

Sport and physical activity for youth with intellectual disability:

An analysis of determinants and outcomes

Submitted by

Nathanial J. Kapsal

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Declaration

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution. No other person's work has been used without due acknowledgment in the main text of the thesis. All research procedures reported in the thesis received the approval of the relevant Ethics/Safety Committees (where required).

I designed the protocol, collected the data, analysed the data, and drafted the manuscript for Study 1 (Chapter 2) titled "Effects of physical activity on the physical and psychosocial health of youth with intellectual disability: A systematic review and meta-analyses". Prof. Chris Lonsdale (supervisor) and Dr. Theresa Dicke (co-supervisor) provided supervision for the manuscript and were involved with data interpretation and manuscript drafting. Prof. Alexandre Morin contributed to early supervision and conceptualization of the study. Diego Vasconcellos contributed to article screening. Prof. Christophe Maïano was involved with study planning and design at early stages. Jane Lee checked risk of bias and data extraction. Prof. Chris Lonsdale, Dr. Theresa Dicke, Prof. Alexandre Morin, and Prof. Christophe Maïano read and contributed to revising the manuscript.

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Date

Statement of Appreciation

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Thesis Abstract

Introduction: Extensive research has supported the physical and psychosocial health benefits of physical activity among typically developing youth. These benefits include higher quality of life, lower risk of disease, higher levels of psychological and emotional well-being, greater school engagement, greater motor skills, more frequent prosocial behaviours, and enhanced self-concept. Compared to their typically developing peers, youth with intellectual disability participate less frequently in physical activity, tend to be less fit, have poorer motor control, and worse mental health. Many studies examining sport and physical activity for youth with disability have focused on a limited range of outcomes or interventions, have not specifically focused on youth with intellectual disability, or examined the prevalence of physical activity and sport behaviours rather than their outcomes and determinants. Therefore, the primary objectives of this thesis were to: (1) Examine the physical and psychosocial health outcomes of physical activity among youth with intellectual disability, and (2) identify potential determinants of sport participation for adolescents with intellectual disability.

Methods: This thesis includes a systematic review with two meta-analyses (Study 1) and a longitudinal study conducted over two years (Study 2). Using a three-level, random-effects and mixed-effects meta-analytic approach, results from 109 studies that included 810 effects of physical activity on either physical or psychosocial health outcomes were explored. The longitudinal study included a sample of 252 Australian adolescents with intellectual disability ($M = 14.98$ years, $SD = 1.85$) at Time 1. At each of the three timepoints, participants completed questionnaires assessing their sport participation, physical self-concept, intrinsic motivation, and worries. They also completed a physical fitness test assessing cardiovascular fitness.

Results: The systematic review and meta-analyses found that physical activity has positive effects on the physical and psychosocial health of youth with intellectual disability.

Resistance training shows the most physical benefits, while teaching movement and sports skills appears to improve both physical and psychosocial health. The results from the longitudinal study suggested that physical self-concept may be a determinant of sport participation; however, sport participation did not appear to predict worries or cardiovascular fitness.

Conclusion: The systematic review and meta-analyses included in this thesis represent the first quantitative synthesis of research focused on the physical and psychosocial benefits of physical activity for youth with intellectual disability. It is promising that this review points to physical activity as a method of improving the physical and psychosocial health of youth with intellectual disability. While the meta-analyses suggested that sport and sport skills training were the most beneficial for of physical activity for this population, the longitudinal study did not support these findings. The longitudinal study, however, did suggest that promoting physical self-concept may help to increase sport participation among youth with intellectual disability.

Chapter 1: Introduction

Youth with intellectual disability form an at-risk and underserved population that is vulnerable to physical and psychosocial issues. This population commonly experiences low self-concept, anxiety, depression, weight problems, difficulties at school, and problems integrating into mainstream society (Huck, Kemp, & Carter, 2010; Maïano, Ninot, Bruant, & Benattar, 2003; Oeseburg, Dijkstra, Groothoff, Reijneveld, & Jansen, 2011; Whitaker & Read, 2006). Instead of focusing on deficits, these issues should be addressed by focusing public policy and research on a strengths-based approach that leads to improvements in the lives of these youth. This approach assumes that these youth can perform the tasks that lead to improvements in their lives while also accounting for their interests, preferences, and goals (Wehmeyer, Shogren, Singh, & Uyanik, 2017). Research has consistently supported the physical and psychosocial health benefits of physical activity among typically developing youth (Babic et al., 2014; Bailey, 2006; Eime, Young, Harvey, Charity, & Payne, 2013; Ekeland, Heian, & Hagen, 2005; Owen et al., 2016; Penedo & Dahn, 2005; Poitras et al., 2016). Research is only beginning; however, to consider physical activity as a vehicle for the improvement of physical and psychosocial health among people with intellectual disability (Heller, McCubbin, Drum, & Peterson, 2011). Studies examining physical activity for youth with a disability have mostly focused on a limited range of outcomes or interventions, have not specifically focused on youth with intellectual disability (as opposed to physical disability), or examined the prevalence of physical activity and sporting behaviours rather than the determinants and outcomes associated with participation in this population. Therefore, the primary objectives of this thesis were to: (1) Examine the physical and psychosocial health outcomes of physical activity among youth with intellectual disability, and (2) Explore potential determinants of participation in sport for these youth.

To address these objectives, this thesis includes a systematic review with two meta-analyses (Study 1) as well as a longitudinal study (Study 2). The systematic review and meta-analyses (Study 1) utilized a three-level, random-effects and mixed-effects meta-analytic approach in which results from 109 studies that included 810 effects of physical activity on either physical or psychosocial health outcomes were examined. The longitudinal study (Study 2) consisted of measurements at three time points across three school years and included a sample of 252 Australian adolescents with intellectual disability. At each of the three timepoints, participants completed questionnaires assessing their physical self-concept, motivation for sport, sport participation, and mental health. They also completed a physical fitness test assessing cardiovascular fitness.

Intellectual Disability

The World Health Organization classifies intellectual disability as an “impairment of skills across multiple developmental areas, such as cognitive functioning and adaptive behavior” (WHO, 2018). It is considered as a set of conditions resulting from genetic, neurological, nutritional, or other factors that impact intellectual development. They typically occur either prior to birth, at birth, or during childhood up to the age of brain maturity. These conditions have varying impact on the individual, ranging from mild to severe (WHO, 2018) and result in below average capacity for self-determination, school achievement, social functioning, and performance on activities of daily living. These issues often exist in combination with physical, sensory, and/or psychiatric impairments (NDS, 2016). In this thesis, intellectual disability is defined as significant limitations both in intellectual functioning and adaptive behaviour that originate before the age of 18 (Schalock et al., 2010; Winnick & Poretta, 2017). Intellectual functioning commonly measured with an IQ test, and a person having a score below 70/75 typically means there are limitations in intellectual functioning. Adaptive behaviours are activities that people do

every day and are characterized by social, conceptual, and practical skills. Some common adaptive behaviours include social responsibility, interpersonal skills, and obeying rules (social); reading, writing, and time (conceptual); and personal care, the use of money, and occupational skills (practical; Schalock et al., 2010; Winnick & Porretta, 2017). People with intellectual disability are also at-risk of having high rates of health issues that include but are not limited to: endocrinological (especially hypothyroidism and diabetes), oral, musculoskeletal, and cardiac, disorders as well as early menopause, dementia, and epilepsy (NDS, 2016; Straetmans, van Schrojenstein Lantman-de Valk, Schellevis, Dinant, 2007; WHO, 2018).

Youth with Intellectual Disability

In 2010, the European branch of the World Health Organization stated that children and young people with intellectual disability have the same rights as every other child (WHO, 2010). These rights include good physical and mental health, a loving family, friends, education, a job, and proper healthcare. Unfortunately, it appears society is failing to help these youth get the most out of life. This is highlighted by a high risk of the negative life and health outcomes described previously and comes at great cost both for the individual and society (Salvador-Carulla & Symonds, 2016). While it is important to recognize that these youth face obstacles to success in schools, in the workplace, and in society, the model of identifying the personal limitations of youth within this population is not sufficient to truly help youth with intellectual disability reach their potential. It is important to recognize both the existence of personal limitations related to intellectual disability as well as the environmental determinants that prevent youth with intellectual disability from reaching their potential. Thus, it could be suggested that the limitations in skills characterized by intellectual disability are not the only factors that predict positive outcomes. More attention should be placed on the idea that intellectual disability is best

understood as a combination of personal factors and environmental determinants. Instead of focusing solely on the personal limitations and merely attempting to raise their level of functioning to a minimum acceptable level, society in general, and research more specifically, must work to identify the ways in which these youth can gain the most value from their lives (Wehmeyer, Shogren, Singh, & Uyanik, 2017). This makes the investigation of the personal factors (limitations) and environmental determinants, such as social support and access to a healthy physical environment (WHO, 2018), that lead to positive life outcomes, and more specifically good health, salient for this population. Creating positive futures for these youth is a critical issue and should be addressed through the cultivation of their psychosocial and physical capabilities. More research focused on addressing the advancement of these processes is required, and this thesis will attempt to fill this gap in the research by highlighting physical activity and sport participation as potential drivers towards improving the physical and psychosocial health of youth with intellectual disability.

Physical Activity

In this thesis, physical activity is defined as “body movement produced by the skeletal muscles and resulting in a substantial increase over the resting energy expenditure” (Bouchard & Shephard, 1994, pp. 77). It can include a broad range of physical pursuits such as: planned exercise (e.g., going to the gym), physical play (e.g., riding a bike around the neighbourhood or climbing on the playground structures during school recess), house/yard work, organized sport, active transport, and recreational fitness walking (Caspersen, Powell, & Christenson, 1985; White, et al., 2017).

Physical activity is positively related to cardiorespiratory fitness and muscular strength, both of which are key components of overall physical health (ACSM, 2017) while physical inactivity is the fourth leading risk factor for early death among the

worldwide general population. Physical inactivity is also a key risk factor for obesity and many life-threatening conditions, such as cardiovascular diseases, cancer, and diabetes, while being physically active leads to significant health benefits and a lower risk (ACSM, 2017; Myers, et al., 2015; O'Donovan, Lee, Hamer, & Stamatakis, 2017; WHO, 2015).

Extensive research has been conducted on the health benefits of physical activity among typically developing youth (for reviews, see Bailey, 2006; Eime, Young, Harvey, Charity, & Payne, 2013; Ekeland, Heian, & Hagen, 2005; Penedo & Dahn, 2005). This research suggests that physical activity, both during school hours and at out-of-school activities, positively impacts the physical, psychological, and social development of adolescents. More specifically, physical activity has been shown to improve the quality of life (Bailey, 2006, Penedo & Dahn, 2005; Poitras et al., 2016), decrease the risk of disease (Bailey, 2006; Poitras et al., 2016), increase levels of psychological and emotional well-being (Bailey, 2006, Eime et al., 2013; Penedo & Dahn, 2005; Poitras et al., 2016), enhance school engagement (Owen et al., 2016), improve motor skills (Bailey, 2006; Poitras et al., 2016), increase the frequency of prosocial behaviours (Bailey, 2006; Eime et al., 2013), and enhance the self-concept (Babic et al., 2014; Ekeland et al., 2005) of typically developing youth.

Unfortunately, four-fifths of youth fail to get the recommended 60 minutes of daily physical activity (Hallal et al., 2012), and research shows that physical activity levels among the least active decrease as they get older (Gillison, Standage, & Skevington, 2011). Exhibiting positive physical activity behaviours early in life (during youth and adolescence) has been shown to be a predictor of participation in physical activity during early adulthood (Perkins, Jacobs, Barber, & Eccles, 2004). Thus, it seems important for youths and adolescents to develop positive physical activity behaviours.

Physical Activity and Sport Participation for Youth with Intellectual Disability

Youth with intellectual disability participate in less physical activity than the rest of the youth population. Because of this inactivity, youth with intellectual disability tend to be less physically fit than their typically developing peers (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001; Lorenzi, Horvat, & Pellegrini, 2000; Rimmer, Yamaki, Davis Lowry, Wang, & Vogel, 2010). The high amounts of physical inactivity and low levels of physical fitness among this population could be a further signal that multiple factors are preventing these youth from participating in sport and physical activities. As previously mentioned, it is likely the combination of personal factors (physical or cognitive limitations) and environmental determinants (through a lack of opportunity to play sport or be physically active; Sallis et al., 2015) would account for the physical inactivity and low physical fitness. This interplay between factors results in youth with intellectual disability having fewer opportunities to be physically active or play sport, being more dependent on others (i.e., parents/caregivers, teachers, etc.) to participate, and lacking motivation to be active compared to typically developing youth (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001). Given their limited of cognitive and social skills, these youth tend to have lower levels of autonomy than their typically developing peers (Wehmeyer, 2005). This makes it difficult for them to embark in self-determined, unstructured forms of physical activity (Fegan, 2011); therefore, structured forms of physical activity provide a mechanism for both physical and psychosocial health interventions among people with intellectual disability (Heller, et al., 2011). For this reason, organized sport may be an important avenue for allowing youth with intellectual disability to be more physically active. Unfortunately, the best practices of sport for youth with intellectual disability are not known and there are no clear, research-based guidelines that currently exist to help them gain the most health benefits from sport (Winnick, 2017).

There are several ways to define sport participation. Sport is typically defined as an activity of physical nature involving a team, school/community, club, or at least some form of organized structure (Turner, Perrin, Coyne-Beasley, Peterson, & Skinner, 2015). For youth with intellectual disability, sport is usually played in school either during mandatory physical education classes, or after school as part of organized extra-curricular activities (Wehmeyer, 2005; Fegan, 2011). Within the school context, organized sport participation can be compulsory or optional depending on the school. It also can take place outside of school as an unstructured, play-focused activity or in a more organized context as part of a club or youth organization (Wehmeyer, 2005; Fegan, 2011).

There are key differences between the sporting experiences of typically developing youth and youth with intellectual disability (Fegan, 2011; Ozer et al., 2012). Typically developing youth tend to be encouraged to engage in more autonomous forms of physical activity, sport, or play in addition to their greater involvement in more organized sport contexts occurring in their schools and communities (Fegan, 2011). In contrast, youth with intellectual disability are typically less autonomous and more likely to have physical activity habits that are restricted to the school context and tend to be non-competitive (Fegan, 2011). The Special Olympics Unified Sports program has attempted to address these differences in sport experience between the two groups. This program aims to provide people with intellectual disability the needed opportunity to “develop physical fitness, demonstrate courage, and experience joy, and participate in a sharing of gifts, skills, and friendship” (Ozer et al., 2012, pp. 230). The hope is that this program and similar large-scale initiatives will allow youth with intellectual disability to gain the physical and psychosocial benefits of participation in sport; however, the benefits among this population are still not fully known.

Benefits of Physical Activity and Sport Participation for Youth with Intellectual Disability

Existing studies examining the benefits of physical activity and sport for children and adolescents with intellectual disability have generally been plagued by methodological limitations (for reviews, see Frey, Stanish, & Temple, 2008; Johnson, 2009; Rimmer, Chen, McCubbin, Drum, & Peterson, 2010). Based on the results of the systematic review included in this thesis, it is clear that the majority of studies have primarily examined: (a) the physical (and not psychosocial) benefits of physical activity, (b) the benefits of competitive sports among athletes with intellectual disability, (c) youth with specific genetic syndromes (e.g. Down syndrome) instead of the broader population of youth with intellectual disability, (d) made comparisons between typically developing youth and youth with intellectual disability, and (e) conducted studies with small samples (see also Johnson, 2009; Rimmer et al., 2010). This thesis attempted to address some of these issues by focusing on aspects of both physical health (e.g. fitness and physiology) and psychosocial health (e.g. mental health, self-concept, social skills) outcomes across various domains of sport and physical activity settings among all youth with mild to moderate intellectual disability.

Physical health. Participation in sport and physical activities is an important driver of physical health for typically developing youth (Bailey, 2006; Malina, 1996; Penedo & Dahn, 2005; Poitras et al., 2016), yet it appears that youth with intellectual disability are not gaining these benefits as they tend to be less physically fit and more overweight than their typically developing peers (Frey & Chow, 2006; Maïano, 2011). Problems related to the physical fitness and physiology of these youth needs to be addressed as it could lead to a negative life-outcomes later in life (NDS, 2016). Fortunately, previous research has demonstrated that individuals with intellectual disability have the ability to show

improvements in physical health during extended physical training interventions (Varela, Sardinha, & Pitetti, 2001). This thesis defined physical health as a combination of physical fitness and physiology factors.

Physical fitness is one aspect of physical health, and Frey and Chow (2006) proposed that the existence (or lack thereof) of a relationship between the participation in sport and physical fitness for youth with intellectual disability is largely determined by how physical fitness is defined. They also recognized that there are several ways to define physical fitness (Frey & Chow, 2006). While the American College of Sports Medicine (ACSM) defines the physical fitness of older people or people with a disability as the ability to perform various activities of daily living (ACSM, 2017), the Council of Europe's Committee for the Development of Sport took a different approach in developing the Eurofit Physical Fitness Test Battery (EUROFIT, 1993). The EUROFIT test battery defines physical fitness for school-aged youth in terms of speed, balance, flexibility, strength, cardiorespiratory endurance, muscular endurance, and body composition. This test battery has been used to test the physical fitness of adolescents with intellectual disability. Mac Donncha and colleagues (1999) demonstrated that adolescents with intellectual disability tended to score significantly lower than their typically developing peers on all subscales of the EUROFIT test battery (Mac Donncha, Watson, McSweeney, & O'Donovan, 1999).

While physical fitness is one commonly examined aspect of physical health, other physiological responses to sport and physical activity can define physical health among youth with intellectual disability as well. Sport and physical activity have also been shown to improve body composition (Frey & Chow, 2006; Maïano, 2011; Rimmer, Rowland, & Yamaki, 2007; Turner et al., 2015), blood lipid levels (Boer et al., 2014; Elmahgoub et al., 2011; Rosety-Rodriguez et al., 2010), bone mineral density (Ferry et al., 2014; Gonzalez-

Aguero et al., 2012; Hemayattalab, 2010; Matute-Llorente, González-Agüero, Gómez-Cabello, Vicente-Rodríguez, & Casajús, 2013; Reza, Rasool, Mansour, & Abdollah, 2013), and blood pressure (Boer et al., 2014; Dyer, 1994) of youth with intellectual disability. These physiological responses were highlighted in the systematic review and one of the meta-analyses in Chapter 2.

In this thesis, physical health was defined and assessed in two ways. The systematic review and meta-analyses (Study 1) took a broad approach to physical health and included measures of cardiovascular/cardiorespiratory fitness, muscular strength/endurance, movement/sport/motor skills, physiology (i.e. bone density, cholesterol, body mass index, weight, body fat percentage, fat free mass, blood lipid, and waist circumference), balance, flexibility, and reaction time. The longitudinal study (Study 2) focused on a narrower aspect of physical health (i.e. cardiovascular/cardiorespiratory fitness) and used the 6-minute walk test to assess the physical health of a sample of adolescents with intellectual disability. This was done following the suggestions of Elmahgoub, Van de Velde, Peersman, Cambier, and Calders (2012), who examined the validity of this test in a sample of adolescents with intellectual disability. In their study, the 6-minute walk test was significantly associated with several aspects of physical health (Elmahgoub et al., 2012).

Psychosocial health. In addition to physical health, improving psychosocial health is another path towards creating positive futures for youth with intellectual disability. Eime and colleagues (2013, pp. 20) suggested “there is general consensus (among the existing research) that participation in sport for all youth and adolescents is associated with improved (psychosocial) health”. However, there is limited evidence of a direct causal link between participation in sport and physical activity and improved psychosocial health for youth and adolescents (Biddle and Asare, 2011; Eime et al., 2013).

Studies have examined the psychosocial health of youth with intellectual disability (e.g. Dagnan & Sandhu, 1999; Emerson & Hatton, 2007; Oeseburg et al., 2011; Stalker, Jahoda, Wilson & Cairney, 2011), yet there is no compelling evidence that suggests psychosocial benefits of physical activity exist. This population is more likely than their typically developing peers to experience low self-concept, anxiety, and depression (Dagnan & Sandhu, 1999; Emerson & Hatton, 2007; Huck et al., 2010; Maïano et al., 2002; Oeseburg et al., 2011; Stalker et al., 2011; Tracey, Craven, & Marsh, 2015; Weiss & Bebko, 2008; Whitaker & Read, 2006). Emerson and Hatton (2007) investigated the prevalence of these psychosocial problems in a sample of youth from the UK, with ($N = 641$) and without ($N = 17,774$) intellectual disability. They concluded that youth with intellectual disability are nearly three times more likely than typically developing youth to present with clinical levels of anxiety and almost two times as likely to present with clinical levels of depressive symptoms (Emerson & Hatton, 2007). A study by Taheri, Perry, and Minnes (2016) also suggested that youth with intellectual disability had fewer friends, participated less frequently in social activities, and had poorer quality of friendships than their typically developing peers.

This thesis examined psychosocial health as a potential outcome of participation in sport and physical activities. To assess psychosocial health, the systematic review and one of the meta-analyses (Study 1) included psychological (e.g. self-concept, self-efficacy, and mental health), cognitive (e.g. knowledge, intelligence), emotional (e.g. enjoyment, affect, fun), behavioural, and social (e.g. friendships) measures. The longitudinal study (Study 2) used measures of anxious symptoms to assess psychosocial health.

Determinants of Sport Participation and Physical Activity

Although youth with intellectual disability have previously shown deficits in self-concept, functioning at school, and integrating into mainstream society (Huck, Kemp, &

Carter, 2010; Maïano, Ninot, Bruant, & Benattar, 2003; Oeseburg, Dijkstra, Groothoff, Reijneveld, & Jansen, 2011; Whitaker & Read, 2006), this thesis focused on a strengths-based approach that assumed inherent ability to participate in sport and physical activity and took into account the self-beliefs (self-concept) and interest (intrinsic motivation) of the youth with intellectual disability. Using a strengths-based approach, this thesis aimed to help these youth reap the potential physical and psychosocial benefits of participation in sport and physical activities that have been witnessed in typically developing youth. For the strengths-based approach to work among this population, it was necessary to better understand ways to increase sport participation among this population. This was done through the examination of two potential determinants of sport participation: physical self-concept and intrinsic motives. These two variables were chosen because of their ability to predict subsequent sport participation for typically developing adolescents (Ekeland et al., 2005; Marsh, Papaioannou, & Theodorakis, 2006; Rey, Vallier, Nicol, Mercier, & Maïano, 2018; Ryan, Williams, Patrick, & Deci, 2009). Research related to the self-determination theory of motivation in physical activity, sport and health suggests that both physical self-concept (defined here as the positive or negative feelings an individual has about themselves physically and their physical abilities; Fox & Corbin, 1989) and intrinsic motivation lead to increased participation (Ryan et al., 2009). This thesis, specifically the longitudinal study (Study 2), used measures of physical self-concept and intrinsic motivation as determinants of sport participation.

Intrinsic motives. Examining the motives to engage or not engage in a behaviour, such as physical activity or sport, is an effective way to predict subsequent behaviour (Dishman, McIver, Dowda, Saunders, & Pate, 2015; Ng, et al., 2012; Owen et al., 2014; Ryan et al., 2009). Within self-determination theory, Deci and Ryan (1985) recognized the existence of intrinsic and extrinsic motives a person can possess that drive them to action.

Extrinsic motives drive a person to action because of the rewards they may receive. These types of motives typically lead more controlled forms of motivation. In contrast, intrinsic motives are defined by feelings of interest, excitement, and confidence towards a behaviour (Deci & Ryan, 2000), and lead to more autonomous forms of motivation. Autonomous motivation has been described as the level of volition one has regarding a behaviour (Deci & Ryan, 1985), and is typically accompanied by higher degrees of effort, participation, and improvisation within sport among typically developing individuals (Healy, Ntoumanis, & Duda, 2016; Ryan et al., 2009). Higher levels of autonomous motivation have also been shown to correlate with more persistence, a positive attitude, improved task performance, and higher overall health (Ng, et al., 2012; Deci & Ryan, 2000). From this it is logical to conclude that when more autonomous forms of motivation, driven by intrinsic motives, toward physical activity and sport are present, that individuals will be more likely to participate (Deci & Ryan, 2000; Ryan et al., 2009; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Sebire, Standage, & Vansteenkiste, 2009). Self-determination theory has also been used to examine motives towards participation in sport and physical activity for people with intellectual disability (Hutzler & Korsensky, 2010); however, due to their cognitive, social, and sometimes physical limitations, youth with intellectual disability tend to present lower levels of autonomy (Nota, Ferrari, Soresi, & Wehmeyer, 2007; Wehmeyer, 2005). Thus, it is not surprising that youth with intellectual disability also tend to present lower intrinsic motivation for physical activity and sport participation (Gilmore, Cuskelly, & Browning, 2015) and are less involved in sport and physical activity than their typically developing peers (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001; Lorenzi et al., 2000; Rimmer et al., 2010; Turner et al., 2015). Shapiro (2003) identified social interactions, bodily movements, and enjoyment as the keys to increasing the intrinsic motives toward sport participation within this population.

Intrinsic motives are likely to result in increased sport and physical activity participation and have been highlighted as important determinants for youth with intellectual disability (Murphy & Carbone, 2008). Unfortunately, few studies have examined motives in youth with intellectual disability (Cuskelly & Gilmore, 2014). There is, therefore, a need for research to determine if intrinsic motives are a key determinant of sport participation for youth with intellectual disability.

