless, the intervention did increase participants’ duration of LTPA, which was a desired outcome. Furthermore, there were positive changes for some of the SCT constructs, with two participants experiencing positive changes in all four SCT constructs, and two experiencing positive change in outcome expectations only. The observed increases in PA and changes in the SCT constructs are consistent with findings from other school-based PA behaviour studies targeting variables that align with SCT in typically developing youth (e.g., Lubans & Sylva, 2006; Schneider et al., 2007). These findings provide support for targeting SCT variables in interventions designed to increase PA among youth with disabilities.

In the second study, Maher et al. (2010) conducted a randomized controlled trial to examine the effects of an eight-week, internet-based PA program (‘Get Set’) among 41 youth with cerebral palsy. This intervention was based on SCT, and its goals were to increase levels of PA, and improve PA knowledge, attitudes, self-efficacy, intentions, and functional capacity (Maher et al., 2010). Short-term improvements were found in MVPA behaviour and knowledge, but these effects were not sustained at 2 and 12 weeks post-intervention (Maher et al., 2010). Furthermore, the intervention had a negative effect on self-efficacy for PA two-week post-intervention (Maher et al., 2010). The authors suggested that participation in the intervention may have heightened participants’ awareness of the difficulties associated with PA behaviour change, and in so doing,
decreased their self-efficacy (Maher et al., 2010). A major limitation of this study was that the authors only targeted and assessed one of the SCT constructs – self-efficacy. Given previous evidence demonstrating that three of the four SCT constructs (i.e., outcome expectations, self-efficacy, and self-regulation) can be modified through a PA intervention, and subsequently mediate increases in PA among youth (both typically developing and with disabilities; Hortz & Petosa, 2008; Cervantes & Porretta, 2013), it is important that these three constructs of SCT are targeted and assessed in future PA intervention research involving youth with disabilities. Furthermore, only youth with cerebral palsy were included in the sample, thus, the effects of an SCT-based intervention (online or otherwise) remain unknown for youth with other types of physical disabilities.

The randomized controlled trial by Maher et al. (2010) was the first study to deliver an SCT-based intervention through the Internet to youth with cerebral palsy. Despite the aforementioned study limitations, Maher et al. (2010) demonstrated that SCT-based PA-enhancing interventions can elicit behaviour change in youth with physical disabilities, even when delivered through technology-based means. Although current evidence supports the impact of face-to-face SCT-based interventions on the PA behaviour of typically developing youth and youth with visual impairments, this traditional method of delivery is of limited value for populations who face challenges with accessibility, including youth with physical disabilities (Maher et al., 2010). There is a need to focus not only on using theory as a framework for the development of effective PA interventions for youth with physical disabilities, but also on ensuring that PA interventions are delivered in a manner that is accessible to this population. Technology-based interventions may offer an alternative for individuals with physical disabilities, as they may be unable to attend traditional face-to-face PA programs due to environmental barriers (e.g., transportation and accessibility) they may encounter (Martin Ginis et al., 2017; Shields et al., 2012). The following section will discuss the potential value of Internet-delivered interventions for youth with physical disabilities, and discuss current evidence of the effects of interventions delivered through the Internet on the PA behaviour of typically developing youth.
1.9 Exploring the Use of Internet-Delivered Physical Activity Interventions for Youth with Physical Disabilities

There has been a dramatic increase in technology-based health behaviour interventions, also termed “eHealth interventions”, with one of the main benefits being their extended reach to individuals (Cushing & Steele, 2010). eHealth interventions are defined as applications of technology that seek to either improve an individual’s understanding of health information or use technology as a surrogate for the clinician in treatment delivery (Boschen & Casey, 2008; Palermo, 2008; Palermo & Wilson, 2009). eHealth interventions can be delivered through mobile and/or smart phones, closed computer systems (i.e., with no Internet access), or the Internet (Ritterband et al., 2003; Palermo & Wilson, 2009). In particular, the Internet has been shown to be an effective method to deliver health behaviour change interventions to youth (Marshall, Leslie, Bauman, Marcus, & Owen, 2003). Exploring the value of using the Internet as a mode of PA intervention delivery may be of value for youth with physical disabilities, as this method of intervention delivery would eliminate the common challenges of accessibility and transportation that are often encountered by this population.

Internet delivery creates the opportunity to increase the reach of PA interventions, as there is evidence that the majority of youth with physical disabilities have access to and use the Internet. For example, Internet access and use was examined in 97 youth with cerebral palsy or acquired brain injury, and it was found that 99% of the sample had access to Internet at home, and 79% reported frequently using e-mail or instant messaging (Lathouwers, de Moor, & Diden, 2009). It was also found that this sample of youth with physical disabilities used the Internet, on average, 4.85 days per week, and are online for 2.93 hours a day (Lathouwers et al., 2009). Furthermore, pilot studies investigating Internet use patterns in youth ages 10 to 18 years with cerebral palsy, muscular dystrophy, or acquired brain injury have found that 95% of respondents used the Internet for instant messaging, school work, social networking with friends/family, e-mail, and using YouTube™ (Newman, Wood, Raghavendra, Lawry, & Sellwood, 2010; Raghavendra, Virgo, Olsson, Connell, & Lane, 2011; Raghavendra et al., 2011). Apart from Internet access and use, a Canadian study investigating a six-month social support intervention for 22 youth (ages 12 to 18 years) with cerebral palsy or spina bifida found that participants considered online interventions helpful for learning new information in an enjoyable manner (i.e., participants reported that a computer-mediated intervention was fun; Barnfather, Stewart, Magill-Evans, Ray,
& LeTourneau, 2011). These findings support the use of the Internet as a platform to deliver PA interventions to youth with physical disabilities.

Although there is limited research investigating the effects of Internet-based interventions on the health behaviour of youth with physical disabilities, there is evidence that SCT-based Internet interventions can enhance key theoretical constructs (e.g., self-regulation) and the PA behaviour of typically developing youth and young adults. Specific to children and youth (ages 6 to 18 years), evidence from a systematic review found that PA interventions delivered through the Internet or mobile phones have demonstrated positive and significant within-group differences in at least one psychosocial (e.g., self-efficacy and PA intentions) or behavioural (light and moderate PA and step count) outcome (Lau, Lau, Wong, & Ransdell, 2011). In another systematic review, Hamel, Robbins, and Wilbur (2010) found that computer- and web-based interventions demonstrate statistically significant increases in the PA behaviour of children and youth (ages 8 to 18 years). Five of the nine studies included in the systematic reviews by Lau et al. (2011) and Hamel et al. (2010) were based on SCT, suggesting that SCT may not only be a suitable theoretical framework for guiding the development of traditional PA interventions targeted towards youth, but also for technology-based PA interventions. Hamel et al. (2011) highlighted that computer- and web-based interventions that are theory-driven are more likely to result in positive outcomes than those that are atheoretical in nature (Hamel et al., 2010). Given that utilizing theory increases the likelihood of intervention effectiveness (Baranowski, Cerin, & Baranowski, 2009; Hamel et al., 2010; Noar, Benac, & Harris, 2007; Weinstem, 2007), behavioural theories should not only be used as a guiding framework in the planning and development of traditional interventions, but also for interventions that are delivered through alternative methods, such as the Internet or other technology-based platforms.

In young adults, a randomized controlled trial by Suminski and Petosa (2006) examined the efficacy of an online, nine-week intervention developed for promoting the use of SCT strategies related to PA among a sample of 127 college students ($M_{\text{age}} = 21.3 \pm 5.5$ years). The intervention consisted of assignments that targeted self-efficacy, social support, and self-regulation strategies (e.g., goal setting, self-monitoring, and planning for long-term PA). Participants who completed the online SCT-based PA intervention demonstrated increased use and knowledge of self-regulatory skills compared to the control group (Suminski & Petosa, 2006). While the impact of this intervention on PA behaviour was not examined, the results demonstrate that SCT-based
interventions delivered through the Internet may positively impact the knowledge and use of self-regulatory strategies and skills for changing PA behaviour in a population who commonly uses the Internet.

In a second randomized controlled trial, the immediate and long-term effects of a six-week, SCT-based online intervention were examined on the self-reported moderate-intensity PA behaviour of 45 female college students (ages 18 to 24 years; Wadsworth & Hallam, 2010). In this study, participants in the intervention arm were given access to a series of websites on a weekly basis that targeted SCT variables (e.g., goal setting, self-monitoring, reinforcements, and outcome expectations). At the end of the six weeks, participants self-reported significantly more days of moderate-intensity PA, with the use of self-regulatory strategies mediating this change (Wadsworth & Hallam, 2010). However, increased levels of self-reported PA were not sustained at six-month follow-up.

Although long-term maintenance of behaviour change is a widespread challenge of intervention research, the findings from the studies by Suminski and Petosa (2006) and Wadsworth and Hallam (2010) demonstrate that SCT variables and self-reported PA can be enhanced in the short-term (i.e., six to nine weeks) through Internet-delivered interventions. Current evidence of the effects of Internet interventions on the PA behaviour of youth and young adults, and Internet usage patterns among youth with physical disabilities provides rationale for the continued examination of the utility of SCT-based Internet PA interventions for youth with physical disabilities.

Given the novelty of online PA interventions for youth, regardless if they are typically developing or have a disability, it is critical to examine the feasibility of an intervention of this nature by conducting a pilot study. A pilot study can be defined as “... [a] test of the methods and procedures to be used on a larger scale if the pilot study demonstrates that the methods and procedures can work” (Last, 2001) or “... [an] investigation designed to test the feasibility of methods and procedures for later use on a large scale or to search for possible effects and associations that may be worth following up in a subsequent larger study” (Everitt, 2006). Rationales for conducting a pilot study include: (1) to assess the feasibility of study procedures that are key to its success, and (2) to examine whether the intervention had an effect on its recipients, and if so, what the effects were (van Teijlingen, Rennie, Hundley, & Graham, 2001).
Although online SCT-based interventions have been found to enhance SCT constructs and PA behaviour in typically developing youth and young adults, evidence for the effects of an online SCT-based intervention for youth with physical disabilities is limited and remains largely unknown. This highlights the need to conduct a pilot investigation to build an understanding of whether such an intervention would be appropriate and valuable for this population prior to moving forward with a larger scale study.
Chapter 2
Rationale, Research Objectives, Research Questions, and Hypotheses

2 Rationale, Research Objectives, Research Questions, and Hypotheses

2.1 Rationale

Taking into consideration the discussion highlighted in Chapter 1, there is a gap within the literature examining theory-based PA interventions in youth with physical disabilities. The increased risk for inactivity and developing inactivity-related secondary health conditions among this population warrants the need to develop and evaluate theory-based interventions targeting PA correlates specific to youth with physical disabilities (Li et al., 2016). Based on past PA intervention work in clinical pediatric populations and typically developing youth, behavioural interventions targeting social cognitive variables, specifically outcome expectations, self-efficacy, and self-regulation, have been shown to be the most effective in facilitating increased PA behaviour (Cushing & Steele, 2010; Hertz & Petosa, 2006).

However, the many barriers that youth with physical disabilities often encounter (Martin Ginis et al. 2017; Shields et al., 2012) may minimize their opportunities to access traditional, face-to-face behavioural interventions intended to enhance these social cognitive variables. Considering that the majority of youth with physical disabilities have access to and often use the Internet for instant messaging, social networking, and YouTube™ (Newman et al., 2010; Raghavendra et al., 2011), using the Internet as a platform may serve as an effective strategy to deliver behavioural PA interventions to this population (Maher et al., 2010).

2.2 Research Objectives and Questions

2.2.1 Research Objectives

The rationale presented in Section 2.1 framed the following objectives for the current study. The first objective was to examine the feasibility of an online, SCT-based PA intervention (entitled Plan to Move) targeting youth (ages 12 to 21 years) with physical disabilities. The second
objective was to examine the short- and longer-term effects of this PA intervention on SCT constructs and the self-reported PA behaviour of this sample.

2.2.2 Research Questions

Based on the aforementioned objectives in Section 2.2.1, the following research questions were posed:

1. What is the feasibility (i.e., implementation fidelity, intervention compliance, and intervention acceptability; see Section 3.5.2 for further details on how feasibility was conceptualized) of an online, SCT-based PA intervention for youth with physical disabilities?

2. What are the short- and longer-term effects of an online SCT-based intervention on SCT constructs (i.e., outcome expectations, self-efficacy, and self-regulation), and the self-reported PA behaviour of youth with physical disabilities?

2.3 Hypotheses

Based on the aforementioned research questions, as well as evidence from previous studies examining the feasibility of online behavioural health interventions (Antezana et al., 2015; Barnfather et al., 2011) and the effects of online SCT-based PA interventions (Maher et al., 2010), the following hypotheses were generated:

1. Given the pilot nature of the current study, and a lack of guidelines pertaining to ‘good’ or ‘poor’ feasibility ratings (Lancaster, 2015; Vandelnotte & De Bourdeaudhuij, 2003), no threshold was established to classify Plan to Move as ‘feasible’ versus ‘unfeasible”. Rather, it was hypothesized that participants would provide positive ratings on indicators of feasibility (e.g., implementation fidelity, intervention compliance, and acceptability).

2. Outcome expectations, self-efficacy, self-regulation, and self-reported PA will be enhanced at the end of the four-week intervention. These increases, however, will not be maintained in the longer-term (i.e., one-month post-intervention completion), and will return to baseline, such that the magnitude of the longer-term effects will be less than those observed for the short-term.
Chapter 3
Methodology

3 Methodology

3.1 Study Design

A single-arm, four-week online PA intervention (Plan to Move) was delivered in the current study. Four weeks was the chosen length, as participant feedback from previous research examining the effects of an online intervention targeting the emotional, psychological, social, and physical well-being of youth (ages 16 to 25 years) indicated four weeks to be an appropriate length for online health behaviour interventions (Antezana et al., 2015). Four weeks was considered an appropriate length, given that: (1) youth are more likely to start using websites and mobile applications as soon as they gain access to them, and gain full mastery quickly; (2) youth tend to use websites and mobile applications for short periods, and therefore a short intervention could improve retention; and (3) youth are transient in their interests, implying that a brief versus lengthier intervention could yield better adherence (Antezana et al., 2015). Plan to Move was delivered in a titrated manner, such that participants received access to each week of the intervention sequentially. Outcome variables (i.e., outcome expectations, self-efficacy, self-regulation, and self-reported PA behaviour) were assessed at baseline (T1), and one week (T2) and one month (T3) following completion of the intervention (see Section 3.4.4 to 3.4.6 for further detail on intervention and assessment procedures).

3.2 Intervention Development

3.2.1 A Brief Overview of Plan to Move

Each of the four weeks of Plan to Move targeted a construct of SCT (i.e., outcome expectations, self-efficacy, and self-regulation). Each week, participants were required to go through a website targeting the respective SCT construct for that week. At the end of each week’s website, participants were then required to complete an accompanying independent activity. This activity was in the format of a Word document and was completed offline. The next section will outline how the weekly websites and independent activities of Plan to Move were developed. Further detail about how the intervention was delivered is provided in Section 3.4.5.
3.2.2 Development of Intervention Materials

The development of the weekly websites and accompanying independent activities was guided by content included in the in-class, face-to-face sessions of RAMP UP, which was a PA-based self-management program for inactive adults with spinal cord injury (Brawley, Arbour-Nicitopoulos, & Martin Ginis, 2013). The student investigator developed intervention materials over a period of four months (September 2016 to December 2016). The following sections describe in detail the development of each part of the intervention.

3.2.2.1 Website Development

Four websites were developed to target three SCT constructs: outcome expectations, self-efficacy, and self-regulatory behaviour (Table 1 provides a detailed summary of the content included in each week’s session). These websites were developed using an online website builder and web-hosting service called Weebly©. Weebly© is a widget-based website builder, where all site elements (e.g., text, images, and videos) can be dragged-and-dropped to custom-design each webpage. A mobile version of each website was automatically generated, allowing users to access these websites not only from their personal computers, but also from their Smartphones.

The website for each of the four Plan to Move sessions included text information and images pertaining to the respective topic for that week, and was supplemented by embedded YouTube™ videos (see Section 3.2.2.2 for further detail on the content and development of these videos). Each online session consisted of multiple webpages that participants would click to progress through. A manipulation check was included on the final webpage of each session to ensure that participants reviewed all of the content. The manipulation checks included one to two questions, asking participants to reflect on a topic they learned during that week’s session (see Appendix A for manipulation check items).

3.2.2.2 Supplementary Videos

Supplementary videos were embedded into all four online sessions. Incorporating videos has been found to be an appropriate strategy to use when delivering interventions targeting youth (Konijn, Veldhuis, & Plaisier, 2013), and therefore deemed necessary to include in Plan to Move. The videos were created by the student investigator using an online animation software called RawShorts Inc. This software includes templates that can be customized with animated
icons, infographics, and characters using a drag-and-drop interface. Videos were created to reinforce concepts that were presented within the text component of the websites (e.g., redefining PA and reflecting upon positive PA experiences to increase task self-efficacy), and to model the skills and strategies being taught during the weekly online sessions to increase their likelihood of and success in PA participation (e.g., a step-by-step example of how to set a S.M.A.R.T. goal). The student investigator recorded voiceovers to guide participants through the content of the videos.

3.2.2.3 Weekly Independent Activities

In addition to the websites, participants completed an accompanying independent activity for each week’s topic (see Appendices B to E for the weekly independent activities). Independent activities were completed offline, as the activities were in the format of a fillable Word document. The main objectives of the independent activities were to: (1) reinforce the concepts presented in each session, (2) model how to apply certain skills and strategies, and (3) provide participants with the opportunity to practice applying the targeted skills and strategies. For example, in Week 3, participants were provided with a concrete example of how to schedule PA, and were then given a calendar template to practice scheduling their own self-managed PA. Each weekly independent activity also included a feedback section, which consisted of a short questionnaire and space to provide general comments about their impressions and experiences of that week. These questionnaires were used to assess the feasibility of each weekly session of Plan to Move (see Section 3.5.2 for further detail on how feasibility was defined and evaluated).
Table 1

Content Overview of Weekly Sessions and Independent Activities of Plan to Move

<table>
<thead>
<tr>
<th>Week</th>
<th>SCT Construct Targeted</th>
<th>Online Session and Independent Activity Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outcome Expectations</td>
<td>- Identifying physical, social, and self-evaluative outcome expectations of PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Identifying personally relevant benefits of PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Discussing realistic expectations of PA</td>
</tr>
<tr>
<td>2</td>
<td>Self-Efficacy (Task)</td>
<td>- Broadening participants’ definition of PA to include small manageable bouts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Learning about the importance of setting realistic, short-term goals to maximize and enjoy regular success in PA context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sharing positive accomplishments related to PA to increase confidence</td>
</tr>
<tr>
<td>3</td>
<td>Self-Regulation</td>
<td>- Learning about the value of engaging in self-monitoring behaviours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Learning about the utility of and how to set S.M.A.R.T. goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Learning how to schedule PA sessions on a calendar</td>
</tr>
<tr>
<td>4</td>
<td>Self-Efficacy (Barriers)</td>
<td>- Identifying key barriers to PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Developing and assessing strategies for overcoming salient PA barriers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Identifying what can help participants be more physically active</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Identifying if and why lapses occur, and how lapses can be prevented</td>
</tr>
</tbody>
</table>
3.2.3 Pre-Testing of Plan to Move Sessions

Prior to study enrolment, a pre-testing phase was conducted with two youth with physical disabilities (ages 17 and 19 years) to ensure that the sessions could be completed within a reasonable amount of time (i.e., approximately 10 to 20 minutes), and that the sessions ran smoothly. The two youth previously participated in the NPAM study, but were ineligible for Plan to Move given their participation in elite-level sport. They were requested to each complete one session from start to finish (i.e., the online session and the independent activity). They were also requested to: (1) provide general feedback (i.e., website layout, independent activity structure, content, and the appropriateness of the language used) about the session they completed; (2) inform the student investigator of any technical issues they encountered while completing each online session and/or independent activity; and (3) comment on how long it took them to complete the session.

Based on this pre-testing phase, Plan to Move sessions were deemed to be of an appropriate length (i.e., 10 to 20 minutes to complete), and that the language used was appropriate for youth across the targeted age range for this study (ages 12 to 21 years). There were some difficulties the two youth had experienced with navigating the independent activity because of formatting incompatibilities, and the volume level of the voiceovers for some of the YouTube™ videos was too quiet and difficult to hear. This feedback was taken into consideration, and the student investigator made appropriate adjustments prior to enrolling study participants.