Physical self-concept. Self-concept is a hierarchical, multidimensional construct (Marsh & Redmayne, 1994) broadly labelled as “a person’s perception of themselves” (Shavelson, Hubner, & Stanton, 1976, pp. 411) and defined by feelings of self-esteem, self-confidence, and self-competence (Marsh & Redmayne, 1994). Physical self-concept is a dimension of self-concept and is another potential key determinant of physical activity and sport participation for youth with intellectual disability. Physical self-concept refers to the positive or negative feelings an individual has about themselves physically and their physical abilities (Fox & Corbin, 1989). For adolescents without disability, physical self-concept is linked to a healthy lifestyle (Grao-Cruces, Nuviala, Fernandez-Martinez, & Perez-Turpin, 2014) while being inversely related to eating disorders (Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006) and positively linked to physical activity behaviours (Babic et al. 2014; Beasley & Garn 2013; Crocker et al., 2006). Low physical self-concept is also a predictor of certain psychological health problems such as anxiety (Crocker et al., 2006; Knapen et al., 2007).

Previous research has examined the relations between the physical self-concepts of youth with intellectual disability and sport and physical activity participation (Ninot, Bilard, & Delignières, 2005; Ninot, Bilard, Delignières, & Sokolowski, 2000; Ninot, & Maïano, 2007; Pan & Davis, 2018; Salaun et al., 2014; Weiss & Bebko, 2008). A recent study by Pan and Davis (2018) examined the physical self-concepts of youth with

intellectual disability who had Special Olympics sporting experience ($n = 43$) to those without Special Olympics sporting experience ($n = 46$). Using a multi-dimensional, hierarchical model of physical self-concept (for details of this model, see Fox & Corbin, 1989), the authors suggested that the Special Olympics sporting experience had a significant effect ($d = 0.42$) on sport competence (one of the four factors of physical self-concept). While the links between self-concept and many aspects of positive health and well-being are strong (Craven & Marsh, 2008), it is important to highlight how increases in physical self-concept lead to behaviour change (i.e. further participation in sport or physical activity). Physical self-concept has been shown to predict participation in sport and physical activity for typically developing youth (Bardid et al., 2016; Barnett, Ridgers & Salmon, 2015; Rottensteiner, Tolvanen, Laakso, & Kontinen, 2015), yet there is no research among youth with intellectual disability that highlights this path.

Overview of Thesis

This thesis focused on two research questions aimed at better understanding the outcomes and determinants of physical activity and sport participation among youth and adolescents with intellectual disability.

Research question 1. What are the physical and psychosocial health outcomes of physical activity among youth with intellectual disability? This question will be examined through the meta-analyses in Study 1 and the primary data collection in Study 2.

Research question 2. Is sport participation predicted by intrinsic motives and physical self-concept, and does participation in sport predict physical fitness and worries? This question is examined in Study 2.

Chapter 2: Effects of Physical Activity on the Physical and Psychosocial Health of Youth with Intellectual Disability: A Systematic Review and Meta-analyses

Extensive research has supported the physical and psychosocial health benefits of physical activity among typically developing youth (Babic et al., 2014; Bailey, 2006; Eime, Young, Harvey, Charity, & Payne, 2013; Ekeland, Heian, & Hagen, 2005; Owen et al., 2016; Penedo & Dahn, 2005; Poitras et al., 2016). Previous systematic reviews have shown that, for typically developing youth, physical activity is associated with higher quality of life (Bailey, 2006, Penedo & Dahn, 2005; Poitras et al., 2016), lower risk of disease (Bailey, 2006; Poitras et al., 2016), higher levels of psychological and emotional well-being (Bailey, 2006, Eime et al., 2013; Penedo & Dahn, 2005; Poitras et al., 2016), greater school engagement (Owen et al., 2016), greater motor skills (Bailey, 2006; Poitras et al., 2016), more frequent prosocial behaviours (Bailey, 2006; Eime et al., 2013), and enhanced self-concept (Babic et al., 2014; Ekeland et al., 2005). In addition, exhibiting positive physical activity behaviours early in life (during youth and adolescence) has been shown to be a predictor of participation in physical activity during early adulthood (Bailey, 2006; Poitras et al., 2016; Perkins, Jacobs, Barber, & Eccles, 2004).

Worldwide, four-fifths of children and adolescents fail to get the recommended 60 minutes of daily physical activity (Hallal et al., 2012), and research shows that physical activity levels among the least active adolescents decrease as they get older (Gillison, Standage, & Skevington, 2011). Physical inactivity among adolescents is concerning, but there are groups within this population are even less physically active than the others. While a similar proportion of youth with intellectual disability meet the recommended levels of daily physical activity (23%, from Boddy, Downs, Knowles, & Fairclough, 2015), compared to their typically developing peers, youth with intellectual disability spend less time being physically active (Faison-Hodge & Porretta, 2004; Horvat &

Franklin, 2001; Lorenzi, Horvat, & Pellegrini, 2000). Faison-Hodge and Porretta (2004), reported that students with intellectual disability are 5% less active during physical education and 8% less active during recess. As a result of these lower activity levels, youth with intellectual disability (characterized by significant limitations both in intellectual functioning and adaptive behaviour that originate before the age of 18; Winnick & Porretta, 2017) tend to be less fit (Oppewal, Hilgenkamp, van Wjick, & Evenhuis, 2013; Salaun & Berthouze-Aranda, 2012; Varela, Sardinha, & Pitetti, 2001; Waninge et al., 2013), more overweight and obese (Maïano, 2011; Must et al., 2014; Rimmer, Yamaki, Davis Lowry, Wang, & Vogel, 2010), and have poorer motor control (Westendorp, Houwen, Hartman, & Visscher, 2011) than their typically developing peers. These children and adolescents are also nearly three times more likely than typically developing youth to present clinical levels of anxiety and almost twice as likely to experience depression (Emerson & Hatton, 2007).

Previous systematic reviews examining physical activity for youth with disability have focused on a limited range of outcomes (Jeng, Chang, Liu, Hou, & Lin, 2017; Hocking, McNeil, & Campbell, 2016), have not specifically focused on youth with intellectual disability (e.g. Johnson, 2009), or examined the prevalence of physical activity behaviour rather than the outcomes associated with physical activity (Frey, Stanish, & Temple, 2008). The current study is the first quantitative synthesis of a broad range of health outcomes associated with physical activity among youth with intellectual disability.

Objectives

The purpose of this review was to synthesize the existing research related to the physical health and psychosocial health outcomes of physical activity for youth with intellectual disability. Based on a review that focused on the health benefits of physical activity for typically developing youth (Janssen & LeBlanc, 2010), the physical health

outcomes considered in this review included measures of reaction time, flexibility, movement/sport skills, cardiovascular/cardiorespiratory fitness, muscular strength/endurance, physiological outcomes, physical functioning, and balance/core stability. The psychosocial health outcomes examined in this review were similar to those used in a review focused on the psychosocial benefits of sport for typically developing youth (Eime et al., 2013). These outcomes included measures of psychological (e.g. self-esteem, general self-concept, well-being, and mental health related), cognitive (e.g. knowledge or intelligence), emotional (e.g. mood and affect), behavioural (e.g. challenging or problem behaviours or behaviours towards being physically active), or social (e.g. friendships, relationships with other, or social maturity) health. The primary aims were to summarize the current state of research in this area, and to highlight the effect of physical activity on physical and psychosocial health in this population. Secondary aims were to explore moderator variables that influence these relations, including (a) study design type; (b) participant disability type; (c) participant intellectual disability level; (d) mean participant age; (e) intervention type; (f) health outcome type; and (g) risk of bias.

Method

Presentation of this review aligns with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Liberati et al., 2009).

Eligibility Criteria

To be included in this systematic review, studies needed to meet the following criteria: (a) full-text article published (in English) before July 2017; (b) published in a peer-reviewed journal; (c) included a quantitative research design that allowed for the calculation of at least one effect size between physical activity and a physical or psychosocial health outcome for youth with intellectual disability; (d) focused on school-aged children (5.0 to 9.9 years) and adolescents (10 to 19.9 years) (WHO, 2015) with an

average sample age between 5.0 to 19.9 years of age; (e) participants with intellectual disability (studies with participants having other developmental disability, such as Down Syndrome or Autism Spectrum Disorder, were included if the level of intellectual disability was also reported); (f) promoted and/or assessed physical activity, sport, or exercise participation and (g) assessed the physical health or psychosocial health outcomes/correlates of physical activity. Studies including participants with physical disability were excluded. Single-case designs were also excluded from the meta-analysis as the calculation of Cohen's d requires a minimum of two participants (see Table 2.2 for details)."

Information Sources

Research articles were gathered using Scopus, ERIC, Web of Science, and Ebscohost database platforms. Within the Ebscohost platform, the following collections were searched: SportDiscus with Full Text, Allied and Contemporary Medicine Database, PsychArticles, Psychology and Behavioral Sciences Collection, CINAHL Complete, Medline, PubMed, Academic Search Complete, and Education Research Complete. Manual searches of articles published between 2000 and 2017 were also conducted within the following peer-reviewed journals devoted to either intellectual disability or adapted physical activity research: American Journal on Intellectual and Developmental Disability, Journal of Intellectual Disability, Journal of Intellectual Disability Research, Intellectual and Developmental Disability, Journal of Applied Research in Intellectual Disability, Journal of Intellectual and Developmental Disability, Adapted Physical Activity Quarterly, and European Journal of Adapted Physical Activity.

Search

Relevant studies were identified through four groups of keywords utilized in previous systematic reviews which focused on either the physical benefits (Janssen &

LeBlanc, 2010) or psychosocial benefits (Eime et al., 2013) of physical activity for youth or people with an intellectual disability (Hilgenkamp, van Wijck, & Evenhuis, 2010; Maïano, Normand, Aime, & Begarie, 2014). The groups of keywords related to (1) the nature of the behaviour (i.e., physical activity, sport, exercise), (2) the participants' age group, (3) the participants' disability, and (4) the possible outcome of physical activity. All four groups were searched within the title, abstract, and keyword fields, while the possible outcomes (group 4) were also searched within the text of the articles. The groups of keywords are presented in Table 2.1.

Table 2.1

Keyword Search Terms

(1) sport* OR 'physical activit*' OR 'adapted physical activit*' OR exercis* OR 'physical educat*' OR 'adapted physical educat*'
(2) child* OR adolescen* OR student* OR youth OR juvenile
(3) 'intellectual* disab*' OR 'learning disab*' OR 'mental* retard*' OR 'developmental dis*' OR 'cognitive dis*' OR 'Prader-Willi' OR 'fragile x' OR klinefelter OR 'down syndrome'
(4) 'physical fitness' OR physio* OR balance OR stab* OR sway* OR agil* OR coordinat* OR 'manual dexterit*' OR 'manual abilit*' OR speed OR flexibility OR strength* OR endurance OR fitness OR 'cardio-vascular fitness' OR 'cardio-vascular capacity' OR 'cardiorespiratory fitness' OR 'cardiorespiratory capacity' OR 'physical* condition*' OR capacity OR 'reaction time' OR 'movement* time' OR 'motor skill*' OR function* OR health* OR 'high cholesterol' OR hypercholesterolemia OR hyperlipidemia OR dyslipidemia OR 'high blood pressure' OR hypertension OR 'metabolic syndrome' OR 'syndrome X' OR 'deadly quartet' OR 'plurimetabolic syndrome' OR 'insulin resistanc*' OR obes* OR overweight OR 'bone density' OR 'bone strength' OR 'bone mass' OR 'bone mineral density' OR social* OR 'prosocial behav*' OR relationship* OR friend* OR psycho* OR 'mental health' OR 'quality of life' OR 'life satisfaction' OR well* OR depress* OR anxi* OR stress OR affect* OR mood OR 'self-concept' OR 'self-esteem' OR 'self-perception' OR 'perce* competen*' OR 'self-belief' OR 'self-worth' OR 'self-efficacy'

Study Selection

First, duplicate titles were removed. Then, two reviewers (NK and DV) independently screened titles and abstracts. Finally, two reviewers (NK and JL) independently assessed the full-text of the remaining articles. Studies meeting the inclusion criteria were then separated into two sets, one focused on the physical health outcomes of physical activity for youth with intellectual disability and the other examining the psychosocial outcomes of physical activity in this population.

Data Collection Process and Data Items

Where possible, pre- and post-program means, standard deviations, and sample sizes were extracted for treatment and control groups for each outcome. Some studies reported the differences between groups/time in the form of F-ratios or t-tests, and in these cases the test values were extracted along with the sample size. From the studies with cross-sectional/observational data, the correlations (or R^2 values) were extracted. Potential moderators were also extracted from each study and categorically coded. Moderator variables included: (a) study design coded as pre-post controlled, single group pre-post, post controlled, or observational; (b) participant disability type coded as ‘yes’ when participants with developmental disability (e.g. Down Syndrome, Autism Spectrum Disorder, etc.) were included, ‘no’ when they were excluded, or ‘n/a’ when other developmental disability were not mentioned; (c) participant intellectual disability level coded as mild, mild/moderate, moderate, or severe; (d) mean participant age coded as child (5-9.9 years) or adolescent (10-19.9 years; WHO, 2015); and (e) intervention type coded as aerobic training (e.g. exercise on a treadmill), resistance training (e.g. weightlifting), movement/sport skills training (e.g. basketball skills training), general physical education/activity (e.g. physical education class), or balance/core stability training. Additionally, random group assignment was coded as present or absent, intensity, defined

here as the percent of maximum exercise output (e.g. heart rate, weight lifted, speed on the treadmill, rating of perceived exertion, etc.) of the intervention was categorized using Exercise and Sport Science Australia's (ESSA's) guidelines (Coombes & Skinner, 2014, pp. 117) as either light (40% - 55% of maximum exercise output), moderate (55% - 70% of maximum exercise output), vigorous (70% - 90% of maximum exercise output), or hard (90%+ of maximum exercise output), and dose of the intervention was calculated as total minutes of participation (minutes of each exposure multiplied by number of exposures).

The first meta-analysis focused on physical health outcomes, including variables coded as cardiovascular/cardiorespiratory fitness (e.g. VO_2max), muscular strength/endurance (e.g. 1-rep max), movement/sport skills (e.g. free-throws made), physiological (e.g. bone density, blood pressure, cholesterol, body mass index, body fat percentage, blood lipid level), physical functioning (e.g. activities of daily living), balance/core stability (e.g. flamingo balance test), flexibility (e.g. sit-and-reach test), or reaction time. The second meta-analysis examined the psychological (e.g. self-esteem, general self-concept, well-being, and mental health related), cognitive (e.g. knowledge or intelligence), emotional (e.g. mood and affect), behavioural (e.g. challenging or problem behaviours or physical activity behaviours), or social (e.g. friendships, relationships with other, or social maturity) health.

Risk of Bias in Individual Studies

Risk of bias in the experimental studies was assessed using the 28-item Downs and Black Quality index (Downs & Black, 1998). A 15-item version of the Downs and Black Quality Index (Rhodes & Quinlan, 2015) was used to assess the risk of bias in the observational studies. In addition, Item 27 (power analysis) was separated into two questions (a) was a power analysis reported, and (b) was there a description of clinically significant effects? Each was coded as 0 (no) or 1 (yes). Also, item 28 ("Was a control

group, sampled from participants of the same population as the treatment group used?”) was added as an additional judgement of bias to account for the possibility of inflated effects from studies without control group comparisons (Waters, Reeves, Fjeldsoe, & Eakin, 2012). Items were coded with 0 (no, criterion was not fulfilled, or unable to determine) or 1 (yes, criterion was fulfilled). See Appendix A for a link to the full details of the risk of bias assessment.

One author rated the risk of bias for all studies. A second reviewer independently scored five randomly selected studies in this review. Percentage agreement, percentage of agreement by chance, and a Cohen’s kappa score (Cohen, 1988) were calculated for the risk of bias assessment. Values over 0.75 for the Cohen’s kappa score were deemed acceptable (Cohen, 1988). For each study, the total risk of bias score was calculated by summing the scores for each item and then dividing by the maximum score of the scale used. This resulted in a quality/risk of bias score on a scale of 0 to 1. As suggested by Minatto, Filho, Berria, and Petroski (2016) and Swain et al. (2011), the quality/risk of bias scores were then labelled as low risk of bias ($\geq .80$), moderate risk ($.50 - .79$), or high risk ($< .50$).

Summary Measures

For the experimental and observational studies that reported means and standard deviations of the health outcomes, an effect size and its variance was calculated as a standardized mean-change score (Becker, 1988) for each outcome. This effect size represented the differences between the pre- and post- intervention means and the treatment and control group means. The resulting effect size was expressed in pooled standard deviation units (see Table 2.2 for details). The studies with cross-sectional/observational data that represented the relation between physical activity and its health outcome through a correlation, t-test, F-test, or regression were first converted to

Cohen's *d* effect sizes and then to Hedges' *g* (see Table 2.2 for details; Borenstein, Hedges, Higgins, & Rothstein, 2009; Rosenthal, 1994). In cases where participation in physical activity was expected to have a negative relation with its outcome (e.g. percentage of body fat and body mass index are expected to decrease when physical activity is increased), the effects were reversed from negative to positive. Many of the studies in these meta-analyses had small sample sizes, so each Cohen's *d* effect size was then corrected for bias in sample size using the correction factor within a Hedges' *g* effect size (see Table 2.2 for details; Hedges & Olkin, 1992).

Table 2.2
Effect Size Calculation Formulas

Formula 1. Standardized mean difference $Cohen's\ d_{biased} = \frac{(Mtrt_{post} - Mtrt_{pre}) - (Mcon_{post} - Mcon_{pre})}{Pooled\ SD_{prepost}}$ $Pooled\ SD_{prepost} = \sqrt{\frac{((n_{trt} - 1) * SD_{trt_{pre}}^2) + ((n_{con} - 1) * SD_{con_{pre}}^2) + ((n_{trt} - 1) * SD_{trt_{post}}^2) + ((n_{con} - 1) * SD_{con_{post}}^2)}{2 * (n_{trt} + n_{con} - 2)}}$ (Borenstein 2009)
Formula 2a. Variance of standardized mean difference for independent groups/measures (treatment and control groups) $Variance_{biased} = \left(\frac{(n_{trt} + n_{con})}{(n_{trt} * n_{con})} + \frac{d_{biased}^2}{2 * n_{total}} \right) * (2 * (1 - r))$ (Borenstein 2009)
Formula 2b. Variance of standardized mean difference for dependent groups/measures (single group or matched pairs) $Variance_{biased} = \left(\frac{1}{n_{total}} + \frac{d_{biased}^2}{2 * n_{total}} \right) * (2 * (1 - r))$ Note: correlation (r) between dependent groups set to 0.5 (Borenstein 2009)
Formula 3. Hedges bias correction factor $Bias\ Correction\ Factor = 1 - \frac{3}{4 * (n_{trt} + n_{con} - 1)}$ (Borenstein 2009)
Formula 4. Hedges bias correction $g_{unbiased} = Cohen's\ d_{biased} * Bias\ Correction\ Factor$

Synthesis of Results

Two separate meta-analyses were performed – one for physical health outcomes (results presented in Table 2.3) and one for psychosocial outcomes (results presented in

Table 2.4). The Hedges' g summary effect (and its Wald Confidence Interval) for each meta-analysis was first calculated using a random-effects meta-analytic approach. These random-effects summary analyses provided insight into the overall effectiveness of physical activity to improve the physical or psychosocial health of youth with intellectual disability. Hedges' g effect size values less than 0.2 were considered small, 0.5 was considered moderate, and above 0.8 was considered large (Cohen, 1992). The heterogeneity of the effect sizes was examined using the Q test statistic, Tau^2 and the I^2 statistic (Borenstein et al., 2009). The Q test statistic quantified the total amount (sum) of heterogeneity across the studies (its associated p -value was also calculated, with a significant result indicating a statistically significant amount of heterogeneity). The Tau^2 statistic estimated the variance of the summary effect, and the I^2 statistic described the percentage of the variance between effect sizes that is due to heterogeneity rather than random variance (Borenstein et al., 2009).

When a single study includes multiple effect sizes, the effect sizes computed for those outcomes are likely not to be independent (Becker, 2000). To account for this possible dependence, a three-level, random effects analysis (where Level 2 refers to the within-study effects, and Level 3 refers to the between-study cluster effect) was performed with each individual study (containing multiple effect sizes) labelled as a study cluster (Cheung, 2014). To determine the utility of the three-level model, its variance was compared to the variance of the two-level, random effects model, with a significant difference ($p < 0.05$) indicating the three-level model should be used.

Risk of Bias across Studies

The potential for publication bias was assessed first through examination of a funnel plot, and then by applying a regression test to test for funnel plot asymmetry (a linear relation between the standard error and the observed effect for each study). When

significant funnel plot asymmetry exists, it could mean that the effect sizes of the smaller studies are larger than the effects found in studies with larger samples. The Henmi and Copas method (Henmi & Copas, 2010) of adjusting the treatment effect was utilized to adjust for small-study effects. Due to the clustering of effect sizes within studies in the three-level analysis, this adjustment was not applied to the three-level model and was only applied to the two-level, random effects model. The assumption was that the clustering of effect sizes in the three-level analysis limited the impact of the small-study effects.

Additional Analyses

Potential sources of heterogeneity in the effect sizes were examined through a three-level, mixed-effects meta-analytic approach. This approach incorporated moderators related to study characteristics and assessed their relations with the effects of physical activity on outcomes for youth with intellectual disability. The study characteristics (study design, participant disability type (e.g. Down Syndrome, Autism Spectrum Disorder, etc.), participant intellectual disability level, mean participant age, intervention type, outcome type, group randomization, and the risk of bias categories) were analysed as moderators in a three-level, mixed-effects model. This model was then compared to the three-level, random-effects model (without moderators) via likelihood-ratio testing. A significant difference ($p < 0.05$) between the two models would indicate the utility of the mixed-effects model. The effect size, represented as Hedges' g (with Wald Confidence Interval), and associated p -value of each variable, was reported. The Tau^2 (total variance between effect sizes) and R^2 (amount of variance explained) for each of the three-level, mixed-effects models were also reported.

Subgroup analysis was also performed such that the effect of each specific physical activity intervention type (e.g. aerobic, resistance, movement skill, general physical activity, balance) was calculated for each of the physical fitness outcomes (e.g.

cardiovascular fitness, muscular strength, sport/movement skills, physiological, physical functioning (e.g. activities of daily living), flexibility, balance, or reaction time). For example, the specific effect of aerobic training interventions (i.e., a type of physical activity) on cardiovascular fitness (as a specific health outcome) was calculated. When possible, a three-level model was used to cluster the effects within a study. When a subgroup relation between specific interventions and outcomes had too few effect sizes to analyse them as a three-level model, they were examined with a two-level analysis (without the clustering of studies). These results are presented in Appendix B.

Results

Links to the .xlsx versions of full dataset for each of the two meta-analyses and the R script used for the analyses are provided in Appendix A.

Study Selection

As shown in Figure 2.1, the search performed in July 2017 yielded 2,935 records. An additional 10 studies were identified through hand-searching of journals. Following the removal of duplicates, 1,777 titles and abstracts were screened by two of the authors. Then, 428 full-text articles were independently reviewed by two of the authors with 109 studies meeting the inclusion criteria. Of these studies, 95 studies included physical health outcomes, and 29 included psychosocial outcomes. Fifteen of these studies included both physical and psychosocial outcomes. See Appendix C for a list of the references included in this study.

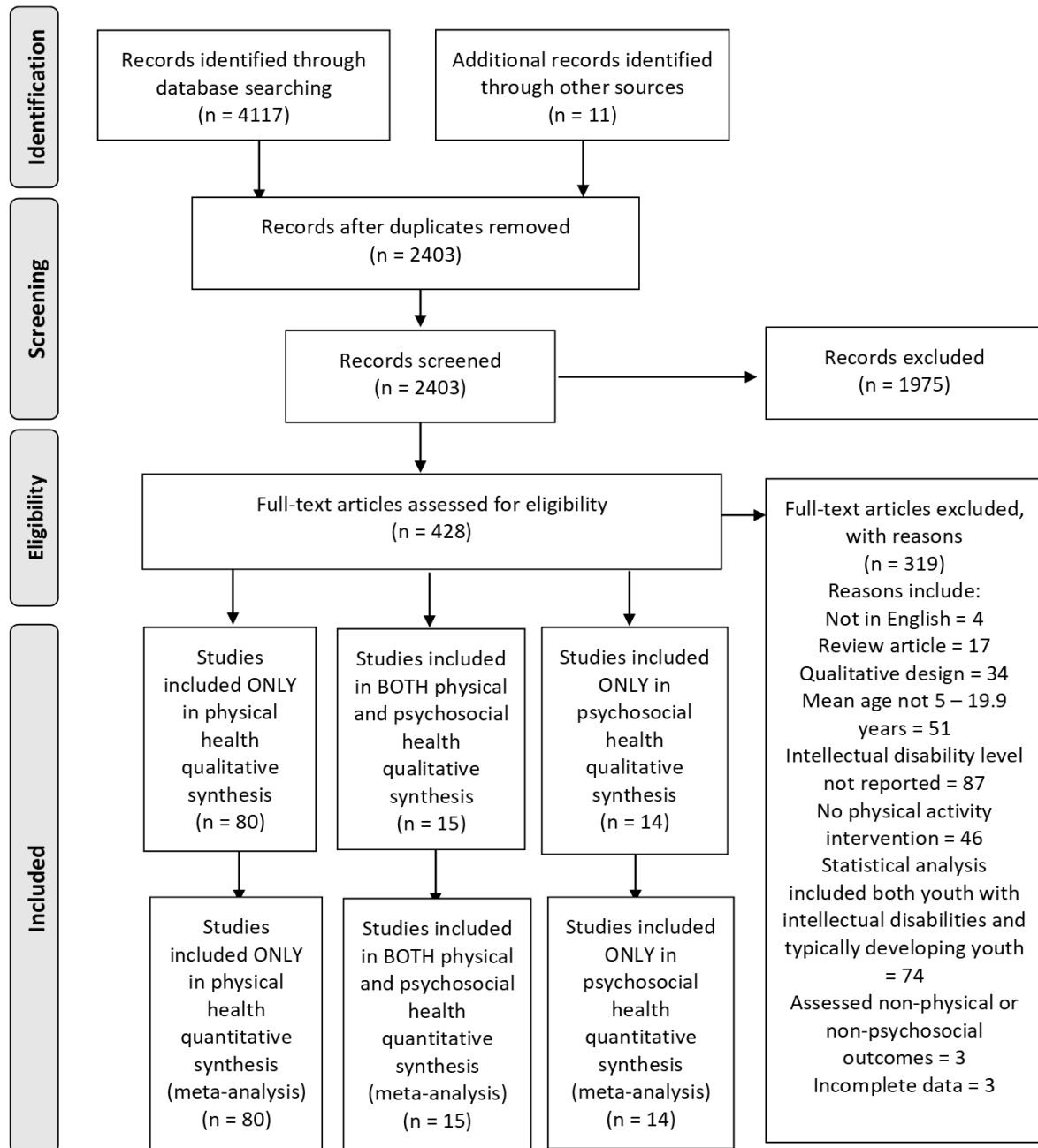


Figure 2.1. PRISMA flow diagram of studies included in the systematic review and meta-analyses.