3.3 Participants

3.3.1 Target Sample Size

A sample size of 21 participants was needed to have 80% power to detect a large-sized effect on the targeted SCT constructs (\(d = .97, p < .01\); Cervantes & Porretta, 2013; Hertz & Petosa, 2006) and PA behaviour (\(d = .96, p = .05\); Maher et al., 2010).

3.3.2 Eligibility Criteria

Youth were required to meet the following inclusion criteria: (a) self-reported having a physical disability (characterized by varying degrees of neuromuscular dysfunction [e.g., compromised upper and/or lower limb function] that can impair a variety of motor activities; Jette & Branch, 1981); (b) aged 12 to 21 years – while there is no widely accepted age range that defines youth,
the disability and rehabilitation literature specifies that ages 12 to 21 years falls within a range defining the transition from youth to adulthood, which itself is framed by the shift from comprehensive child- and family-centred systems and programs, such as schools and pediatric rehabilitation centres, to more fragmented systems for adults (Antle et al., 1999; Stewart et al., 2001); (c) able to read and speak in English; and (d) able to complete surveys verbally over the telephone. Exclusion criteria included: (a) visual and/or hearing impairment; (b) self-reported cognitive impairment; and/or (c) participation in elite-level sport.

3.4 Study Procedures

This section provides details on study procedures from participant recruitment to the one-month post-intervention assessment. Figure 2 provides a summary of study procedures.

3.4.1 Recruitment

3.4.1.1 The National Physical Activity Monitoring Study

The National Physical Activity Monitoring (NPAM) study assessed the 24-hour movement behaviours of Canadian youth (ages 12 to 21 years) with physical disabilities and visual impairments. Upon completion of the NPAM study, participants were asked if they were interested in participating in future research. Those who expressed interest were provided with a study recruitment flyer for Plan to Move (see Appendix F). Participants who had already completed the NPAM study and previously expressed interest in future research were contacted via e-mail by the student investigator with information about Plan to Move (see Appendix G for e-mail template).

3.4.1.2 Existing Community Services and/or Programs

As a secondary recruitment strategy, information about Plan to Move was shared with Easter Seals Ontario, which is a provincial organization that provides support and offers programs to children and youth with physical disabilities. A study flyer (Appendix F) was shared with the contact person to post on the Easter Seals Ontario website (www.easterseals.org), and was also included in the monthly e-newsletter that is distributed to families utilizing their services. Youth and/or families interested in participating had the option to contact the student investigator via e-mail, at which point the information letter and study consent forms (Appendices H to J) were provided via e-mail.
3.4.2 Screening

Most youth and/or families who were recruited from the NPAM study, excluding those with visual impairments, were eligible for the current study, thus no screening was required. Those recruited outside of the NPAM study were screened for eligibility by the student investigator via e-mail correspondence. The student investigator requested youth interested in participating to confirm their eligibility based on a list of criteria provided to them via e-mail (see Appendix K for eligibility screening criteria). If eligible and willing to participate, youth were requested to indicate when they would prefer to be contacted via telephone by the student investigator to obtain verbal consent and/or assent, and complete the baseline assessment.

3.4.3 Consent and Assent Process

An information letter and consent form outlining study details were e-mailed to interested youth and families prior to being asked to provide informed consent (see Appendices H to J). This ensured that the participant and/or parent had enough time to review the information letter and consent form to understand what the study entailed. Given that participants from this study were recruited across Canada, verbal consent over the telephone was obtained and documented from parents and/or guardians, as well as participants who were over the age of 18 years. Verbal assent was subsequently obtained from participants who were under the age of 18 years (see Appendix L for the script that was used to obtain consent and assent; see Appendix M for the tracking form that was used to document consent and assent). Verbal consent and assent were obtained rather than electronic or written consent to verify that the parent was aware of their child participating in the study and that the youth understood all details of the study.

3.4.4 Baseline Assessment

After determining eligibility and obtaining informed consent, the student investigator outlined each of the components of the intervention (i.e., online session and offline independent activity) that were to be completed on a weekly basis. After providing an overview of the intervention procedures to participants, the student investigator administered the measures described in Section 3.5.3.
3.4.5 Intervention Delivery

*Plan to Move* was delivered to participants via e-mail. Immediately following completion of the baseline assessment, the student investigator e-mailed participants the first session (i.e., Week 1) of *Plan to Move*, which included a Uniform Resource Locator (URL) to the online session along with the accompanying independent activity. After going through the website content for Week 1, participants completed the manipulation check embedded within the final webpage to ensure that they reached the end of the online session for Week 1. After submitting their response to the manipulation check, participants were directed to the next webpage where they were prompted to complete the accompanying independent activity for Week 1, which was e-mailed to them with the URL, and then e-mailed back to the student investigator within one week of receiving it. Access to the online session for Week 2 was only provided once participants e-mailed the student investigator their completed Week 1 independent activity. The same access-restricted procedure was followed for Weeks 3 and 4 of the intervention. Thus, participants completed one session per week (comprised of the online session and its accompanying offline independent activity) over the course of four weeks. Management of intervention delivery was minimal, as it simply required the student investigator to monitor which weeks of the intervention each participant had completed and was currently in the process of completing, and to send one email per week to participants with the appropriate intervention materials (i.e., URL and independent activity). Reminder Short Message Service (SMS) messages were sent to participants: (a) if they had not completed the online session and/or offline independent activity within the week of receiving the intervention materials, and/or (b) prior to providing access to each upcoming online session. There is evidence supporting the use of SMS reminders to enhance health behaviour intervention compliance among children and youth living with chronic illnesses (Dowshen, Kuhns, Johnson, Holodya, & Garofalo, 2012; Miloh et al., 2009). The interactivity and element of personalization offered by SMS messaging has been identified as one of the key characteristics underlying the success of health behaviour interventions (Cole-Lewis & Kershaw, 2010).

3.4.6 Post-Intervention Assessments

One week and one month after participants completed Week 4 of *Plan to Move*, the student investigator contacted them by telephone once again to complete the same set of measures that were administered at baseline during the first telephone interview (see Section 3.5.3 for the
measures administered). In addition to this set of measures, participants were requested to provide qualitative feedback about *Plan to Move* (further details on the structure of these discussions is provided in Section 3.5.2.3). Upon completion of the one-month post-intervention assessment, participants were compensated a total of $25 for participating in the study. They received $5 for each weekly session they completed (four weeks x $5 per week = $20), and $5 for completing all three assessments (i.e., baseline, and one-week and one-month post-intervention). In addition to monetary compensation, participants received five volunteer/community service hours that could be used for fulfilling mandatory school board community service requirements. This compensation strategy was used in the NPAM study, as it has been found to be of value to youth with physical disabilities (based on conversations with physiotherapists and recreational therapists).
Figure 2. Outline of Study Procedure

Study Enrolment:
Further details provided to participants, and then student investigator obtained informed consent (and assent if necessary)

Baseline Assessment:
Participants completed a demographics questionnaire, and measures of social cognitive variables, and self-reported PA

Week 1:
Outcome Expectations

Week 2:
Task Self-Efficacy

Week 3:
Self-Regulation

Week 4:
Barrier Self-Efficacy

One-Week Post-Intervention Assessment:
Participants completed the same set of measures as during the baseline assessment

One-Month Post-Intervention Assessment:
Participants completed the same set of measures as during the baseline assessment, and provided feedback about Plan to Move
3.5 Outcome Measures

The following section describes the methods and measures used to assess: (1) sample characteristics; (2) the feasibility of Plan to Move; and (3) the targeted SCT constructs and self-reported PA behaviour.

3.5.1 Demographics

During the first telephone interview, participants were asked to self-report on the following demographic variables: age, gender, ethnicity, height, weight, type of physical disability, how long they had experienced their physical disability, and the use of mobility devices (e.g., wheelchair, walker, crutches, or other). See Appendix N for a template of the demographics questionnaire that was administered.

3.5.2 Feasibility

There is no widely used theory or model conceptualizing the parameters of feasibility or its measurement, nor are there guidelines pertaining to ‘good’ or ‘poor’ feasibility ratings (Lancaster, 2015; Vandelanotte & De Bourdeaudhuij, 2003). The National Institute of Health Research (NIHR, 2015) has published guidelines on how to define and evaluate feasibility, which have been agreed upon by the Efficacy and Mechanism Evaluation, Public Health Research, Health Technology Assessment, and Research for Patient Benefits programs. In line with the guidelines proposed by the NIHR (2015), feasibility was conceptualized in this study as an umbrella term encompassing the following constructs: (a) practicality of delivery (to what degree is the intervention being delivered as intended – this is more commonly referred to as ‘implementation fidelity’ in the literature [Carroll et al., 2007], and will be referred to as such for the purpose of this study); (b) intervention compliance (to what extent is the intervention being used as intended); and (c) intervention acceptability (to what extent is the intervention perceived as appropriate and satisfying).

3.5.2.1 Implementation Fidelity

Based on Carroll et al.’s (2007) conceptualization of the term, two elements of fidelity were assessed: (1) dose (the amount of an intervention delivered to and received by participants); and (2) adherence (the degree to which an intervention was delivered as intended – frequency of delivery was selected as a specific outcome of interest from Carroll et al.’s (2007) proposed
parameters of adherence, as the scheduled delivery of each week of *Plan to Move* and post-intervention assessments was an integral part of the intervention’s design). Evaluating implementation fidelity is critical, as it allows for a deeper understanding of intervention effects (Carroll et al., 2007). For example, an intervention may have been ineffective because it was not delivered to participants in its entirety (i.e., incomplete dose), or it may not have been delivered as intended (i.e., poor adherence). Evaluating these elements of implementation fidelity may contextualize and provide clarity in understanding why an intervention was or was not effective.

To monitor *dose*, the student investigator documented the delivery of each week of *Plan to Move* and the administration of post-intervention assessments for each participant. The delivery of each week and post-intervention assessments were dichotomized as ‘complete’ or ‘incomplete’. To monitor *frequency of delivery*, the dates of delivery of each week of the intervention, and of the one-week and one-month post-intervention assessments were also documented in a database by the student investigator to determine whether the intervention and subsequent post-intervention assessments were delivered and conducted in a timely manner. *Frequency of delivery* was dichotomized as ‘on-time’ or ‘late’, where ‘on-time’ delivery was defined as each week of *Plan to Move* being delivered to participants within seven days of completing the previous week. Administration of the one-week and one-month post-intervention assessments was categorized as ‘on-time’ if they were completed in the subsequent and fourth week following completion of the final week of *Plan to Move*, respectively (i.e., 3 to 11 days and 17 to 25 days after completing Week 4, respectively). The mean percentage of the dose of *Plan to Move* (i.e., ‘complete’ versus ‘incomplete’) delivered by the student investigator, and of on-time delivery (i.e., ‘on-time’ versus ‘late’) was calculated for *Plan to Move* as a whole, and for each week of *Plan to Move*. Mean percentages of the completion and on-time administration of the one-week and one-month post-intervention assessments were also calculated.

### 3.5.2.2 Intervention Compliance

Compliance to each component of *Plan to Move* (i.e., completion of manipulation checks and weekly independent activities) was documented in a database by the student investigator. All responses to the manipulation checks and independent activities were reviewed by the student investigator to ensure that participants completed them as intended (i.e., there were no missing responses and responses related to the questions being asked), and in a timely manner (i.e., each
session was completed within seven days of receiving the URL and independent activity for that respective week). Thus, manipulation check and independent activity completion was dichotomized as ‘complete’ or ‘incomplete’, and ‘on-time’ or ‘late’. Compliance (i.e., degree of and timeliness of completion) to the weekly online sessions and independent activities was documented for each participant. A mean percentage of participants’ weekly and overall compliance to the online sessions and accompanying independent activities was calculated.

Video viewership was examined through the Analytics feature on YouTube™. To examine compliance to the videos embedded within the online sessions, mean view time duration (in minutes) and the percentage of each video viewed were documented for all videos embedded within the websites. These statistics provided insight on the consumption of the videos included in Plan to Move. A mean view time percentage for videos per weekly session and all videos across the four weeks were then calculated.

3.5.2.3 Intervention Acceptability

Feedback questionnaires were included in each independent activity to assess the acceptability of each week of Plan to Move. There are no guidelines pertaining to how acceptability is measured or what level of acceptability is required to predict behaviour change (Vandelanotte & Bourdeaudhuij, 2003). However, there are several key concepts that have been identified in the literature to be of importance in evaluating users’ perceived acceptability of an intervention, including credibility, comprehensibility, overall satisfaction, user-friendliness, and utility (Bowen et al., 2009; Prochaska, Zabinski, Calfas, Sallis, & Patrick, 2000; Tones & Tilford, 2001). These concepts framed the items that were included in the weekly feedback questionnaires. Participants rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) whether each weekly session was interesting, taught them new and trustworthy information, was easy to navigate, and presented information and strategies that would help them be more active in the future beyond their participation in Plan to Move. Participants were also prompted to provide other feedback about any technical issues they may have encountered while completing the online session, or general comments about what they liked and found most useful about that session. A mean score (1 to 7) for each item of the weekly feedback questionnaires was calculated to examine participants’ perceived acceptability of each week of Plan to Move, and of Plan to Move as whole.
Further, participants were requested to provide qualitative feedback about Plan to Move during the one-month post-intervention assessment, which was facilitated by the student investigator. These discussions were guided by the following topics: (a) what participants liked and/or did not like about Plan to Move (i.e., satisfaction); (b) suggestions for improvements to Plan to Move; (c) the potential impact the intervention had on participants; and (d) the utility of the learned skills and strategies, in the context of PA. Discussions were transcribed verbatim by the student investigator.

3.5.3 Social Cognitive Variables and Self-Reported Physical Activity Behaviour

Participants completed the following measures over the telephone at baseline, as well as one week and one month following completion of the Plan to Move intervention. The student investigator recorded responses to each item on behalf of participants.

3.5.3.1 Outcome Expectations

Outcome expectations were assessed using a truncated version of an 11-item questionnaire developed by Winters (2001; see Appendix O). Participants responded to item pairs regarding their personal beliefs about a particular outcome occurring as a result of engaging in PA (e.g., “PA will help me to have an adventure”; “PA will get rid of my frustrations”), and the value they place on the particular outcome (e.g., “Being adventurous is fun”; “It feels good to get rid of my frustrations”). These items were rated on a Likert scale ranging from 1 (never) to 6 (always). Outcome expectation scores were calculated by multiplying the belief-outcome component with the value-outcome component of each item, and then summing each product for a total score. Possible score ranges were 22 to 396, with higher scores indicating more positive outcome expectations of PA, and a greater perceived likelihood of experiencing those outcomes. This scale has demonstrated acceptable reliability among high school students (α = .85 to .94; Stevens, 2006; Winters, 2001). In the current study, this scale demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .86 to .91.
3.5.3.2 Self-Efficacy

The following scales were administered to assess task and self-regulatory self-efficacy.

3.5.3.2.1 Task Self-Efficacy

An 8-item instrument, based on the Lifestyle Education for Activity Program (LEAP) II Scale, was administered to assess task self-efficacy (see Appendix P). Items were rated on a Likert scale ranging from 1 (disagree a lot) to 5 (agree a lot). A sample item is, “I can be physically active during my free time on most days.” This measure has demonstrated acceptable test-retest reliability and factorial validity in youth (Motl et al., 2000). While this measure has been used to assess task self-efficacy for PA in an online PA intervention study for youth with cerebral palsy, psychometric properties were not specified (Maher et al., 2010). A mean score (1 to 5) was calculated, with higher scores indicating greater task self-efficacy. In the current study, this instrument demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .73 to .74.

3.5.3.2.2 Self-Regulatory Self-Efficacy

Self-efficacy was assessed in the following domains of self-regulation: (1) goal-setting, (2) scheduling, and (3) barriers (King & Frederiksen, 1984). Previous reliable and valid measures assessing the goal-setting and scheduling domains of self-regulation in adults with spinal cord injury were modified for the current study (Arbour-Nicitopoulos, Martin Ginis, & Latimer, 2009; Brawley, Arbour-Nicitopoulos, & Martin Ginis, 2013; Latimer, Martin Ginis, & Arbour, 2006).

3.5.3.2.2.1 Goal-Setting

A 4-item instrument (Strachan & Brawley, 2008) was used to assess participants’ confidence in their ability to set and accomplish short-term PA goals (see Appendix Q). A sample item is, “How confident are you that you can set realistic goals for maintaining your PA for the next four weeks?” Each item was rated on a scale ranging from 0 (not at all confident) to 100 (completely confident) percent. A mean percentage score was calculated, with higher scores indicating greater self-efficacy for setting short-term PA goals. The language of these scales was modified, such that “independent physical activity” was replaced with “physical activity”. In the current study, these four items demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .81 to .92.
3.5.3.2.2.2 Scheduling

A 7-item instrument (Woodgate & Brawley, 2008) was administered to assess participants’ confidence in their ability to schedule a self-managed PA routine (see Appendix R). A sample item is, “How confident are you that you can arrange your schedule to do physical activity each week no matter what for the next 4 weeks?” Each item was rated on a scale ranging from 0 (not at all confident) to 100 (completely confident) percent. A mean percentage score was calculated, with higher scores indicating greater self-efficacy for scheduling self-managed PA. In the current study, these seven items demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .84 to .89.

3.5.3.2.2.3 Barriers

An 8-item instrument (see Appendix S) was administered to measure participants’ confidence to overcome common barriers that may prevent youth from being physically active. Of these eight items, six (i.e., fatigue, competing commitments with friends and/or family, soreness, bad weather, a lot of school work, good shows on television) were used to examine barrier self-efficacy in school-aged children (ages 11 to 13 years), and demonstrated high internal consistency ($\alpha = .86$; Foley et al., 2008). Two additional items relating to transportation problems and a lack of support were included, as these are salient PA barriers that individuals with physical disabilities often encounter (Martin Ginis et al., 2017; Shields et al., 2012). These items have been used to assess barrier self-efficacy in adults with spinal cord injury (Martin Ginis et al., 2013). Items were rated on a Likert scale ranging from 1 (not confident at all) to 7 (completely confident). A mean score (1 to 7) was calculated, with higher scores indicating greater barrier self-efficacy. In the current study, these eight items demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .81 to .82.

3.5.3.3 Self-Regulation

Two components of self-regulatory behaviour were measured: goal-setting, and planning and scheduling. The following sections describe the measures that were administered to assess these behaviours.
3.5.3.3.1 Goal-Setting

The 10-item Exercise Goal Setting Scale (EGS; Rovniak et al., 2002; see Appendix T) was used to assess two components of goal-setting: (1) the act of goal-setting (e.g., “I have developed a series of steps for reaching my exercise goals”); and (2) self-monitoring (e.g., “I usually keep track of my progress in meeting my goals”). The EGS has not been validated in youth with physical disabilities, but has demonstrated good internal reliability (α = .89) among college-aged students (Rovniak et al., 2002), and in adults with multiple sclerosis (Suh, Weikert, Dlugonski, Sandroff, & Motl, 2011). The language of this scale was adapted for the current study by replacing “exercise” with “physical activity”. Items were rated on a Likert scale ranging from 1 (does not describe) to 5 (describes completely). Items that were negatively worded (e.g., “I find it difficult to measure whether I have achieved my physical activity goals”) were reverse-scored. A mean of summed scores was then calculated, ranging from 10 to 50, with higher scores reflecting a stronger tendency to set PA goals. In the current study, these 10 items demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .80 to .89.

3.5.3.3.2 Planning and Scheduling

The 10-item Exercise Planning and Scheduling Scale (EPS; Rovniak et al., 2002; see Appendix U) was used to assess how participants planned and scheduled their PA. This scale has demonstrated good internal reliability (α = .87) and test-retest reliability (r = .89) in college-aged students (Rovniak et al., 2002). Similar to the EGS, the language of the EPS was adapted for the current study by replacing “exercise” with “physical activity”. Items were rated on a Likert scale ranging from 1 (does not describe) to 5 (describes completely). Items that were negatively worded (e.g., “When I’m very busy, I don’t do much physical activity”) were reverse-scored. A mean of summed scores was then calculated, ranging from 10 to 50, with higher scores reflecting a stronger tendency to plan and schedule for PA. In the current study, these 10 items demonstrated acceptable internal consistency across all time points, with Cronbach’s alpha values ranging from .84 to .89.