Meta-analysis 1: The Effects of Physical Activity on the Physical Health of Youth with Intellectual Disability

Study Characteristics

Ninety-five independent studies involving 122 treatment samples reported the effects of either receiving a physical activity intervention or participating in physical activity on physical health outcomes. These studies provided 661 effect sizes and included a total sample of $N = 2,939$ participants with intellectual disability. This total sample included 1,591 participants who received some type of physical activity intervention, 909 participants who were in control groups, and 439 participants who were included in observational research. Of the 122 treatment samples, 54 (44.3%) were pre/post controlled experimental designs, of which 44 (81.5%) were randomized into treatment and control groups. Single group pre/post experimental designs represented 48 of the treatment samples (39.3%), post-test controlled designs made up three of the 122 treatment samples (2.5%), while 17 (13.9%) involved cross-sectional or observational designs. Regarding the mean age of the participants, 40 of the 122 treatment samples (32.8%) included children (5-9.9 years) and 81 (66.4%) included adolescents (10-19.9 years). One study did not report the mean age of the participants but stated that they were children (Funk, 1971).

Regarding the level of intellectual disability of the participants, 36 samples (29.5%) included only participants with mild intellectual disability, while 33 samples (27%) included participants with both mild and moderate intellectual disability, 15 samples (12.3%) included participants with moderate intellectual disability, and one sample (0.8%) included participants with severe intellectual disability. All participants in this meta-analysis have intellectual disability. However, 37 of the treatment samples (30.3%) did not report a specific level of intellectual disability. Regarding participant disability type, 59 treatment samples (48.4%) included participants with disability (e.g. Down Syndrome,

Autism Spectrum Disorder, Prader-Willi Syndrome, etc.) other than intellectual disability, while 10 of the treatment samples (8.2%) excluded participants who had disability other than intellectual disability, and 53 treatment samples (43.4%) did not mention whether the participants had any developmental disability other than intellectual disability.

Intensity of the intervention could be another important consideration when examining the effects of physical activity interventions on health outcomes. Unfortunately, only a small number (25; 20.5%) of the 122 treatment samples in this review mentioned the intensity of the physical activity interventions. Of the 25 studies that mentioned intervention, 11 of the studies had moderate intensity (55% - 70% of maximum exercise output) interventions, seven had vigorous intensity (70% - 90% of maximum exercise output) interventions, seven had hard intensity (90+% of maximum exercise output) interventions, and none of the studies had light intensity (40% - 55% of maximum exercise output) interventions.

The 122 treatment samples were involved in 34 (27.9%) aerobic physical activity interventions, 10 (8.2%) resistance training physical activity interventions, 28 (23%) movement skills physical activity interventions, 41 (33.6%) general physical activity/education, and nine (7.4%) interventions based on balance or core stability. Of the 661 effect sizes, 81 (12.3%) were related to cardiovascular/cardiorespiratory fitness outcomes, 184 (27.8%) to muscular strength/endurance outcomes, 108 (16.3%) to movement/sport skills outcomes, 137 (20.7%) to physiological outcomes (body fat %, cholesterol, waist circumference, etc.), 14 (2.1%) to physical functioning, 112 (16.9%) to balance/stability outcomes, nine (1.4%) to flexibility outcomes, and 16 (2.4%) to reaction time outcomes.

Risk of Bias within Studies

The risk of bias assessment indicated that 22 of the 95 studies (23.2%) were categorized as presenting low risk of bias while the rest displayed moderate (71.6%) to high (5.3%) risk of bias. The poorest scoring risk of bias items related to power analysis, the blinding of the participants and researchers to the interventions or outcomes, and the reporting of adverse events occurring during intervention (see link in Appendix A for full risk of bias assessment results). Agreement between the two reviewers (NK and JL) of the risk of bias scores for the five randomly selected studies was acceptable based on the percent agreement (91.4%) and Cohen's kappa (0.803).

Synthesis of Results

The overall two-level random effects analysis showed a moderate effect of physical activity on physical health outcomes for youth with intellectual disability ($g = 0.651$, $p < .001$). This effect was associated with a high degree of heterogeneity ($Q = 2556.232$, $p < .001$, $Tau^2 = 0.226$, $I^2 = 77.4\%$). These results are presented in Table 2.3.

Three-level model. The comparison between the two-level random effects model with the three-level random effects model showed that these models were significantly different (likelihood-ratio test = 458.19, $p < .001$), supporting the superiority of the three-level model. The summary effect of physical activity on physical health outcomes for youth with intellectual disability using a three-level (effect sizes nested within studies) random effects model was large ($g = 0.773$, $p < .001$). In this model, the within-study cluster (Level 2) and between-study cluster (Level 3) explained 5.3% and 78.5% of the total variance, respectively. These results are presented in Table 2.3.

Risk of Bias across Studies

Examination of the funnel plot revealed a non-linear relation between the sample size and the magnitude of the effects, suggesting small-study effects. A regression test

suggested funnel plot asymmetry ($p < .001$) which could again be due to small-study effects. The Henmi and Copas method (Henmi & Copas, 2010) of adjusting for small-study effects gave a small-to-moderate summary effect ($g = 0.394$, $Tau^2 = 0.232$) using a two-level, random-effects model.

Moderation Analyses

Study characteristics. Study design (i.e., pre/post controlled vs post controlled vs pre/post vs observation) did not moderate the relation between physical activity and physical health ($p = 0.518$). Random group assignment also had minimal impact on the effects of the interventions on physical health outcomes ($p = 0.329$). The dose (in total minutes) of the intervention was not a significant moderator ($p = 0.841$). The categorical intensity of the interventions was a significant moderator ($p < .001$, 57.1% between-study variance) with moderate [55% - 70% of maximum exercise output] intensity ($g = 0.886$, $p < .001$) and hard [90%+ of maximum exercise output] intensity ($g = 0.602$, $p = 0.105$) interventions showing larger effects than vigorous [70% - 90%] intensity ($g = 0.344$, $p = 0.277$) interventions. However, moderate intensity was the only category showing statistical significance. This category had 11 studies, while vigorous and hard only had seven each. It should again be noted that only 25 of the 122 treatment samples reported intensity of the interventions and these surprising results should be interpreted with caution. The risk of bias did not moderate the effect of physical activity on physical health ($p = 0.795$).

Participant characteristics. Participants' age category was a statistically significant moderator ($p = 0.024$, 3.9% between-study variance), with children ($g = 0.982$, $p < .001$) showing a larger effect size than adolescents ($g = 0.681$, $p < .001$). Intellectual disability level was a significant moderator ($p = .001$, 6.1% between-study variance) with physical activity having a larger effect ($g = 1.010$, $p < .001$) on participants with moderate

intellectual disability than on those with mild intellectual disability ($g = 0.687, p < .001$). Having disability other than intellectual disability (e.g. Down Syndrome, Autism Spectrum Disorder, etc.) was also a statistically significant moderator ($p < .001$) but explained a very small amount of the between study variance (0.8%). This could have been caused by 192 of the effect sizes not reporting whether the participants had disability in addition to intellectual disability, thus removing a large portion of the variance from this analysis.

Physical health outcome type. Physical health outcome type was a statistically significant moderator ($p < .001$) and explained 13.4% of the between-study variance. The largest effect sizes were associated with reaction time ($g = 1.134, p < .001$), flexibility ($g = 0.908, p < .001$) and movement/sport skills ($g = 0.814, p < .001$). Cardiovascular/cardiorespiratory fitness ($g = 0.792, p < .001$) and muscular strength/endurance ($g = 0.777, p < .001$) were associated with moderate-to-large average effect sizes. Physiological outcomes ($g = 0.511, p < .001$), physical functioning ($g = 0.663, p < .001$), and balance/core stability ($g = 0.683, p < .001$) were associated with moderate effect sizes. Within the physiological outcomes, 26 effect sizes specifically addressed body mass index. These effect sizes were analysed as a 2-level random effects model, and were not statistically significant ($g = 0.035, p = 0.4026$).

Intervention type. Intervention type was a statistically significant moderator ($p < .001$) and explained 37.9% of the within-study variance. Interventions involving resistance training ($g = 1.162, p < .001$) or movement/sport skills ($g = 1.070, p < .001$) were associated with the largest effect sizes. Balance and core stability training ($g = 0.783, p < .001$) interventions were associated with moderate-to-large effect sizes, while general physical education/activities ($g = 0.616, p < .001$) and aerobic training ($g = 0.543, p < .001$) were associated with moderate effect sizes.

Subgroup moderation analyses. Results highlighting the relation between each type of intervention (resistance training, movement/sport skills, balance and core stability training, general physical activities, and aerobic training) and each outcome type (cardiovascular/cardiorespiratory fitness, muscular strength, movement/sport skills, balance, reaction time, flexibility, and physiological health) are presented in the Appendix B.

Table 2.3
Summary Effects: Physical Activity on Physical Health Outcomes

Two-level, random-effects model													
#ES	ES (g)	Wald CI	(p)	Q	Tau ²	I ²							
661	0.651	0.602-0.700	<.001	2556.232	0.226	77.4%							
Three-level, random-effects model													
#ES	k	ES (g)	Wald CI	p	Q	Tau ² 2	Tau ² 3	I ² 2	I ² 3				
661	95	0.773	0.638-0.908	<.001	2556.232	0.026	0.391	5.3%	78.5%				
Three-level, mixed-effects/moderation models													
Moderator	Subgroup	ANOVA (p)	R ² 2	R ² 3	# ES	Clusters	ES (g)	Wald CI	p	Tau ² 2	Tau ² 3	I ² 2	I ² 3
Study design		0.518	0%	2.8%									
Random group assignment		0.329	0%	0.5%									
Risk of Bias		0.795	0%	1.1%									
Age category		0.024	0.2%	3.9%									
	Children				149	29	0.982	0.738-1.227	< .001	0.029	0.591	4.1%	83.3%
	Adolescents				507	65	0.681	0.521-0.840	< .001	0.025	0.310	6.1%	75.0%
Intellectual disability level		< .001	0.4%	6.1%									
	Mild				212	29	0.687	0.477-0.898	< .001	0.045	0.255	11.1%	62.8%
	Mild/Moderate				197	26	0.746	0.526-0.967	< .001	0.034	0.350	6.6%	68.8%
	Moderate				108	14	1.010	0.707-1.312	< .001	0.004	0.210	1.1%	62.7%
	Severe				1	1	0.231	-1.348-1.810	0.774				
Other developmental disability		< .001	0%	0.8%									
	No				66	9	0.756	0.338-1.174	< .001	0.040	0.246	9.6%	58.7%
	Yes				353	46	0.668	0.480-0.855	< .001	0.029	0.402	5.9%	81.7%
Outcome type		< .001	100%	13.4%									
	Cardiovascular Fitness				81	30	0.792	0.648-0.936	< .001	0	0.586	0%	86.8%
	Muscular Strength				184	40	0.777	0.641-0.912	< .001	0.053	0.135	19.5%	49.5%
	Movement/Sport Skills				108	27	0.814	0.672-0.957	< .001	0	0.307	0%	79.4%
	Physiological				137	37	0.511	0.415-0.687	< .001	0.000	0.123	0%	69.5%
	Physical functioning				14	7	0.663	0.430-0.896	< .001	0.259	0.078	63.5%	19.2%
	Flexibility				112	21	0.908	0.736-1.081	< .001	0	0.382	0%	70.1%
	Balance/Core stability				9	7	0.683	0.453-0.912	< .001	0	0.888	0%	56.7%
	Reaction Time				16	5	1.134	0.687-1.581	< .001	0	0.205	0%	54.4%
Intervention type		< .001	37.9%	0%									
	Aerobic Training				154	27	0.543	0.328-0.757	< .001	0.089	0.827	8.6%	79.6%
	Resistance Training				46	10	1.162	0.920-1.403	< .001	0.082	0.248	20.0%	60.6%
	Movement/Sport Skills				161	25	1.070	0.834-1.306	< .001	0.001	0.610	0%	83.9%
	General Physical Activity/Education				230	30	0.616	0.414-0.818	< .001	0.007	0.215	2.7%	78.3%
	Balance/Core Stability				70	9	0.783	0.481-1.084	< .001	0	0.245	0%	65.7%

ES effect size, k study clusters, CI confidence interval, g Hedges' g, p significance

Meta-analysis 2: The Effects of Physical Activity on the Psychosocial Health of Youth with Intellectual Disability

Study Characteristics

Twenty-nine independent studies involving 33 treatment samples reported the effects of physical activity on psychosocial health. These studies provided 149 effect sizes and included a total sample of $N = 1,261$ participants with intellectual disability. This total sample included 657 participants who received some type of physical activity intervention, 378 participants who were in control groups, and 226 participants who were included in observational research. Of the 33 treatment samples, 18 (54.5%) were pre/post controlled experimental designs, of which 10 (55.6%) were randomized into treatment and control groups. Single group pre/post experimental design represented eight of the 33 treatment samples (24.2%), post-test controlled designs made up four of the 33 treatment samples (12.1%), while three (9.1%) involved observational designs. Regarding the mean age of the participants, 11 of the 33 treatment samples (33.3%) included children (5-9.9 years) and 22 (66.7%) included adolescents (10-19.9 years).

Regarding the level of intellectual disability of the participants, 14 of the 33 treatment samples (42.4%) included only participants with mild intellectual disability, while 14 samples (42.4%) included participants with both mild and moderate intellectual disability, three (9.1%) included participants with moderate intellectual disability, and no sample included participants with severe intellectual disability. All participants in this meta-analysis have intellectual disability. However, two of the treatment samples (6.1%) did not report a specific level of intellectual disability. Regarding participant disability, eight of the 33 treatment samples (24.2%) included participants with developmental disability (e.g. Down Syndrome, Autism Spectrum Disorder, Prader-Willi Syndrome, etc.),

apart from intellectual disability while four of the treatment samples (12.1%) excluded participants who had any disability other than intellectual disability, and 21 of the treatment samples (63.6%) did not mention additional disability.

The 33 treatment samples were involved in two (6.1%) aerobic physical activity interventions, one (3%) resistance training physical activity interventions, 14 (42.4%) movement/sport skills physical activity interventions, one (3%) intervention focused on balance or core stability training, and 14 (42.4%) on general physical activity/physical education. Of the 149 effect sizes, 34 (22.8%) were related to psychological outcomes, 50 (33.6%) to cognitive outcomes, seven (4.7%) to emotional outcomes, 25 (16.8%) to behavioural outcomes, and 33 (22.1%) to social outcomes.

Risk of Bias within Studies

The risk of bias assessment indicated that six of the studies (20.7%) were categorized as presenting low risk of bias, while the rest displayed moderate (72.4%) to high (6.9%) risk of bias. The full results for each of the risk of bias assessment items are provided in the Appendix. Agreement between the two reviewers (NK and JL) of the risk of bias scores for the five randomly selected studies was acceptable based on the percent agreement (91.4%) and Cohen's kappa (0.803).

Synthesis of Results

The overall two-level random effects analysis showed a moderate effect of physical activity on psychosocial health outcomes for youth with intellectual disability ($g = 0.682$, $p < .001$). This effect was associated with a high degree of heterogeneity ($Tau^2 = 0.471$, $Q = 824.789$, $I^2 = 85.2\%$). These results are presented in Table 2.4.

Three-level model. The comparison between the two-level random effects model with the three-level random effects model showed that these models were significantly different ($p < .001$), supporting the superiority of the three-level model. The summary

effect of physical activity on physical outcomes for youth with intellectual disability using a three-level (effect sizes nested within studies) random effects model was moderate- to-large ($g = 0.695$, $p < .001$). In this model, the within-study cluster (Level 2) and between-study cluster (Level 3) explained 34.3% and 49.8% of the total variance, respectively. These results are presented in Table 2.4.

Risk of Bias across Studies

Examination of the funnel plot revealed a non-linear relation between the sample size and the magnitude of the effects, suggesting small-study effects. A regression test suggested funnel plot asymmetry ($p < .001$) which could again be due to small-study effects. The Henmi and Copas method (Henmi & Copas, 2010) of adjusting for small-study effects gave a summary effect ($g = 0.614$, $Tau^2 = 0.387$) using a two-level random-effects model similar to the summary effect without the adjustment (i.e., $g = 0.682$).

Moderation Analyses

Study characteristics. Study design (i.e., pre/post controlled vs post controlled vs pre/post vs observation) was a statistically significant moderator ($p = 0.009$) and explained 48.7% of the between-study variance. Specifically, pre/post controlled ($g = 0.543$, $p < .001$) and single group pre/post ($g = 0.415$, $p = 0.025$) studies revealed moderate effects of physical activity on psychosocial health, while single time point measures of post controlled ($g = 1.059$, $p < .001$) and cross-sectional/observational ($g = 1.498$, $p < .001$) studies reported showed larger effect sizes. Risk of bias was also a statistically significant moderator ($p = 0.028$), explaining 35.7% of the between-study variance. However, an easily interpretable pattern did not emerge: large effects were found in studies with a high ($g = 1.409$, $p < .001$) and low ($g = 1.007$, $p < .001$) risk of bias, while moderate effects were found in studies with a moderate risk of bias ($g = 0.509$, $p < .001$).

Participant characteristics. Participants' age category ($p = 0.821$) and level of intellectual disability ($p = 0.193$) were not moderators in these samples. However, participants having disability other than intellectual disability was a significant moderator ($p < .001$) and explained 21.4% of the between-study variance. Physical activity had a larger effect size for participants with other developmental disability ($g = 1.062, p < .001$) than for participants with no other disability ($g = 0.514, p = 0.084$).

Psychosocial outcome type. Outcome type moderated the effect of physical activity on psychosocial health ($p = 0.019$), explaining 5.7% of the between-study variance. The largest effect sizes were associated with psychological outcomes (e.g. self-concept, efficacy, mental health; $g = 0.754, p < .001$), behavioural outcomes ($g = 0.986, p < .001$) and social outcomes ($g = 0.723, p < .001$). Cognitive outcomes (e.g. knowledge, IQ) were associated with moderate effect sizes ($g = 0.534, p < .001$). Finally, the effects of physical activity on emotional outcomes (enjoyment, affect, fun) were not statistically significant ($g = 0.249, p = .227$).

Intervention type. Intervention type as a moderator approached statistical significance ($p = .076$) and explained 25.2% of the between-study variance. Interventions involving movement/sport skills ($g = 0.966, p < .001$) had large effects, while general physical activity/physical education had moderate effects on psychosocial health ($g = 0.405, p = .006$). The few studies examining interventions involving resistance training ($g = 0.582, p = .309$), aerobic training ($g = 0.680, p = .091$), or balance/core stability training ($g = 0.405, p = .430$) reported effects that were not statistically significant.

Table 2.4
Summary Effects: Physical Activity on Psychosocial Health Outcomes

Two-level, random-effects model													
#ES	ES (g)	Wald CI		p	Q	Tau ²	I ²						
145	0.682	0.557-0.807		< .001	824.798	0.471	85.2%						
Three-Level, random-effects model													
#ES	k	ES (g)	Wald CI		p	Q	Tau ² 2	Tau ² 3	I ² 2	I ² 3			
145	29	0.695	0.475-0.915		< .001	824.798	0.177	0.256	34.3%	49.8%			
Three-level, mixed-effects/moderation models													
Covariate	Subgroup	ANOVA (p)	R ² 2	R ² 3	# ES	k	ES (g)	Wald CI	p	Tau ² 2	Tau ² 3	I ² 2	I ² 3
Study Design		0.009	0%	48.7%									
	Pre/post controlled				71	17	0.543	0.308-0.778	< .001	0.022	0.134	8.1%	50.0%
	Single group pre/post				26	7	0.415	0.052-0.779	0.025	0.068	0.080	31.5%	37.0%
	Post controlled				30	2	1.059	0.518-1.600	< .001	0.193	0.124	49.8%	32.0%
	Cross-sectional/Observational				18	3	1.498	0.992-2.004	< .001	0.640	0.247	67.8%	26.1%
Random group assignment		< .001	0%	0%									
Risk of Bias		0.028	0%	35.7%									
	Low risk				42	6	1.007	0.618-1.397	< .001	0.367	0.346	47.6%	44.9%
	Moderate risk				89	21	0.509	0.283-0.735	< .001	0.052	0.136	18.7%	48.7%
	High risk				14	2	1.409	0.683-2.135	< .001	0.073	0	27.8%	0%
Age category		0.821	0%	0%									
Intellectual disability level		0.193	0%	24.3%									
Other developmental disability		< .001	0%	21.4%									
	No				33	3	0.514	-0.068-1.095	0.084	0.146	0.006	68.5%	2.8%
	Yes				37	8	1.062	0.653-1.471	< .001	0.517	0.327	56.8%	35.9%
Outcome type		0.019	13.2%	5.7%									
	Psychological				31	14	0.754	0.461-1.048	< .001	0.068	0.272	15.5%	61.2%
	Cognitive				50	13	0.534	0.239-0.829	< .001	0.142	0.132	41.6%	38.8%
	Emotional				7	4	0.249	-0.201-0.699	0.277	0.130	0	68.3%	0%
	Behavioural				24	9	0.986	0.654-1.319	< .001	0.185	0.557	22.1%	66.4%
	Social				33	17	0.723	0.443-1.002	< .001	0.171	0.274	31.3%	50.2%
Intervention type		0.076	3.0%	25.2%									
	Aerobic Training				5	2	0.680	-0.107-1.468	0.091	0.257	0	83.3%	0%
	Resistance Training				2	1	0.582	-0.540-1.703	0.309	0	0	0%	0%
	Movement/Sport Skills				92	13	0.966	0.692-1.239	< .001	0.280	0.372	37.7%	50.0%
	General Physical Activity/Education				43	13	0.405	0.115-0.694	0.006	0	0.077	0%	50.6%
	Balance/Core Stability				3	1	0.405	-0.601-1.412	0.430	0	0	0%	0%

ES effect size, k study clusters, CI confidence interval, g Hedges' g, p significance

Discussion

The aim of the current review and meta-analyses was to synthesize existing research on the physical and psychosocial health benefits of physical activity for youth with intellectual disability. These meta-analyses showed that physical activity had a positive impact on both the physical and psychosocial health of youth with intellectual disability. These findings are congruent with research highlighting the benefits of physical activity for typically developing youth (Babic et al., 2014; Bailey, 2006; Eime et al., 2013; Ekeland et al., 2005; Owen et al., 2016; Penedo & Dahn, 2005; Poitras et al., 2016).

Previous research showed that, compared to their typically developing peers, youth with intellectual disability participate less frequently in physical activity (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001; Lorenzi et al., 2000) and are less physically fit (Oppewal et al., 2013; Rimmer et al., 2010; Salaun & Berthouze-Aranda, 2012; Waninge et al., 2013). Due to these low physical activity participation rates and fitness levels, it is possible that any increase in physical activity, regardless of the type of intervention used, could improve their physical health (Warburton, Nicol, & Bredin, 2006). Intervention and outcome type were significant moderators for both physical and psychosocial outcomes. When considering physical health outcomes, intervention type only explained differences across effect sizes within studies, rather than between studies. Outcome type explained all the variance within studies as well as a large portion of the variance between studies. This means the success of a physical activity intervention for youth with intellectual disability is likely to depend heavily on the specific type of results (i.e., outcomes) the practitioner is seeking to achieve. In terms of physical health outcomes, practitioners could expect to see the largest changes in reaction time, flexibility and movement/sport skills. In contrast, when looking at the effect of physical activity on psychosocial health, intervention type explained more of the variance than did outcome type. This result suggests that the type of

intervention is more important for improving psychosocial health than physical health. For improving the psychosocial health of youth with intellectual disability, our review indicates that practitioners should consider implementing interventions related to sport and movement skills training over general physical activity/education.

Youth with intellectual disability accumulate about half of their daily physical activity at school during physical education class (Queralt, Vicente-Ortiz, & Molina-Garcia, 2016). Therefore, it seems important to highlight this specific context of physical activity when examining the outcomes of physical activity. Within general physical education, educators can expect to see improvements in both the physical and psychosocial health of their students with intellectual disability. However, compared with psychosocial health, larger improvements in physical health could be expected. This suggests that either the physical educators in the studies included in our review more effectively encouraged their students' physical development compared with their psychosocial development, or that in-school physical education is a relatively poorer intervention for psychosocial enhancement among youth with intellectual disability.