3.5.3.4 Physical Activity Behaviour

The Leisure-Time Physical Activity Questionnaire for People with Spinal Cord Injury (LTPAQ-SCI; Martin Ginis, & Latimer, 2007) was administered to assess self-reported PA (see Appendix
The LTPAQ-SCI consists of six items, where participants are asked to self-report the number of days, and amount of time (in minutes) on those days, they spent engaging in mild-, moderate-, and heavy-intensity PA, during their leisure time, in the last seven days. Although the LTPAQ-SCI has not been used in youth with physical disabilities, it has been found to be valid and reliable for adults with spinal cord injury (Martin Ginis, Phang, Latimer, & Arbour-Nicitopoulos, 2012). Total weekly minutes spent engaging in mild, moderate, and heavy PA was calculated by multiplying the number of self-reported days by the number of minutes on those days. Weekly minutes of mild-, moderate-, and heavy-intensity PA were then summed for a total amount of weekly minutes of PA overall. Plan to Move did not have an explicit objective of increasing a certain intensity of PA, thus participants’ PA behaviour was not categorized by intensity for data analysis.

### 3.6 Data Analysis

SPSS Version 24.0 was used to perform all statistical analyses. Descriptive statistics (i.e., means, standard deviations, and frequencies) were performed to summarize sample demographic characteristics (e.g., age, gender, and ethnicity). To address Research Question #1, descriptive statistics were also performed to summarize feasibility outcomes (i.e., implementation fidelity, intervention compliance, and intervention acceptability). To further address the element of acceptability within Research Question #1, content analysis was conducted on the discussions between the student investigator and participants to reveal themes and trends within the established discussion topics (Weber, 1985). The frequency of words and phrases pertaining to the identified themes and trends were recorded to provide a systematic and objective means to make valid inferences from the discussions with participants to describe and quantify findings of interest (Berelson, 1952; Downe-Wamboldt, 1992; Weber, 1985). A post-positivist perspective guided these discussions and subsequent analyses by the student investigator (Lincoln & Guba, 2000). Within the post-positivist paradigm, although the researcher pursues empirical knowledge, they acknowledge that one cannot fully capture a “true” and objective reality due to the presence of inherent biases and accepts the existence of subjective realities (Lincoln & Guba, 2000). Given the post-positivist perspective of the researcher, content analysis was deemed an appropriate qualitative method to analyze participants’ experiences and opinions, while acknowledging the potential influence of researcher bias during interviews and subsequent analyses (Lincoln & Guba, 2000). Researcher bias was managed by approaching and analyzing
discussions with participants through a critical realist lens (Guba & Lincoln, 1994). This approach allowed the student investigator to facilitate discussions with the understanding that participants’ perspectives on and opinions of Plan to Move, whether shared or unique, were shaped by their personal experiences and would ultimately enhance the depth of the student investigator’s understanding of the acceptability of Plan to Move. Additionally, discussions were guided by general topics, which were introduced to participants in a neutral manner (e.g., to evaluate participants’ satisfaction with Plan to Move, the student investigator asked, “What did you think about the program?”). Together, these strategies were undertaken by the student investigator to minimize researcher bias where possible.

For the social cognitive and PA behaviour outcomes, data cleaning procedures were conducted to identify univariate outliers. Tests of normality (i.e., Shapiro-Wilk test) and sphericity (i.e., Mauchly’s Sphericity test) were performed to ensure that assumptions of normality and equal variances (i.e., homoscedasticity) for the within-subject conditions were satisfied. Univariate outliers were identified and adjusted to the next highest, acceptable value (Tabachnick & Fidell, 2007) for the following measures: (1) self-regulatory self-efficacy at one-week (n = 1) and one-month (n = 1) post-intervention; and (2) total self-reported weekly minutes of PA at baseline (n = 1), and one-week (n = 1) and one-month (n = 1) post-intervention. No other univariate outliers were found. Tests of normality (i.e., Shapiro-Wilk test) revealed that all outcome variables at baseline, and one-week and one-month post-intervention were normally distributed (all ps > .05, ranging from .07 to .98). Thus, the assumption of normality was satisfied for all outcome variables at all time points. Mauchly’s Sphericity test revealed that variances of within-subject conditions were not equal for (1) self-regulatory self-efficacy for scheduling and planning ($\chi^2[2] = 10.54, p = .01$), and (2) total self-reported weekly minutes of PA ($\chi^2[2] = 9.17, p = .01$). All other outcome variables demonstrated equal within-subject variance (all ps > .05, ranging from .10 to .81). A Greenhouse-Geisser correction was used when the assumption of homoscedasticity was violated for self-regulatory self-efficacy for scheduling and planning, and total self-reported weekly minutes of PA.

To address Research Question #2, a series of one-way repeated measures analyses of variance (RM-ANOVAs) were conducted to examine if there were any differences in participants’ outcome expectations, self-efficacy, self-regulation, and self-reported PA behaviour from baseline (T1), to one-week (T2) and one-month (T3) post-intervention. In addition to the $F$-ratios
that are provided within the RM-ANOVAs, partial eta squared values ($\eta^2_p$s) were interpreted to quantify the magnitude of observed differences. Effect sizes were interpreted based on Cohen’s (1992) guidelines, such that $\eta^2_p$s of .10, .25, and .40 represented small, medium, and large effect sizes, respectively. Post-hoc analyses for significant $F$-tests, using Bonferroni corrections, were performed to identify between which time points change was significant (i.e., from T1 to T2 or T3, and/or T2 to T3).
Chapter 4
Results

4 Results

4.1 Participants

This section outlines participant flow throughout the intervention and characteristics of the final sample ($N = 16$) of participants who completed the study in its entirety.

4.1.1 Participant Flow

Figure 3 provides a detailed outline of participant flow from study enrolment to the one-month post-intervention assessment. Of the 33 youth who were assessed for eligibility, 20 (60.6%) were enrolled in the study. Of these 20 youth, 16 (80.0%) completed the study (i.e., they completed all four weeks of Plan to Move, and baseline and post-intervention assessments). Four (20.0%) participants were lost to follow-up.

4.1.2 Demographic Characteristics

Participant demographics are presented in Table 2. Sixteen youth completed the study. The mean age of the sample was 17.44 years ($SD = 2.68$; range = 13 to 21 years). The majority of the sample self-reported as White (68.75%), being female (68.75%), and using a mobility device (87.50%). The majority of participants reported having cerebral palsy ($n = 3$), muscular dystrophy ($n = 3$), or spinal cord injury ($n = 4$; combined 62.50%), and had been living with their physical disability for an average of 11.19 years ($SD = 6.66$). Demographic characteristics of those excluded from the study and lost to follow-up are also presented in Table 2.
Figure 3. Participant Flow
Table 2

Demographic Characteristics of Participants who Completed Study, were Excluded, or Lost to Follow-Up

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Completed Study (N = 16)</th>
<th>Excluded (n = 11)</th>
<th>Lost to Follow-Up (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in years (M ± SD)</strong></td>
<td>17.44 ± 2.68</td>
<td>17.00 ± 2.59</td>
<td>16.25 ± 3.10</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5 (31.25%)</td>
<td>7 (63.64%)</td>
<td>0 (0.00%)</td>
</tr>
<tr>
<td>Female</td>
<td>11 (68.75%)</td>
<td>4 (36.36%)</td>
<td>4 (100.00%)</td>
</tr>
<tr>
<td><strong>Body Mass Index (kg/m²)</strong></td>
<td>21.92 ± 6.55</td>
<td>22.51 ± 5.47</td>
<td>21.46 ± 2.64</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>11 (68.75%)</td>
<td>9 (81.82%)</td>
<td>3 (75.00%)</td>
</tr>
<tr>
<td>Chinese</td>
<td>2 (12.50%)</td>
<td>1 (9.09%)</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (18.75%)</td>
<td>1 (9.09%)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Type of Physical Disability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebral Palsy</td>
<td>3 (18.75%)</td>
<td>7 (63.61%)</td>
<td>2 (50.00%)</td>
</tr>
<tr>
<td>Muscular Dystrophy</td>
<td>3 (18.75%)</td>
<td>1 (9.09%)</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td>Neuromuscular Disorder</td>
<td>2 (12.50%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Spinal Cord Injury</td>
<td>4 (25.00%)</td>
<td>2 (18.18%)</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>4 (25.00%)</td>
<td>1 (9.09%)</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td><strong>Years Living with Physical Disability (M ± SD)</strong></td>
<td>11.19 ± 6.66</td>
<td>15.45 ± 3.33</td>
<td>9.75 ± 7.41</td>
</tr>
<tr>
<td><strong>Use a Mobility Device</strong></td>
<td>14 (87.50%)</td>
<td>9 (81.81%)</td>
<td>3 (75.00%)</td>
</tr>
<tr>
<td>Manual wheelchair</td>
<td>4 (25.00%)</td>
<td>4 (36.36%)</td>
<td>-</td>
</tr>
<tr>
<td>Power wheelchair</td>
<td>5 (31.25%)</td>
<td>3 (27.27%)</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td>Cane</td>
<td>2 (12.50%)</td>
<td>-</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td>Crutches</td>
<td>1 (6.25%)</td>
<td>-</td>
<td>1 (25.00%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (12.50%)</td>
<td>2 (18.18%)</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note. M = mean, SD = standard deviation
Values are frequencies unless otherwise specified*
4.2 Feasibility Outcomes

4.2.1 Implementation Fidelity

*Plan to Move* was delivered in its full *dose*, with all four weeks (100%) being delivered to all participants. With regards to *adherence*, weekly sessions were delivered to participants in a timely manner. Each week of *Plan to Move* was delivered to participants, on average, 4.35 (SD = .41) days after they completed the previous week’s session. The average on-time delivery rate of the weekly sessions was 98.38%. The one-week and one-month post-intervention assessments were administered in a timely manner to 93.75% (15 of 16) and 87.50% (14 of 16) of participants, respectively. Participants completed the one-week and one-month post-intervention assessments, on average, 6.94 (SD = 4.02) and 22.31 (SD = 4.22) days, respectively, after completing Week 4 of *Plan to Move*. These values were within the specified ranges of ‘on-time’ post-intervention assessment administration (i.e., within 3 to 11 days, and 17 to 25 days for the one-week and one-month post-assessments, respectively). Table 3 provides further details on the delivered dose and rate of on-time delivery of each week of *Plan to Move*, and the completion of the baseline and post-intervention assessments.

4.2.2 Intervention Compliance

With regards to intervention compliance, participants completed, on average, 93.75% of the weekly online sessions (as indicated by completion of weekly manipulation checks) and 96.88% of the independent activities. Participants took, on average, 5.23 (SD = 1.50) days to complete each week of the intervention upon receiving the URL to the online session and the independent activity via e-mail. On-time completion of the intervention overall was 81.25%. All (100%) participants completed Week 1 in a timely manner, whereas Weeks 2 to 4 were completed in a timely manner by 75% (12 of 16) of the participants. Table 3 provides further details on participants’ overall compliance to each component of each week of *Plan to Move* (i.e., frequency and timeliness of online session and independent activity completion). Table 4 provides an individual breakdown of each participant’s timely or untimely completion of the online sessions, independent activity, and post-intervention assessments.

Participants viewed, on average, 69.89% of the total minutes of YouTube™ videos embedded within the online sessions, with the average view time percentages of each of the seven videos
ranging from 60.81% to 86.11%. Notably, the “Welcome” video in Week 1 was viewed for the longest duration of time, whereas the videos in Week 3 had the lowest combined view time percentage (64.10% for both the “Goal-Setting” and “Scheduling” videos). Table 5 provides further details on the viewership of each YouTube™ video.
Table 3

*Implementation Fidelity and Intervention Compliance Outcomes*

<table>
<thead>
<tr>
<th>Intervention Component</th>
<th>Dose</th>
<th>Number of days to deliver&lt;sup&gt;a&lt;/sup&gt; ± SD (Range)</th>
<th>Adherence: On-time delivery (%)</th>
<th>Online session completion (%)</th>
<th>Independent activity completion (%)</th>
<th>Number of days to complete&lt;sup&gt;b&lt;/sup&gt; ± SD (Range)</th>
<th>On-time completion of each week (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline&lt;sup&gt;c&lt;/sup&gt;</td>
<td>100.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overall</td>
<td>100.00</td>
<td>4.35 ± .41 (0 – 7)</td>
<td>98.38</td>
<td>93.75</td>
<td>96.88</td>
<td>5.23 ± 1.50 (0 – 13)</td>
<td>81.25</td>
</tr>
<tr>
<td>Week 1</td>
<td>100.00</td>
<td>4.00 ± 1.93 (0 – 7)</td>
<td>93.50</td>
<td>100.00</td>
<td>100.00</td>
<td>5.88 ± 3.59 (0 – 13)</td>
<td>75.00</td>
</tr>
<tr>
<td>Week 2</td>
<td>100.00</td>
<td>4.25 ± 2.08 (0 – 7)</td>
<td>100.00</td>
<td>93.75</td>
<td>93.75</td>
<td>5.38 ± 4.15 (0 – 15)</td>
<td>75.00</td>
</tr>
<tr>
<td>Week 3</td>
<td>100.00</td>
<td>4.81 ± 2.34 (0 – 7)</td>
<td>100.00</td>
<td>93.75</td>
<td>93.75</td>
<td>6.69 ± 5.03 (1 – 15)</td>
<td>75.00</td>
</tr>
<tr>
<td>Week 4</td>
<td>100.00</td>
<td>6.94 ± 4.02 (3 – 15)</td>
<td>93.75</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>One-week post&lt;sup&gt;c&lt;/sup&gt;</td>
<td>100.00</td>
<td>22.31 ± 4.22 (17 – 30)</td>
<td>87.50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<sup>a</sup> Number of days between participants’ completion of each week of *Plan to Move* and delivery of the following week by the student investigator

<sup>b</sup> Number of days for participants to complete each week upon receiving materials (i.e., link to online session and independent activity) via e-mail

<sup>c</sup> Refers to the three assessments conducted by the student investigator, and do not represent weekly sessions
Table 4

**On-Time\(^a\) Completion of Each Week of Plan to Move and Subsequent Post-Intervention Assessments**

<table>
<thead>
<tr>
<th>Participant(^b)</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>One-Week Post-Assessment</th>
<th>One-Month Post-Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>6</td>
<td>✓</td>
<td>✓</td>
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<td>x</td>
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<tr>
<td>7</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>8</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
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<td>9</td>
<td>✓</td>
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<tr>
<td>10</td>
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</tr>
<tr>
<td>11</td>
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<td>x</td>
<td>x</td>
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<td>✓</td>
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</tr>
<tr>
<td>12</td>
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<td>✓</td>
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</tr>
<tr>
<td>13</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>14</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>15</td>
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<td>x</td>
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<td>✓</td>
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<tr>
<td>16</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

\(^a\) ‘On-time completion’ was defined as within seven days for weekly sessions, and within the subsequent and fourth week following completion of Plan to Move for the one-week and one-month post-intervention assessments, respectively

\(^b\) Names were replaced with ID numbers to protect participant anonymity
Table 5  

*YouTube™ Video Compliance*

<table>
<thead>
<tr>
<th>Week</th>
<th>Title</th>
<th>Length of Video (m:ss)</th>
<th>Average Length Viewed (m:ss)</th>
<th>Average View Time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1 to 4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>69.89</td>
</tr>
<tr>
<td>Week 1</td>
<td>Overall&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>73.46</td>
</tr>
<tr>
<td></td>
<td>Welcome</td>
<td>1:12</td>
<td>1:02</td>
<td>86.11</td>
</tr>
<tr>
<td></td>
<td>Benefits of PA</td>
<td>1:14</td>
<td>0:45</td>
<td>60.81</td>
</tr>
<tr>
<td>Week 2</td>
<td>Overall&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>71.99</td>
</tr>
<tr>
<td></td>
<td>Redefining PA</td>
<td>1:31</td>
<td>1:05</td>
<td>71.43</td>
</tr>
<tr>
<td></td>
<td>Breaking Down PA</td>
<td>1:42</td>
<td>1:14</td>
<td>72.55</td>
</tr>
<tr>
<td>Week 3</td>
<td>Overall&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>64.10</td>
</tr>
<tr>
<td></td>
<td>Goal-Setting</td>
<td>2:50</td>
<td>1:04</td>
<td>61.18</td>
</tr>
<tr>
<td></td>
<td>Scheduling</td>
<td>1:31</td>
<td>1:01</td>
<td>67.03</td>
</tr>
<tr>
<td>Week 4</td>
<td>Overall&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>70.00</td>
</tr>
<tr>
<td></td>
<td>Barriers</td>
<td>1:00</td>
<td>0:42</td>
<td>70.00</td>
</tr>
</tbody>
</table>

<sup>a</sup>Refers to the average view time percentage across all videos included within that week’s session
4.2.3 Acceptability

4.2.3.1 Weekly Feedback Questionnaires

Ratings provided by participants in the weekly feedback questionnaires indicated that *Plan to Move* was acceptable. Participants reported learning new information ($M = 5.30, SD = .48$) that was interesting ($M = 5.57, SD = .24$), easy to understand ($M = 6.39, SD = .38$), and trustworthy ($M = 6.25, SD = .38$). Participants also rated the websites as easy to use and navigate ($M = 6.58, SD = .30$). Participants indicated that they would use the strategies they learned in *Plan to Move* in the future to be more physically active ($M = 5.77, SD = .31$). Table 6 provides further details on participants’ ratings of the acceptability of each week of *Plan to Move*. 
Table 6

Summary of Perceived Acceptability Evaluated in Weekly Feedback Questionnaires

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean Score (1 – 7) ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weeks 1 to 4</strong></td>
<td></td>
</tr>
<tr>
<td>This session taught me new information</td>
<td>5.30 ± .48</td>
</tr>
<tr>
<td>This session was interesting</td>
<td>5.57 ± .24</td>
</tr>
<tr>
<td>This session was easy to understand</td>
<td>6.39 ± .38</td>
</tr>
<tr>
<td>The information I learned was trustworthy</td>
<td>6.25 ± .38</td>
</tr>
<tr>
<td>The website was easy to use and navigate</td>
<td>6.58 ± .30</td>
</tr>
<tr>
<td>I believe that the skills I learned will help me be more physically active</td>
<td>5.77 ± .31</td>
</tr>
<tr>
<td><strong>Week 1: Outcome Expectations (n = 16)</strong></td>
<td></td>
</tr>
<tr>
<td>This session taught me new information</td>
<td>4.81 ± 1.72</td>
</tr>
<tr>
<td>This session was interesting</td>
<td>5.38 ± 1.71</td>
</tr>
<tr>
<td>This session was easy to understand</td>
<td>6.63 ± .50</td>
</tr>
<tr>
<td>The information I learned was trustworthy</td>
<td>5.88 ± 1.71</td>
</tr>
<tr>
<td>The website was easy to use and navigate</td>
<td>6.63 ± .62</td>
</tr>
<tr>
<td>I believe that the skills I learned will help me be more physically active</td>
<td>5.13 ± 1.86</td>
</tr>
<tr>
<td><strong>Week 2: Task Self-Efficacy (n = 16)</strong></td>
<td></td>
</tr>
<tr>
<td>This session taught me new information</td>
<td>5.25 ± 1.13</td>
</tr>
<tr>
<td>This session was interesting</td>
<td>5.31 ± 1.25</td>
</tr>
<tr>
<td>This session was easy to understand</td>
<td>6.69 ± .79</td>
</tr>
<tr>
<td>The information I learned was trustworthy</td>
<td>6.13 ± 1.09</td>
</tr>
<tr>
<td>The website was easy to use and navigate</td>
<td>6.50 ± 1.26</td>
</tr>
<tr>
<td>I believe that the skills I learned will help me be more physically active</td>
<td>5.44 ± 1.31</td>
</tr>
<tr>
<td><strong>Week 3: Self-Regulation (n = 15)</strong></td>
<td></td>
</tr>
<tr>
<td>This session taught me new information</td>
<td>5.93 ± .80</td>
</tr>
<tr>
<td>This session was interesting</td>
<td>5.73 ± 1.28</td>
</tr>
<tr>
<td>This session was easy to understand</td>
<td>6.13 ± 1.55</td>
</tr>
<tr>
<td>The information I learned was trustworthy</td>
<td>6.53 ± .83</td>
</tr>
<tr>
<td>The website was easy to use and navigate</td>
<td>6.60 ± .74</td>
</tr>
<tr>
<td>I believe that the skills I learned will help me be more physically active</td>
<td>6.20 ± 1.15</td>
</tr>
<tr>
<td><strong>Week 4: Barrier Self-Efficacy (n = 15)</strong></td>
<td></td>
</tr>
<tr>
<td>This session taught me new information</td>
<td>5.20 ± 1.78</td>
</tr>
<tr>
<td>This session was interesting</td>
<td>5.87 ± 1.64</td>
</tr>
<tr>
<td>This session was easy to understand</td>
<td>6.13 ± 1.25</td>
</tr>
<tr>
<td>The information I learned was trustworthy</td>
<td>6.47 ± .99</td>
</tr>
<tr>
<td>The website was easy to use and navigate</td>
<td>6.60 ± 1.06</td>
</tr>
<tr>
<td>I believe that the skills I learned will help me be more physically active</td>
<td>5.87 ± 1.60</td>
</tr>
</tbody>
</table>
4.2.3.2 Participants’ Qualitative Feedback Provided during One-Month Post-Intervention Assessment

Participants provided qualitative feedback on their overall satisfaction with Plan to Move, improvements for the future, its potential impact, and the utility of the skills and strategies learned during Plan to Move. The following subsections discuss findings of the content analysis of these discussions. Table 7 provides a summary of emerging themes and trends within the aforementioned discussion topics, and the frequencies of certain words and phrases pertaining to those themes.

4.2.3.2.1 Satisfaction

Overall, participants indicated that they were satisfied with Plan to Move. Two themes that emerged from discussions of their satisfaction with Plan to Move were its user-friendliness and the impact of the YouTube™ videos.

4.2.3.2.1.1 User-Friendliness

Ease of use and comprehensibility emerged as two sub-themes relating to the user-friendliness of Plan to Move. Pertaining to ease of use, all participants indicated that the websites were easy to navigate. Participants highlighted that the process of accessing and progressing through the websites was simple, as there was only one URL per week and one button that they had to click to progress through the webpages for each session. Participants also indicated that the ability to access the websites from their Smartphone or tablet provided a degree of convenience that encouraged them to use the website more than they would have if they could only access the websites from a desktop or laptop. Beyond convenience, being able to access the online sessions from their Smartphone or tablet allowed participants to start engaging with the websites more promptly, as some participants reported accessing the website immediately from their Smartphone upon receiving the URL via e-mail from the student investigator. In addition to the accessibility of each week’s online session, participants indicated that the layout and functionality of the websites were preserved even when accessed via Smartphone. Simple navigation and compatibility of the websites with participants’ Smartphone or tablet Internet browsers were important elements of the user-friendliness of the weekly websites.
In terms of comprehensibility, participants indicated that the websites and accompanying independent activities were easy to understand and “made sense” (Participant 13). The sectioned design of each website ensured that participants were not overwhelmed by content. As Participant 15 described, “[…] there wasn’t a lot of information on one page, so it wasn’t overwhelming. Each section had the right amount of information”. Having multiple webpages, each targeting a different component of each week’s topic, allowed participants to focus on and have a deeper understanding of the content being presented. Furthermore, participants indicated that the design of the YouTube™ videos allowed for easy understanding of the content being presented. As Participant 14 described, "As you were speaking on the video, there were words on the screen too. That just helped everything make sense in my head.” Incorporating both verbal and visual methods of communication within the videos enhanced participants’ understanding of the information presented.

Lastly, participants indicated that the independent activities were easy to follow and understand, such that they understood what the questions were asking and how those questions related to the content presented on the accompanying website. As Participant 11 stated, “I liked how the activities were structured. The questions you asked made sense, and everything really came together for me.” Several participants highlighted that while the content of the independent activities themselves made sense, the activities also provided them with an opportunity to connect the questions being asked to the content presented on the websites. This prompted further thought of the content and enhanced the clarity of what was taught on the websites. Altogether, this feedback revealed that the simple and compatible user-interface, and the clarity of information presented in all parts of Plan to Move (i.e., the websites, embedded YouTube™ videos, and independent activities) were critical elements underlying participants’ perceived satisfaction with the intervention.

### 4.2.3.2.1.2 Impact of YouTube™ Videos

All participants indicated that they enjoyed the YouTube™ videos embedded within the websites. Two subthemes that emerged from discussions of participants’ enjoyment of the YouTube™ videos related to its role in: (1) summarizing and reinforcing concepts presented in-text on the websites, and (2) maintaining engagement during each weekly session.
Participants indicated that the YouTube™ videos were effective in summarizing content in a concise manner. As Participant 4 described, “The videos were really good, I feel like they summarized the main points in the two or three minutes.” Furthermore, participants highlighted that providing a verbal and animated summary of the in-text content “made it more understandable” (Participant 1). For example, although there were in-text guides of how to apply certain skills and strategies, Participant 3 stated, “I definitely liked having the videos instead of just reading the plain text with pictures. Having the combination of animations and narration helped me reinforce the information in my opinion.” Thus, not only did the videos effectively summarize content, but also reinforced how to apply certain skills and strategies.

Emerging as a second subtheme, participants indicated that the YouTube™ videos made the online sessions more engaging. This subtheme was closely related to and supports why the videos were effective in reinforcing concepts and making them more understandable. Many participants reported being visual learners – thus, providing information visually and verbally through the videos were more salient means of communication in comparison to text, and promoted engagement in the delivered content. As Participant 6 described, “I liked how there was writing on the screen that I could watch, and you were also talking. So I could use both methods. I could follow along and stay engaged.” Thus, participants perceived the YouTube™ videos as an element of the intervention that they could interact with. Overall, participants’ perceived satisfaction with Plan to Move was largely related to its user-friendliness, and the role of the embedded videos in enhancing their understanding of the content, and promoting engagement.

4.2.3.2.2 Improvements

Two trends that emerged from discussions of how Plan to Move could be improved included addressing issues relating to the formatting of independent activities and the value of providing additional information about, for example, PA guidelines and recommendations.

4.2.3.2.2.1 Formatting of Independent Activities

Several participants reported having some type of technical difficulty with the independent activities, largely related to formatting. Participants encountered issues with images covering portions of text, or parts of the document becoming obstructed when entering responses into the fillable text boxes. Although most participants stated that formatting issues were minor and
simple to resolve by deleting images that obstructed the text, some participants recommended: (1) using fillable Portable Document Format, instead of Word, to enhance compatibility across different operating systems and/or versions of software, or (2) incorporating the independent activities within the websites themselves to eliminate offline completion of the activity altogether.

4.2.3.2.2.2 Additional Information

Two participants indicated that although the examples provided were detailed and relatable, additional examples demonstrating how to apply self-regulatory skills would aid in enhancing their understanding of and increasing their confidence to engage in those behaviours beyond their participation in Plan to Move. As Participant 13 stated, “You could add a little bit more detail, maybe other examples of certain skills.” In particular, participants were interested in more in-depth examples of how to set a S.M.A.R.T. goal, as it was one of the more complex and novel skills introduced in Plan to Move.

Furthermore, two participants suggested that including more information pertaining to the mechanisms underlying the benefits of PA would be valuable. In reference to the first week of Plan to Move, which targeted outcome expectations, Participant 1 stated, “[…] providing more scientific information for some things, like some studies or background. You see the value for those things. That would also help with motivation and drive to start being active.” Two participants suggested that including information pertaining to guidelines of how often one should be active, sample exercises, self-care (e.g., nutrition), and resources with information about accessible facilities and sport opportunities would be valuable. Notably, youth who expressed the value of learning more in-depth information relating to the benefits of PA and resources to become more active were among the older participants (ages 20 to 21 years). Participant 7 stated, “It may be good for teenagers or like younger teens who haven’t yet been educated on the benefits of physical activity, and may use excuses to not be active. I think for me, it may be really nice if the program had links to sport associations to get you involved or accessible facilities to stay fit. Sample exercises, that kind of stuff.” Although PA prescription or having youth achieve the recommended amount of PA were not objectives of Plan to Move, these suggestions provide insight on the type of information that older youth may be seeking when trying to increase their levels of PA.
4.2.3.2.3 Potential Impact

Two themes that emerged from discussions of the potential impact of Plan to Move on participants’ PA behaviour included heightened awareness of opportunities to be physically active and the reframing of their perspectives on PA.

4.2.3.2.3.1 Heightened Self-Awareness in the Context of Physical Activity

Many participants indicated that Plan to Move prompted them to think more about their PA behaviour. In particular, participants described that they had become more aware of opportunities when they could be physically active throughout the day. As Participant 5 stated, “I can find key points where I can fit physical activity here or there or whenever. It changed how I looked at things, and how much time I have.” A few participants recalled that completing the self-monitoring activity in Week 3 helped them realize that they have time to incorporate PA into their day without necessarily disrupting their routine, and also helped them identify at which times throughout the day they thought they could be active. A particular opportunity that several participants highlighted was going for short walks or doing stretches during homework breaks instead of going on their Smartphone. Participants shared that they felt encouraged to continue self-monitoring, as it allowed them to be more cognizant of how they spent their time, and of opportunities that could be spent engaging in PA instead of other activities.

Conversely, two participants indicated that while self-monitoring increased their awareness of opportunities for when they could be physically active, it also heightened their awareness of the challenges of incorporating PA into a busy schedule. As Participant 4 described, “It also made me realize that making time sometimes to workout is kind of hard.” Participant 14 shared a similar experience, but stated, “When there’s a day when I realize maybe I’m doing too much, I can schedule certain things for other days when I’m not doing as much. Especially with the chart, it was really easy to see where I could plan my physical activity.” Thus, participants’ heightened awareness of their time not only helped them identify opportunities for when they could be physically active, but also prompted them to consider more effectively scheduling other aspects of their life to minimize the perceived barrier of not having enough time to engage in PA.
4.2.3.2.3.2  Reframing their Perspective on Physical Activity

Participants reported a shift in their definition of and approach to PA. For example, Participant 5 shared, “I think what I realized the most was that physical activity is not just going to the gym, or playing a certain sport.” Participants described that Plan to Move broadened their definition of PA to include more enjoyable and manageable activities. Participants also reported that by broadening their definition of PA, they recognized that they were more active than they previously thought, which in turn enhanced their confidence to continue pursuing PA. Participants also shared that Plan to Move changed how they perceived and approached PA. For example, Participant 6 reported, “I see it now like it’s not so much of a chore all the time, and physical activity doesn’t need to be like doing an hour at a time. You can do 10 minutes here and 10 minutes there. It doesn’t seem so much anymore.” Further, Participant 10 stated, “By only doing 10 minutes at a time, it makes it more manageable and less intimidating.” Participants shared that Plan to Move not only broadened their definition of PA, but also reinforced a sense of flexibility in how they could approach PA. Participants were encouraged by the concept of being physically active in shorter bouts throughout their day, as that approach would help them overcome perceived barriers relating to a lack of time, and provided them with the perceived control of incorporating PA in ways that were manageable and reasonable.

4.2.3.2.4  Utility

Two themes emerging from discussions of the utility of Plan to Move included the relevance of self-regulatory behaviours and the likelihood of applying specific skills and strategies in the future.

4.2.3.2.4.1  Relevance of Self-Regulatory Behaviours

Participants highlighted the significance of the self-regulatory skills introduced in Plan to Move. In particular, participants emphasized the value of learning how to set a S.M.A.R.T. goal, and the importance of purposefully scheduling time to work towards achieving that goal. When asked which skills were most helpful, Participant 5 shared, “I think goal-setting definitely, because usually when I think of having a physical activity goal I think like okay I want to do this. But if I actually write stuff down on a calendar […] I can see my progress more clearly.” Additionally, participants reported having several competing interests, such as school and medical appointments. Thus, beyond scheduling and planning for PA in a calendar, participants
emphasized the utility of using reminders as a tool to prompt them to engage in PA and prevent lapses that would have otherwise occurred as a result of competing interests or simply forgetting. For example, Participant 4 shared, “Instead of just putting it in my calendar and forgetting to do it, putting it in my calendar and setting reminders really helped me remember to actually go and achieve that goal or workout that I wanted to do.” Overall, participants indicated that the self-regulatory behaviours taught in Plan to Move were relevant and practical, such that those skills helped address salient issues including, but not limited to, not being able to monitor their progress or simply forgetting to engage in PA.

4.2.3.2.4.2 Current and Future Application of Skills and Strategies

Overall, most participants reported currently using at least one skill or strategy they learned in Plan to Move, with the act of setting reminders and S.M.A.R.T. goals being the most commonly reported. Conversely, there were a few participants who did not report currently using the skills they learned. When inquired as to why they were not applying the skills learned in Plan to Move, most indicated that they were busy with end-of-semester commitments (e.g., final projects and exams). For example, Participant 13 shared, “I know I don’t have as much time now because exams are coming up, but after that, I know that I’m going to try to use these skills to be more active.” Beyond current use, most participants reported that they believed they would use the skills and strategies learned in Plan to Move in the future to help them become more physically active or maintain their activity levels. Although many participants were aware of self-regulatory behaviours, such as goal-setting and scheduling, participants indicated that Plan to Move served as a prompt for them to start engaging in self-regulatory behaviours in the context of PA. For example, Participant 13 stated, "The skills were helpful. I will probably use them in the future to make me more active. I knew most of the skills that you were talking about, but it got me thinking more about them.” Participants also indicated that including examples of how to apply those skills in a step-by-step fashion were valuable, as the examples provided them with a structured approach to apply those skills, specifically in the context of PA. Overall, most participants indicated that they were currently using the skills they learned in Plan to Move, and also indicated their intent to continue or start using them in the future to enhance their PA. These discussions demonstrate that participants believed the skills they learned were relevant and helpful, and that they would likely continue or begin to use certain skills in the future.
Table 7

Content Analysis Summary

<table>
<thead>
<tr>
<th>Emerging Themes and Trends</th>
<th>Frequency of Key Words and Phrases Pertaining to Theme</th>
<th>Sample Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) User-friendliness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Ease of Use</td>
<td>16</td>
<td>“I really liked the websites. The websites were working. Sometimes, websites aren't working that well and they like break down easy. I liked how this one was working good, I just clicked a link and got there. It was easy to use.” – Participant 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It was easy. The nice thing about it too was that I could use it on my phone and iPad. Using it on my phone was convenient.” – Participant 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I thought they were really easy to use because there weren't a lot of different links, and only one button I had to press when I got through one section.” – Participant 15</td>
</tr>
<tr>
<td>ii) Comprehensibility</td>
<td>14</td>
<td>“As you were speaking on the video, there were words on the screen too. That just helped everything make sense in my head.” – Participant 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I liked the activities. It was broken down really well, and I understood exactly what I had to do. It helped me understand the information you have on the website and put it into context for me.” – Participant 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I liked how the information was in different sections to keep you interested, and made it easy to understand stuff.” – Participant 5</td>
</tr>
</tbody>
</table>
### Table 7

**Content Analysis Summary**

<table>
<thead>
<tr>
<th>Emerging Themes and Trends</th>
<th>Frequency of Key Words and Phrases Pertaining to Theme</th>
<th>Sample Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Impact of YouTube™ Videos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| i) Summarized and Reinforced Concepts | 16 | “I definitely liked having the videos instead of just reading the plain text with pictures. Having the combination of like animations and narration or music helped me reinforce the information in my opinion.” – Participant 3  
“Let's say if I was reading something and kind of forgot, I would watch the video and it kind of summarized everything.” – Participant 5  
“One thing I noticed that really nice was the videos. I liked how they summed everything up really nicely. Like from reading the website to watching the video, it made it more understandable.” – Participant 1  
“I liked the videos a lot. I thought they were really easy to understand. It helped break everything down more and helped me understand it more.” – Participant 15 |
| ii) Engaging | 13 | “It was good to catch the eye and kept me intrigued. For me, I like visuals, rather than just always reading.” – Participant 8  
“The videos were good. Like it kept me engaged.” – Participant 5 |
<table>
<thead>
<tr>
<th>Emerging Themes and Trends</th>
<th>Frequency of Key Words and Phrases Pertaining to Theme</th>
<th>Sample Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Improvements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Formatting</td>
<td>13</td>
<td>“I was having some issues with formatting. I would not recommend doing the activities on Word. If there was like an online program that would work universally, that would probably be better.” – Participant 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I found the first few were properly formatted, […] but there were a few pictures covering the questions. Maybe have like on the website that you use, have the questionnaires […]. Have it on the website so then you don’t have the document where the formatting gets messed up.” – Participant 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The only thing I would slightly complain about, I had to move around some of the icons to actually read the question.” – Participant 13</td>
</tr>
<tr>
<td>b) Additional Information</td>
<td>7</td>
<td>“I think like when you’re talking about goal-setting, there were some really good examples but I just feel like maybe if you were like a little more descriptive it would be better.” – Participant 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“[…] providing more scientific information for some things, like some studies or background. You see the value for those things. That would also help with motivation and drive to start being active.” – Participant 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I would like to know more about nutrition and stretching and all that kind of stuff after physical activity, like how to take care of your body if you’re sore. How often you should be exercising, as in like when you should take a rest, and rotating muscle groups, would have been really helpful.” – Participant 7</td>
</tr>
</tbody>
</table>
Table 7

**Content Analysis Summary**

<table>
<thead>
<tr>
<th>Emerging Themes and Trends</th>
<th>Frequency of Key Words and Phrases Pertaining to Theme</th>
<th>Sample Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Potential Impact</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Heightened Self-Awareness in the Context of PA</td>
<td>12</td>
<td>“I never really thought about my physical activity, what I do, and how I plan it.” – Participant 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I’ve become more aware of when I’m working out or when I might have time to. It also made me realize that making time sometimes to work out is kind of hard.” – Participant 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“If I don’t have time to do physical activity, like if I have a lot of homework, I realized like oh if I actually take breaks I can do stuff. So like when you’re talking about incorporating physical activity into a busy schedule really helps a lot because I do have a busy schedule. I can find key points where I can fit physical activity here or there or whenever. It changed how I looked at things, and how much time I have.” – Participant 5</td>
</tr>
<tr>
<td>b) Reframing their Perspective on PA</td>
<td>7</td>
<td>“I think what I realized the most was that physical activity is not just going to the gym, or playing a certain sport. Like there’s a lot of things you can do in your daily life that can count for physical activity, like into your just your daily routine without having to disrupt it. Like taking longer walks.” – Participant 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I see it now like it’s not so much of a chore all the time, and physical activity doesn’t need to be like doing an hour at a time. You can do it like 10 minutes here and 10 minutes there. It doesn’t seem so much anymore.” – Participant 6</td>
</tr>
</tbody>
</table>
### Table 7

**Content Analysis Summary**

<table>
<thead>
<tr>
<th>Emerging Themes and Trends</th>
<th>Frequency of Key Words and Phrases Pertaining to Theme</th>
<th>Sample Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Utility</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Self-Regulatory Behaviours</td>
<td>11</td>
<td>“A big thing for me is not having time. These skills help me have some insight on how to plan to have more time to be active.” – Participant 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Instead of just putting it in my calendar and forgetting to do it, setting reminders really helped me remember to actually go and achieve that goal or workout that I wanted to do.” – Participant 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I think goal-setting definitely, because usually when I think of having a physical activity goal I think like okay I want to do this. But if I actually write stuff down […] I can see my progress more clearly.” – Participant 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I liked having a set plan and sticking to that plan. I put reminders on my phone to stretch during homework breaks, or while watching TV. I liked it, because I need to do those stretches for my spasms anyway.” – Participant 6</td>
</tr>
<tr>
<td>b) Current and Future Application of Skills and Strategies</td>
<td>7</td>
<td>“I think I’d use the things I learned to continue working out. Like the reminders definitely are a huge help, and have been something I’ve been using since I learned about them.” – Participant 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The skills were helpful. I will probably use them in the future […]. I knew most of the skills that you were talking about, but it got me thinking more about them.” – Participant 13</td>
</tr>
</tbody>
</table>
4.3 Changes in Physical Activity-Related Social Cognitive Variables and Self-Reported Physical Activity Behaviour

A series of one-way RM-ANOVAs detected significant, small-to-large sized differences in five SCT outcomes: task self-efficacy ($F[2, 11] = 5.89, p = .01, \eta^2_p = .28$), self-regulatory self-efficacy for goal-setting ($F[2, 11] = 4.22, p = .02, \eta^2_p = .22$), barrier self-efficacy ($F[2, 11] = 4.66, p = .02, \eta^2_p = .24$), goal-setting behaviour ($F[2, 11] = 11.01, p < .001, \eta^2_p = .42$), and scheduling and planning behaviour ($F[2, 7] = 10.66, p < .001, \eta^2_p = .42$). Although a small, significant main effect was detected in self-regulatory self-efficacy for goal-setting, Bonferroni’s corrections did not reveal any significant post-hoc effects (all adjusted $ps > .05$), indicating that there were no significant differences in this variable between any pairwise comparisons.