Results of the moderation analyses also suggest that participant characteristics, such as age, intellectual disability level, and having other developmental disability, are important factors to consider when utilizing physical activity to improve the physical and psychosocial health of youth with intellectual disability. While physical activity appears to be beneficial for the majority of these youth, interventions aimed at improving physical health could be specifically targeted to the youth who are likely to improve the most. For example, when participating in any type of physical activity, children showed greater physical health improvements than adolescents. Additionally, youth with higher levels of intellectual disability showed greater improvements in their physical health than those moderate or mild intellectual disability. Finally, differential effects were found among

youth who have intellectual disability and youth who have other developmental disability (such as Autism Spectrum Disorder or Down Syndrome). Regarding their psychosocial enhancement, it appears that youth with other developmental disability may benefit more from physical activity than youth who have an intellectual disability.

Recommendations for Practitioners

Practitioners seeking the greatest improvements in both the physical and psychosocial health of youth with intellectual disability may wish to focus interventions on playing sport and training sports/movement skills. These types of physical activities appear more effective at increasing both physical and psychosocial health than other types of exercise training, such as resistance training, aerobic training, and balance/core stability training. The enhanced benefits of playing sport could be due to the social nature of many of these activities versus the solitary nature of resistance exercise or running. This fits with the previous research among youth with developmental disability and suggests that youth with intellectual disability gain more benefit from physical activities when they are performed in groups (Johnson, 2009).

Limitations

A limitation of the current review and meta-analyses is that most (71.6%) of the included studies showed at least a moderate risk of bias. The risk of bias assessment tool used in this review contained items that were focused on either the reporting or quality of the interventions used. Because most of the studies in this review had a moderate risk of bias, it is possible that the true effects of the physical activity interventions used in these studies were smaller than what was reported in this meta-analysis. While it is logical to conclude that using high standards for reporting and conducting interventions will result in greater improvements in any/all outcomes, it is important to note that any assessment around the efficacy and reproducibility of interventions is difficult when there is a shortfall

in the reporting of these interventions (i.e. a moderate to high risk of bias; Hoffmann et al., 2014). It should also be noted that risk of bias was only a significant moderator for the psychosocial health outcomes in this review. Regarding specific items in the risk of bias assessment, the poorest scoring items related to the blinding of participants and researchers, randomization, and having control groups from the same population as the intervention group. From this, it can be suggested that increasing the number of randomized controlled trials would be an effective way of strengthening the evidence and reducing the risk of bias in this field (Johnson, 2009; Rimmer & Rowland, 2008). However, it is difficult to recruit large samples within this population (Johnson, 2009) and sufficiently powered randomized controlled trials are challenging to conduct, making meta-analytic studies such as this one particularly valuable. A related limitation of our review was the presence of small-study effects. Although the use of Hedges' g as the main summary effect can address this issue by correcting for the sample size, small-study effects still existed. The Henmi and Copas adjustment reduced the physical health outcomes summary effect size from a moderate-to-large effect to a small-to-moderate effect. The inflated effects of these small studies are quantified by this adjustment.

A large amount of heterogeneity was also present across studies. Attempts to explain this heterogeneity were made through moderation analyses. However, a large proportion of the heterogeneity remained unexplained by the moderators considered here. People with intellectual disability possess a wide range of adaptive skills (Schalock et al., 2010), and perhaps because of this diversity, a large portion of the unexplained variance is likely to occur at the participant-level (Level 1) and is difficult to explore without access to the primary data. While acknowledging the aforementioned challenges in recruiting large samples from this population, further research is needed to determine which individual

level variables influence the effects of physical activity on physical and psychosocial health in this population.

Future Research

There is a continued need for future research in this area to focus on enhancing the lives of youth with intellectual disability through physical activity. The best way to accomplish this is likely through the development of large-scale randomized, controlled designed studies that include scalable interventions which can effectively promote and disseminate physical activities to youth with intellectual disability through the use of sport and movement skills training. These future, large-scale studies would not only provide opportunities, skills, and motivation for a larger number of youth with intellectual disability to be more physically active, but also highlight the methods that most effectively promote physical activity among this population. Formative work in this area could be accomplished through both the examination of the barriers to physical activity that youth with intellectual disability face (Stanish & Frey, 2008), and exploration of the motives leading to increased physical activity (Murphy & Carbone, 2008).

Another potential area for future research could focus on further exploration of the differing effects of physical activity between the youth with intellectual disability and the youth with developmental disability, such as Autism Spectrum Disorder and Down Syndrome, who also have an intellectual disability. The current meta-analyses indicate differing effects of physical activity on the physical and psychosocial health of youth with intellectual disability compared to youth with other developmental disability and an intellectual disability. This fits with the suggestions that youth with various developmental disability (intellectual disability vs Down Syndrome vs Autism Spectrum Disorder vs Prader-Willi Syndrome, etc) present with a wide range of adaptive skills and physical abilities (Winnick & Porretta, 2017). Previous research suggests these differing in

experiences could be due to the social nature of the activities (Solish, Perry, & Minnes, 2010; Taheri, Perry, & Minnes, 2016), but this hypothesis is mostly unconfirmed. Further comparison of the physical activity experiences between these groups of youth is warranted.

Conclusions

This review represents the first quantitative synthesis of research focused on the physical and psychosocial benefits of physical activity for youth with intellectual disability. Previous research suggests that youth with intellectual disability tend to be less fit, more overweight, have more limited motor control, and more likely to have poorer mental health than their typically developing peers (Emerson & Hatton, 2007; Maïano, 2011; Must et al., 2014; Oppewal et al., 2013; Salaun & Berthouze-Aranda, 2012; Waninge et al., 2013; Westendorp et al., 2011). Thus, it is promising that this review points to physical activity as a method of improving the physical and psychosocial health of youth with intellectual disability. Scalable physical activity promotion programs for children and adolescents with intellectual disability that can reach the whole population are required and should be a research and policy priority.

Chapter 3: The Determinants of Sport for Adolescents with Intellectual Disability: A Longitudinal Study

Adolescents with intellectual disability form an at-risk and underserved population that is vulnerable to physical and psychosocial health issues. This population commonly experiences low self-concept, anxiety, depression, weight problems, difficulties at school, increased risk of disease, and problems integrating into mainstream society (Huck et al., 2010; Maïano et al., 2003; Oeseburg et al., 2011; Whitaker & Read, 2006).

Results from the systematic review and meta-analyses described in the previous chapter showed that sport and physical activity participation has positive effects on the physical and psychosocial health of youth with intellectual disability. However, these adolescents generally engage in less sport and physical activity than their typically developing peers (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001; Lorenzi et al., 2000). There is also evidence that physical fitness (Hartman, Smith, Westendorp, & Visscher, 2014; Lahtinen, Rintala, & Malin, 2007), and mental health (Emerson & Hatton, 2007) decrease over time for this population. While it is important to recognize these deficits in the functioning of adolescents with intellectual disability, it is also important for research to focus on what can be done to help these adolescents reap the potential physical and psychosocial benefits of participation in sport and physical activities that have been witnessed in typically developing adolescents. Using a strengths-based approach that assumes there is a physical ability to participate in sport, it is necessary to better understand ways to best increase sport participation among this population through the examination of two determinants: physical self-concept and intrinsic motivation for physical activity and sport. It is clear that increasing participation in sport and physical activity has the potential to improve the physical and psychosocial health of adolescents in this population. Therefore, it is a priority for research to examine the effective ways of

increasing participation in sport and physical activity among adolescents with intellectual disability. This can be done through not only the examination of personal factors that limit the likelihood of participation in sport but also through the factors that may lead to increased sport participation, such as intrinsic motivation and physical self-concept. This study specifically focused on sport participation which was highlighted in the meta-analyses as an effective type of physical activity for improving both the physical and psychosocial health of adolescents with intellectual disability.

This study examined two potential determinants of sport participation: intrinsic motives and physical self-concept. These two variables were chosen because extensive research has shown they are important motivational predictors of physical activity and sport participation for typically developing adolescents (Babic et al., 2014; Ekeland et al., 2005; Owen, Smith, Lubans, Ng, & Lonsdale, 2014; Teixeira, Carraca, Markand, Silva, & Ryan, 2012). In addition, there is evidence that increasing the self-determination (i.e. intrinsic motivation) and general self-concept of people with intellectual disability leads to several positive outcomes, including: Enhancements in quality of life (Neuman & Reiter, 2017; Nota et al., 2007), life satisfaction (Santilli, Nota, Ginevra, & Soresi, 2014), academic achievement (Erickson, Noonan, Zheng, & Brussow, 2015), and insertion into mainstream society (Maïano et al., 2003; Ninot et al., 2000). There is, however, little evidence from samples of people with intellectual disability regarding the importance of intrinsic motivation and physical self-concept for increasing participation in sport and physical activity participation (Pan & Davis, 2018).

Intrinsic Motives for Sport

Intrinsic forms of motivation for sport and physical activity have been shown to play an important role in shaping the sport and physical activity participation across adolescence (see Owen et al., 2014 for a review) and adulthood (see Teixeira et al., 2012

for a review). In terms of physical health, Infurna and Gerstorf (2012) reported that motivation (as autonomous motivation), leading to increased physical activity, was associated with significant increases in grip strength and decreases in cardiovascular disease risk factors and waist circumference among typically developing adolescents (Infurna & Gerstorf, 2012). The associations between intrinsic motivation and health outcomes (i.e. fitness and body composition) being mediated by behavioural pathways (i.e. greater activity participation) were also seen among physically inactive adults in a study by Thørgersen-Ntoumani, Shepherd, Ntoumanis, Wagenmakers, and Shaw (2016). Intrinsic motives towards participation in sport and physical activity have been examined among people with intellectual disability (Gilmore et al., 2015; Hutzler & Korsensky, 2010). Due to their cognitive, social, and sometimes physical limitations, youth with intellectual disability tend to present lower levels of independence (Nota et al., 2007; Wehmeyer, 2005). They also tend to report lower intrinsic motivation for physical activity and sport participation (Gilmore et al., 2015), which may be responsible for the patterns of low participation in sport and physical activity typically witnessed in this population (Faison-Hodge & Porretta, 2004; Horvat & Franklin, 2001; Lorenzi et al., 2000; Rimmer et al., 2010).

Physical Self-concept

Another potential key determinant of physical activity and sport participation for adolescents with intellectual disability is physical self-concept. Physical self-concept refers to the positive or negative feelings an individual has about themselves physically and their physical abilities (Fox & Corbin, 1989). For typically developing adolescents, physical self-concept is linked to a healthy lifestyle (Grao-Cruces et al., 2014) and inversely related to unhealthy behaviours (Crocker et al., 2006). For adolescents with intellectual disability, positive cross-sectional relations between physical self-concept and participation in sport

have been established (Briere & Siegle, 2008; Maïano et al., 2002; Maïano, Ninot, & Errais, 2001; Ninot et al., 2005; Pan & Davis, 2018; Weiss & Bebko, 2008), yet there is no research to-date that examines physical self-concept as a predictor of changes in sport participation over time for this population.

Overview

The aims of the current study were to:

1. Examine the trajectories of sport participation, two hypothesized determinants (i.e. intrinsic motives and physical ability self-concept), and two hypothesized outcomes (i.e. physical fitness and mental health) over two years among a sample of adolescents with intellectual disability.
2. Determine if the trajectories of the hypothesized determinants are related to the trajectories of sport participation and potential outcomes.
3. Explore whether hypothesized determinants at one time point can predict future changes in sport participation.
4. Test a model leading from determinants, through sport participation, to potential physical and psychosocial health outcomes.

Method

This study included a sample of Australian adolescents with intellectual disability and their parents and caregivers. Measurements were taken at three time points over three school years. At each of the three timepoints, participants completed questionnaires assessing their physical self-concept, intrinsic motives for sport, participation in sport, and their anxious worrying. Each year, they also completed a physical fitness test assessing their cardiovascular fitness. While data for each school was collected at different times during the school year, data collection occurred at the same time of the school year for each school. For example, School A had their data collection during term 2 while School B

had theirs collected during term 3. The following year, School *A* would once again have data collection during term 2 and School *B* would have theirs during term 3. A sensitivity analysis was conducted to determine if the term in which the data was collected had an impact on sport participation. An analysis of variance determined that sport participation was not significantly impacted [$F(3,238) = 1.22, p = 0.30$] by the term of the school year in which the data was collected. Over the course of this three-year longitudinal study, some students graduated, left school, or changed schools. There was no follow-up with these students, and they were considered as dropping out of the study. The data they provided was still included in the analysis. See the missing data analyses section below for information about how this data was handled.

Students

All students included in this study had a diagnosis of intellectual disability as defined by Schalock et al. (2010). This definition states that significant limitations exist both in intellectual functioning and adaptive behaviour that originate before the age of 18. Students presented with mild (Intelligence Quotient between 50 and 75) to moderate (IQ between 35 and 55) intellectual disability levels and were limited in their adaptive behavioral skills (Schalock et al., 2010; Winnick & Poretta, 2017) and could understand English sufficiently to respond to the questionnaires. Students attended school full-time either within a support unit that included only students with intellectual disability, or in a combination of support unit classes and mainstream regular classes (shared with typically developing students). Students with physical disability were excluded from the study.

Procedure

This study was approved by the Australian Catholic University Human Research Ethics Committee, The New South Wales Department of Education and Communities' State Education Research Application Process, and the Catholic Education Dioceses of

Parramatta, Bathurst, Broken Bay, Newcastle and Maitland, and Canberra and Goulburn.

All researchers and research assistants involved in data collection for this project were trained to administer the procedures and had been cleared to work with students via the New South Wales Working with Children Check process. Schools that agreed to participate helped obtain parental consent forms for all students who participated in the study. To ensure confidentiality, student names were not kept with their data, instead, each piece of student data in the study was identified with a confidential code. The data was re-identifiable; however, only the lead investigator and the project manager had access to this information. All raw data was kept in a locked cabinet.

The specific language used to provide instructions was given to each research assistant to help ensure that each student received the same instructions and that the instructions were appropriate to the students' level of understanding. These instructions were created and checked for appropriateness by two experts in the field of intellectual disability research. Both experts have established track records of publishing in this field and continue to publish highly-cited research focused on the life experiences of youth with intellectual disability. Before and during data collection, students were consistently asked to confirm that they understood the instructions given to them and were willing to participate in the research. All students were given the choice to participate or return to their class without facing consequences from their nonparticipation. Students were told that they had the right to refuse consent, to withdraw from the study at any time, or to skip testing sections if they so desired without suffering any consequences. Students also provided verbal consent after regularly scheduled breaks from the questionnaire and before each new section/test of the testing protocol.

For the questionnaire portion of the data collection, students with mild levels of intellectual disability completed the assessments in groups of five with one research

assistant. Students with moderate levels of intellectual disability completed the assessments in dyads with a research assistant. The research assistant for each group of students ensured comprehension of the questions, checked for consent, helped students focus on answering the questions, and gave instructions related to each questionnaire. The questionnaires were completed during school in their usual classroom and students followed their typical schedule for breaks and lunch. In addition to the student questionnaires, a parent questionnaire was mailed to the participants' listed home address. The parents were asked to complete and return the questionnaire at their earliest convenience. Return envelopes and postage were provided. In cases where the parent questionnaires were not returned in the three to six months following data collection, a letter was sent to the same address asking the parents to fill out the questionnaire and return it in the return envelope. This process was repeated each year of data collection.

For the physical testing portion of this research the students were asked to wear sports clothes (shorts and a t-shirt). First, students were asked to remove their shoes and socks so they could be weighed and height could be measured in the classroom. Research assistants helped with the removal of shoes and socks when necessary. If students felt uncomfortable removing their socks, they were allowed to wear them. A stadiometer was used to measure height, and students were asked to stand with their feet together, stand straight, place their arms alongside their body and look straight ahead. To measure weight, a Tanita body composition analyser was used. The students were asked to stand in the middle of the scale, stand straight, put their arms alongside their body, look straight ahead and stay still. Once height and weight were taken for each student, they were guided outdoors or to the gymnasium by a research assistant to complete the cardiovascular fitness testing. Requirements for this space included a non-elevated, open area (grass, concrete, hardwood, etc.) at least 30 metres long and 10 metres wide. When choosing the area where

the physical testing would take place, considerations were made regarding weather, safety, and privacy. Once ready, students were given verbal instructions and a demonstration was provided prior to the test. To encourage continued participation in the physical testing process, verbal encouragement was given. See Appendix G for instructions and diagram of this test.

Measures

All self-reported measures used in this study were adapted to the cognitive level of the students. These adaptations were based on the procedures used by Maïano and colleagues (Maïano, Bégarie, Morin, & Ninot, 2009; Maïano, Morin, Bégarie, & Ninot, 2011) and Marsh, Tracey, and Craven (2006) and were intended to improve question comprehension and answer clarity for the students. To accommodate the cognitive needs of the students, all questions and instructions were read aloud (Marsh, Craven, & Debus, 1991). Then, the students were asked questions to ensure comprehension. Instead of presenting the students with answer choices based on a traditional Likert-type response scale, responses were provided by the students in two steps. First, students responded to the question with a “yes” or “no”, and then by clarifying whether they meant “sometimes”, “always”, or “never”. For each measure the response items were coupled with a corresponding graphical depiction of the various anchoring points on continuum of possible answers (see Maïano et al., 2009; 2011; Wong & Baker, 1988). Additionally, the critical words of each item were represented through a pictogram (for example, the word “fun” was represented by a smiling face, and the word “muscles” was represented by a stick figure flexing its muscles). Each item of the self-report measures also included the choice “Doesn’t understand the question” that could be ticked by researcher assistants, if required.

Demographic information. Each participating school was asked to provide the following demographic information for each student: Date of birth, year in school, ethnicity, gender, IQ (w/date and test type), parents' names, and contact information (phone number, mailing address and email).

Sport participation. For this thesis, sport is defined as an activity of physical nature involving a team, school/community, club, or at least some form of organized structure (Turner et al., 2015). For youth with intellectual disability, sport is usually played in school either during mandatory physical education classes, or after school as part of organized extra-curricular activities (Wehmeyer, 2005; Fegan, 2011). The level of sport participation among the students was assessed via student self-report. This scale was developed specifically for this study and asked the students "Last week, which days did you practice sport?" If the student reported they practiced sport on Monday either in-school or outside of school, that day was coded with a 1. If the student reported they did not play a sport that day, it was coded with a 0. The score for this scale was the total number of days per week the student practiced sport (maximum 7 days). See Appendix F for measure.

It should be noted that adolescents with intellectual disability typically possess limited memory skills which makes it difficult for them to reliably report participation patterns (Fegan, 2011; Lanfranchi, Cornoldi, & Vianello, 2002; Lifshitz, Kilberg, & Vakil, 2016; Voelker et al., 1990). Due to these limited memory skills, sport participation was also assessed via parent/caregiver reports. A letter outlining the purpose and method of the study and containing the questionnaire for the parents/caregivers was sent home with each student. The parents/caregivers were asked "In general, how many times a week is your child practicing sport outside of school?".

Physical ability self-concept. Physical Ability is a subscale of the 64-item Self-Description Questionnaire I – Individual Administration (SDQI-IA; Marsh, 1988). The 8-item Physical Ability subscale showed good reliability ($\alpha = 0.96$) in the current data and was also found to be a reliable measure among a sample of 211 children with intellectual disability ($\alpha = 0.82$, Physical Ability subscale; Tracey, 2002). Confirmatory factor analysis (CFA) has shown strong factorial validity (e.g., factor loadings range from 0.60 to 0.85 and factor correlation coefficient r 's range from 0.28 to 0.50 with reading, mathematics, school, physical appearance, peer relationships, parent relationships, and general self-concepts) in samples with intellectual disability (Tracey, 2002).

Each item of this scale was introduced by asking the students to “Think about yourself and your body, and what you are able to do with your body”. These measures utilized a six-point scale with answers ranging from “Totally disagree” to “Totally agree”, as well as the previously mentioned graphical scale. An example of an item from this scale included: “I like to run and play hard”. See Appendix H for full measure.

Intrinsic motives. The 15-item, revised version of the Motivation to be Physically Active Measure (MPAM-r; Ryan et al., 1997) was used to assess the students' intrinsic motives towards participating in sport and physical activities. The Intrinsic Motives subscale of the MPAM-r consisted of 9 items and showed acceptable reliability in this sample ($\alpha = 0.92$). It was also found to present satisfactory scale score reliability (α subscales = 0.78 - 0.92) in a sample ($N = 155$) of university students (Ryan et al., 1997). This scale asked the students “Why do you do sports?”, and each item began with “I do sports because...” An example of an item from this scale included: “I do sport because it is fun”. Participants were asked to rate items from both measures using a five-point scale with answers ranging from “Totally disagree” to “Totally agree”. See Appendix I for full measure.

Cardiovascular fitness. To assess cardiovascular fitness, the 6-minute walk test was used. In this test, students were asked to walk back and forth between two cones placed 25 metres apart, turning around the cone at each end, for six consecutive minutes (Guyatt et al., 1985). This test was performed in groups with between two to six students walking simultaneously. A research assistant was assigned to a maximum of two students. The research assistant was tasked with counting laps, encouraging, guiding, demonstrating, and correcting students during the test. See Appendix G for instructions and diagram of the 6-minute walk test.

To determine the test-retest reliability, Elmahgoub, Van de Velde, Peersman, Cambier, and Calders (2012) twice administered the test to a sample of adolescents with intellectual disability ($n = 61$) one week apart. They reported strong test-retest reliability (ICC $r = 0.82$) and also found that the 6-minute walk test scores significantly correlated with peak oxygen uptake ($r = 0.69$; Elmahgoub et al., 2012).

Worries. Ten items comprise the Worries subscale of the Intellectual Disability version of the Glasgow Anxiety Scale (GAS-ID; Mindham & Espie, 2003). This scale was used to measure the anxious symptoms of worrying among the students and showed acceptable reliability in this sample ($\alpha = 0.87$). Previous studies have shown that the GAS-ID items presented satisfactory test-retest reliability ($r = 0.95$), scale score reliability ($\alpha = 0.96$), and criterion-related validity in relation to scores on the Beck Anxiety Inventory ($r = 0.75$) among individuals ($M_{age} = 36.93$ years) with mild intellectual disability (Mindham & Espie, 2003). An example item from the GAS-ID was: “I worry a lot”. All items on this measure were rated on a five-point scale ranging from “Never” to “Always”, where students were asked “How do you feel?” and to indicate their answers based on how they had been feeling “since last week”. See Appendix J for full measure.

Data cleaning process. Data was cleaned using procedures outlined by Van den Broeck, Cunningham, Eeckels, and Herbst (2005). Data was screened for a lack or excess of data, outliers in the data, unexpected distribution patterns, and overall inconsistencies. This was done through examination of the summary/descriptive statistics of each item to be sure they fit into expected ranges and distributions. The process of diagnosing any data as troublesome focused on examining whether these issues were caused by input error, measurement error, or if the prior expected values (ranges or distributions) were incorrect. After the errors and missing values were identified, they were discussed between the authors and handled with either correcting, deleting, or leaving unchanged. This process was conducted first by the project manager (and research assistants) and then duplicated by the authors.

Missing data analyses. Missing data was considered as Missing at Random (MAR) because it was likely related to the students' intellectual disability, with students having a lower IQ being more likely to have missing data or not answer questions. This means, while there may be a systematic explanation for the data to be missing, the specific values of the missing data are considered random. Items that were marked by the researchers as "Doesn't understand the question" were also considered missing. This occurred for less than 1% (around 0.7%) of the items across the three years of the study. Missing data was handled by full information maximum likelihood with robust weighted least square (for ordered- categorical items including less than 5 answer categories) estimators available in Mplus (Muthén & Muthén, 2012). Potential missing data mechanisms were explored by creating a dropout group (i.e., students who did not participate in all three waves of measurement) and a complete data group (i.e., students who completed all three waves of measurement). A series of t-tests were used to examine mean differences between the dropout group and the complete data group for each of the

variables used in the analyses. There were no differences in the means of intrinsic motives ($t = 1.43, p = 0.15$), physical ability self-concept ($t = 0.19, p = 0.85$), worries ($t = -1.42, p = 0.16$), sport participation ($t = 0.04, p = 0.97$), or cardiovascular fitness ($t = -0.49, p = 0.63$) between the two groups.

Categorical Data. The scores from the Intrinsic Motives subscale of the MPAM-r, the Physical Ability subscale of the SDQI-IA, and the Worries subscale of the GAS-ID were considered as having ordered-categorical responses when performing confirmatory factor analysis, longitudinal invariance, and structural equation modelling. This was done for two reasons. First, students were asked to answer ‘yes’ or ‘no’ to each question before being asked to further categorize their answers into a Likert-type scale (Muthén, 1984; Lubke & Muthén, 2004). Second, these scales used the previously described graphical scale where each response was partnered with a face that corresponded to the students’ feelings about the specific item. This graphical scale combined with response style further creates unknown distances between each response. Sport participation and cardiovascular fitness data were treated as continuous.

Preliminary Analyses

Factor analysis. CFA of the full model was used to test how well the data fit the proposed measurement model that included measures of all hypothesized determinants (physical ability self-concept, and intrinsic motives), sport participation, and outcomes (worries, cardiovascular fitness). Since chi-square tests of model fit are sensitive to sample size and deviations from normality, it is typical to focus on sample size independent indices (Marsh, Balla, & Hau, 1996; Marsh, Hau, & Grayson, 2005), particularly the comparative fit index (CFI), the Tucker Lewis index (TLI), the root mean square error of approximation (RMSEA), and the 90% confidence interval of the RMSEA. Values greater than .90 for CFI and TLI and values less than .08 or .06 for the RMSEA support good

model fit (Hu & Bentler, 1999). In addition, RMSEA 90% CI values smaller than .05 for the lower bound and .08 for the upper bound or having the range contain 0 provide acceptable evidence of model fit (MacCallum, Browne, & Sugawara, 1996).

Longitudinal invariance. Invariance of the structural model assessed in the CFA was tested over the three time points for the following measures: worries, physical ability, and intrinsic motives. For each, the model fit of the configural model (where factor loadings and item intercepts were freely estimated) was compared to that of the metric model (where factor loadings were constrained to be invariant). Then, fit indices for the metric model were compared to that of the scalar model (where factor loadings and intercepts were constrained to be invariant). Tests of measurement invariance were evaluated through the changes in the CFI and RMSEA. A change of .01 or less in the CFI and a change of .015 or less in the RMSEA of a more restricted model suggested that the invariance hypothesis should not be rejected (Marsh et al., 2009).

Main Analyses

Growth models (Aims 1 and 2). To examine the trajectories of sport participation, its potential determinants (i.e. intrinsic motives and physical ability self-concept) and potential outcomes (i.e. physical fitness and mental health) over time among the sample (Aim 1), basic latent growth curve models were tested for each variable (i.e., intrinsic motives, physical self-concept, sport participation, cardiovascular fitness, and worries) based on their scalar (i.e., strict) measurement invariance models. For more information about the scalar models of these factors, see the longitudinal invariance analyses in the preliminary analyses section. For each measure across the three time points, the latent growth curve models estimated two aspects: the rate of change (or slope) and the average initial level (or intercept). Here, a significant slope (represented by a *p*-value less than .05)

indicated that there was a significant change in the variable over time with a positive β representing an increase and negative representing a decrease.

The slopes and intercepts were also correlated across constructs to determine if change in one construct was related to a change in the other (Aim 2). For example, the correlation between the slope and intercept of physical ability self-concept and the slope and intercept of sport participation were tested in order to determine if changes in physical ability self-concept were related with changes in sport participation over time. Due to the large number of comparisons (variables) in this growth curve model compared to the sample size, factor scores were saved from the preliminary (strict invariance) measurement models and used in this model to allow for the estimation of correlations between the slopes and intercepts of all of the constructs in one model. This was done because factor scores, as compared to scale scores, typically provide partial implicit control of measurement errors and better preserve the underlying measurement structure (Morin & Marsh, 2015).

Relations between the determinants and changes in sport participation (Aim 3). A structural equation modelling (SEM) model of the relations between the determinants of sport participation and participation in sport (Figure 3.1) was used to test whether the determinants of sport participation could predict sport participation in the sample over time. Latent constructs were used to represent intrinsic motives, physical ability self-concept while sport participation was a single item score. The factor scores from the invariance testing were used as a way to account for the loss of data over time.

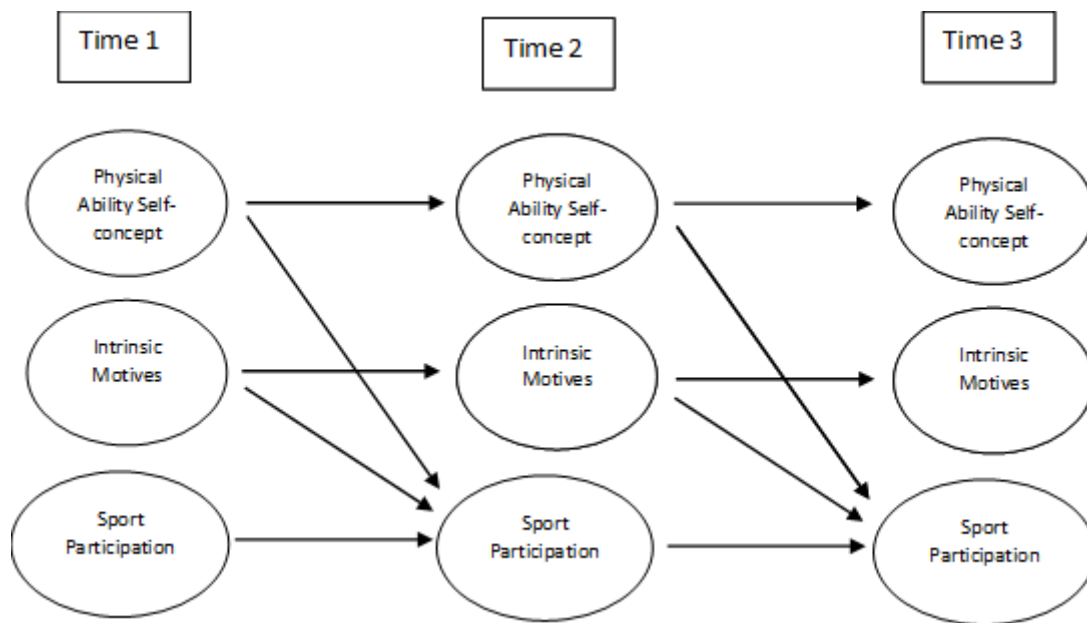


Figure 3.1. The structural path model was used to test the ability of the determinants of sport participation to predict subsequent sport participation.

Longitudinal mediation model (Aim 4). Relations between sport participation, its determinants (intrinsic motives and physical ability self-concept), and its outcomes (physical fitness and worries) were investigated using SEM. A fully longitudinal mediation model, as described by Maxwell and Cole (2007) and shown in Figure 3.2, was used to test the relations between physical ability self-concept, intrinsic motives, sport participation, cardiovascular fitness and worries. Based on the suggestions from Maxwell and Cole (2007), the following hypotheses were tested in order to determine longitudinal mediation: (a) the intrinsic motives at Time 1 will predict sport participation at Time 2, (b) physical ability self-concept at Time 1 will predict sport participation at Time 2, (c) sport participation at Time 2 will predict cardiovascular fitness at Time 3, (d) sport participation at Time 2 will predict worries at Time 3, and (e) the determinants of sport participation (intrinsic motives and physical ability self-concept) at Time 1 will predict the outcomes of sport participation (i.e. cardiovascular fitness and worries) at Time 3.

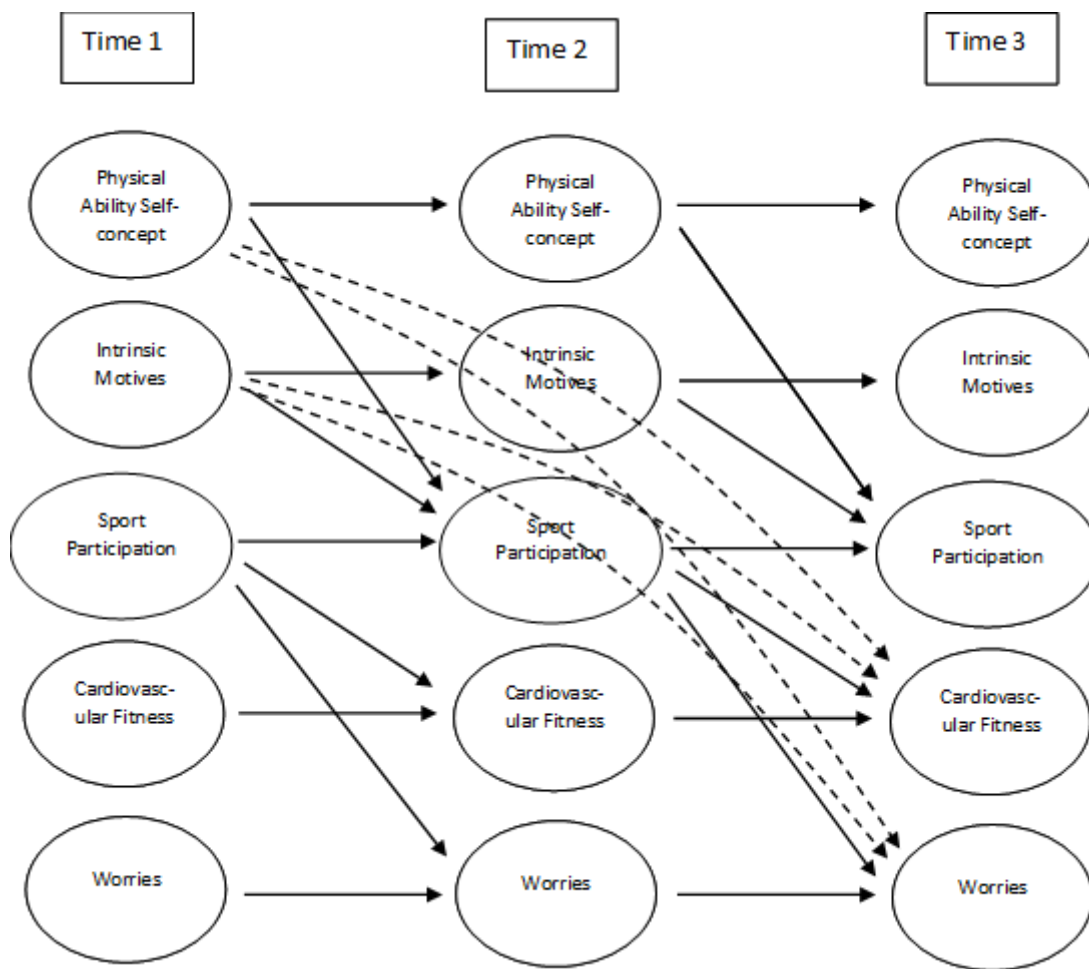


Figure 3.2. A fully longitudinal mediation model (Maxwell and Cole, 2007) was used to determine if sport participation was a mediator between the determinants (physical ability self-concept and intrinsic motives) and outcomes (cardiovascular fitness and worries). Solid arrows represent direct paths while dotted arrows represent indirect paths.

Results

Demographic information. The sample of students at Time 1 included 252 students with an age range of 12 to 19 years ($M = 14.98$, $SD = 1.85$) as well as 84 parents or caregivers (missing = 66.7%). The sample of students included 169 males and 71 females, and 162 students were categorized as having mild levels of ID and 78 with a moderate level of intellectual disability. At Time 2 the sample included 189 students

(retention rate = 75%) and 49 parents and caregivers (missing = 74.1%). At Time 3 151 students (retention rate= 80% of Time 2, 60% of Time 1) and 44 parents and caregivers remained (missing = 70.9%). All students who participated in the study were able to complete some part of the data collection procedures. For students who were unable to provide answers for any item of the measures, the researcher ticked “Doesn’t understand the statement”. This occurred for less than 1% (around 0.7%) of the items across the three years of the study. Since it accounted for such a small amount of the data, these answers were treated as missing (see data cleaning procedure section above for details regarding the handling of missing data). The demographic information of the students is presented in Table 3.1. Due to the scarcity of data present in the parent/caregiver reports of sport participation (less than one-third present at each timepoint), only the student’s reported sport participation was used in the analyses. In addition, reasons for students leaving the study were not recorded, and there was no follow-up with the students who dropped out of the study. It was possible that the loss in students from the study was due to graduation, leaving school, or changing schools, but this was merely speculation and not confirmed.

Table 3.1

Student Demographic Information

	Time 1	Time 2	Time 3
IQ	57.91 (12.65)		
Height	1.63 (0.11)	1.66 (0.10)	1.67 (0.13)
Weight	63.26 (19.58)	64.90 (19.10)	67.44 (18.81)
Age	14.98 (1.85)	15.75 (1.66)	16.12 (1.58)

Note. All values refer to the mean score (*SD*). Time 1 *N* = 252, Time 2 *N* = 189, Time 3 *N* = 151.

Descriptive statistics. Means and standard deviations of each construct at each time point are presented in Table 3.2. Correlations between constructs are also presented in Table 3.2. Cross-sectional findings showed hypothesized determinants were generally weakly to moderately correlated with sport participation ($r = .16 - .35$). Intrinsic motivation and physical self-concept were strongly correlated ($r = .45 - .79$). Sport participation had weak to negligible correlations with hypothesized outcomes (worries $r = -.01 - .17$ & cardiovascular fitness $r = .05 - .20$). The outcomes did not appear to correlate with each other.

Table 3.2

Means, Standard Deviations, and Correlations for Intrinsic Motivation, Physical Ability Self-concept, Sport Participation, Cardiovascular Fitness, and Worries over Three Timepoints

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Intrinsic motives - T1	-														
2. Intrinsic motives - T2	.69**	-													
3. Intrinsic motives - T3	.55**	.74**	-												
4. Physical ability self-concept - T1	.74**	.62**	.45**	-											
5. Physical ability self-concept - T2	.58**	.79**	.66**	.76**	-										
6. Physical ability self-concept - T3	.55**	.68**	.76**	.68**	.85**	-									
7. Sport participation - T1	.26**	.28**	.17*	.29**	.21**	.17*	-								
8. Sport participation - T2	.09	.13	.17*	.16	.23**	.30**	.31**	-							
9. Sport participation - T3	.19*	.16*	.24**	.27**	.35**	.27**	.14*	.34**	-						
10. Cardiovascular fitness - T1	.03	.12	.17	.10	.15	.14	.18**	.19*	.05	-					
11. Cardiovascular fitness - T2	.11	.10	.12	.22**	.11	.01	.16	.08	.08	.28**	-				
12. Cardiovascular fitness - T3	-.14	-.09	.09	-.18	.02	-.05	.14	.20*	.07	.25**	.14*	-			
13. Worries - T1	-.05	-.24**	-.17	-.10	-.29**	-.26**	-.01	-.17*	-.11	-.02	.02	.00	-		
14. Worries - T2	-.01	-.07	.02	-.16*	-.12	-.07	.02	-.10	.02	-.02	.05	.08	.51**	-	
15. Worries - T3	-.08	-.07	.14	-.22**	-.11	.05	-.03	-.07	.01	.10	.03	.05	.59**	.57**	-
Mean	4.09	4.06	4.01	4.45	4.38	4.20	3.16	2.77	2.95	489.81	470.09	427.23	1.82	1.62	1.50
SD	0.67	0.59	0.53	0.94	0.84	0.71	2.23	2.15	2.19	92.57	73.48	90.73	0.89	0.82	0.78

Note. * $p < .05$, ** $p < .01$; Time 1 $N = 252$, Time 2 $N = 189$, Time 3 $N = 151$; SD standard deviation, T Time.

Preliminary Analyses

Factor structure. The measurement model with latent factors representing physical ability self-concept, intrinsic motives, and worries as well as the observed variables of sport participation and cardiovascular fitness demonstrated good fit to the data across the three time-points ($\chi^2 = 4158.79$, $df = 3360$, $p < .001$, CFI = .95, TLI = .95, RMSEA = .031, RMSEA 90% CI = .028-.034). Each of the items had significant loadings ($p < .05$) onto their respective factors that ranged from (*estimate* = .43 to .94) which suggested that the latent factors were well-defined. The factor loadings for the latent factors representing intrinsic motives, physical ability self-concept, and worries are shown in Table D.1 in the Appendix.

Longitudinal invariance. Results of measurement model invariance testing across the three time-points are presented in Table 3.3. Each of the three models (testing configural, metric, and scalar invariance) showed adequate fit with the data, and the changes in the CFI ($\Delta CFI = .002$ between configural and metric models and $\Delta CFI = .003$ metric and scalar models) and RMSEA were within the range to suggest the factor structure was invariant across time ($\Delta RMSEA < .015$).

Table 3.3

Longitudinal Invariance of the Full Measurement Model

	CFI	TLI	RMSEA	DIFFTEST* <i>p</i> -value
Configural model	.951	.946	.081	
Metric model	.953	.951	.077	.36
Scalar model	.956	.963	.067	.16

Note. *Chi-square difference testing comparing the more constrained model to its predecessor.

Main Analyses

Growth models (Aims 1 and 2). Using latent growth curve models, the trajectories of the five variables (i.e. intrinsic motives, physical ability self-concept, sport participation, cardiovascular fitness, and worries) included in this study were examined across the three timepoints (Aim 1). First, a basic growth curve model was specified for each using their respective scalar measurement model. These models showed good fit to the data. For more information about the fit of the scalar model see the longitudinal invariance section of this study. Table 3.4 presents the results of the five univariate growth curve models. Intrinsic motives ($slope = -.13; p < .05$), physical ability self-concept ($slope = -.08; p < .05$), cardiovascular fitness ($slope = -.29; p < .05$), and worries ($slope = -.17; p < .05$) significantly decreased over time while sport participation showed no change.

Table 3.5 provides the correlations of the slopes and intercepts across constructs (Aim 2). Significant correlations between the intercepts of physical ability self-concept and the other four constructs were seen (intrinsic motives $r = .74, p < .01$, sport participation $r = .27, p < .01$, cardiovascular fitness $r = .15, p < .01$, and worries $r = -.11, p < .05$). The intercepts of intrinsic motives and sport participation ($r = .27, p < .01$), and sport participation and cardiovascular fitness ($r = .18, p < .01$) also showed weak, significant correlations. Regarding the rates of change over time (slopes), intrinsic motives and physical ability self-concept increased at similar rates as seen by the significant correlation between their slopes ($r = .10, p < .01$). The relations between the slope of worries and both physical ability self-concept ($r = .06, p < .05$) and intrinsic motives ($r = .06, p < .05$) were also significant but weak. Weak, negative correlations were also seen between the slopes and intercepts of intrinsic motives and physical ability self-concept ($r = -.13$ to $-.15, p < .01$) as well as between the slope of intrinsic motives and intercept of

worries ($r = -.04, p < .05$). There was also a significant correlation between the slope and intercept of worries ($r = .13, p < .01$).

Table 3.4

Estimated Means and Rates of Change for the Growth Curve Models of Each Construct

Model	Intercept (mean level)	Slope (rate of change)
Intrinsic motives	4.60**	-.13**
Physical ability self-concept	4.47**	-.08**
Sport participation	3.02**	-.07
Cardiovascular fitness	491.00**	-.29**
Worries	2.04**	-.17**

* $p < 0.05$, ** $p < 0.01$

Table 3.5

Correlations between Estimated Levels (intercepts) and Rates of Change (slopes): Determinants, Sport Participation, and Outcomes based on Growth Curve Models

	<u>Intercepts</u>					<u>Slopes</u>				
	1	2	3	4	5	1	2	3	4	5
<u>Intercepts</u>										
1. Intrinsic motives	-									
2. Physical ability self-concept	.74**	-								
3. Sport participation	.27**	.27**	-							
4. Cardiovascular fitness	.10	.15**	.18**	-						
5. Worries	-.05	-.11*	-.05	-.03	-					
<u>Slopes</u>										
1. Intrinsic motives	-.15**	-.14**	-.04	.02	-.04*	-				
2. Physical ability self-concept	-.13**	-.14**	-.04	-.01	-.03	.10**	-			
3. Sport participation	-.06	.01	-.02	-.06	-.01	.02	.01	-		
4. Cardiovascular fitness	-.09	-.09	-.03	.02	.03	.01	.01	.02	-	
5. Worries	-.03	-.05	-.01	.03	.13**	.06*	.06*	.02	-.01	-

* $p < 0.05$, ** $p < 0.01$

Relations between the determinants and sport participation (Aim 3). First, a model indicating stable effects of the variables over time was tested. This model included the autoregressive paths of the variables (i.e. intrinsic motives, physical ability self-concept, sport participation, physical fitness, and worries) at Time 1 on themselves at Time 2 and again on themselves between Time 2 and Time 3. Additionally, variables could correlate with each other within each time (e.g., intrinsic motivation and sport participation at Time 1). Model fit for the autoregressive model was acceptable ($\chi^2 = 1992.83$, $df = 1454$, $p < .001$, CFI = .95, TLI = .95, RMSEA = .04). Physical ability self-concept, intrinsic motives, and worries significantly predicted themselves across time, thus, showing stability while sport participation only predicted itself between the first two time-points and cardiovascular fitness did not predict itself across time (Table 3.6).

Table 3.6

Autoregressive Effects: Latent Factors Representing Intrinsic Motives, Physical Ability Self-concept, and Worries and the Observed Variables Sport Participation and Cardiovascular Fitness.

Factor/Variable	Time 1 - Time 2	Time 2 - Time 3
	β	β
Intrinsic motives	.74***	.77***
Physical ability self-concept	.88***	.86***
Sport participation	.45***	.15
Cardiovascular fitness	.06	.19
Worries	.52***	.99***

Note. Time 1 $N = 252$, Time 2 $N = 189$, Time 3 $N = 151$

* $p < .05$, ** $p < .01$, *** $p < .001$;

The cross-lagged paths representing the relations between the determinants of sport participation and participation in sport (Figure 3.1) were then added to the autoregressive

model in order to test whether the determinants of sport participation could predict changes in sport participation in the sample. Figure 3.3 shows the β -coefficient and p -value for each of these paths. This longitudinal panel model fit the data well ($\chi^2 = 3821.30$, $df = 3123$, $p < .001$, CFI = .95, TLI = .95, RMSEA = .03). The autoregressive paths were still significant and positive and are not reported with the cross-lagged paths in Figure 3.3. The cross-lagged paths between physical ability self-concept and sport participation from Time 1 to Time 2 ($\beta = .34$, $p < .05$) and from Time 2 to Time 3 ($\beta = .37$, $p < .05$) respectively, were significant. The paths between intrinsic motives and sport participation were not significant. Due to the high correlation between physical ability self-concept and intrinsic motives over the three timepoints ($r = .45$ to $.79$; see Table 3.2), it was necessary to test whether these constructs had differing effects on sport participation. A model constraining the paths of intrinsic motives and physical ability self-concept to sport participation to be equal was compared to the model with the freely estimated paths. These models were significantly different ($\chi^2 = 8.43$, $df = 2$, $p < .05$) suggesting that physical ability self-concept was a stronger predictor of sport participation than intrinsic motives.

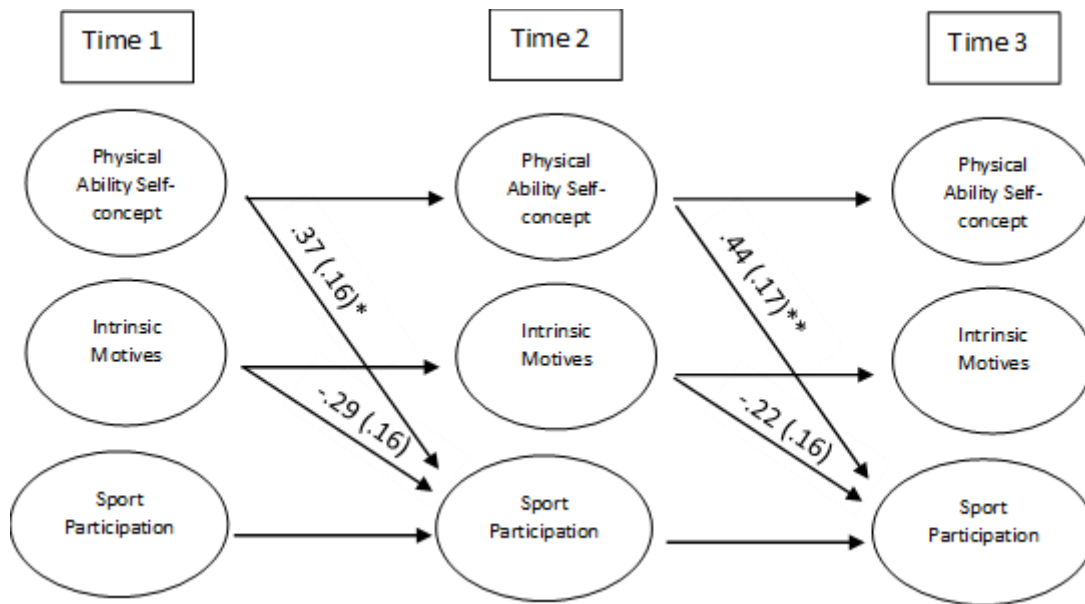


Figure 3.3. The structural path model of the lagged relations between the determinants of sport participation and sport participation. Presented as standardized effects (standard error).

Note: Autoregressive paths not reported. See autoregressive model results (Table 3.6) for details.

* $p < .05$, ** $p < .01$.

Longitudinal mediation model (Aim 4). This model included the paths examined in the autoregressive model as well as the hypothesized direct paths between determinants at Time 1 and outcomes at Time 3 shown in Figure 3.2. This model tested whether prior intrinsic motives and physical ability self-concept are related to subsequent sport participation, and whether earlier sport participation is related to later cardiovascular fitness and worries. This model fit the data well and did not drop below the previously suggested values $\chi^2 = 4075.37$, $df = 3344$, $p < .001$, CFI = .95, TLI = .95, RMSEA = .03. The autoregressive paths were still significant and positive. The only other significant direct paths were between physical ability self-concept at Time 1 and sport participation at Time 2 ($\beta = .37$, $p < .05$) and between physical ability self-concept at Time 2 and sport participation at Time 3 ($\beta = .44$, $p < .05$). The rest of the direct and indirect paths between

intrinsic motives, physical ability self-concept, sport participation, cardiovascular fitness, and worries were not significant.

Table 3.7

Effects of the Longitudinal Mediation Model Testing Lagged Paths Traveling from Determinants of Sport Participation, through Sport Participation, and to the Outcomes of Sport Participation.

Path	Direct effect	Standard error
Time 1 - Time 2	β	SE
Intrinsic motives - Sport participation	-.29	.16
Physical ability self-concept - Sport participation	.37*	.16
Sport participation - Cardiovascular fitness	.26	.15
Sport participation - Worries	.04	.14
Time 2 - Time 3		
Intrinsic motives - Sport participation	-.22	.16
Physical ability self-concept - Sport participation	.44*	.17
Sport participation - Cardiovascular fitness	-.07	.18
Sport participation - Worries	-.05	.15
Time 1 - Time 3	Indirect Effect	SE
Intrinsic motives - Cardiovascular fitness	.07	.12
Intrinsic motives - Worries	.21	.15
Physical ability self-concept - Cardiovascular fitness	-.10	.15
Physical ability self-concept - Worries	-.28	.19

Note. All effects are standardized effects. Autoregressive paths are not reported. *SE* = standard error. Time 1 *N* = 252, Time 2 *N* = 189, Time 3 *N* = 151.