Contrary to hypothesis, post-hoc analyses using the Bonferroni correction revealed that task and barrier self-efficacy significantly increased from baseline to one-month post-intervention (adjusted $ps = .01$ and $.04$, respectively), but demonstrated no significant differences between baseline and one-week post-intervention, and one-week and one-month post-intervention (adjusted $ps > .05$). Goal-setting, and scheduling and planning behaviours significantly increased from baseline to one-week post-intervention (adjusted $ps = .01$), and from baseline to one-month post-intervention (adjusted $ps = .01$). However, as hypothesized, there were no significant increases in these self-regulatory behaviours between one-week and one-month post-intervention (all adjusted $ps > .05$). No significant differences were detected in outcome expectations ($F[2, 11] = 2.66, p = .09, \eta^2_p = .15$), and self-regulatory self-efficacy for scheduling and planning ($F[2, 11] = 1.79, p = .20, \eta^2_p = .11$).

A significant, medium-sized difference was detected in self-reported PA behaviour ($F[2, 11] = 5.32, p = .01, \eta^2_p = .26$). Contrary to hypothesis, post-hoc analyses using the Bonferroni correction revealed that self-reported PA behaviour significantly increased between baseline and one-month post-intervention (adjusted $p = .04$), but was not significantly different between baseline and one-week post-intervention, or one-week and one-month post-intervention (adjusted $ps > .05$). Table 8 provides a summary of means of all outcome variables at each assessment, and of RM-ANOVA findings.
Table 8

Means, Standard Deviations, and One-Way ANOVAs for Social Cognitive Variables and Self-Reported PA

<table>
<thead>
<tr>
<th>Variable (Potential Range)</th>
<th>Baseline $M \pm SD$ (Actual Range)</th>
<th>One-week post $M \pm SD$ (Actual Range)</th>
<th>One-month post $M \pm SD$ (Actual Range)</th>
<th>F-ratio (df)</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outcome expectations (22 – 396)</td>
<td>264.69 ± 61.44 (168 – 396)</td>
<td>290.56 ± 65.75 (168 – 396)</td>
<td>281.50 ± 61.08 (163 – 396)</td>
<td>2.66 (2, 11)</td>
<td>.09</td>
<td>.15</td>
</tr>
<tr>
<td>2. Task self-efficacy (1 – 7)</td>
<td>3.43 ± .61 (2.29 – 4.57)</td>
<td>3.79 ± .45 (2.86 – 4.29)</td>
<td>3.81 ± .59 (2.57 – 4.57)</td>
<td>5.89 (2, 11)</td>
<td>.01</td>
<td>.28</td>
</tr>
<tr>
<td>3. Goal-setting self-efficacy (0 – 100%)</td>
<td>69.84 ± 14.56 (45.00 – 95.00)</td>
<td>77.47 ± 15.85 (51.25 – 100.00)</td>
<td>75.70 ± 11.39 (57.50 – 95.00)</td>
<td>4.22 (2, 11)</td>
<td>.02</td>
<td>.22</td>
</tr>
<tr>
<td>4. Scheduling and planning self-efficacy (0 – 100%)</td>
<td>72.19 ± 17.05 (32.14 – 96.43)</td>
<td>75.96 ± 16.54 (38.57 – 98.57)</td>
<td>75.89 ± 14.13 (40.00 – 92.14)</td>
<td>1.79 (2, 11)</td>
<td>.20</td>
<td>.11</td>
</tr>
<tr>
<td>5. Barrier self-efficacy (1 – 7)</td>
<td>4.29 ± .90 (2.75 – 5.88)</td>
<td>4.83 ± 1.14 (2.63 – 6.50)</td>
<td>4.81 ± 1.08 (3.38 – 6.88)</td>
<td>4.66 (2, 11)</td>
<td>.02</td>
<td>.24</td>
</tr>
<tr>
<td>6. Goal-Setting (10 – 50)</td>
<td>28.69 ± 7.27 (17 – 39)</td>
<td>34.44 ± 8.49 (18 – 46)</td>
<td>35.31 ± 6.06 (19 – 44)</td>
<td>11.01 (2, 11)</td>
<td>&lt;.001</td>
<td>.42</td>
</tr>
<tr>
<td>7. Scheduling (10 – 50)</td>
<td>28.44 ± 8.64 (16 – 45)</td>
<td>34.38 ± 8.02 (19 – 49)</td>
<td>33.88 ± 6.49 (20 – 45)</td>
<td>10.66 (2, 11)</td>
<td>&lt;.001</td>
<td>.42</td>
</tr>
<tr>
<td>8. Total self-reported weekly minutes of PA</td>
<td>248.13 ± 171.34 (50 – 590)</td>
<td>320.75 ± 184.64 (40 – 670)</td>
<td>415.94 ± 365.46 (45 – 1185)</td>
<td>5.32 (2, 11)</td>
<td>.02</td>
<td>.26</td>
</tr>
</tbody>
</table>

*Note. M = mean; SD = standard deviation; $\eta^2_p$ = partial eta squared, such that .10 = small, .25 = medium, and .40 = large effect sizes (Cohen, 1992)*
Chapter 5
Discussion

5 Discussion

5.1 Summary
The purpose of this pilot study was to examine the feasibility of Plan to Move, and its short- and longer-term effects on the social cognitions and self-reported PA behaviour of youth with physical disabilities. Key study findings are discussed in the following sections, along with this study’s contributions to a growing field of research on youth-focused PA interventions delivered through technology-based platforms.

5.2 Main Findings

5.2.1 Feasibility of Plan to Move
Various outcomes (i.e., implementation fidelity [dose and adherence], intervention compliance, and acceptability) were examined to assess the feasibility of Plan to Move. The feasibility of Plan to Move was supported by: (1) good implementation fidelity, (2) good intervention compliance, (3) positive ratings on indicators of acceptability, and (4) participants’ perceived satisfaction with and utility of the intervention. Overall, Plan to Move was delivered to and completed by participants successfully. Implementation fidelity was high, with Plan to Move being delivered in its full dose (i.e., all weekly sessions were delivered to all participants) and in a timely manner, with an average on time delivery rate of 98.38%. Only one of the weekly sessions was not delivered on-time to one participant; this was due to technical issues with the e-mail server being used to deliver intervention materials. Intervention compliance was also high, with participants completing, on average, 93.75% of the online sessions, and 96.88% of the independent activities. One possible explanation for these high compliance rates was the introduction of new topics on a weekly basis through the titrated delivery of the intervention. Participants indicated during the one-month post-intervention assessment that learning about a new topic on a weekly basis maintained their interest, and that Plan to Move’s online delivery was convenient and made it more manageable for them to complete. Weekly e-mail and SMS reminders also may have contributed to the high compliance rate observed in the current study.
While there is limited research evaluating the efficacy of SMS reminders in enhancing adherence to health behaviour interventions, with the majority of studies evaluating the utility of SMS as a platform to deliver health behavior interventions, there is evidence supporting the use of SMS reminders to enhance medication adherence among youth living with chronic illnesses (Miloh et al., 2009; Neville et al., 2002). Considering that youth are among those with the highest levels of Smartphone use, and commonly use SMS as a mode of communication (Lenhart, Ling, Campbell, & Purcell, 2010), it may be worthwhile to incorporate SMS reminders in future PA interventions to enhance the frequency and quality of compliance. With regard to the timeliness of weekly completion, although all participants completed Week 1 of Plan to Move in a timely manner, 75% (i.e., 12 of 16) of participants completed Weeks 2 to 4 within seven days. It is important to note that only two participants consistently did not complete Weeks 2 to 4 in a timely manner, taking, on average, 9.33 days to complete these weeks of Plan to Move. While this is not substantially greater than the seven day threshold for ‘on-time completion’, being aware of issues relating to compliance may provide insight on dampened intervention effects, either at the individual or group level (Wanner, Martin-Diener, Bauer, Braun-Fahrlander, & Martin, 2010).

Several participants indicated that having Plan to Move delivered through the Internet on a weekly basis allowed for easy access to the intervention and maintained their interest. This is an important finding given the documented challenges with retaining participants in technology-based health behaviour interventions, in comparison to other modes of contact, such as face-to-face interaction (Li, Browne, & Wetherbe, 2006). In particular, several Internet-based intervention studies have reported that a substantial proportion of users either stop using the intervention or drop out before completion of the intervention (Eysenbach, 2005; Wangberg, Bergmo, & Johnsen, 2008). This phenomenon is a distinct characteristic of technology-based health behaviour interventions, as engagement with the intervention platform (e.g., Internet or mobile application) is mostly at the discretion of the participant (Eysenbach, 2005). For example, in a one-month Internet-based LTPA program for adults with physical disabilities (ages 18 to 44 years), the authors reported an attrition rate of 50% from baseline to one-month post-intervention (Kosma, Cardinal, & McCubbin, 2005). Evidently, participants have the option to readily disengage from the technology-based intervention platform at any point in time, and perhaps more easily than discontinuing their attendance to a face-to-face intervention (Eysenbach, 2005).
Beyond issues relating to high rates of attrition in technology-based interventions, there is evidence demonstrating that participants’ use of websites or online modules often declines as they progress through an Internet-based PA intervention (Leslie, Marshall, Owen, & Bauman, 2005; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). Although most participants completed each week of *Plan to Move* as intended, imperfect participant compliance and sustained engagement is a common challenge of online interventions, and often contributes to the dampening of intervention effects (Wanner et al., 2010). While perfect compliance is a desirable outcome of any intervention, it is often not realistic due to participants’ competing interests and obligations. Issues with participant compliance to interventions delivered through the Internet are further compounded, compared to face-to-face interventions, given that there is no guarantee that recipients will engage with and use the intervention as intended by the interventionist (Glasgow et al., 2007).

Considering the well-documented challenges associated with participant retention and maintaining user engagement in an Internet-based PA intervention, a relatively low attrition rate (20.0%) and high intervention compliance (i.e., 93.75% of online sessions and 96.88% of independent activities) are promising. This may have been attributable to the shorter duration of *Plan to Move* in comparison to other technology-based PA interventions targeted towards youth, which have been found to range from two weeks to two years in length (Lau et al., 2011). When asked about the length of *Plan to Move*, most participants indicated that four weeks was long enough for them to absorb the information they learned, while maintaining their interest. Given that youth tend to use websites and mobile applications for short periods of time, and are transient in their interests (Antezana et al., 2015), a shorter intervention may have facilitated greater compliance and retention than a longer intervention would have. Given the relatively high rate of participant compliance in the current study, and previously observed dose-response relationships for Internet health interventions (An et al., 2006; Eysenbach, 2002; Steele, Mummery, & Dwyer, 2007), it may be worthwhile to design shorter, rather than longer, PA interventions when targeting youth.

Beyond outcomes of implementation fidelity and intervention compliance, participants provided positive ratings (i.e., scores above the Likert scale’s ‘neutral’ anchor point) on indicators of acceptability in the weekly feedback questionnaires. Overall, participants indicated that each week of *Plan to Move* was easy to navigate and understand, and provided credible information
that they would likely use in the future to manage their PA behaviour. Positive ratings on ease of use were expected, as youth tend to gain full mastery of websites and mobile applications quickly (Antezana et al., 2015). Previous research has found that youth, both typically developing and those with physical disabilities, perceive technology-based interventions as easy to use and a credible source of new information (Barnfather et al., 2011; Haerens, Deforche, Vandelanotte, Maes, & De Bourdeaudhuij, 2007). Similar outcomes were revealed in the current study through discussions between the participants and the student investigator during the one-month post-intervention assessment. Participants shared that, overall, they were satisfied with Plan to Move, and participating in the intervention provided them with a set of skills that would likely help them manage their PA behaviour in the future. The main markers of participants’ satisfaction with Plan to Move included: (1) its user-friendly design, and (2) the role of the YouTube™ videos in enhancing engagement and their understanding of the information being presented. This feedback provides evidence for the efficacy of the simplistic and straightforward design of an online behaviour change intervention. Participants indicated that simple navigation and compatibility of the websites with their Smartphone and tablet Internet browsers were major elements relating to the user-friendliness of Plan to Move. Smartphone and/or tablet access enhanced the accessibility of Plan to Move, and also allowed participants to engage with the intervention more promptly than they may have from a desktop or laptop. These findings provide support for the delivery of PA interventions through modes that are readily accessible by the intended audience (van Gemert-Pijnen et al., 2011).

Previous evidence of the frequent use of YouTube™ by youth with physical disabilities (Newman et al., 2010; Raghavendra et al., 2011) and current participants’ perceived acceptability of incorporating YouTube™ videos as a method to deliver and reinforce information supports the continued use of videos as an intervention strategy for this population. On average, participants viewed 69.89% of the total minutes of all seven videos. Thus far, Internet-based PA interventions targeting youth have been largely text- or graphics-based (Maher, 2008). The incorporation of YouTube™ videos within a PA intervention was novel, and thus, expected outcomes relating to viewership compliance and impact were unknown. Despite evidence that youth, both typically developing and with physical disabilities, often engage with social media, particularly YouTube™ (Newman et al., 2010; Raghavendra et al., 2011), there is a lack of empirical research investigating the use and efficacy of YouTube™ as a platform for or element
of youth-centred health behaviour change interventions. However, participants’ positive response to the YouTube™ videos in Plan to Move indicated that this strategy may be efficacious for delivering elements of a PA intervention to youth with physical disabilities. As participants indicated during the one-month post-intervention assessment, the YouTube™ videos were an element of the intervention that they felt they could interact with, and also helped reinforce concepts and strategies more than plain text and images would have. These findings support the importance of communicating information through means that are interesting and salient to the intended audience (van Gemert-Pijnen et al., 2011). Further work is needed to determine optimal video length and content to maximize overall intervention efficacy. Overall, the observed feasibility outcomes support Hypothesis #1, such that Plan to Move was delivered to and completed by participants successfully, and that participants perceived the intervention as acceptable.

5.2.2 Effects of Plan to Move on Social Cognitive Variables and Self-Reported Physical Activity Behaviour

Significant, small-to-large sized increases were detected in some SCT variables and in self-reported PA behaviour. In particular, participants demonstrated an increase in self-efficacy (i.e., task and barrier) one month after completing Plan to Move, and the use of self-regulatory behaviours (i.e., goal-setting, and planning and scheduling) one week and one month after completing Plan to Move. There were significant, small-to-medium sized increases in task and barrier self-efficacy. This is inconsistent with previous findings from Maher et al. (2010), whose SCT-based Internet intervention (‘Get Set’) led to decreased levels of task self-efficacy at 2 and 12 weeks post-intervention. The authors proposed that participating in Get Set may have heightened participants’ awareness of the difficulties associated with PA behaviour change, and as a result, decreased their self-efficacy for PA (Maher et al., 2010). One potential explanation for differences in participants’ self-efficacy outcomes between the current study and Get Set is that Plan to Move did not only target self-efficacy, but also self-regulatory behaviours. Although participants were encouraged to set goals in Get Set, self-regulation was not explicitly targeted or assessed. Participants were not provided with a step-by-step approach on how to set PA goals, self-monitor their PA behaviour, or overcome barriers. Rather, the Get Set modules focused on enhancing self-efficacy for PA by targeting PA knowledge and attitudes. Perhaps learning about self-regulatory strategies to manage PA behaviour in Plan to Move counteracted potential
negative effects on self-efficacy by providing participants with the means to overcome or minimize certain difficulties related to engaging in PA that may have been revealed by participating in the intervention. This supports the importance of targeting self-regulation, in addition to outcome expectations and self-efficacy, in PA interventions for youth with physical disabilities.

In addition to improvements in self-efficacy, participants also demonstrated significant, large-sized increases in their use of self-regulatory behaviours (i.e., goal-setting, and planning and scheduling). This is consistent with previous work, which has found that SCT-based interventions can effectively enhance self-regulation in typically developing youth (Hortz & Petosa, 2008), as well as among youth with disabilities (Cervantes & Porretta, 2013). Although participants in Plan to Move demonstrated increases in goal-setting and scheduling behaviours from baseline to one-week and one-month post-intervention, these differences were not complemented by increases in self-regulatory self-efficacy for these behaviours. This dichotomy may have resulted from the respective instruments operationalizing the behaviours of goal-setting, and planning and scheduling differently. For example, the self-regulatory self-efficacy instrument for goal-setting asked participants to indicate their level of confidence to engage in the general act of goal-setting to maintain or increase their PA over the next four weeks, whereas the EGS asked participants to indicate the degree to which they engaged in a subset of specific goal-setting behaviours (e.g., writing and breaking goals down into a series of steps), without reference to an explicit window of time. The general versus specific language used to describe these self-regulatory behaviours may explain the discrepancy between participants’ confidence to engage in self-regulatory behaviours and their actual behaviour. Further, the lack of reference to a specific time frame in the EGS and EPS likely led participants to reflect on their self-regulatory behaviours in the present moment or near future, whereas the self-regulatory self-efficacy measures likely prompted participants to reflect on their confidence to engage in the specified behaviours prospectively in the upcoming four weeks. Alternatively, there may have been a ceiling effect for participants’ self-regulatory self-efficacy. Participants reported somewhat high levels of self-efficacy for goal-setting (69.84%) and scheduling and planning (72.19%) at baseline. These high ratings were not, however, accompanied by high ratings for engaging in self-regulatory behaviours at baseline. A potential explanation for this discrepancy may be related to the positive illusory bias, in which an individual’s self-perceptions or estimation of
their ability to perform certain actions is reliably greater than the objective accuracy of those perceptions or estimations (Moore & Healy, 2008; Taylor & Brown, 1988). This bias has been observed in youth, with evidence of the overestimation of academic and social competencies (Brendgren, Vitaro, Turgeon, Poulin, & Wanner, 2004; Cole, Martin, Peeke, Seroczy, & Fier, 1999).

Contrary to Hypothesis #2, a significant, medium-sized increase in participants’ self-reported PA behaviour was found between baseline and one-month post-intervention. Although PA was not categorized by intensity for the purpose of data analyses, it is interesting to note that participants self-reported engaging in 55.00 and 91.88 more minutes of mild- and moderate-intensity PA, respectively, at one-month post-intervention than at baseline, whereas their self-reported weekly minutes of heavy-intensity PA did not show any notable differences (i.e., 75.50 minutes per week at baseline versus 76.88 minutes per week at one-month post-intervention). Despite evidence for longer-term increases in PA behaviour in the current study, it is important to acknowledge the potential influence of response bias. Participants’ knowledge of the intervention’s focus on enhancing PA behaviour may have influenced their responses to items pertaining to their PA behaviour. Therefore, the self-reported increases in PA behaviour from baseline to one-month post-intervention must be interpreted with caution. Although utilizing objective measures of PA behaviour (e.g., accelerometer) would mitigate issues relating to self-report bias, such instruments were not feasible for the current study due to the logistics of providing participants with such an instrument for all three assessments (i.e., baseline, and one-week and one-month post-intervention). Additionally, it is important to acknowledge that some baseline assessments were administered during the winter months, whereas the corresponding one-month post-intervention assessment was administered during the spring. Thus, although increases in participants’ PA may not have been a result of response bias, it may have rather been due to seasonal conditions being more conducive to participants engaging in PA outdoors (Lindsay et al., 2015). If seasonal conditions impacted PA behaviour in some way, it could be argued that participants were more inclined to engage in PA outdoors after completing Plan to Move than they would have been prior to, or that participants’ increased levels of PA approaching spring is a typical trend in their PA behaviour, irrespective of their participation Plan to Move. Whether Plan to Move had a direct influence on PA behaviour cannot be discerned from the current analyses. Future work should include more objective measures of PA
behaviour, and control for potential seasonal effects on PA behaviour by restricting the duration of the study within one season.

The results provided partial support for Hypothesis #2. Increases in self-regulation were detected between baseline, and one-week and one-month post-intervention, whereas increases in self-efficacy (i.e., task and barrier) and self-reported PA behaviour were detected between baseline and one-month post-intervention only. These findings demonstrate that some SCT variables were enhanced both in the short- and longer-term, whereas other SCT variables and PA behaviour were only enhanced in the longer-term. Given the complexity of behaviour change, one week was likely not a sufficient amount of time for participants to apply the skills and strategies learned from the intervention in such a way that would produce significant, or detectable, behaviour change. Although it could be argued that the maintenance of enhanced social cognitive variables and self-reported PA behaviour at the one-month post-intervention assessment is not indicative of the true long-term effects of Plan to Move, these findings provide evidence that these variables can be enhanced within a four week period, and that these increases can be maintained for at least four weeks post-intervention. The steady maintenance of newly adopted habits or behaviours may take up to six months to achieve (Prochaska & DiClemente, 1983), thus future research should aim to examine longer-term intervention effects on cognitive and behavioural outcomes beyond that of the effects one-month post-intervention.

Contrary to Hypothesis #2, there were no significant differences in outcome expectations from baseline to one-week or one-month post-intervention. This is inconsistent with previous research, which has demonstrated that outcome expectations can be enhanced in youth with sensory disabilities by the end of a five-week SCT-based PA intervention (Cervantes & Porretta, 2013). Notably, however, outcome expectations were high at baseline ($M = 264.69, SD = 61.44$), which may be indicative of a ceiling effect. Alternatively, discussions with participants during the one-month post-intervention assessment suggested that outcome expectations may need to be targeted differently in youth with physical disabilities. For example, two participants commented on their interest in and the value of providing information about the scientific mechanisms underlying the benefits of PA. Perhaps providing information about the mechanisms underlying the benefits of PA may enhance their salience, and in turn, more effectively enhance participants’ outcome expectations in comparison to providing a list of benefits that most individuals are likely aware of. Given evidence of outcome expectations being a direct predictor of PA
behaviour in typically developing youth (Harmon et al., 2014; Martin et al., 2008), exploring how outcome expectations can be more effectively targeted and enhanced in youth with physical disabilities would be of value and could potentially have positive influences on their PA behaviour.

5.3 Strengths and Limitations

As with all studies, the current study is not without its limitations. It is critical to acknowledge the likelihood of sampling bias and a lack of a control group to mitigate issues surrounding sampling biases. Individuals who are more receptive to and interested in increasing their levels of PA would more likely express interest in and take the initiative to participate in PA research. Participants’ heightened receptivity and motivation to increase their PA may have played a role in the favourable outcomes observed in the current study. Despite the likelihood of sampling bias, participants’ self-reported levels of PA were varied, ranging from 50 to 590 total weekly minutes of mild, moderate, and heavy intensity PA combined. This indicated that this sample captured a wide range of activity levels at baseline, and did not only favour those who were relatively physically active prior to completing Plan to Move. However, this sample likely was not entirely representative of youth with physical disabilities who have lower levels of functioning and are impacted by barriers to PA participation to a greater extent than their higher functioning peers (Law, Petrenchik, King, & Hurley, 2007). Thus, caution should be given with regards to the generalizability of the outcomes experienced by the current sample to youth with physical disabilities who may be of lower functioning.

Further, there are a few statistical limitations that must be acknowledged. First, the target sample size was not achieved, leaving the current study underpowered and at risk for Type II Error (Cohen, 1992). As such, interpretation of the results focused on effect sizes, despite several outcomes demonstrating significant increases between baseline and post-intervention, as assessed using a $p \leq .05$ cut-off following Bonferroni adjustment. However, given the pilot nature of the current study, a sample size calculation was not required, as one of the objectives of a pilot study itself is to inform sample size calculations for larger scale studies (Thabane et al., 2010). Second, many outcome measures were selected based on best available evidence for the reliability and validity in typically developing youth or adults with a spinal cord injury. The psychometric properties of the included instruments, beyond Cronbach’s alpha values calculated
for the current study, remain largely unknown for youth with physical disabilities. Thus, further testing of the instruments included in this study is needed to validate their internal consistency. Finally, given the largely descriptive nature of this pilot study, causal inferences cannot be made with regard to the direct effects of Plan to Move on outcomes pertaining to social cognitive variables and PA behaviour.

Despite the noted limitations, this study is supported by several strengths. The Plan to Move intervention was rooted in theory and targeted known correlates of PA in youth, while several other technology-based PA interventions thus far have been atheoretical in nature (Lau et al., 2011). There is evidence demonstrating that youth-based PA interventions that lack theoretical foundations show minimal success in facilitating behaviour change, whether these interventions are delivered in person or through technology-based means (Baranowski et al., 1998; Hamel et al., 2010; Lewis et al., 2002). Utilizing theory may allow for the identification of the active ingredients of an intervention, and allow for a more thorough understanding of intervention effects (Bartholomew et al., 2006; Michie et al., 2013). In the current study, utilizing SCT as a guiding framework allowed for the operationalization of which constructs were or were not successfully enhanced. This provided insight on how certain constructs may need to be targeted differently in the future, or perhaps might not be relevant to youth with physical disabilities in the context of enhancing PA behaviour. Future SCT-based studies for youth with physical disabilities should continue to target self-efficacy, but also focus on self-regulatory behaviours. Further, to enhance their salience, outcome expectations may need to be targeted differently in future PA interventions for youth with physical disabilities than they are in PA interventions for typically developing youth or youth with other types disabilities.

This is the first study to examine the feasibility of an online PA intervention for youth with physical disabilities. Beyond evaluating effects of the intervention on the social cognitive and behavioural outcomes of interest, the comprehensive assessment of feasibility outcomes (i.e., implementation fidelity, intervention compliance, and acceptability) itself was a methodological strength of this study. Given the novelty of this intervention, assessing markers of feasibility allowed for a deeper understanding of whether the underlying methods and procedures of the intervention could be executed successfully (Carroll et al., 2007). Results from the current study relating to outcomes of feasibility provided insight on the processes that worked and did not work, and may contextualize why certain parts of the intervention were or were not effective.
Evaluating feasibility outcomes highlights processes that may need to be revisited in the future to enhance future intervention execution and success in this population, or processes that were successfully executed and perhaps contributed to the success of the intervention (Carroll et al., 2007). For example, although imperfect, intervention compliance was quite high. Previous Internet-based PA interventions have reported poor overall compliance, and dramatic reductions in intervention exposure in later parts of the intervention period (Leslie et al., 2005; Steele et al., 2007). In the current study, however, all participants completed all four weeks of Plan to Move, and mostly in a timely manner. As mentioned previously, this is may be attributable to the shorter duration and titrated delivery of the intervention, and the weekly e-mail and SMS reminders. Perhaps these strategies helped maintain the youth participants’ interest throughout the duration of the intervention, and may be useful to enhance participant retention in future youth-based PA interventions.

Despite being a small sample, a broad range of physical disabilities was represented (e.g., cerebral palsy, muscular dystrophy, neuromuscular disorder, and spinal cord injury). This is the first study to examine the effects of an SCT-based PA intervention, online or otherwise, among youth with a spectrum of physical disabilities, whereas previous work has only examined effects on youth with cerebral palsy (Maher et al., 2010). Having a sample of youth with several types of physical disabilities and at different levels of functioning also provided varied insights on the perceived acceptability of the intervention, thus enhancing the generalizability of the intervention to youth with a range of physical disabilities.

Another strength of this study was the user-centred approach throughout the development, implementation, and evaluation of Plan to Move. Technology-based health interventions are often developed with only a marginal level of engagement with the end-user, which may explain commonly encountered issues with the usability of such interventions (Kelders, van Gemert-Pijnen, Werkman, & Seydel, 2010; Nijland, van Gemert-Pijnen, Boer, Steehouder, & Seydel, 2008) or high attrition (Eysenbach, 2005; Wangberg et al., 2008). Involving and obtaining feedback from the intended audience (i.e., two youth with physical disabilities) in the pre-testing phase, gathering weekly participant feedback on each session of Plan to Move, and engaging in discussions with participants during the one-month post-intervention assessment about their experience of Plan to Move provided invaluable insights that would not have been captured without pursuing a user-centred approach. Engaging youth throughout the research process, from
the pre-testing to pilot phase, provided them with the opportunity to share their opinions and experiences of, and suggestions for *Plan to Move*. This approach aligns with the Spiral Technology Action Research model of eHealth intervention development, which emphasizes the importance of engaging in ongoing dialogue with end-users of the intervention or program (Skinner, Maley, & Norman, 2006). In order for a technology-based intervention to be successful, it must be appropriate for and received well by its intended users (Skinner et al., 2006). To ensure that an intervention is well-received and appropriate, it is critical to gather the perspectives of those to whom the intervention is being delivered, and subsequently adjust the design of the intervention based on their feedback (Skinner et al., 2006).

Further, participants’ insights and opinions during the one-month post-intervention assessment provided depth beyond what could be captured by quantitative methods alone (i.e., weekly feedback questionnaires). For example, participants indicated on the weekly feedback questionnaires that the websites were easy to understand and navigate. Although this is valuable information, discussions with participants added another layer of depth to that finding, and allowed for a more thorough understanding of what exactly made the websites easy to understand and navigate. This mixed-methods, youth-centred methodological approach afforded the opportunity to have a more in-depth understanding of how *Plan to Move* was received by participants, and can provide guidance in developing and delivering future PA interventions to maximize favourable outcomes (De Beurs, van Bruinessen, Noordman, Friele, & van Dulmen, 2017; Stinson et al., 2010; Wozney, Baxter, & Newton, 2015). Participants provided perspectives on *Plan to Move* that were personally relevant to them, and their opinions and thoughts may have gone unheard if not for the mixed methodological approach of this study.

## 5.4 Implications and Future Directions

This pilot study provided evidence that an Internet-delivered PA intervention is feasible, and can lead to enhanced self-efficacy, self-regulation, and self-reported PA behaviour among youth with physical disabilities. High rates of compliance to and participants’ positive ratings on their perceived acceptability of *Plan to Move* indicated that Internet-delivery may be an alternative, yet effective, means to deliver PA interventions to youth with physical disabilities. Given the unique challenges that youth with physical disabilities face, these outcomes are encouraging, as utilizing technology-based platforms, such as the Internet, can minimize barriers relating to
accessibility and transportation, and in turn, possibly extend the reach of such PA interventions to more youth with physical disabilities.

Second, this intervention’s success in enhancing certain social cognitive constructs (i.e., self-efficacy and self-regulation) and PA behaviour within four weeks is promising, as it demonstrates that a shorter intervention can still effectively enhance cognitive and behavioural outcomes. Several PA interventions are much longer and have reported poor compliance or high rates of attrition (Lau et al., 2011; Leslie et al., 2005; Steele et al., 2007). This is particularly relevant for technology-based interventions targeted towards youth, as youth tend to use websites and mobile applications for short periods of time and are transient in their interests, suggesting that delivering a shorter intervention may be an appropriate strategy to improve intervention retention and compliance (Antezana et al., 2015). Given the observed patterns of cognitive and behaviour change in the current study, a future randomized controlled trial with a larger sample size is warranted to: (1) minimize the potential for sampling bias, (2) ensure that the sample is representative of the larger population of youth with physical disabilities, and (3) provide a point of comparison to understand the effects of being exposed Plan to Move versus not being exposed. In addition, although this study demonstrated that increases in self-efficacy, self-regulation, and self-reported PA behaviour can be maintained for at least four weeks post-intervention, further work is needed to elucidate the longer-term effects of Plan to Move on participants’ social cognitions and PA behaviour.

Third, participants’ opinions and thoughts on Plan to Move were invaluable, and highlighted opportunities for future research and intervention development. Participants provided insights on what should be carried forward from Plan to Move when developing future PA interventions, and what they would like to see done differently in the future. Based on participant feedback, future online PA interventions should continue to include videos as a means of delivering information, and should also be accessible via Smartphone or tablet. All participants spoke to their enjoyment of the embedded YouTube™ videos, as they delivered information in an understandable and engaging manner, and had more of a lasting impact than the information presented in-text. Participants indicated that the compatibility of the websites with their Smartphones provided them with the convenience of accessing the online sessions promptly. In line with Smartphone compatibility, participants would like to see the weekly independent activities built in to the website itself rather than having to complete it offline. Thus, future
youth-based PA interventions should streamline all components of the intervention within one interface that is accessible via Smartphone. In addition, participants suggested including resources on accessible facilities and local sport opportunities and providing information relating to other aspects of self-care (e.g., nutrition, physical conditioning). This feedback provides insight on the kind of information and resources that youth with physical disabilities may be seeking when they are looking to increase their PA behaviour, and should be considered in the development and design of future PA interventions for this population.

Lastly, although this pilot study examined and evaluated several indicators of feasibility, future work should incorporate means to more effectively monitor and evaluate participant exposure to the intervention. Most Internet-based behaviour change programs have found that participants do not spend a considerable amount of time accessing or engaging with online interventions, implying minimal participant exposure to the critical ingredients of the intervention (Eysenbach, 2005; Danaher, Boles, Akers, Gordon, & Severson, 2006). Assessing participant Web behaviour while interacting with the online intervention could help identify which elements of the intervention youth are spending the most and least time engaging with. Website usage statistics, including information on which pages are visited, when and how often, and for how long, would provide insight on how future online PA interventions can be designed to enhance engagement and improve intervention outcomes.
6 Conclusion

This pilot study explored the feasibility and effects of an online PA intervention for youth with physical disabilities. This study’s findings contribute to a growing body of research on technology-based PA interventions, and highlights opportunities for future research. Overall, the results support the use of the Internet as a platform to deliver PA interventions to youth with physical disabilities. This study provided evidence that an Internet-based PA intervention can be successfully delivered to, completed, and perceived as acceptable by youth with physical disabilities. Further, this study provided evidence that targeting social cognitive constructs can enhance cognitive and behavioural outcomes. Findings from this pilot study can provide guidance on how Internet-based PA interventions for youth with physical disabilities can be designed or improved in the future to maximize favourable intervention outcomes. Continued research in the area of Internet-based PA interventions for youth with physical disabilities is critical. The Internet delivery of PA interventions creates opportunities for this population to learn about strategies that can help them become more physically active, and hopefully translate into effective behaviour change that they may not have otherwise been able to experience without the option of Internet delivery.
References


Appendices

Appendix A: Manipulation Check Items

*These questions will be presented at the end of each session as a manipulation check.*

**Week 1: Outcome Expectations**

1. What was one topic that was covered during today’s session?
2. Name one outcome expectation you have for being physically active

**Week 2: Self-Efficacy**

1. How can you increase your confidence to be more physically active?

**Week 3: Self-Regulation**

1. Name one strategy for increasing physical activity that was discussed in this week’s session.

**Week 4: Overcoming Barriers and Preventing Lapses**

1. Name one type of barrier to physical activity.
2. What is a lapse?
Appendix B: Independent Activity – Week 1

PLAN TO MOVE: WEEK 1

By the end of this activity, we hope you are able to:

✓ Identify the general benefits of physical activity
✓ Identify personally relevant benefits of increasing your physical activity

The purpose of our study is to provide strategies to help youth with physical disabilities increase their levels of physical activity. Let’s work through a few questions!

LET’S BRAINSTORM!

How would you define physical activity?
Click here to enter text.

What do you think are the short- and long-term benefits of physical activity? List a few below!
Click here to enter text.

What are some more personally relevant benefits (e.g., physical, social, emotional) that you think you can experience by increasing your levels of physical activity?
Click here to enter text.
Thank you for taking part in the first week of Plan to Move! To finish off this week, we would appreciate if you could take a few minutes to let us know what you thought of the first session.

Please answer the follow questions. **You can indicate your answer by checking off the respective box, by clicking on it. Please pick one number between 1 and 7.**

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(1 = \text{strongly disagree}; \ 4 = \text{neutral}; \ 7 = \text{strongly agree})
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Overall, what did you learn from this session, and how do you think it could help you increase your physical activity? If you have any other comments, you can also indicate them below.

Click here to enter text.
Appendix C: Independent Activity – Week 2

PLAN TO MOVE: WEEK 2

By the end of this activity, we hope you are able to:

✓ Broaden your definition of physical activity
✓ Identify times when you were physically active
✓ Reflect on and share positive experiences and accomplishments

REDEFINING PHYSICAL ACTIVITY!

After completing this week’s session, how would you define physical activity now, and how has your definition changed from before you started this study?

Click here to enter text.

With your new definition of physical activity in mind, think about and share with us the times when you were physically active! For example, going for a wheel or a walk is considered physical activity! List a few below!

Click here to enter text.
To build your confidence in your ability to increase physical activity, it can help to reflect on the positive experiences you’ve had so far, and to share those experiences!

Below, tell us more about a few times when you had a positive experience related to physical activity, and what about it made it enjoyable.

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Talk about your positive physical activity experiences with a friend or your parents! The more you think and talk about these positive experiences, the more you realize what you’re capable of doing!
WEEK 2: FEEDBACK

Thank you for taking part in the second week of Plan to Move! To finish off this week, we would appreciate if you could take a few minutes to let us know what you thought of the second session.

Please answer the follow questions. **You can indicate your answer by checking off the respective box, by clicking on it. Please pick one number between 1 and 7.**

\[(1 = \text{strongly disagree}; \ 4 = \text{neutral}; \ 7 = \text{strongly agree})\]

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<td>6. The information I learned and activities I did will help me increase my confidence to be more physically active in the future.</td>
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Overall, what did you learn from this session, and how do you think it could help you increase your physical activity? If you have any other comments, you can also indicate them below.

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Appendix D: Independent Activity – Week 3

PLAN TO MOVE: WEEK 3

By the end of this activity, we hope you are able to:

✓ Understand what self-monitoring is, and how it can be a useful tool for increasing your physical activity
✓ Understand how to use inactivity logs as a self-monitoring strategy
✓ Understand what S.M.A.R.T. goal-setting is, and how you can set S.M.A.R.T. goals
✓ Practice scheduling physical activity sessions on a calendar to help you achieve those goals

This week, we’d like you to think about finding time to be physically active! Often, we think that we are too busy to be physically active, but there may be time during our day when we could be active. For this activity, identify those times when you are inactive, but possibly could engage in physical activity.

We’ve created a 24-hour log for you to shade in all the times when you’re sedentary throughout the week (e.g., watching TV, going on the computer, talking on the phone). Even if you think that you could spend 10 or 15 minutes of that sedentary time being active instead (e.g., going for a walk, playing catch), you can type in the box how many minutes you think you can be active at that time! Here’s an example of how you would fill out your log. On the next page, you can fill out a log just like this!

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Now that you’ve thought about the times that you could potentially be physically active throughout the week, we would like you to **think about your motivations for wanting to increase your levels of physical activity.** Why do you want to be more physically active? For example, maybe you want to be more active to help with muscle tightness, or maybe to beat a personal best. You can type your responses in the text box below!

**I want to increase my levels of physical activity because…**

Click here to enter text.

**What do you think are the benefits of increasing your levels of physical activity?** You can list the benefits in the text box below!

Click here to enter text.
2. GOAL-SETTING

Now that you’ve taken the time to think about when you’re sedentary throughout the week, and the times when you can be physically active instead, let’s try to set some goals to work towards being more active! If you remember from this week’s online session, setting S.M.A.R.T. goals is a really helpful way to help you achieve your physical activity goals.

**LET’S SET SOME GOALS!**

We would like for you to set a specific, short-term physical activity goal that you will try to achieve within the next week. You can increase an activity you’re currently doing, or introduce a new activity into your routine – it’s up to you!

**GOAL-SETTING TIPS:**

- It’s important to set short-term goals that are specific
- Make sure your goal is **challenging**, but still **achievable**!
- **Remember**: success comes at a different pace for everyone, so keep working towards your goals – every bit of progress counts!
Now that you know how to set goals, we want you to try to set a specific, short-term physical activity goal that is challenging, but you think you can still achieve in the next week.

1. The type of activity I want to do within the next week is:
   
   Click here to enter text.

2. How many minutes of this activity do you want to complete?
   
   Click here to enter text.

3. What resources do you think you’ll need to help you achieve this goal? We encourage you to talk to your parents, and think about if they can be involved in some way and help you achieve your goals! Type your response in the text box below!

   Click here to enter text.
3. SCHEDULING

So far, you’ve identified times when you can be more physically active, and have set specific physical activity goals! The next important step is to actually schedule time to work towards achieving your physical activity goals!

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<td>Stretch for 20 minutes</td>
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SCHEDULING TIPS:

- Use an actual calendar to write out what days you want to be more physically active
- Be as specific as you can! You can think about what time during the day you want to do certain activities
- If you prefer, make use of your smart phone! You can even set reminders to help you keep on top of when you schedule to do activities.
Now that we’ve shown you an example of how to schedule your physical activity, we want you to try to schedule activities to work towards your physical activity goal on this calendar. Indicate the activity you will do, on what date, and for how long. You can even use your smartphone calendar to schedule your activity, and set a reminder to help you remember to do it!

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</tbody>
</table>

*Note: You do not have to schedule something for everyday on this calendar; just fill in the days that you would like to schedule an activity.* 😊
Thank you for taking part in the third week of Plan to Move! To finish off this week, we would appreciate if you could take a few minutes to let us know what you thought of the third session.