* $p < .05$, ** $p < .01$.

Discussion

Previous research shows that physical activity and sport participation has positive effects on adolescents with intellectual disability. These adolescents, however, participate in less sport than their typically developing peers. The overall goal of the current study was, therefore, to investigate determinants of sport participation. The specific aims of the current study were to: (1) examine the trajectories of sport participation, two potential determinants (i.e. intrinsic motives and physical ability self-concept) and two potential outcomes (i.e. physical fitness and mental health) over three years among a sample of adolescents with intellectual disability, (2) determine if the trajectories of the hypothesized determinants are related to the trajectories of sport participation and potential outcomes, (3) explore whether hypothesized determinants at one time point can predict changes in sport participation, and (4) test a model leading from determinants, through sport participation, to potential physical and psychosocial health outcomes.

Addressing the first aim, the growth models showed significant decreases in the determinants (physical ability self-concept and intrinsic motives) and outcomes (cardiovascular fitness and worries), while sport participation did not change significantly over the three time points. The observed decrease in self-concept aligns with previous research on typically developing adolescents (Diseth, Meland, & Breidablik, 2014; Way, Reddy, & Rhodes, 2007), and was accompanied by a significant decrease in intrinsic motives. This was unsurprising given the strong correlation that were observed between the two constructs. While it was promising that the adolescents in this study showed decreases in worries over time, the significant decreases in cardiovascular fitness were cause for concern. Previous research has suggested that fitness is likely to decrease over time in youth with intellectual disability (Hartman et al. 2014; Lahtinen et al., 2007). The decrease in cardiovascular fitness was alarming as it has been associated with increased

body fat, higher rates of depression, lower mood and self-esteem, and poorer academic performance among typically developing children and adolescents (Ortega, Ruiz, Castillo, & Sjostrom, 2008). However, these results should be interpreted with caution due to the use of the 6-minute walk test as an indicator of cardiovascular fitness. While this test has been shown to be a reliable and valid measure of fitness for adolescents with intellectual disability (Elmahgoub et al., 2012), it is highly sensitive to varying procedures (Holland et al., 2014). Based on the review from Holland and colleagues (2014), variations in the procedures that impact the results of the 6-minute walk test are related to walking track distances, use of verbal encouragement by the researcher assistants, varied testing surfaces (e.g. concrete versus grass versus gymnasium), locations (e.g. near the school possibly causing classmate interference versus in a secluded area away from the school), or walking group sizes. For the current study, while every attempt was made to keep these aspects of the 6-minute walk test consistent across all data collection sites (i.e. schools), this was not always possible because of unplanned issues like poor weather, a lack of appropriate testing spaces at the schools, or the unavailability of appropriate school spaces.

The second aim of this study was to examine the longitudinal relations between the five constructs (i.e. intrinsic motives, physical ability self-concept, sport participation, cardiovascular fitness, and worries). Correlations between the intercepts of these constructs suggested that students with higher initial/mean physical abilities self-concepts were more intrinsically motivated, participated more in sport, had better cardiovascular fitness, and were less worried. These results began to highlight the importance of physical ability self-concept for this sample. In addition, the students who had higher initial levels of intrinsic motives also participated more in sport, and the students who participated in more sport had better cardiovascular fitness. Regarding the rates of change over time, intrinsic motives and physical ability self-concept increased at similar rates. Again, this

was not surprising as the two constructs were strongly correlated. The weak, negative correlations between the slopes and intercepts of intrinsic motives and physical ability self-concept suggested that students with higher intrinsic motives and physical self-concepts typically decreased over time. Overall, no significant changes over time were seen for sport participation. In addition, variations in participant-level sport participation were not significantly related to any of the rates of change or means for any of the other constructs in the study.

While examining the means and rates of change of the outcomes as well as their relations to the other constructs was not a main aim of the current study, the relations of worries to the other constructs provided some interesting results. For example, it appeared that worries also increased at the same rate as both physical ability self-concept and intrinsic motives. In addition, the weak, negative correlations between the slope of intrinsic motives and intercept of worries suggested that students with more worries saw a decrease in their intrinsic motives. Surprisingly, there was a significant correlation between the slope and intercept of worries suggesting that the students with the most worries also saw an increase in their worrying over time.

The third aim of this study was to test the ability of the hypothesized determinants of sport participation (i.e. physical ability self-concept and intrinsic motives) to predict subsequent sport participation. The results of the path model suggested that physical ability self-concept was a significant predictor of changes in sport participation. This study is believed to be the first evidence that physical self-concept may be a determinant of sport participation for this population. In addition, while physical ability self-concept and intrinsic motives were both significantly correlated with sport participation, intrinsic motives lost its power to predict sport participation in the path model. Given that the correlations between physical ability self-concept and intrinsic motives were substantial,

and the individual effects of physical ability self-concept and intrinsic motives were not equal (based on the comparison of freely estimated and constrained models), it again appeared that physical ability self-concept is an important determinant of sport participation for this sample.

The final aim of the study was to explore whether sport participation was a mediator between its determinants and outcomes. Based on the results of the longitudinal mediation model, it was not a mediator. While significant effects were seen between physical ability self-concept and sport participation in the longitudinal mediation model, there were no other clear patterns of direct effects between the other determinant (i.e. intrinsic motives) and sport participation or between sport participation and its outcomes (i.e. cardiovascular fitness and worries). Based on the results of the meta-analyses in the previous chapter, these findings were contrary to expectations. One possible explanation is that it was difficult for the adolescents with intellectual disability in this study to accurately report their sport participation patterns. This was because they typically possess limited memory skills (Fegan, 2011; Lanfranchi, Cornoldi, & Vianello, 2002; Lifshitz, Kilberg, & Vakil, 2016; Voelker et al., 1990). In the current study, the students were asked to recall their behaviours from the past week, and it is possible that memory issues may have contributed to the sporadic relations between sport participation and its outcomes. This issue was anticipated before beginning this study, and sport participation was also assessed via parent/caregiver reports; however, only a small percentage of the parent reports were returned making the data unusable in this study.

Another possible explanation for sport participation not being a mediator between its determinants and outcomes was that the low levels of student reported sport participation (around 3 days per week) were not enough to extract the benefits of the sport participation to increase cardiovascular fitness and mental health. With the

recommendation for adolescents being that they should participate in daily sport or physical activity (WHO, 2010), it appeared that the students in the current study were not close to meeting this recommendation. This fits with the observations from Faison-Hodge and Porretta (2004) which suggested that adolescents with intellectual disability are not gaining the benefits of sport participation and need to do more.

With the results of this study suggesting that physical self-concept was a determinant of sport participation, the use of an intervention focused on increasing physical self-concepts of adolescents with intellectual disability may be worthwhile. However, unknown exogenous factors may have been influencing the participation in sport in this sample. Based on ecological models of health behaviour, these exogenous factors are likely related to aspects which were not accounted for in this study, such as, interpersonal (e.g. social or cultural), intrapersonal (e.g. psychological or biological), environmental, and/or political (e.g. public policy) influences (Sallis, Owen, & Fisher, 2015). Potential factors could have been interpersonal influences, such as parents not placing importance on sport participation for their children; or intrapersonal influences, such as sport being fun enough; or environmental or policy-based influences, such as school scheduling or the students simply not having the opportunity to participate in sport (Sallis, Owen, & Fisher, 2015).

Strengths and Limitations

This study addressed some of the shortfalls in the previous research focused on the sport participation experiences of adolescents with intellectual disability by using a large sample with three repeated measures over two years. Another strength of the current study was the methods used for the collecting questionnaire data. The graphical answer scale (Maïano et al., 2009) combined with the individual administration methods highlighted

both in the procedure section of this study and by Marsh et al., (2006) were expected to increase the reliability of the data; thus, making them a strength.

One limitation of the current research was the use of a longitudinal, observational research design as opposed to an experimental design. The current study was successful in identifying trajectories, examining relations between the constructs, and making predictions about changes over time. But, due to the observational nature of this study, all exogenous factors that were likely to impact the sport participation of this sample were again not accounted for and could not be controlled. Previous research has suggested that the barriers preventing the participation in sport among people with intellectual disability include: limited opportunities, lack of time, lack of energy, the difficulty of the sporting activities, missing interest or enjoyment, lack of means of transportation to and from the activity, high financial costs, poor weather, health issues, life/job concerns, and a lack of knowledge/guidance regarding appropriate sporting activities (Frey, Buchanan, & Rosser Sandt, 2005; Heller, Hsieh, & Rimmer, 2003; Messent, Cooke, & Long, 1998). Some of these factors were likely to impact this study's sample thus having an effect on sport participation.

In addition to the potential issues with sport participation measurement, a limitation of this study was the use of the 6-minute walk test as an indicator of cardiovascular fitness. While this test has been shown to be a reliable and valid measure of fitness for adolescents with intellectual disability (Elmahgoub et al., 2012), the test's high sensitivity to varying procedures and methodologies may have contributed to its lack of predictive ability (Holland et al., 2014). In addition, it was unclear if this test could be performed in groups. Hinckson, Dickinson, Water, Sands, and Penman (2013) performed the test with overweight and obese children/adolescents with intellectual disability in groups of two while Elmahgoub et al., (2012) and Nasuti, Stuart-Hill, and Temple (2013) had the

participants with intellectual disability perform the test individually. This study had several participants perform the walk test simultaneously, and this may have caused their walking speed to be normalized resulting in the test not being a measure of true cardiovascular fitness.

Future Research

One area for future research could be the inclusion of a measure of non-sport related physical activity in a study looking to explore the determinants and outcomes of physical activity among this population. Activities like physical play (e.g., riding a bike around the neighbourhood or climbing on the playground structures during school recess), house/yard work, and active transport could be included in this study. Using a non-sport measure of physical activity would likely reduce the effect of some of the exogenous factors because these activities have fewer requirements for participation than sport. The non-sport physical activities also require little equipment and instruction, thus reducing the barriers to activity. It could also be suggested that this measure of physical activity should include the use of an objective measure of physical activity behaviours, such as an accelerometer.

The previously mentioned exogenous factors that may have impacted sport participation in this sample warrant further exploration. One way these exogenous factors could be mitigated was through using a sport intervention. The previous chapter of this thesis highlighted sport as an important activity for increasing the physical and psychosocial health of youth with intellectual disability, and most of these studies were interventions. The use of sport intervention would make it more likely that the students would participate in sport and gain the associated physical and psychosocial health benefits.

With the results of the current study suggesting that physical self-concept was an important predictor of sport participation among this population, then another important area of future research is the use of an intervention focused on increasing physical self-concepts of adolescents with intellectual disability. Such an intervention would test the true effects of changes in physical self-concept would have on sport participation. While a physical self-concept intervention may be a novel idea for adolescents with intellectual disability, it has been used for typically developing adolescents (for a review and meta-analysis of interventions see, O'Mara, Marsh, Craven, & Debus, 2006) and more recently for adolescents with learning disability (Abed, 2017). These interventions could be performed in the classroom or at home and could be easily distributed between the teachers, parents, and caregivers of adolescents with intellectual disability.

Finally, other personal and environmental factors that may have impacted sport participation in the sample also warrant further exploration. These factors could have been related to interpersonal influences, such as parents not placing importance on sport participation for their children; or intrapersonal influences, such as sport being fun enough; or environmental/policy-based influences, such as school scheduling or the students simply not having the opportunity to participate in sport (Sallis et al., 2015). When a lack of transportation to sport facilities or of the necessary equipment, participation in those activities is likely to be compromised (Alexandris, Tsorbatzoudis, & Grouios, 2002). There appears to be limited evidence regarding the barriers to sport participation among children and adolescents with intellectual disabilities, yet research does exist regarding the barriers to participation for adults with intellectual disabilities. This research suggested that barriers to the participation in sport for adults with intellectual disabilities include: limited opportunities, lack of time, lack of energy, the difficulty of the sporting activities, missing interest or enjoyment, lack of means of transportation to and from the activity, high

financial costs, poor weather, health issues, life/job concerns, and a lack of knowledge/guidance regarding appropriate sporting activities (Frey, Buchanan, & Rosser Sandt, 2005; Heller, Hsieh, & Rimmer, 2003; Messent, Cooke, & Long, 1998). Formative work in this area could be accomplished through the examination of the barriers to physical activity that youth with intellectual disabilities face (Stanish & Frey, 2008).

Conclusion

Compared to their typically developing peers, adolescents with intellectual disability are likely to have poorer cardiovascular fitness (Oppewal et al., 2013; Varela et al., 2001) and are at an increased risk to experience feelings of anxiety (Emerson & Hatton, 2007; Stalker et al., 2011). To help adolescents with intellectual disability reap the benefits of sport and physical activity it is necessary for research to better identify ways to increase participation among this population. The current study highlighted the effect that physical self-concept may have on sport participation. Fostering positive physical self-concept may be a way to increase sport participation and ultimately benefit adolescents with intellectual disability.

Chapter 4: Discussion and Conclusions

The primary objectives of this thesis were to examine health outcomes of sport and physical activity participation, and to explore potential determinants of participation in these activities among youth with intellectual disability. To address these objectives, this thesis included two studies. One was a systematic review with two meta-analyses (Chapter 2) that examined the effects of a range of physical activities on the physical and psychosocial health outcomes of children and adolescents in this population. The second study was a longitudinal study (Chapter 3) that examined the trajectories of the hypothesized determinants, sport participation, and its potential outcomes. It also tested the ability of the determinants to predict sport participation and explored the potential mediating role of sport participation between its determinants and outcomes. This second study aimed to address some of the strengths and limitations discussed in the systematic review and meta-analyses. It included a large sample of adolescents with intellectual disability, relative to other research in this field, and measured participant three times over two years, which is an extended period of time compared with other studies in the area.

The rest of this chapter provides an overview and discussion of the results from the two studies in this thesis, followed by general recommendations for practitioners who work with youth with intellectual disability. Strengths and limitations of the studies in this thesis are discussed and future research in this field is suggested.

Study 1 Overview

The aims of the systematic review and meta-analyses (Chapter 2) were to synthesize the literature, estimate the effects of physical activity on the physical and psychosocial health of youth with intellectual disability and determine if variables related to study and participant characteristics moderate these effects. This study utilized a three-level, random-effects and mixed-effects meta-analytic approach in which results from 109

studies that included 810 effects of physical activity on either physical or psychosocial health outcomes were examined. The results indicated that physical activity had a large effect on physical health and a moderately-large effect on psychosocial health. These effects were accompanied by a large amount of heterogeneity.

Results of the moderation analyses suggested that the types of outcome and intervention moderated the effects of physical activity on both physical and psychosocial health while the design of the study and associated risk of bias moderated the effects of physical activity only on psychosocial health. Participant characteristics, such as age, intellectual disability level, and having other developmental disability also are important factors to consider when utilizing physical activity to improve the physical and psychosocial health of youth with intellectual disability. While physical activity appears to be beneficial for the majority of these youth, interventions aimed at improving physical health could be specifically targeted to the youth who are likely to improve the most. For the youth who have shown the least improvements, new interventions outside of the ones included in this thesis should be developed. To highlight the differential effects among groups within the population of youth with intellectual disability, when participating in any type of physical activity, children showed greater physical health improvements than adolescents. Additionally, youth with higher levels of intellectual disability showed greater improvements in their physical health than those moderate or mild intellectual disability. Finally, differences were seen between youth who have intellectual disability and youth who also have other developmental disability (e.g., Autism Spectrum Disorder or Down Syndrome). Regarding their psychosocial enhancement, it appeared that youth with other developmental disability may benefit more from physical activity than youth who have an intellectual disability.

Study 2 Overview

The specific aims of the longitudinal study (Chapter 3) were to: (1) examine the trajectories of sport participation, two potential determinants (i.e. intrinsic motives and physical ability self-concept), and two potential outcomes (i.e. physical fitness and mental health) over two years among a sample of adolescents with intellectual disability, (2) determine if the trajectories of the hypothesized determinants are related to the trajectories of sport participation and potential outcomes, (3) explore whether hypothesized determinants at one time point can predict changes in sport participation, and (4) test a model leading from determinants, through sport participation, to potential physical and psychosocial health outcomes. This study included a sample of 252 Australian adolescents with intellectual disability and consisted of measurements at three time points taken over two school years. At each of the three timepoints, participants completed questionnaires assessing their physical self-concept, intrinsic motivation, sport participation, and mental health, and participated in a test of their cardiovascular fitness.

Addressing the first aim of this study, the estimated trajectories of the latent growth models showed significant decreases in the determinants (physical ability self-concept and intrinsic motives) and outcomes (cardiovascular fitness and worries) over the two years in the sample. Sport participation did not change significantly over time. While it was promising that the adolescents in the study showed decreases in worries over time, it was concerning that decreases were seen in cardiovascular fitness over the two years. Previous research has suggested that fitness was likely to decrease over time in youth with intellectual disability (Hartman et al., 2014), and lower levels of fitness are correlated with many negative health outcomes among typically developing children and adolescents (Ortega et al., 2008). This was a cause for concern because, compared to the rest of the population, people with intellectual disability have a higher risk for health problems (NDS,

2016), and it is possible that the decreasing fitness levels could be an indicator of future negative health outcomes for this sample.

The second aim of this study was to examine the relations between the trajectories of the five constructs. These correlations suggested that students with higher initial/mean physical abilities self-concepts were more intrinsically motivated, participated more in sport, had better cardiovascular fitness, and were less worried. In addition, the trajectories of physical self-concept and intrinsic motives were correlated, which was unsurprising as these two constructs were highly correlated over the three timepoints. One unexpected result of this study was that the trajectory of worries positively correlated with the trajectories of both physical ability self-concept and intrinsic motives. One possible interpretation of this finding is that as a student's perception of their physical abilities increased over time, so too did their worries over that same time. This relation between the trajectories of physical self-concept and worries fits with previous findings from Salaun et al. (2014) that highlighted the relations between the physical self-perceptions (self-concepts) and body image dissatisfaction of obese adolescents with intellectual disability.

The longitudinal paths model showed that physical ability self-concept was a predictor of subsequent sport participation, while intrinsic motives were not. As previously mentioned, physical ability self-concept and intrinsic motives were highly correlated across the three time points; however, further testing of this model revealed that physical ability self-concept was a better predictor of sport participation than intrinsic motives.

In the longitudinal mediation model, the paths from physical ability self-concept to sport participation were still significant; however, there were no other clear patterns of direct effects between the other determinants (i.e., intrinsic motives) and sport participation or between sport participation and its outcomes (i.e., cardiovascular fitness

and worries). This suggested that sport participation was not a mediator between the determinants and outcomes in this sample.

Contributions to the Literature

The meta-analyses included in this thesis are believed to be the first quantitative syntheses of a broad range of health outcomes associated with physical activity among youth with intellectual disability. These findings are congruent with research highlighting the benefits of physical activity for typically developing youth (Babic et al., 2014; Bailey, 2006; Eime et al., 2013; Ekeland et al., 2005; Owen et al., 2016; Penedo & Dahn, 2005; Poitras et al., 2016).

Sport was highlighted in the meta-analyses as among the most beneficial forms of physical activity for both the physical and psychosocial health of youth with intellectual disability. The enhanced benefits of playing sport could be due to the social nature of many of these activities versus the solitary nature of resistance exercise or running. Previous research among youth with developmental disability also suggested that youth with intellectual disability gained more benefit from physical activities when they were performed in groups (Johnson, 2009).

The second study in this thesis built on the results of the systematic review and meta-analyses by including a large sample (relative to other research in this field) of adolescents with intellectual disability, and by concentrating on sport participation rather than the broader category of physical activity. The focus of the study was to explore potential determinants of sport participation among adolescents with intellectual disability. Before this study, there was little evidence from samples of people with intellectual disability regarding the importance of intrinsic motivation and physical self-concept as determinants for sport and physical activity participation (Pan & Davis, 2018). From the results of the growth models and the longitudinal path model, this study highlighted the

importance of physical self-concept as a determinant of sport participation for this population. This is a significant contribution to the literature because the links between general self-concept and many aspects of positive health and well-being among youth with intellectual disability are strong (Craven & Marsh, 2008). Thus, it is important to highlight how increases in physical self-concept lead to behaviour change (i.e. further participation in sport or physical activity). For typically developing youth, physical self-concept has been shown to predict participation in sport and physical activity (Bardid et al., 2016; Barnett, Ridgers & Salmon, 2015; Rottensteiner, Tolvanen, Laakso, & Konttinen, 2015), yet this is the first study among youth with intellectual disability that highlights this path.

Strengths and Limitations

For years, researchers and public policy makers have highlighted the need for research to inform the sport and physical activity practices among youth with intellectual disability (Frey et al., 2008; Johnson, 2009; Luiselli, 2017; NDS, 2016). From the systematic review included in this thesis it was clear that the research examining the effects and determinants of physical activity among youth with intellectual disability should include larger samples, comparisons of participants over time rather than cross-sectional observations, a broader range of health outcomes, and a focus on sport for this population. The meta-analyses and longitudinal study in this thesis attempted to address some of these issues.

Relative to other research in the field of intellectual disability, the meta-analyses gathered a large amount of studies and data while the longitudinal study sampled a large number of participants. Both included measurements taken over time and examined a variety of outcomes related to both physical and psychosocial health. This was important because there is a wide range of benefits of sport and physical activity for typically developing youth (Babic et al., 2014; Bailey, 2006; Eime et al., 2013; Ekeland et al., 2005;

Owen et al., 2016; Penedo & Dahn, 2005; Poitras et al., 2016), and the research involving youth with intellectual disability should, as this thesis does, reflect those outcomes as well.

Alongside the strengths of the studies in this thesis there were some limitations that should be addressed. These limitations included: the large amount of unexplained variance in the meta-analyses and longitudinal study, the use of the 6-minute walk test as an indicator of cardiovascular fitness in the longitudinal study, and the lack of response from the parents/caregivers regarding the sport participation of students in the longitudinal study.

The meta-analyses showed a large amount of heterogeneity in effect sizes and the longitudinal study was unable to explain significant amounts of variance in sport participation and outcomes. The meta-analyses attempted to explain the heterogeneity through moderation analyses; however, a large proportion remained unexplained. People with intellectual disability possess a wide range of adaptive skills (Schalock et al., 2010), and perhaps because of this diversity, a large amount of unexplained variance was likely to occur. Thus, while it was certainly helpful to use models and regression analysis to predict outcomes for this populations, it was possible that any research with children or adolescents with intellectual disability would produce large amounts of unexplained variance.

The use of the 6-minute walk test as an indicator of cardiovascular fitness may have been a limitation of the longitudinal study. While this test has been shown to be a reliable and valid measure of fitness for adolescents with intellectual disability (Elmahgoub et al., 2012), the test's high sensitivity to varying procedures and methodologies may have contributed to its lack of predictive ability (Holland et al., 2014). In a thorough review of the research that used the 6-minute walk test as an indicator of cardiovascular fitness, Holland and colleagues (2014) determined that verbal

encouragement from the researchers and walking track layout were issues that may have impacted the within-student results of this test. Changes in these procedures between the first and second or second and third tests may have resulted in variation in the 6-minute walk test distances that were independent from changes in sport participation in the sample. While instructions were given to the researchers (see Appendix G for details) regarding when to give verbal encouragement, the enthusiasm with which the researchers gave this encouragement may have varied. Youth with intellectual disability are highly sensitive to verbal encouragement (Pastore et al., 2000), and variations in the verbal encouragement could result in up to a 30% increase in performance on this walking test (Enright et al., 2003). The walking track layout also may have impacted the results of this test. Due to scheduling conflicts and space availability at the schools, various surfaces (concrete versus grass versus gymnasium) and locations (near the school possibly causing classmate interference versus in a secluded area away from the school) were occasionally used each year of data collection and likely impacted the results as well. In addition, it is unclear if this test should be performed in groups. Hinckson, Dickinson, Water, Sands, and Penman (2013) performed the test with overweight and obese children/adolescents with intellectual disability in groups of two while Elmahgoub et al., (2012) had the participants with intellectual disability perform the test individually. Nasuti, Stuart-Hill, and Temple (2013) also had the participants with intellectual disability walk individually, but with a pacer walking 1-3 metres ahead. The longitudinal study in this thesis had up to 6 students perform the walk test simultaneously, and this may have caused the students' walking speed to be normalized, resulting in the students in the same group walking similar distances, meaning some may not have approached their cardiovascular limit. Because the students were likely to be placed in different groups for each of the tests, the normalized distances of each subsequent group were likely to be different as well. This again resulted

in random variation in the 6-minute walk test distances that were independent from changes in sport participation in the sample.

Another possibility was that the random variation may have occurred in the student's reported sport participation in the longitudinal study rather than in the measurement of cardiovascular fitness, and this variation was likely independent from changes in the outcomes (i.e. cardiovascular fitness and worries). In this study, the students were asked to recall their sport participation behaviours from the past week, and it was possible that issues with recall/memory (Fegan, 2011; Lanfranchi, Cornoldi, & Vianello, 2002; Lifshitz, Kilberg, & Vakil, 2016; Voelker et al., 1990) may have contributed to random variation in sport participation. This issue was anticipated before beginning this study, and sport participation was also assessed via parent/caregiver reports; however, only a small percentage of the parent reports were returned. Due to the scarcity of data present in the parent/caregiver reports of sport participation (less than one-third present at each timepoint), only the student's reported sport participation was used in the analyses.