Please answer the follow questions. **Indicate your answer by checking off the respective box, by clicking on it. Please pick one number between 1 and 7.**

*(1 = strongly disagree; 4 = neutral; 7 = strongly agree)*

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<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>1. This session taught me new information.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
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<tr>
<td>2. This session was interesting.</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>3. This session was easy to understand.</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>4. The information I learned was trustworthy.</td>
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<td>5. The website was easy to use and navigate.</td>
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<td>6. I will use the skills I learned in this session in the future to help me be more physically active.</td>
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<td>7. I believe that the skills that I learned will actually help me be more physically active.</td>
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Overall, what did you learn from this session, and how do you think it could help you increase your physical activity? If you have any other comments, you can also indicate them below.
Appendix E: Independent Activity – Week 4

PLAN TO MOVE: WEEK 4

By the end of this activity, we hope you are able to:

✓ Evaluate your success at setting and achieving your physical activity goals
✓ Identify personal barriers to physical activity
✓ Identify lapses and strategies to prevent lapses
✓ Continue to develop your goal-setting and scheduling skills

LET’S REFLECT!

Last week, you set a specific, short-term physical activity goal. Let’s reflect!

What was your goal, and did you achieve that goal? If not, what do you think prevented you from achieving your goal?

Click here to enter text.

Was your goal challenging and achievable? Moving forward, would you change anything about how you set your physical activity goal last week?

Click here to enter text.
1. OVERCOMING BARRIERS

This week we talked about barriers. Barriers are negative cues that impact our physical activity. Cues can trigger us to action OR inaction – barriers are those cues that lead to inactivity.

Over the past month, what are some barriers you faced that either stopped you from doing your normal activity OR made you struggle with the decision to be active? For each barrier, try to identify a solution, using the strategies from the online session, that could help you overcome it.

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<tr>
<th>BARRIER</th>
<th>SOLUTION</th>
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<td>5. Click here to enter text.</td>
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TIP! When coming up with solutions, think about whether you can adapt on your own to overcome each barrier. If not, think about who can help you overcome those barriers!
If your solutions involved the help of others (i.e., social support), tell us more about how they could play a role in helping you overcome barriers to physical activity.

<table>
<thead>
<tr>
<th>SOCIAL SUPPORT</th>
<th>HOW CAN THEY HELP?</th>
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<tr>
<td><strong>Example</strong>: Friends</td>
<td><strong>Example</strong>: I can go for a wheel or for a walk to the park with a friend in the neighbourhood after school.</td>
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2. Click here to enter text.  
1. Click here to enter text.  
2. Click here to enter text.
This week, we also talked about preventing lapses. A lapse is missing or breaking some plan or scheduled event one to two times because of barriers. For example, missing your scheduled evening walk because of bad weather is a lapse. However, avoiding going for your scheduled walk even in nice weather is an extended lapse.

For the next activity, we want you to think about some barriers to physical activity that you have encountered in the past, and that have led to lapses or maybe even extended lapses. Then, think about strategies to counter those lapses to make a comeback! For example, a counter-strategy to bad weather is to check the weather for the next nice day, and plan to go for your evening walk then!
LET’S SET ANOTHER GOAL!

Having thought about the different barriers you may encounter to physical activity, and learning strategies to overcome lapses, we want you to set another physical activity goal. Reflect on the goal that you set last week and the information that you learned this week to help you set a realistic and achievable goal!

1. The type of activity I want to do within the next week is:

   Click here to enter text.

2. How many minutes of this activity do you want to complete?

   Click here to enter text.

3. What resources do you think you’ll need to help you achieve this goal? We encourage you to talk to your parents, and think about if they can be involved in some way and help you achieve your goals! Type your response in the text box below!

   Click here to enter text.

   Now, let’s **schedule time** to achieve your goal!

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Thank you for taking part in the final week of Plan to Move! To finish off this week, we would appreciate if you could take a few minutes to let us know what you thought of the final session.

Please answer the follow questions. **You can indicate your answer by checking off the respective box, by clicking on it. Please pick one number between 1 and 7.**

*(1 = strongly disagree; 4 = neutral; 7 = strongly agree)*

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<tr>
<td>1. This session taught me new information.</td>
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<td>2. This session was interesting.</td>
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<td>3. This session was easy to understand.</td>
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<td>6. The strategies I learned to overcome barriers and prevent lapses will help me maintain a more physically active lifestyle in the future.</td>
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Overall, what did you learn from this session, and how do you think it could help you increase your physical activity? If you have any other comments, you can also indicate them below.

Click here to enter text.
Volunteers Needed! [Ages 12-21 years]

Earn up to $25 + volunteer hours!

We are seeking youth (ages 12 – 21 years) with a physical disability (e.g., cerebral palsy, spinal cord injury, muscular dystrophy, spina bifida, amputation, etc.) to take part in a study about physical activity!

This study is called Plan to Move! What you would be doing for this study is completing 4 online sessions that teach you strategies to be more physically active in your daily life. In addition to these sessions, you would be completing a few questionnaires over the phone related to your current physical activity behaviour.

By completing the study, you can receive a $25 e-gift card of your choice to Foot Locker, Chapters, Best Buy, Cineplex or Amazon! Your participation in this study can also count towards your volunteer/community service hours for your school’s requirements! We will provide you with a signed letter confirming the time you spent participating in our study 😊

Participation in this study is voluntary and you may choose to withdraw at any time. All information collected will be kept confidential.

If you are interested in participating, please contact the Student Investigator, Ms. Ritu Sharma, at ri.sharma@mail.utoronto.ca 😊

Appendix F: Study Recruitment Flyer
**Appendix G:** E-mail Template to be Sent to Youth Recruited from the NPAM Study

Hi [youth’s name],

Since you indicated that you’d be interested in participating in future research, I thought I would reach out to you about another physical activity study being conducted by researchers at the University of Toronto.

The study is called *Plan to Move*, and the purpose of this study is to examine the effects of a 4-week online program designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity and physical activity-related cognitions. During this program, you would be learning strategies about how to become more physically active. I have attached a study flyer and consent form for you to take a look at for more detail about the study.

If you decide to participate in *Plan to Move*, your participation would involve the following:

- Completing a demographics questionnaire
- Completing a set of questionnaires about your thoughts relating to physical activity (e.g., your confidence in your ability to be physically active or plan for physical activity) at the beginning of the study, and one-week and one-month following completion of the program
- Completion of the 4-week online program, and the complementary independent activities for each session
- Providing feedback about the program and your experiences

You can receive up to a total of $25 and 5 volunteer hours for participating. Please let me know if you have any questions.

If you would like to enroll into the study, please let me know a few dates and times that would be best for me to contact you to obtain consent and get started with the questionnaires.

Sincerely,

Ritu Sharma  
M.Sc. Candidate | Research Coordinator  
University of Toronto
Appendix H: Letter of Information and Informed Consent Form – for Youth over 18 Years

Plan to Move Letter of Information

Research Team
Student Investigator: Ms. Ritu Sharma, Faculty of Kinesiology and Physical Education, University of Toronto, E-mail: ri.sharma@mail.utoronto.ca

Co-Investigator: Dr. Kelly Arbour-Nicitopoulos, Faculty of Kinesiology and Physical Education, University of Toronto, E-mail: kelly.arbour@utoronto.ca

Purpose of Research
You are invited to participate in Plan to Move! This study has been approved by the University of Toronto’s Office of Research Ethics. The purpose of Plan to Move is to examine the effects of an online intervention designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity and physical activity-related cognitions.

Who is eligible to participate?
We are looking for Canadian youth between the ages of 12 and 21 years, who have a physical disability (e.g., cerebral palsy, spina bifida, muscular dystrophy, spinal cord injury, arthritis).

What will happen during the study?
Plan to Move is a 4-week study, during which you will complete 4 online sessions (i.e., one session a week), that teach you strategies to become more physically active. Before you begin these online sessions, you will complete a demographics questionnaire, and a set of questionnaires about your thoughts relating to physical activity (e.g., your confidence in your ability to be physically active or plan for physical activity, the likelihood of you being physically active even in the presence of barriers, etc.) over the telephone with the Study Investigator. The Student Investigator will also explain the study in detail to you, and what you can expect from these online sessions. One week and one month after you complete the 4 online sessions, you will complete the same set of questionnaires as you did before the online sessions, over the telephone with the Student Investigator. You will also be asked to provide some feedback about your experience while completing these online sessions. Thus, in total, you will be completing these sets of questionnaires three times.

Are there any potential harms, risks, or discomforts that I should be aware of?
There is a very small chance that you may feel apprehensive to answer some of the questions relating to your thoughts about physical activity, given your personal experiences with physical activity. However, you do not have to respond to any questions you feel uncomfortable answering, and you do not have to explain why you chose not to answer. Other than that, there are no known risks associated with participating in this study.
**Are there good things about this study?**
The findings from this study will contribute to our knowledge on the effectiveness of physical activity interventions for youth with physical disabilities. Currently, we don’t know much about this topic, so your participation in this study will help us understand how effective physical activity interventions are for youth like yourself, and whether they actually lead to increases in physical activity and improve physical activity-related cognitions.

**How will the information gathered from this study be kept confidential?**
All information that is shared with the Student Investigator will be kept strictly confidential, and will be stored in Dr. Arbour-Nicitopoulos’ locked laboratories on a secure, password-protected computer. No information that discloses the identity of you or your family will be released or published without consent, unless required by law. This legal obligation includes a number of circumstances, such as suspected child abuse, where research documents are ordered to be produced by a court of law and where researchers are obliged to report to the appropriate authorities. After data analysis is complete, data cannot be withdrawn and collected data will be stored by the research team for up to 5 years on a secure, password-protected computer in Dr. Arbour-Nicitopoulos’ laboratory.

**Will I be compensated for my involvement in the study?**
Yes, all participants will be compensated $5 for each online session they complete per week, for a total of $20, and an additional $5 for completing the questionnaires over the telephone. In total, you can receive up to $25 for participating in our study, which will be in the form of an eGift Card to Foot Locker, Best Buy, Chapters, Cineplex or Amazon. You will also have the opportunity to use the hours you spend in our study towards volunteer/community service hours. We will e-mail or mail out a letter of participation, indicating the number of hours spent.

**Voluntary Participation and Early Withdrawal**
Your participation in this study is voluntary and involves no risk to you as a person. You may refuse to participate or answer any questions asked of you without penalty or explanation. You may withdraw your assent to participate in the study at any time. If you choose to withdraw from the study, you will also have the option to withdraw the information that you provided. However, your data cannot be withdrawn after data analysis is complete. Contact the researcher by phone 647-521-9357 or by e-mail at ri.sharma@mail.utoronto.ca if you would like to withdraw their information. If you have any questions or concerns about your rights as a research participant, please contact the Office of Research Ethics at ethics.review@utoronto.ca or call 416-946-3273.
Acceptance of the Conditions of the Research Process and Consent

By signing this form, I acknowledge that:

a) The research team has given me the opportunity to ask questions regarding this research study and its procedures and that these questions have been answered to my satisfaction.

b) At any time during the study, I may request further clarification from the research team. I can do this by contacting the Principal Investigator by phone (647) 521-9357 or by e-mail at ri.sharma@mail.utoronto.ca.

c) This study is investigating the effects of an online physical activity intervention for Canadian youth with physical disabilities.

d) The researchers would like me to complete four online sessions on a weekly basis, which will focus on strategies to become more physically active, and a set of questionnaires about my physical activity-related cognitions before, one week and one month after I complete the four online sessions.

e) I am under no obligation to participate in the research study, am free to withdraw from the study at any time, without explanation, and that I am free to withdraw my permission and consent at any time during the research study. However, my data cannot be withdrawn after data analysis is complete.

f) I am free now, and in the future, to ask any questions about the study.

g) I have been told that my information will be kept confidential, except where release of information is required by law, e.g., suspected child abuse, public health.

h) I understand that no information that would identify me will be released or printed.

i) The possible harms and discomforts and the possible benefits (if any) of this research study have been explained to me, and in no way does signing this consent form waive my legal rights nor does it relieve the researchers or involved institutions from their legal and professional responsibilities. I have been given a copy of this consent form for my records.
Consent

I, ________________________ (print name), agree to the above terms and agree to participate in Plan to Move.

__________________________  ______________
Participant Signature       Date

__________________________  ______________
Researcher (Print Name)     Researcher Signature
Appendix I: Letter of Information and Informed Consent Form – Parent version for youth below the age of 18 years

Plan to Move Letter of Information

Research Team
Student Investigator: Ms. Ritu Sharma, Faculty of Kinesiology and Physical Education, University of Toronto, E-mail: ri.sharma@mail.utoronto.ca

Co-Investigator: Dr. Kelly Arbour-Nicitopoulos, Faculty of Kinesiology and Physical Education, University of Toronto, E-mail: kelly.arbour@utoronto.ca

Purpose of Research
Your child is invited to participate in Plan to Move! This study has been approved by the University of Toronto’s Office of Research Ethics. The purpose of Plan to Move is to examine the effects of an online intervention designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity and physical activity-related cognitions.

Who is eligible to participate?
We are looking for Canadian youth between the ages of 12 and 21 years, who have a physical disability (e.g., cerebral palsy, spina bifida, muscular dystrophy, spinal cord injury, arthritis).

What will happen during the study?
Plan to Move is a 4-week study, during which your child will complete 4 online sessions (i.e., one session a week), that teach your child strategies to become more physically active. Before your child begin these online sessions, your child will complete a demographics questionnaire, and a set of questionnaires about their thoughts relating to physical activity (e.g., their confidence in their ability to be physically active or plan for physical activity, the likelihood of them being physically active even in the presence of barriers, etc.) over the telephone with the Study Investigator. The Student Investigator will also explain the study in detail to you and your child, and what your child can expect from these online sessions. One week and one month after you complete the 4 online sessions, your child will complete the same set of questionnaires as you did before the online sessions, over the telephone with the Student Investigator. Your child will also be asked to provide some feedback about your experience while completing these online sessions. Thus, in total, your child will be completing these sets of questionnaires three times.

Are there any potential harms, risks, or discomforts that I should be aware of?
There is a very small chance that your child may feel apprehensive to answer some of the questions relating to their thoughts about physical activity, given their personal experiences with physical activity. However, they do not have to respond to any questions they feel uncomfortable answering, and they do not have to explain why you chose not to answer. Other than that, there are no known risks associated with participating in this study.
Are there good things about this study?
The findings from this study will contribute to our knowledge on the effectiveness of physical activity interventions for youth with physical disabilities. Currently, we don’t know much about this topic, so your child’s participation in this study will help us understand how effective physical activity interventions are for youth with physical disabilities, and whether they actually lead to increases in physical activity and improve physical activity-related cognitions.

How will the information gathered from this study be kept confidential?
All information that is shared with the Student Investigator will be kept strictly confidential, and will be stored in Dr. Arbour-Nicitopoulos’ locked laboratories on a secure, password-protected computer. No information that discloses the identity of your child or your family will be released or published without consent, unless required by law. This legal obligation includes a number of circumstances, such as suspected child abuse, where research documents are ordered to be produced by a court of law and where researchers are obliged to report to the appropriate authorities. After data analysis is complete, data cannot be withdrawn and collected data will be stored by the research team for up to 5 years on a secure, password-protected computer in Dr. Arbour-Nicitopoulos’ laboratory.

Will my child be compensated for my involvement in the study?
Yes, all participants will be compensated $5 for each online session they complete per week, for a total of $20, and an additional $5 for completing the questionnaires over the telephone. In total, your child can receive up to $25 for participating in our study, which will be in the form of an eGift Card to Foot Locker, Best Buy, Chapters, Cineplex or Amazon. Your child will also have the opportunity to use the hours you spend in our study towards volunteer/community service hours. We will e-mail or mail out a letter of participation, indicating the number of hours spent.

Voluntary Participation and Early Withdrawal
Your child’s participation in this study is voluntary and involves no risk to them as a person. Your child may refuse to participate or answer any questions asked of you without penalty or explanation. Your child may withdraw their assent to participate in the study at any time. If your child chooses to withdraw from the study, your child will also have the option to withdraw the information that you provided. However, your child’s data cannot be withdrawn after data analysis is complete. Contact the researcher by phone 647-521-9357 or by e-mail at ri.sharma@mail.utoronto.ca if you would like to withdraw their information. If you have any questions or concerns about your rights as a research participant, please contact the Office of Research Ethics at ethics.review@utoronto.ca or call 416-946-3273.
**Acceptance of the Conditions of the Research Process and Consent**

*By signing this form, I acknowledge that:*

a) The research team has given me and my child the opportunity to ask questions regarding this research study and its procedures and that these questions have been answered to my satisfaction.

b) At any time during the study, I or my child may request further clarification from the research team. I can do this by contacting the Principal Investigator by phone (647) 521-9357 or by e-mail at ri.sharma@mail.utoronto.ca.

c) This study is investigating the effects of an online physical activity intervention for Canadian youth with physical disabilities.

d) The researchers would like my child to complete four online sessions on a weekly basis, which will focus on strategies to become more physically active, and a set of questionnaires about their physical activity-related cognitions before, one week and one month after they complete the four online sessions.

e) My child is under no obligation to participate in the research study, is free to withdraw from the study at any time, without explanation, and my child and I are free to withdraw our permission and consent/assent at any time during the research study. However, my child’s data cannot be withdrawn after data analysis is complete.

f) I am free now, and in the future, to ask any questions about the study.

g) I have been told that my child’s information will be kept confidential, except where release of information is required by law, e.g., suspected child abuse, public health.

h) I understand that no information that would identify my child or family will be released or printed.

i) The possible harms and discomforts and the possible benefits (if any) of this research study have been explained to my child and I, and in no way does signing this consent form waive my legal rights nor does it relieve the researchers or involved institutions from their legal and professional responsibilities. I have been given a copy of this consent form for my records.
Consent

I, ________________________ (print parent/guardian’s name), agree to the above terms and allow my child __________________ (print child’s name) to participate in Plan to Move.

__________________________  ______________
Parent Signature                Date

__________________________  ______________
Researcher (Print Name)         Researcher Signature
Appendix J: Letter of Information and Informed Assent Form – for Youth below the Age of 18 Years

Plan to Move Assent

Why are we doing this study?
You are invited to participate in Plan to Move! We are doing this study to examine the effects of an online intervention designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity and physical activity-related cognitions.

Who can participate?
We are looking for Canadian youth between the ages of 12 and 21 years, who have a physical disability (e.g., cerebral palsy, spina bifida, muscular dystrophy, spinal cord injury, arthritis).

What will happen during the study?
If you choose to take part in Plan to Move, we will ask you to do the following:
- A demographics questionnaire
- 4 online sessions (i.e., one session a week), that teach you strategies to become more physically active
- A set of questionnaires about your thoughts relating to physical activity over the telephone with the Study Investigator, before, one week and one month after you finish the online sessions. In total, you will complete this set of questionnaires three times.
- Provide some feedback about your experience while completing these online sessions

Are there any bad things about the study?
There is a very small chance that you may feel apprehensive to answer some of the questions relating to your thoughts about physical activity, given your personal experiences with physical activity. However, you do not have to respond to any questions you feel uncomfortable answering, and you do not have to explain why you chose not to answer. Other than that, there are no known risks associated with participating in this study.

Are there good things about this study?
The findings from this study will help us understand how effective physical activity interventions are for youth with physical disabilities. Currently, we don’t know much about this topic, so your participation in this study will help us understand how effective physical activity interventions are for youth like yourself, and whether these interventions actually lead to increases in physical activity and improve physical activity-related cognitions.

Who will know what I did in the study?
No one will know your answers to any of the questionnaires, or know what you did during the study, other than the research team involved in the study. All information will be kept
confidential, and your information will be anonymous, which means that your name won’t be on anything.

**Do I get anything for participating?**
Yes, all participants will receive $5 for each online session they complete per week, for a total of $20, and an additional $5 for completing the questionnaires over the telephone. In total, you can receive up to $25 for participating in our study, which will be in the form of an eGift Card to Foot Locker, Best Buy, Chapters, Cineplex or Amazon. You will also have the opportunity to use the hours you spend in our study towards volunteer/community service hours. We will e-mail or mail out a letter of participation, indicating the number of hours spent.

**Do I have to do this? What if I am not sure?**
It is up to you if you want to be in the study or not. Nobody will be angry or upset if you do not want to be in the study. The researcher will talk to your parents or guardians about the study, and you should talk to them about it too! If you have any questions or concerns about your rights as a research participant, please contact the Office of Research Ethics at ethics.review@utoronto.ca or call 416-946-3273.

**Assent**

I, _________________________ (print name) agree to participate in *Plan to Move*.

Participant’s Signature: _________________________ Date: _________________________

Witness Signature: _________________________ Date: _________________________
Appendix K: Screening Guidelines for E-mail or Telephone Correspondence

Hi [participant’s name],

Thank you for expressing interest in Plan to Move! Before we begin, I would like to make sure that you are eligible for this study. Please answer the screening questions below. You do not need to indicate specific answers – yes or no will be adequate to help me determine if you’re eligible to participate!

1. Do you have a physical disability?
2. Do you have a visual and/or hearing impairment?
3. Do you have a cognitive impairment?
4. Are you between the ages of 12 to 21 years?
5. Are you able to read and speak English?
6. Are you able to verbally complete surveys over the telephone?
7. Do you participate in elite-level sport?

Once I receive your response, I will follow up with you to let you know if you are eligible for this study. If you are eligible and interested in participating, you will be asked to provide a few days and times that would be best to conduct the first telephone interview so I can obtain your consent to participate, and explain the study in further detail.

Sincerely,

Ritu

Script for Screening Process Conducted over the Telephone

Student Researcher: Hello [participant’s name]. My name is Ritu Sharma, and I’m from the University of Toronto. Thank you for expressing interest in Plan to Move! Before we begin, I would like to make sure that you are eligible for this study. I have a few questions for you. You only need to answer the questions with yes or no – you do not need to indicate specific answers.

Proceed with questions 1 – 7 listed above.

If participant is ineligible, thank them for their time.

If they are eligible, notify them that you will be sending them a study flyer and consent forms for them to review, and set up a date and time to call them again in the next few days to obtain informed consent and administer the baseline measures.
Appendix L: Telephone Consent and Assent Script

Obtaining Parental Consent and Child Assent

Parental Consent

Student Researcher: Hello [parent’s name]. This is Ritu calling from Plan to Move. I e-mailed you the consent and assent forms a few days ago, along with the Study Flyer – have you had a chance to read them over?

Before I get your consent, I would like to go over what the study is about with you and answer any questions you may have. The purpose of this study is to examine the effects of an online physical activity program designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity behaviour and physical activity-related cognitions. Currently, there is a lack of research on physical activity programs for this population, so by doing this study, we hope to better understand whether this type of program is effective in increasing the physical activity participation of youth with physical disabilities, and also to gain some feedback from these youth about the program itself to help improve the design of future programs.

The program is called Plan to Move, and it is a 4-week study, during which your child will complete 4 online sessions (i.e., one session a week), that teach your child strategies to become more physically active. Before your child begins these online sessions, your child will complete a demographics questionnaire, and a set of questionnaires about their thoughts relating to physical activity (e.g., their confidence in their ability to be physically active or plan for physical activity, the likelihood of them being physically active even in the presence of barriers, etc.) over the telephone with myself. I will also explain to your child what they can expect from these online sessions. This will take approximately 15 to 20 minutes. Then, your child will complete four online sessions and independent activities that complement those sessions. I will be giving them access to one online session per week, and will send them the follow up independent activities to complete after the session. It is expected that it will take a total of 10 to 20 minutes to complete the online session and independent activity each week.

Your child will receive reminder e-mails and text messages to complete the sessions and independent activities. You and/or your child can choose to opt out of receiving reminder text messages. One week and one month after your child completes the 4 online sessions, your child will complete the same set of questionnaires as they did before the online sessions, over the telephone with myself. Your child will also be asked to provide some feedback about their experience while completing these online sessions.

To finish off, I would like to inform you of potential risks of participating in the telephone interviews. Since we are asking your child about cognitions related to physical activity, they may be uncomfortable with answering certain questions because of their personal experiences with physical activity. In light of this, your child does not have to answer any questions that make them feel uncomfortable, and they don’t have to give us any explanation about why they chose not to answer. Even if they skip some questions, they can still participate in the study. Furthermore, your child will be learning about skills and strategies to increase their levels of physical activity. Although they are not required to increase their levels of physical activity to participate in this study, they may choose to use the skills they learn to be more physically active.
active. Although there are many benefits associated with physical activity, it is also important that they understand that being more active is associated with some potential physical risks (e.g., chance of injury). Thus, it is important that they take the appropriate safety considerations (e.g., stretching exercises, progressive and not drastic increases in intensity) prior to and while engaging in physical activity. Also, if they are new to physical activity and/or have any underlying health conditions, we encourage you and your child to consult with their physician about what types of physical activity are safe and appropriate for them to avoid any adverse effects. There are no other risks involved with this study, all of the information collected during these interviews and the program will be kept confidential, and you or your child can withdraw at any point if you wish to do so.

Your child will receive $5 for each session they complete, and $5 for completing the questionnaires over the phone, for a total of up to $25. We will also be giving out 5 volunteer hours for your child’s participation, which can be put towards mandatory volunteer requirements in schools.

Do you have any questions about the study? Do we have your consent for your child to participate in the study? Would you be ok with me sending your child a reminder text message after they’re given access to the next each of the program, just to remind them to complete the session for that week?

Make note of whether the parent opts in or out of the text message reminders on Appendix G.

If parent does not have any questions, obtain verbal consent and make a record of this on the Consent/Assent Tracking Form (Appendix G).

If parent does not consent to participate, thank them for taking the time to speak on the phone with you and let them know they can contact us any time at the e-mail address given in the information letter.

Child Assent

Student Researcher: Now, since your child is the participant in our study, it is important that we make sure they are willing to take part! If your son/daughter agrees to participate, do you think you would have the time now to complete the baseline interview? If not we can schedule for the first interview at a later time when you are available. Can we please speak to [child’s name] to get their permission to participate?

Hi [youth’s name]. My name is Ritu Sharma, and I’m running the study called Plan to Move. Since we’re asking you to participate, it’s very important to us that you understand exactly what the study is about. We are doing this study to figure out how useful a physical activity program designed for youth with physical disabilities is in increasing your levels of physical activity and your thoughts related to physical activity.

This is a four-week program, during which you will help me complete some questionnaires about your thoughts relating to physical activity (e.g., your confidence in your ability to be physically active or plan for physical activity). Then, you’ll be given access to an online program, where you’ll learn about strategies to help you be more physically active. In addition to those online
sessions, you’ll also be completing independent activities that go with each week of the program. You’ll be given access to one online session per week, and will complete the accompanying independent activity during the same week. It is expected that it will take a total of 10 to 20 minutes to complete the online session and independent activity each week.

One week and one month after you finish the 4 online sessions, you’ll do the same set of questionnaires as you did before the online sessions, over the telephone with myself. You will also be asked to provide some feedback about your experience while completing these online sessions.

Right now, we don’t know too much about physical activity programs for youth with physical disabilities, so by doing this study, we hope to better understand whether this type of program would be effective. Also, by getting your feedback about the program, we can hopefully improve on the design of future physical activity programs for youth like yourself.

You will receive $5 for each session you complete, and $5 for completing the questionnaires over the phone, for a total of up to $25. We will also be giving out 5 volunteer hours for your participation, which can be put towards mandatory volunteer requirements in schools.

If there are any questions in these surveys that make you feel uncomfortable, you do not have to answer them and you can still be in our study. It is up to you whether or not you want to answer certain questions. Also, if you do decide to use the strategies that you learn about to be more active, it’s important to remember to be safe before and while engaging in physical activity – be sure to stretch before, and take small and manageable steps when increasing the intensity of your physical activity. If you’re new to physical activity, or have any underlying health conditions, it’s a always a good idea to talk to your doctor about physical activity so they can help you understand what types of activities are safe and appropriate for you. Also, something really cool we’ll be doing for this study is sending out text message reminders to remind you to about the phone call later that day. To finish off, do you have any questions about the study? Do we have your permission to participate in the study?

Would you be ok with us sending you one text message as a quick reminder for you to complete the online session and independent activity? Make note of whether they opt in or out of receiving the text message reminders on Appendix G.

If youth does not have any questions, obtain verbal assent and make a record of this on the Consent Tracking Form (Appendix G).

If youth does not assent to telephone interviews, thank them for taking the time to speak on the phone with you and let them know they can contact us any time at the e-mail address given in the information letter.

Obtaining Youth Consent

Student Researcher: Hello [youth’s name]. This is Ritu calling from Plan to Move. I e-mailed you the consent forms a few days ago, along with the Study Flyer – have you had a chance to read them over?
Before I get your consent, I would like to go over what the study is about with you and answer any questions you may have. The purpose of this study is to examine the effects of an online physical activity program designed for youth with physical disabilities (ages 12 – 21 years) on levels of physical activity behaviour and physical activity-related cognitions. Currently, there is a lack of research on physical activity programs for this population, so by doing this study, we hope to better understand whether this type of program is effective in increasing the physical activity participation of youth with physical disabilities, and also to gain some feedback from these youth about the program itself to help improve the design of future programs.

The program is called Plan to Move, and it is a 4-week study, during which you will complete 4 online sessions (i.e., one session a week), that teach you strategies to become more physically active. Before you begin these online sessions, you will complete a demographics questionnaire, and a set of questionnaires about your thoughts relating to physical activity (e.g., you confidence in their ability to be physically active or plan for physical activity, the likelihood of you being physically active even in the presence of barriers, etc.) over the telephone with myself. I will also explain to you what you can expect from these online sessions. This will take approximately 15 to 20 minutes. Then, you will complete four online sessions and independent activities that complement those sessions. I will be giving you access to one online session per week, and will send you the follow up independent activities to complete after the session. It is expected that it will take a total of 10 to 20 minutes to complete the online session and independent activity each week.

You will receive reminder e-mails and text messages to complete the sessions and independent activities. You can choose to opt out of receiving reminder text messages. One week and one month after you complete the 4 online sessions, you will complete the same set of questionnaires as you did before the online sessions, over the telephone with myself. You will also be asked to provide some feedback about your experience while completing these online sessions.

To finish off, I would like to inform you of potential minor risks of participating in the telephone interviews. Since we are asking you about cognitions related to physical activity, you may be uncomfortable with answering certain questions because of your personal experiences with physical activity. In light of this, you do not have to answer any questions that make you feel uncomfortable, and you don’t have to give us any explanation about why you chose not to answer. Even if you skip some questions, you can still participate in the study. Furthermore, you will be learning about skills and strategies to increase your levels of physical activity. Although you are not required to increase your levels of physical activity to participate in this study, you may choose to use the skills you learn to be more physically active. Although there are many benefits associated with physical activity, it is also important to understand that being more active is associated with some potential physical risks (e.g., chance of injury). Thus, it is important that you take the appropriate safety considerations (e.g., stretching exercises, progressive and not drastic increases in intensity) prior to and while engaging in physical activity. Also, if you are new to physical activity and/or have any underlying health conditions, we encourage you to consult with your physician about what types of physical activity are safe and appropriate for you to avoid any adverse effects. There are no other risks involved with this study, all of the information collected during these interviews and the program will be kept confidential, and you can withdraw at any point if you wish to do so.
You will receive $5 for each session you complete, and $5 for completing the questionnaires over the phone, for a total of up to $25. We will also be giving out 5 volunteer hours for your participation which can be put towards mandatory volunteer requirements in schools.

Do you have any questions about the study? Do we have your consent for you to participate in the study? Would you be ok with me sending you a reminder text message after you’re given access to the next each of the program, just to remind you to complete the session for that week?

*Make note of whether the youth opts in or out of the text message reminders on Appendix G.*

*If youth does not have any questions, obtain verbal consent and make a record of this on the Consent/Assent Tracking Form (Appendix G).*

*If youth does not consent to participate, thank them for taking the time to speak on the phone with you and let them know they can contact us any time at the e-mail address given in the information letter.*
## Appendix M: Consent and Assent Tracking Form

<table>
<thead>
<tr>
<th>Name</th>
<th>Date of Consent</th>
<th>Parent/Youth (18+) Consent</th>
<th>Child Assent (if applicable)</th>
<th>RA’s Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Interviews + Intervention</td>
<td>SMS Reminders</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interviews + Intervention</td>
<td>SMS Reminders</td>
<td></td>
</tr>
</tbody>
</table>
Appendix N: Demographics Questionnaire

PART A:
1. Please indicate your gender?
   - Male
   - Female
   - Transgendered

2. Please indicate your age ________________

3. Please indicate your grade at school ________________

4. How would you usually describe yourself?
   - Arabic
   - Chinese
   - Black or African American
   - Latin American
   - South Asian (e.g., Indian, Pakistani, Sri Lanka)
   - Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)
   - West Asian (e.g., Afghan, Iranian)
   - White
   - Other: _____________________
   - Prefer not to answer

5. Please indicate your height: ________________

6. Please indicate your weight: ________________

PART B:

7. Can you please describe what kind of physical disability you have?
   - Amputation
   - Brain Injury
   - Cerebral Palsy
   - Juvenile Arthritis
   - Multiple Sclerosis
   - Muscular Dystrophy
   - Neuromuscular Disorder
   - Spinal Cord Injury
   - Stroke
   - Other: _____________________

8. Please indicate for how long you have experienced this disability (eg: since birth):
9. Do you use a mobility device?
   o Yes
   o No

10. If you answered YES to Question 9 please choose any aids or devices that you typically use (check all that apply)

   o Cane
   o Walker
   o Crutches
   o Wheelchair
      o Manual
      o Electric
   o Other: ______________

11. Is there any additional information we should know about you that may influence your participation in this study?
### Appendix O: Truncated 11-Item Outcome Expectancy Questionnaire

For each question, respond by circling the number that most accurately reflects how often physical activity will result in that particular reason to be active.

<table>
<thead>
<tr>
<th>Physical activity will:</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relieve my stress.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Stress reduction is important to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Make me more relaxed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>I like to stay relaxed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. Get rid of my frustrations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>It feels good to release my frustrations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. Get me to calm down.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>When I feel out of control, calming myself is helpful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. Make me feel more healthy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>I feel good when I feel healthy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. Keep me in good condition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>I like to stay in good physical condition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Physical Activity Will:</td>
<td>Never</td>
<td>Rarely</td>
<td>Occasionally</td>
<td>Often</td>
<td>Usually</td>
<td>Always</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>-------</td>
<td>--------</td>
<td>--------------</td>
<td>-------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>7. Make me more lean.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>It is important to me to work on being lean.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. Help me attain physical mastery without thought.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>It feels good to master physical movement without having to think.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. Help me to feel exhilarated.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>I like to experience physical exhilaration.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. Give me an opportunity to make bold decisions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>It is important to me to make bold decisions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. Help me to have an adventure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Being adventurous is fun.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
### Appendix P: 7-Item Task Self-Efficacy for Physical Activity Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Disagree a lot</th>
<th>Disagree</th>
<th>Neither agree or disagree</th>
<th>Agree</th>
<th>Agree a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I can be physically active during my free time on most days.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I can ask my parent or other adult to do physically active things with me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I can be physically active during my free time on most days even if I could watch TV or play video games instead.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I can be physically active during my free time on most days even if it is very hot or cold outside.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I can ask my best friend to be physically active with me during my free time on most days.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I can be physically active during my free time on most days even if I have to stay at home.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I have the coordination I need to be physically active during my free time on most days.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix Q: 4-Item Self-Regulatory Self-Efficacy for Goal-Setting Questionnaire

Instructions: Please indicate how confident you are that you can complete each of the following behaviours over the next 4 weeks using the scale below.

Place the appropriate number from the scale (0 – 100%) on the line following the statement.

0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%

Not at all confident  Somewhat confident  Completely confident

1. Set realistic goals for maintaining my physical activity for the next 4 weeks. _____
2. Set realistic goals for increasing my physical activity for the next 4 weeks. _____
3. Develop plans to reach my physical activity goals for the next 4 weeks. _____
4. Follow through with my physical activity goals for the next 4 weeks, even though it may be difficult at times. _____
Appendix R: 7-Item Self-Regulatory Self-Efficacy for Scheduling Questionnaire

INSTRUCTIONS: The following is a list of behaviours associated with participating in physical activity for the next 4 weeks. Please consider each specific behaviour as it applies to you.

Please indicate how confident you are that you can complete each of the following behaviours over the next 4 weeks using the scale below.

Place the appropriate number from the scale (0 – 100%) on the line following the statement.

Not at all confident Somewhat confident Completely confident

How confident are you that you can …

1. Participate in physical activity an additional one time per week, each week for the next 4 weeks. ______

2. Plan for participation in my physical activity sessions each week for the next 4 weeks. ______

3. Arrange my schedule to do physical activity regularly no matter what for the next 4 weeks. _____

4. Maintain a definite plan to restart my physical activity if I should miss any sessions for the next 4 weeks. ______

5. Make up times when I miss my regular physical activity sessions for the next 4 weeks. _____

6. Make sure that I do not miss more than one day of physical activity due to other obligations for the next 4 weeks. ______

7. Organize my week’s time and responsibilities around my physical activity no matter what for the next 4 weeks. _____
### Appendix S: 8-Item Self-Regulatory Self-Efficacy for Barriers Questionnaire

For the following questions, please indicate how confident you are with each statement on a scale from 1 (not at all confident) to 7 (completely confident).

Assuming you were very motivated, how confident are you that you could participate in physical activity if:

<table>
<thead>
<tr>
<th></th>
<th>Not Confident at All</th>
<th>Completely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) you feel tired or fatigued</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(b) if you have a lot of activities to do with your friends and/or family</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(c) you have transportation problems</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(d) you have pain or soreness</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(e) the weather is very bad</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(f) you don’t have someone to help</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(g) you have a lot of school work</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(h) there are good TV shows on</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
**Appendix T: 10-Item Modified Exercise Goal-Setting Scale (EGS)**

<table>
<thead>
<tr>
<th></th>
<th>Does not Describe</th>
<th>Describes Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I often set physical activity goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. I usually have more than one major physical activity goal.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3. I usually set dates for achieving my physical activity goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4. I don’t typically write down my physical activity goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5. My physical activity goals help to increase my motivation for doing physical activity.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6. I find it difficult to measure whether or not I have achieved my physical activity goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. I tend to break more difficult physical activity goals down into a series of smaller goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. I usually keep track of my progress in meeting my goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. I have developed a series of steps for reaching my physical activity goals.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>10. I usually achieve the physical activity goals I set for myself.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix U: 10-Item Exercise Planning and Scheduling Scale (EPS)

<table>
<thead>
<tr>
<th>Item</th>
<th>Does not Describe</th>
<th>Describe Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I never seem to have enough time to engage in physical activity.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. Physical activity is generally not a high priority when I plan my schedule.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Finding time for physical activity is difficult for me.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. I try to fit in physical activity when I have free time.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. I schedule all events in my life around my physical activity routine.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. I schedule my physical activity at specific times each week.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. I plan my weekly physical activity schedule.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. When I am very busy, I don’t do much physical activity.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Everything is scheduled around my physical activity routine.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. I try to engage in physical activity at the same time/same day each week to keep a routine going.</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix V: Leisure-Time Physical Activity Questionnaire for People with Spinal Cord Injury (LTPAQ-SCI)

INSTRUCTIONS: I am going to ask you about the time you spent engaging in mild, moderate, and heavy intensity LTPA in the last 7 days.

Leisure Time Physical Activity (LTPA) is physical activity that you choose to do during your free time, such as physical play, exercising, playing sports, gardening, taking the dog for a walk, pushing/wheeling for transportation. Necessary physical activities such as physiotherapy, grocery shopping are not considered LTPA.

1. Mild intensity LTPA requires very light physical effort; mild intensity activities make you feel like you are working a little bit, but you can keep doing them for a long time without getting tired…

During the last 7 days, on how many days did you do mild intensity LTPA? _______

On those days, how many minutes did you usually spend doing mild intensity LTPA? ______

2. Moderate intensity LTPA requires some physical effort; moderate intensity activities make you feel like you are working somewhat hard, but you can keep doing them for a while without getting tired.

During the last 7 days, on how many days did you do moderate intensity LTPA? ______

On those days, how many minutes did you usually spend doing moderate intensity LTPA? ______

3. Heavy intensity LTPA requires a lot of physical effort. Heavy intensity activities make you feel like you are working really hard, almost at your maximum. You cannot do these activities for very long without getting tired. These activities may be exhausting.

During the last 7 days, on how many days did you do heavy intensity LTPA? ______

On those days, how many minutes did you usually spend doing heavy intensity LTPA? ______