Future Research

There is an ongoing need for research to focus on enhancing the lives of youth with intellectual disability through sport and physical activity, and one way to accomplish this would be through further examination of the relations between sport participation and its determinants. The use of an intervention focused on increasing the physical self-concepts of adolescents with intellectual disability has promise. While a physical self-concept intervention may be a novel idea for adolescents with intellectual disability, this type of intervention has been used for typically developing adolescents (for a review and meta-analysis of interventions see, O'Mara, Marsh, Craven, & Debus, 2006) and more recently for adolescents with learning disability (Abed, 2017). As highlighted by O'Mara et al., (2006), self-concept interventions could aim at enhancing self-concept either directly or

indirectly. The interventions designed to directly enhance self-concept typically involve a focus on the participants better understanding themselves, their feelings, and experiences, as well as having a better understanding of others and their experiences. Interventions designed to indirectly enhance self-concept are likely to focus on improving performance, building skills, or developing relationships with others (O'Mara et al., 2006). In addition, Marsh and Redmayne (1994) highlighted the importance of using non-academic interventions to focus on improving non-academic self-concepts, such as physical self-concept. The meta-analysis by O'Mara et al., (2006) synthesized the results of 145 studies that included 16,900 typically developing youth participating in self-concept interventions. They showed that interventions delivered by teachers aimed at directly (enhancing self-concept that included praise and including randomly assigned groups had the largest effects on self-concept. This type of intervention may also have the potential to increase the physical self-concept of youth with intellectual disability and warrants consideration for future research.

The current state of the research in this field is highlighted by the large number of studies included in the systematic review and meta-analyses that showed a moderate-high risk of bias. From the risk-of-bias assessment in the systematic review the poorest scoring items were related to the blinding of participants and researchers, randomization, and having control groups from the same population as the intervention group. From these low scoring items, it was suggested that there is a need for more large-scale randomized, controlled designed studies that include scalable interventions which can effectively promote and disseminate physical activities to youth with intellectual disability through the use of sport and movement skills training. These future, large-scale studies would not only provide opportunities, skills, and motivation for a larger number of youth with intellectual

disability to be more physically active, but also highlight the methods that most effectively promote physical activity among this population.

It is important to recognize that individuals with intellectual disability face unique barriers to sport participation that are not as relevant in groups of typically developing individuals (Stanish & Frey, 2008). This is largely due to the greater reliance of individuals with intellectual disability on their caregivers for guidance, support, organization, and even transportation. Thus, the factors that may have impacted sport participation in the sample in the longitudinal study also warrants further exploration. These factors could have been related to interpersonal influences, such as parents not placing importance on sport participation for their children; or intrapersonal influences, such as sport being fun enough; or environmental or policy-based influences, such as school scheduling or the students simply not having the opportunity to participate in sport (Sallis et al., 2015). When a lack of transportation to sport facilities or of the necessary equipment, participation in those activities is likely to be compromised (Alexandris, Tsorbatzoudis, & Grouios, 2002). There appears to be limited evidence regarding the barriers to sport participation among children and adolescents with intellectual disability, yet research does exist regarding the barriers to participation for adults with intellectual disability. This research suggested that barriers to the participation in sport for adults with intellectual disability include: limited opportunities, lack of time, lack of energy, the difficulty of the sporting activities, missing interest or enjoyment, lack of means of transportation to and from the activity, high financial costs, poor weather, health issues, life/job concerns, and a lack of knowledge/guidance regarding appropriate sporting activities (Frey, Buchanan, & Rosser Sandt, 2005; Heller, Hsieh, & Rimmer, 2003; Messent, Cooke, & Long, 1998). Formative work in this area could be accomplished

through the examination of the barriers to physical activity that youth with intellectual disability face (Stanish & Frey, 2008).

Another potential area for future research could focus on the exploration of the differing effects of physical activity between the youth with intellectual disability and the youth with developmental disability, such as Autism Spectrum Disorder and Down Syndrome, who also have an intellectual disability. The meta-analyses in this thesis indicated there are differing effects of physical activity on the physical and psychosocial health of youth with intellectual disability compared to youth with other developmental disability and an intellectual disability. This fits with the suggestions that youth with various developmental disability (e.g. Intellectual disability vs Down Syndrome vs Autism Spectrum Disorder vs Prader-Willi Syndrome) present with a wide range of adaptive skills and physical abilities (Winnick & Porretta, 2017). Previous research suggests these differing in experiences could be due to the social nature of the activities (Solish, Perry, & Minnes, 2010; Taheri, Perry, & Minnes, 2016), but this hypothesis is mostly unconfirmed. Further comparison of the physical activity experiences between these groups of youth is warranted.

Practical implications

When considering the physical health outcomes highlighted in the meta-analyses, intervention type only explained differences across effect sizes within studies, rather than between studies. Outcome type explained all the variance within studies as well as a large portion of the variance between studies. For practitioners, this means the success of a physical activity intervention for youth with intellectual disability is likely to depend heavily on the specific type of results (i.e., outcomes) they are seeking to achieve. In terms of physical health outcomes, practitioners could expect to see the largest changes in reaction time, flexibility and movement/sport skills. In contrast, when looking at the effect

of physical activity on psychosocial health outlined in the meta-analyses, intervention type explained more of the variance than did outcome type. This result suggested that the type of intervention was more important for improving psychosocial health than physical health. For improving the psychosocial health of youth with intellectual disability, our review indicates that practitioners should consider implementing interventions related to sport and movement skills training over general physical activity/education.

Regarding the interventions examined in the systematic review and meta-analyses, resistance training showed the most physical benefits. This finding fits with previous suggestions that resistance training is an important part of any exercise program for all populations (ACSM, 2017). However, the feasibility of engaging the population in an intense resistance training program has been questioned (Biddle & Batterham, 2015). While high-intensity is not a necessary requirement of resistance training for this population, engaging a large number of children or adolescents with intellectual disability in a consistent and supervised resistance training program would be even more difficult than for typically developing youth. Such a program involving weights and specific movement patterns would require nearly the same number of qualified exercise specialists as participants. Even if resistance training were performed on exercise machines designed for safety, issues of guidance and help with movement progressions would still be present. This suggests the most sustainable option for practitioners may be to teach movement and sport skills to their students with intellectual disability. Fortunately, the meta-analyses suggested that sport appeared to improve both the physical and psychosocial health of youth with intellectual disability. This finding could be important, and the enhanced benefits of playing sport could be related to the social nature of these activities versus the solitary nature of resistance exercise or running. When compared to other physical activity modalities, such as resistance training or cardiovascular training, teaching sport and

movement skills has the potential to be performed in large groups with minimal equipment. The most important requirement for this type of physical activity intervention would be having not only a qualified physical educator, but someone who is skilled in delivering clear directions, is assertive, and can organize and guide groups effectively. This person should also have experience working with youth with intellectual disability and possess a requisite level of patience.

Physical activity at school during physical education class is the main source of physical activity for youth with intellectual disability (Queralt et al., 2016). The meta-analyses in this thesis suggested that general physical education has benefits for both the physical and psychosocial health of their students with intellectual disability, yet educators should expect to see larger improvements in physical health. This suggested that either the physical educators in the included studies were more effective at encouraging their students' physical development compared with their psychosocial development, or that in-school physical education was a relatively poorer intervention for psychosocial enhancement among youth with intellectual disability.

To help adolescents with intellectual disability reap the benefits of sport and physical activity that were shown in the meta-analysis, it is necessary to increase the participation among this population. The longitudinal study highlighted the positive effect that physical self-concept has on sport participation. For practitioners, fostering positive physical self-concept may have the potential to increase the sport participation of youth with intellectual disability. This could be done in a similar fashion to the self-concept interventions highlighted in the "Future research" section of this chapter.

Conclusion

The systematic review and meta-analyses included in this thesis represent the first quantitative synthesis of research focused on the physical and psychosocial benefits of

physical activity for youth with intellectual disability. It was promising that this review points to physical activity as a method of improving the physical and psychosocial health of youth with intellectual disability. To help adolescents with intellectual disability reap the benefits of physical activities that have been witnessed in the meta-analyses in Chapter 2, it was necessary for research to better document ways to best facilitate a change towards increased participation in sport and physical activities among this population. The longitudinal study in Chapter 3 did this while focusing on the sport participation experiences of adolescents with intellectual disability by using a large sample with repeated measures tracked three times over two years. The results showed that physical self-concept was an important determinant of sport participation for this sample.

While it is important to recognize that youth with intellectual disability face obstacles to success in schools, in the workplace, or in society, identifying limitations is not enough to truly help youth with intellectual disability reach their fullest potential. Instead of merely attempting to raise their level of functioning to a minimum acceptable level, society in general and more specifically research, must work to identify the ways in which these youth can gain the most possible value from their lives (Wehmeyer, Shogren, Singh, & Uyanik, 2017). This makes the current investigation of positive life outcomes, and more specifically good health, salient for this population. Creating positive futures for these youth is a critical issue and this thesis has taken a step in addressing this issue through the cultivation of the psychosocial and physical capabilities of youth with intellectual disability.

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Appendix A: Link to Online Supplemental Materials (Study 1)

Open Science Framework link to extracted and calculated data, R scripts of analyses, and Risk of Bias Assessment for the manuscript entitled:

“Effects of physical activity on the physical and psychosocial health of youth with intellectual disability: A systematic review and meta-analyses.”

<https://osf.io/7n3jm/files/>

Appendix B: Subgroup Moderation Analysis Table (Study 1)

Table B.1.

Subgroup Moderation Analyses: *Effects of each intervention on physical health outcomes*

Intervention	Outcome	#ES	k	ES (g)	Wald CI	(p)	$Tau^2_{_2}$	$Tau^2_{_3}$	Q	$I^2_{_2}$	$I^2_{_3}$
Aerobic	Cardiovascular Fitness	30	8	1.100	0.283-1.917	0.008	0.023	1.296	145.446	1.6%	92.3%
	Strength	45	7	0.762	0.174-1.350	0.011	0.041	0.571	167.418	5.9%	82.6%
	Movement skills	6	2	1.656	0.289-3.024	0.018	0.768	0.646	43.206	49.2%	41.4%
	Physiological	43	12	0.432	0.135-0.730	0.004	0.176	0.146	188.636	45.3%	37.8%
	Balance	10	2	2.137	1.336-2.940	0.000	0.609	0.114	32.473	62.1%	11.7%
Resistance	Flexibility	0									
	Reaction time	0									
	Cardiovascular Fitness	0									
	Strength	24	7	0.499	0.290-0.708	0.000	0.126	0.009	73.123	65.1%	4.5%
	Movement skills*	2	2	0.195	-0.100-0.489	0.773	0.000		0.083	0%	
	Physiological*	5	2	0.018	-0.143-0.180	0.408	0.000		3.986	0%	
	Balance	0									
	Flexibility	0									
	Reaction time*	2	1	0.815	0.505-1.125	0.000	0.000		0.049	0%	
	Cardiovascular Fitness*	13	6	1.005	0.631-1.378	0.000	0.684		36.885	68.4%	
Movement skills	Strength	42	10	0.735	0.502-0.968	0.000	0.029	0.094	97.499	15.4%	49.5%
	Movement skills	36	12	1.117	0.461-1.774	0.001	0.093	1.202	170.057	6.7%	87.5%
	Physiological*	7	4	0.106	-0.077-0.289	0.256	0.014		7.445	24.5%	
	Balance*	25	7	0.577	0.404-0.750	0.000	0.049		40.063	29.6%	
	Flexibility*	2	2	0.236	-0.528-1.000	0.544	0.197		6.368	67.4%	
General Physical Education	Reaction time	13	3	1.137	1.095-1.639	0.000	0.074		18.227	30.4%	
	Cardiovascular Fitness*	30	12	0.531	0.353-0.709	0.000	0.153		103.059	77.8%	
	Strength*	46	13	0.579	0.451-0.707	0.000	0.124		153.204	73.0%	
	Movement skills*	33	9	0.423	0.307-0.540	0.000	0.069		63.788	48.3%	
	Physiological	68	13	0.216	0.128-0.303	0.000	0.071		191.199	68.3%	
	Balance*	3	3	1.251	0.402-	0.004	0.371		13.717	75.7%	

					2.101						
	Flexibility*	5	4	0.466	0.184- 0.748	0.001	0.056		10.855	54.3%	
	Reaction time	1									
Balance	Cardiovascular Fitness	1									
	Strength*	9	2	0.268	-0.019- 0.555	0.068	0.122		24.186	64.2%	
	Movement skills*	6	1	0.673	0.471- 0.876	0.000	0.000		4.886	0%	
	Physiological*	2	2	0.120	-0.220- 0.460	0.488	0.000		0.083	0%	
	Balance	22	4	0.505	0.112- 0.898	0.012	0.000	0.135	65.837	0%	66.3%
	Flexibility	1									
	Reaction time	0									

Note: ES = effect size, k = study clusters, CI = confidence interval, g = Hedges' g , p = significance

*Analysed as a two-level model

Appendix C: Additional References (Study 1)

Below are the references included in the systematic review and meta-analyses examining the effects of sport and physical activity on the physical and psychosocial health of youth with intellectual disability in Study 1.

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Appendix D: Latent Factor Loadings Table (Study 2)

Table D.1.

Factor loadings of the structural models for the latent factors representing intrinsic motives, physical ability self-concept, and worries at each time.

Latent Factor	Item	Estimate	S.E.	Est./S.E.	P-value
Intrinsic motives (Time 1)	MPAM item 1	0.858	0.027	31.716	0.000
	MPAM item 2	0.672	0.040	16.619	0.000
	MPAM item 3	0.893	0.027	32.685	0.000
	MPAM item 4	0.843	0.028	30.118	0.000
	MPAM item 5	0.698	0.042	16.781	0.000
	MPAM item 8	0.752	0.037	20.278	0.000
	MPAM item 9	0.837	0.027	30.450	0.000
	MPAM item 14	0.865	0.027	32.594	0.000
	MPAM item 15	0.737	0.036	20.325	0.000
Intrinsic motives (Time 2)	MPAM item 1	0.924	0.018	52.059	0.000
	MPAM item 2	0.720	0.040	18.010	0.000
	MPAM item 3	0.930	0.019	48.583	0.000
	MPAM item 4	0.800	0.034	23.590	0.000
	MPAM item 5	0.701	0.042	16.756	0.000
	MPAM item 8	0.739	0.035	21.014	0.000
	MPAM item 9	0.870	0.028	31.267	0.000
	MPAM item 14	0.819	0.033	24.879	0.000
	MPAM item 15	0.794	0.041	19.551	0.000
Intrinsic motives (Time 3)	MPAM item 1	0.836	0.031	26.839	0.000
	MPAM item 2	0.764	0.041	18.417	0.000
	MPAM item 3	0.857	0.027	31.430	0.000
	MPAM item 4	0.860	0.033	26.277	0.000
	MPAM item 5	0.598	0.046	13.063	0.000
	MPAM item 8	0.789	0.034	22.949	0.000
	MPAM item 9	0.835	0.036	23.196	0.000
	MPAM item 14	0.940	0.022	42.173	0.000
	MPAM item 15	0.872	0.035	25.259	0.000
Physical ability self-concept (Time 1)	SDQI item 1	0.703	0.040	17.480	0.000

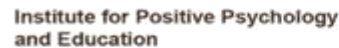
	SDQI item 9	0.682	0.041	16.543	0.000
	SDQI item 17	0.785	0.033	23.649	0.000
	SDQI item 25	0.661	0.043	15.224	0.000
	SDQI item 33	0.906	0.025	35.981	0.000
	SDQI item 41	0.693	0.044	15.808	0.000
	SDQI item 49	0.821	0.035	23.623	0.000
	SDQI item 57	0.774	0.032	24.474	0.000
Physical ability self-concept (Time 2)	SDQI item 1	0.755	0.033	22.631	0.000
	SDQI item 9	0.834	0.026	32.102	0.000
	SDQI item 17	0.884	0.024	36.128	0.000
	SDQI item 25	0.693	0.039	17.839	0.000
	SDQI item 33	0.918	0.019	48.340	0.000
	SDQI item 41	0.715	0.040	18.043	0.000
	SDQI item 49	0.872	0.029	30.046	0.000
	SDQI item 57	0.747	0.039	19.241	0.000
Physical ability self-concept (Time 3)	SDQI item 1	0.729	0.042	17.284	0.000
	SDQI item 9	0.694	0.045	15.556	0.000
	SDQI item 17	0.838	0.032	25.935	0.000
	SDQI item 25	0.779	0.041	19.209	0.000
	SDQI item 33	0.891	0.033	26.735	0.000
	SDQI item 41	0.627	0.047	13.402	0.000
	SDQI item 49	0.793	0.033	24.128	0.000
	SDQI item 57	0.649	0.039	16.659	0.000
WORRIES (Time 1)	GAS item 1	0.695	0.044	15.639	0.000
	GAS item 2	0.425	0.073	5.851	0.000
	GAS item 3	0.571	0.058	9.920	0.000
	GAS item 4	0.654	0.047	13.916	0.000
	GAS item 5	0.853	0.033	25.608	0.000
	GAS item 6	0.787	0.039	20.443	0.000
	GAS item 7	0.495	0.061	8.072	0.000
	GAS item 8	0.679	0.049	13.720	0.000
	GAS item 10	0.576	0.056	10.212	0.000
WORRIES (Time 2)	GAS item 1	0.694	0.051	13.641	0.000

	GAS item 2	0.527	0.064	8.270	0.000
	GAS item 3	0.673	0.054	12.570	0.000
	GAS item 4	0.711	0.048	14.877	0.000
	GAS item 5	0.835	0.034	24.434	0.000
	GAS item 6	0.683	0.057	11.925	0.000
	GAS item 7	0.752	0.051	14.629	0.000
	GAS item 8	0.677	0.056	12.162	0.000
	GAS item 10	0.698	0.061	11.439	0.000
WORRIES (Time 3)	GAS item 1	0.803	0.040	20.280	0.000
	GAS item 2	0.589	0.060	9.843	0.000
	GAS item 3	0.762	0.044	17.251	0.000
	GAS item 4	0.926	0.025	37.457	0.000
	GAS item 5	0.759	0.047	15.983	0.000
	GAS item 6	0.723	0.047	15.329	0.000
	GAS item 7	0.735	0.049	14.975	0.000
	GAS item 8	0.730	0.047	15.488	0.000
	GAS item 10	0.650	0.061	10.572	0.000

Note: Based on the suggestions of Muthén (1984) and Lubke and Muthén (2004), these latent constructs were considered as having categorical data.

MPAM = Motivation to be Physically Active Measure (MPAM-r; Ryan et al., 1997); SDQI = Self-Description Questionnaire I – Individual Administration (SDQI-IA; Marsh, 1988); GAS = Glasgow Anxiety Scale (GAS-ID; Mindham & Espie, 2003).

Appendix E: Information and Consent Forms (Parent & Teacher)



Parent Main Study Information Sheet

Project Title: Effects of the school environment and physical activity and sport on the psychological well-being and health of children with intellectual disability.

Who is carrying out the study?

You and your child are invited to participate in a study conducted by Professor Alexandre Morin from the Institute for Positive Psychology and Education at the Australian Catholic University.

What is the study about?

This study aims to study the effects of the school environment and physical activity or sport on the psychological and physical well-being of children with intellectual disability.

These questions have been rarely studied in a population with intellectual disability, and even more rarely by the simultaneous consideration of information reported by the children themselves, their parents, and their teachers. As such, the results have the potential to provide rich avenues of action for school communities wishing to adapt their practices to this population.

Note also that this is one of the largest studies regarding the psychological and social experiences of children with intellectual disability, internationally.

What does the study involve?

Your participation will involve completing a questionnaire including general descriptive information about yourself, your family and your child (marital status, level of education, relationship, age and gender of your child, level of intellectual disability, etc.) as well as more detailed information about your child, covering: (a) his/her behaviours, (b) his/her mood (i.e., well-being, depression) and level of stress and anxiety, (c) his/her diet, (d) the importance he/she attributes to school, (e) his/her grade level and academic achievement, (f) his/her school environment (kind of environment past and present, and duration of schooling in these environments), and (g) his/her practice of physical and sports activities outside the school. The total time to complete the questionnaires should not exceed three hours.

The participation of your child will involve completing questionnaires in which he/she will be asked: (a) what he/she feels when he/she is alone (e.g., if he is happy, if sad, etc.) and with others (e.g., if it feels worse or if they feel better, etc.), (b) if he/she like himself/herself and is happy himself/herself, (c) if he/she is healthy, (d) his/her relations with others and with you, (e) their experience at school, and with students and adults in the school, and (f) if he/she does sport in school and outside. In addition, your child will be weighed and measured, and will complete fitness tests adapted to his/her disability (breathing, walking, balance, strength, flexibility, and speed) in order to obtain a more accurate view of his/her physical health. These questionnaires and tests will be administered with the help of members of the research team who will ask some questions and provide verbal explanations appropriate to your child's level of understanding. The entire data collection will not exceed two half-days, and it will be directly in your child's school.

The participation of your child's teacher will involve completing a questionnaire including general information about themselves (sex, age, years of teaching experience, etc.) and more detailed questionnaires about your child, focusing on: (a) his/her mood (e.g., well-being, depression) and his/her level of stress and anxiety, (b) his/her maladaptive behaviours (e.g., aggressive behaviour, hyperactivity, etc.), (c) his/her grade level and academic achievement (d) the importance he/she attributes to school, (e) his/her school environment (type of current environment and duration of schooling in this environment), (f) his/her behaviour and his/her relationship with his/her teacher and with other students and his/her best friend and (g) his/her physical activities and sport practices at school.

Other required information. For the purposes of this study, a recent (no more than two years old) assessment of your child's exact IQ will be obtained at the beginning of the study. If this information is not available at that time from the school records, and cannot be carried out by the school psychologist (which would be ideal), we will see that it is carried out by our research team. After this initial assessment, access to school psychologists' routine assessments will be obtained, minimally every four years. If routine assessments are not available after a four year period, we will see that it is carried out by our research team.

Likewise we will need access to your child's school record for the duration of the study (10 years). Thus, agreeing to your child's participation also implies that you agree to grant us access to this information for the duration of the study. Please note that once your child turns 18 years, we will seek his/her consent to further access his/her school record. Note that this access is limited to the purposes of this study.

Confidentiality. The data collected in this study is completely confidential and cannot lead to the identification of any members of your family. Confidentiality will be ensured by identifying each questionnaire by an alphanumeric code, consisting of four letters and four numbers that we assign to you. Only this alphanumeric code will appear on the completed questionnaires, documents and data set. The correspondence between this code and your child's identity will be kept in a secured facility at the Australian Catholic University with access limited to core members of the research team. For clarity purposes, the name of your child will be indicated on a removable sticker on the distributed questionnaires. This sticker will be removed by the person completing the questionnaire before returning it back to us.

Please note that this is the first part of a longitudinal study to assess the impact of positive or negative experiences of life, school and sports on the long-term development and future societal integration of children with an intellectual disability.

How much time will the study take?

Your participation should not exceed three hours and your child's participation will not exceed two half-days, conducted directly in your child's school.

Children not participating in the study will engage in pleasant activities during the time the research is being carried out, not in line with the main curricular content to avoid penalising those students who do participate.

The information collected will be:

The questionnaires will be stored in a locked research room at the Institute for Positive Psychology and Education (Australian Catholic University) for a period of 5 years after the end of this project and then destroyed.

Your child's responses will be matched with some of their academic records. However, their responses and records will be kept in a database that will not include any of their personal information like their name so their responses will be kept anonymous.

The questionnaires will be accessed by the main investigators of this research and their research assistants.

Used to answer the questions of this research project, and other research questions related to sport, well-being and school (including international comparisons and further secondary analyses).

Will the study benefit me?

There will be no direct benefit to you or your child. However the participation of you and your child will result in a gain in knowledge that will be critical for designing school-based interventions that aim to promote psychological and physical well-being among children with Intellectual Disability.

Will the study involve any discomfort for me or my child?

The only anticipated discomfort is the time required to participate in the project, lasting approximately three hours for you, and two half-days for your child. However, given that the other students from his or her class will also be asked to participate, no loss of learning will be incurred for your child if he/she chooses to participate. Your child will not be penalised in any way for participating in this study.

It is highly unlikely, but still possible that answering the questions could cause your child some minor psychological discomfort (e.g., anger, shame, sadness and surprise) or lead him/her to realise personal difficulties that he/she may have. If this happens, he/she will be given the opportunity to not answer the more sensitive questions, to suspend the completion of the questionnaires, or to discuss these issues with members of the research team.

The following services can also be sought by you or your child:

Lifeline - 13 11 14

Kids Helpline - 1800 55 1800

SANE Australia - 1800 18 7263

Sydney Counselling Centre - 9415 2223

Finally, if the data collected from your child leads us to identify major symptoms of distress that could potentially endanger his/her health, then we will need to break this confidentiality to enable an appropriate action to ensure his/her well-being.

How is this study being paid for?

The study is being funded by the Australian Research Council and has been approved by the ACU Human Research Ethics Committee and the Diocese of Broken Bay.

Will anyone else know the results? How will the results be disseminated?

The results generated from this research will be published in research journals, presented at conferences and research symposia. Furthermore, aggregated results will be provided to the participating schools and will be placed on a website for access by students and their parents. The findings of this research will also be disseminated via PhD theses.

However, all disseminated information will be in a non-identifiable format. That is, the results of the research will not identify you, your family, or your child.

Can I withdraw from the study?

The participation of you and your child is entirely voluntary. You and/or your child may withdraw from the study at any time - or you may withdraw your child from the study at any time, at which point you will also have the possibility of requesting that all information provided by you and/or your child be destroyed. Similarly, you and your child are completely free to opt out of any component of this study, or to skip any section of the study, at any time, without consequences.

As this is a longitudinal study, you will be contacted each year to verify whether you are still willing to participate in this study. You will both be completely free to accept or refuse to join this longer - term follow-up, regardless of your decision to participate, or not, in the first measurement.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

If you would like to know more about this research at any stage, please feel free to contact Professor Alexandre Morin on (02) 9701 4661 or by email: Alexandre.Morin@acu.edu.au or the Project Manager, Dr Natasha Magson on (02) 9701 4636 or by email: Natasha.Magson@acu.edu.au, replacing Dr Jessica Fulcher, Jessica.Fulcher@acu.edu.au who is currently on maternity leave.

What if I have a complaint?

The ethical aspects of this study involving staff and/or students of schools in the Diocese of Broken Bay have been approved by Director of Schools, Catholic Schools Office. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Catholic Schools Office (telephone 9847 0000; email: mail@dbb.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Parent Main Study Consent Form

I, [print name], give consent for myself and my child [print name of child]..... to participate in the research project titled: Effects of the school environment and physical activity and sport on the psychological well-being and health of children with intellectual disability.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my child's involvement in the project with the researcher/s.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I have discussed participation in the project with my child and my child agrees to their participation in the project.

I understand that both mine and my child's involvement is confidential and that the information gained during the study may be published but no information about me or my child will be used in any way that reveals our identity.

I understand that our participation in this project is voluntary. We can withdraw from the study at any time, without it affecting my child's academic standing or relationship with the school. I also understand that my signature on this form only indicates my participation for this year and that I will be contacted in the upcoming years regarding my ongoing participation.

I consent to myself, my child and my child's teacher completing the questionnaires, for my child's survey responses to be matched to their academic record (until my child reaches 18yrs of age) and for their IQ score to be disclosed to the research team. I also consent for my child to participate in the physical assessment. (Please cross out any activity that you do not provide consent for).

Your child's name: _____

Your child's signature: _____

Your name: _____

Your Signature: _____

Date: _____

If your child is in shared custody the consent of both parents regarding the child's participation is necessary.

Second parent's signature: _____

Date: _____

The ethical aspects of this study involving staff and/or students have been approved by Director of Schools, Catholic Schools Office. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Catholic Schools Office (telephone 9847 0000; email: mail@dbb.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Teacher Main Study Information Sheet

Project Title: Effects of the school environment and physical activity and sport on the psychological well-being and health of children with intellectual disability

Who is carrying out the study?

You are invited to participate in a study conducted by Professor Alexandre Morin from the Institute for Positive Psychology and Education at the Australian Catholic University.

What is the study about?

This study aims to determine the effects of the school environment and physical activity or sport on the psychological and physical well-being of children with intellectual disability.

These questions have been rarely studied in a population with intellectual disability, and even more rarely by the simultaneous consideration of information reported by the children themselves, their parents, and their teachers. The results of this study will be extremely rich in terms of potential courses of action for the school environment and teachers who wish to adapt their practices to this population.

Note also that this is one of the largest studies on the psychological and social experiences of children with intellectual disability, internationally.

What does the study involve?

Your participation will involve completing a questionnaire, each year of the study, including general information about yourself (sex, age, years of teaching experience, etc.) as well as more detailed questionnaires about one or more target students, focusing on: (a) his/her mood (e.g., well-being, depression) and his/her level of stress and anxiety, (b) his/her maladaptive behaviours (e.g., aggressive behaviour, hyperactivity, etc.), (c) his/her grade level and academic achievement (d) the importance he/she attributes to school, (e) his/her school environment (type of current environment and duration of schooling in this environment), (f) his/her behaviour and his/her relationship with you and with other students and his/her best friend and (g) his/her physical activities and sport practices at school.

How much time will the study take?

Your participation should not exceed 40 minutes per student and, depending on agreement sought from your school, you should be able to complete all of these questionnaires during the time we will spend with your students.

The information collected will be:

Stored in a locked research room at the Institute for Positive Psychology and Education (Australian Catholic University) for a period of 15 years after the end of this project and then destroyed.

Accessed by the main investigators of this research and the research assistants.

Used to answer the questions of this research project, and other research questions related to sport, well-being and school (including international comparisons and further secondary analyses).

Will the study benefit me?

There will be no direct benefit to you. However your participation will result in a gain in knowledge that will be critical for designing school-based interventions that aim to promote psychological and physical well-being among children with Intellectual Disability.

Will the study involve any discomfort for me?

The only anticipated discomfort is the time required to participate in the project.

How is this study being paid for?

The study is being funded by the Australian Research Council and has been approved by the ACU Human Research Ethics Committee and the Diocese of Broken Bay Catholic Education Office.

Will anyone else know the results? How will the results be disseminated?

The results generated from this research will be published in research journals, presented at conferences and research symposia. Furthermore, aggregated results will be provided to the participating schools and will be placed on a website for access by students and their parents. The findings of this research will also be disseminated via PhD theses.

However, all disseminated information will be in a non-identifiable format. That is, the results of the research will not identify you or the student that you provide information about.

Can I withdraw from the study?

Your participation in the study is entirely voluntary. You may withdraw from the study at any time, at which point you will also have the possibility of requesting that all information provided by you be destroyed.

Can I tell other people about the study?

Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

What if I require further information?

If you would like to know more about this research at any stage, please feel free to contact Professor Alexandre Morin on (02) 9701 4661 or by email: Alexandre.Morin@acu.edu.au or the Project Manager, Dr Natasha Magson on (02) 9701 4636 or by email: Natasha.Magson@acu.edu.au, replacing Dr Jessica Fulcher, Jessica.Fulcher@acu.edu.au who is currently on maternity leave.

What if I have a complaint?

The ethical aspects of this study involving staff and/or students of schools in the Diocese of Broken Bay have been approved by Director of Schools, Catholic Schools Office. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Catholic Schools Office (telephone 9847 0000; email: mail@dbb.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

School of Education



Institute for Positive Psychology
and Education



Teacher Main Study Consent Form

I, [print name], give consent to participate in the research

project titled: Effects of the school environment and physical activity and sport on the psychological well-being and health of children with intellectual disability.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information with the researcher/s.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me or the student I provide information about will be used in any way that reveals our identity.

I understand that my participation in this project is voluntary. I can withdraw from the study at any time.

I consent to completing the questionnaire about myself and one or more target students. (Please cross out any activity that you do not provide consent for).

Your name: _____

Signature: _____

Date: _____

The ethical aspects of this study involving staff and/or students of schools in the Diocese of Broken Bay have been approved by Director of Schools, Catholic Schools Office. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Catholic Schools Office (telephone 9847 0000; email: mail@dbb.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Appendix F: Sport Participation Measure

SECTION 5 – You and the sports

1. Do you practice **SPORT** at **SCHOOL**?

☐ ⁽¹⁾ Yes ☐ ⁽⁰⁾ No

2. Do you practice sport when you are not at school (for example, in the evenings or on weekends?)

☐ ⁽¹⁾ Yes ☐ ⁽⁰⁾ No

3. Last week, which days **did** you practice sport?

To answer, you must mark with an X the box beside the days on which you practiced sport.

	At School	Outside of School
Monday	☐	☐
Tuesday	☐	☐
Wednesday	☐	☐
Thursday	☐	☐
Friday	☐	☐
Saturday	☐	☐
Sunday	☐	☐

Answer like this	☐	or	☐	or	☒
	✓		x		

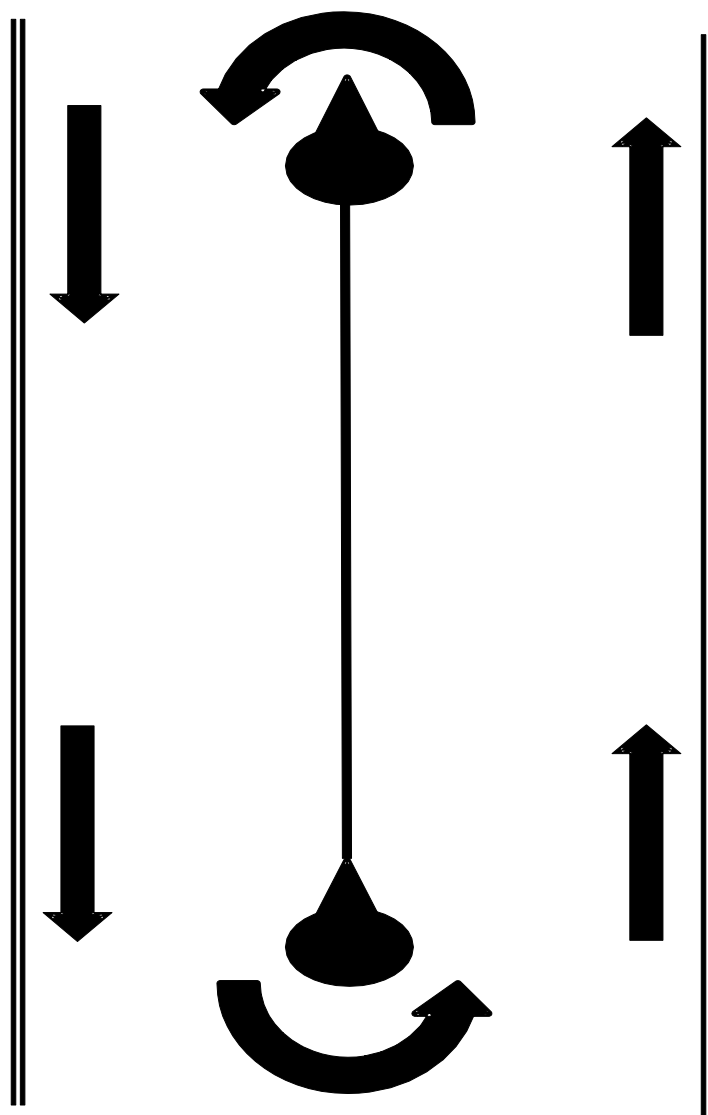
Appendix G: Six-minute Walk Test Instructions (Cardiovascular Fitness)

2.5 'Six-minute walking test' (Guyatt et al., 1985)

The information presented below is taken and adapted from the following references:
 Guyatt, G. H., Sullivan, M. J., Thompson, P. J., Fallen, E. L., Pugsley, S. O., Taylor, D. W. (1985).
 The 6-minute walk: A new measure of exercise capacity in patients with chronic heart failure.
Canadian Medical Association Journal, 132, 919–923.

Material	One 30- to 50-metre-long walking corridor (hard surface). The recommended length, however, is 30 metres. The corridor can be outdoors. One chronometer and one whistle. Two cones, 4 arrows, 3 strips of tape to form the corridor. One measuring wheel and some adhesive tape.
Instructions for the participant	'The objective of this test is to walk back and forth as many times as you can in 6 minutes. You will walk back and forth along this corridor. Six minutes is a long time to walk, so you will have to make an effort. You may feel tired. So, you can slow down, stop or rest if you need to. You can lean or hold on to the wall, but you must start walking again as soon as you feel better. Remember that you must walk as far as you can in 6 minutes. You must walk back and forth along the corridor, turning around the cones. You must go around the cones and continue without hesitating. Now, I will show you how. See how I turn back without hesitating. During the test, you cannot speak because it will affect your performance. Each minute, I will tell you how much time is left. After 6 minutes, I will ask you to stop. Are you ready? I will count how many times you turn around. Remember that you must walk as far as you can in 6 minutes, but without running. You can start now or whenever you're ready.' <u>During the test, the following time points must be given to the participant:</u> – 'That's very good, keep going', at <u>30 seconds</u> – 'That's very good, only 5 more minutes, keep going', at <u>1 minute</u>. – 'That's very good, keep going', at <u>1 minute 30 seconds</u> – 'That's very good, only 4 more minutes, keep going', at <u>2 minutes</u>. – 'That's very good, keep going', at <u>2 minutes 30 seconds</u> – 'That's very good, only 3 more minutes, keep going', at <u>3 minutes</u>. – 'That's very good, keep going', at <u>3 minutes 30 seconds</u> – 'That's very good, only 2 more minutes, keep going', at <u>4 minutes</u>. – 'That's very good, keep going', at <u>4 minutes 30 seconds</u> – 'That's very good, only 1 more minute, keep going', at <u>5 minutes</u>. – 'That's very good, keep going', at <u>5 minutes 30 seconds</u> – 'Very soon, I will tell you to STOP (or whistle); at that point, you must stay where you are', at <u>5 minutes 45 seconds</u> – 'And now, STOP' (or blow the whistle), at <u>6 minutes</u>
Instructions for the examiner	When giving the participant instructions, you must show him/her what to do. The participant must wear his/her usual shoes and usual walking aids or orthotics. He/she should not have done any 'vigorous' exercise in the 2 hours before the test. For participants with spatial awareness problems, visual markers can be

	used (arrows pointing in the direction that the participant must walk, a line separating the two directions, two distinct lanes, etc.). The participant must not warm up before the test. Start the chronometer when the participant starts walking and stop it at 6 minutes.
Tests	Only one test.
Result	The number of metres and centimetres is recorded (accuracy of 0.01 metre). The information must be written DIRECTLY on the participant's sheet .
Example	210.50 metres



Representation of the layout

Appendix H: Self-description Questionnaire I - IA (Physical Ability Self-concept)

SECTION 3 – Are you happy with you?

YOUR CAPACITIES

INSTRUCTIONS

I will read you sentences to understand what **YOU THINK** about **YOURSELF** (in **GENERAL**, at **SCHOOL**, in **SPORTS**), **YOUR BODY**, **YOUR FRIENDS** and **YOUR PARENTS**. This is not an exam. There is no right or wrong answer, and everyone's answers will be different. After reading the sentence, I will ask you to tell me whether **'yes' you agree** or **'no' you disagree** with this sentence. You must answer according to what **YOU THINK** about **YOURSELF** (in **GENERAL**, at **SCHOOL**, in **SPORTS**), **YOUR BODY**, **YOUR FRIENDS** and **YOUR PARENTS**. There are a few sentences that you may have trouble understanding. If you do not understand a sentence or a word in a sentence, tell me, **'I don't know what that means'**. It's okay; I will try to explain it to you or find other words.

After each sentence, you must **CROSS** or **TICK** the box that corresponds to **YOUR ANSWER**. You must **CROSS** or **TICK**: the **1st box** if your answer is **'No, I totally disagree'**; the **2nd box** if your answer is **'No, I strongly disagree'**; the **3rd box** if your answer is **'No, I disagree'**; the **4th box** if your answer is **'Yes, I agree'**; the **5th box** if your answer is **'Yes, I strongly agree'**; or the **6th box** if your answer is **'Yes, I totally agree'**. I will explain to you the meaning of **'No, I totally disagree'**; **'No, I strongly disagree'**; **'No, I disagree'**; **'Yes, I agree'**; **'Yes, I strongly agree'**; **'Yes, I totally agree'**.

Now, we will begin the questionnaire. I will read you the sentence slowly. Ask me if you would like me to repeat it.

1.     I can run fast. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	2.    I am good looking. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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7. I am good at school work. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	8. I do lots of important things. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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9. I like to run and play hard. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	10. I like the way my body looks. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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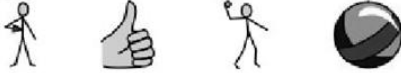


29.     I am interested in reading. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement							Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	30.    I am interested in maths. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement							Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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31.     I learn things quickly at school. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement							Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	32.     I can do thing as well as most people. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement							Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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35. Other kids want me to be their friend. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	36. My parents and I spend a lot of time together. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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37. I enjoy reading assignments. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	38. I learn things quickly in maths. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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41. I can run a long way without stopping. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	42. I have a good looking body. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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43.  I have more friends than other kids. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	44.  My parents are easy to talk to. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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49.  I am a good athlete. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	50.  I am better looking than most of my friends.  <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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51.  I am popular with kids or my own age.  age. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	52.  I get along well with my parents. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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57.  I am good at throwing a ball. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐	58.  I have beautiful hair, a beautiful nose,  beautiful eyes, etc.. <table border="1"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Strongly disagree</th> <th>Disagree</th> <th>Agree</th> <th>Strongly agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement	Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree	☐	☐	☐	☐	☐	☐	☐
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59. Other kids like me. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	60. My parents and I have a lot of fun together. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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61. I learn things quickly in reading. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	62. I like all school work. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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63. $\left(\frac{2}{+3}\right)^{++}$ I enjoy doing maths. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐	64. When I do something, I do it well. <table style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="3">No, I</th> <th colspan="3">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Totally disagree</td> <td>Strongly disagree</td> <td>Disagree</td> <td>Agree</td> <td>Strongly agree</td> <td>Totally agree</td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I			Yes, I			Doesn't understand the statement								Totally disagree	Strongly disagree	Disagree	Agree	Strongly agree	Totally agree		☐	☐	☐	☐	☐	☐	☐
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Appendix I: Motives for Physical Activity Measure (Intrinsic Motives)

YOUR MOTIVATION TO DO SPORT

INSTRUCTIONS

In the following sentences, we want to know, 'WHY YOU DO SPORTS?' This is not an exam. There is no right or wrong answer, and everyone's answers will be different. After reading the sentence, I will ask you to tell me whether 'yes' you agree or 'no' you disagree with this sentence. You must answer according to what **MAKES YOU WANT TO DO SPORTS**. There are a few sentences that you may have trouble understanding. If you do not understand a sentence or a word in a sentence, tell me, 'I don't know what that means'. It's okay; I will try to explain it to you or find other words.

After each sentence, you must **CROSS** or **TICK** the box that corresponds to **YOUR ANSWER**. You must **CROSS** or **TICK**: the **1st box** if your answer is 'No, I totally disagree'; the **2nd box** if your answer is 'No, I disagree'; the **3rd box** if your answer is 'Sometimes Yes, Sometimes No'; the **4th box** if your answer is 'Yes, I agree'; or the **5th box** if your answer is 'Yes, I totally agree'. I will explain to you the meaning of 'No, I totally disagree'; 'No, I disagree'; 'Sometimes Yes, Sometimes No'; 'Yes, I agree'; 'Yes, I totally agree'.

Now, we will begin the questionnaire. I will read you the sentence slowly. Ask me if you would like me to repeat it.

I DO SPORT...

1.  Because it is fun. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐	2.  Because I want to be with my friends. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐
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3.  Because I like to do sports. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐	4.  Because I want to improve my skills. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐
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5.  Because I like to succeed at doing difficult things. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐	6.  Because I want to have more muscles to look better. <table border="1"> <thead> <tr> <th colspan="2">No, I</th> <th>Sometimes</th> <th colspan="2">Yes, I</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Totally disagree</th> <th>Disagree</th> <th>In between</th> <th>Agree</th> <th>Totally agree</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No, I		Sometimes	Yes, I		Doesn't understand the statement	Totally disagree	Disagree	In between	Agree	Totally agree	☐	☐	☐	☐	☐	☐
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I DO SPORT...

7.   + 
Because I want to have more energy.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

8.    
Because I want to get better

physically.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

9.   
Because I like being with people who

  ++
love sports.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

10.     
Because I want to improve my physical

fitness.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

11.    
Because I want to improve my

 
appearance.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

12.    & 
Because I want to be strong and


healthy.

No, I		Sometimes	Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree	
					
☐	☐	☐	☐	☐	☐

I DO SPORT...

13.

Because I want to be attractive to others.

No, I		Sometimes		Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree		
☐	☐	☐	☐	☐	☐	

14.

Because I have fun when I do



sports.

No, I		Sometimes		Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree		
☐	☐	☐	☐	☐	☐	

15.

Because I enjoy being with others.

No, I		Sometimes		Yes, I		Doesn't understand the statement
Totally disagree	Disagree	In between	Agree	Totally agree		
☐	☐	☐	☐	☐	☐	

Appendix J: Glasgow Anxiety Scale - ID (Worries)

SECTION 6 – How do you feel?

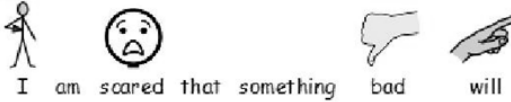
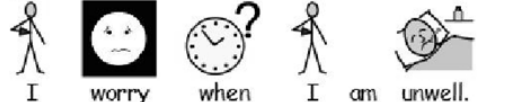
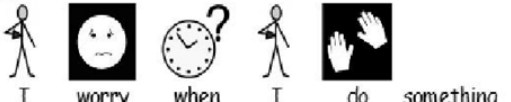
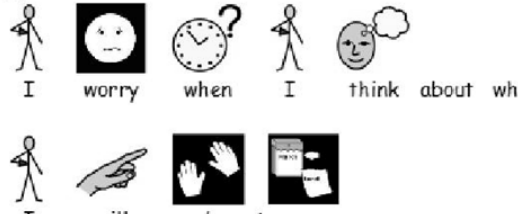
INSTRUCTIONS

I am going to read you sentences to find out **HOW YOU HAVE BEEN FEELING** since **LAST WEEK** (since _____ - replace with the corresponding day of the week). This is not an exam. There is no right or wrong answer, and everyone's answers will be different. After reading the sentence, I will ask you to tell me whether 'yes' or 'no' **YOU HAVE FELT THIS WAY** or **WHETHER YOU HAVE THOUGHT ABOUT IT** since _____. If you answer 'yes', you will have to tell me **HOW MANY TIMES YOU HAVE FELT THIS WAY** or **HAVE THOUGHT ABOUT IT** since _____. There are a few sentences that you may have trouble understanding. If you do not understand a sentence or a word in a sentence, tell me, 'I don't know what that means'. It's okay; I will try to explain it to you or find other words. After each sentence, you must **CROSS** or **TICK** the box that corresponds to **YOUR ANSWER**. You must **CROSS** or **TICK**: the **1st box** (show him/her the figure at the same time) if your answer is 'No, never'; the **2nd box** if your answer is 'Yes, rarely'; the **3rd box** if your answer is 'Yes, sometimes'; the **4th box** if your answer is 'Yes, often'; or the **5th box** if your answer is 'Yes, always'. I will explain to you the meaning of 'No, never'; 'Yes, rarely'; 'Yes, sometimes'; 'Yes, often'; and 'Yes, always'. Now, we will begin the questionnaire. I will read you the sentence slowly. Ask me if you would like me to repeat it.

Since _____

1.    I worry a lot. <table border="1"> <thead> <tr> <th>No</th> <th colspan="4">Yes</th> <th>Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No	Yes				Doesn't understand the statement							☐	☐	☐	☐	☐	☐	2.    I think about many things at the same time.  <table border="1"> <thead> <tr> <th>No</th> <th colspan="4">Yes</th> <th>Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No	Yes				Doesn't understand the statement							☐	☐	☐	☐	☐	☐
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3.    I worry a lot about my parents or family.  <table border="1"> <thead> <tr> <th>No</th> <th colspan="4">Yes</th> <th>Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No	Yes				Doesn't understand the statement							☐	☐	☐	☐	☐	☐	4.    I worry when I think about what will happen to me later.     <table border="1"> <thead> <tr> <th>No</th> <th colspan="4">Yes</th> <th>Doesn't understand the statement</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No	Yes				Doesn't understand the statement							☐	☐	☐	☐	☐	☐
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Since _____

5.  I am scared that something bad will  happen to me. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐	6.  I worry when I am unwell. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐
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7.  I worry when I do something  new. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐	8.  I worry when I think about what I will do tomorrow. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐
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9.  I can stop worrying when I  want to. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐	10.  I worry when I think about death. <table border="1"> <thead> <tr> <th colspan="2">No</th> <th colspan="4">Yes</th> <th rowspan="2">Doesn't understand the statement</th> </tr> <tr> <th>Never</th> <th>Rarely</th> <th>Sometimes</th> <th>Often</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>	No		Yes				Doesn't understand the statement	Never	Rarely	Sometimes	Often	Always	☐	☐	☐	☐	☐	☐	☐
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No		Yes				Doesn't understand the statement																																	
Never	Rarely	Sometimes	Often	Always																																			
☐	☐	☐	☐	☐	☐	☐																																	

Appendix K: ACU Research Ethics Approval



Human Research Ethics Committee Committee Approval Form

Principal Investigator/Supervisor: Professor Alex Morin, Professor Rhonda Craven, Dr Danielle Tracey
Co-Investigators: Associate Professor Christophe Maiano
Student Researcher: : N/A

Ethics approval has been granted for the following project:
 Furthering Positive Futures for Children with Intellectual Disabilities: A Longitudinal Investigation.
for the period: 29/04/2014 - 22/12/2018
Human Research Ethics Committee (HREC) Register Number: 2014 64N

Special Condition/s of Approval

Prior to commencement of your research, the following permissions are required to be submitted to the ACU HREC:
 N/A

The following standard conditions as stipulated in the *National Statement on Ethical Conduct in Research Involving Humans (2007)* apply:

- (i) that Principal Investigators / Supervisors provide, on the form supplied by the Human Research Ethics Committee, annual reports on matters such as:
 - security of records
 - compliance with approved consent procedures and documentation
 - compliance with special conditions, and
- (ii) that researchers report to the HREC immediately any matter that might affect the ethical acceptability of the protocol, such as:
 - proposed changes to the protocol
 - unforeseen circumstances or events
 - adverse effects on participants

The HREC will conduct an audit each year of all projects deemed to be of more than low risk. There will also be random audits of a sample of projects considered to be of negligible risk and low risk on all campuses each year.

Within one month of the conclusion of the project, researchers are required to complete a *Final Report Form* and submit it to the local Research Services Officer.

If the project continues for more than one year, researchers are required to complete an *Annual Progress Report Form* and submit it to the local Research Services Officer within one month of the anniversary date of the ethics approval.

K. Pashley

Signed: Date: 06/05/2014.....
 (Research Services Officer, McAuley Campus)