The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

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Abstract

Children with Attention-Deficit Hyperactivity Disorder (ADHD) often experience challenges in physical activity (PA) behaviours due to their poor movement performances (Harvey et al., 2007) that may also overlap with movement behaviour disorders, like Developmental Coordination Disorder (DCD; Sergeant, Piek, & Oosterlaan, 2006). The purpose of this pilot study was to investigate the PA experiences of boys with ADHD who had a range of movement difficulties. It explored the good and not so good PA days of six boys with ADHD to gain a broader understanding of PA experiences from each child's perspective. The convenience sample of six boys with ADHD, 7-12 years, was recruited from an ADHD clinic at a provincial mental health university institute in Ouebec, Canada. A sequential mixed-method research design was employed to understand the boys' PA experiences. First, two quantitative movement skill assessment tests, Movement Assessment Battery for Children-2 (MABC-2) and Test of Gross Motor Development-Second Edition (TGMD-2), were administered. The boys were categorized into two groups, based on the results from the MABC-2 test scores. Three boys were placed into the Amber/Red (A/R)-Zone group (i.e., "at risk" of having DCD or movement difficulties) and three boys were placed into the Green (G)-Zone group (i.e., no movement difficulties). The TGMD-2 scores showed that both groups demonstrated poor fundamental movement skills. This finding was expected for the A/R-Zone group but not for the G-Zone group. A new qualitative, visual research method, called the storybook-telling interview technique, was also created for this pilot study. The method enabled child-friendly, semi-structured PA interviews to be conducted with each participant. Within- and between-case analyses were performed during thematic analyses. Five themes emerged from the interview: Activity, Knowledge, Self-Awareness, Other People and Interview. Both groups shared similar experiences because they related positive feelings about performing specific movement skills and playing with family and friends during PA. A few differences were also present. The boys in the A/R-Zone group experienced asocial behaviours from their peers (e.g., exclusion) whereas the boys in the G-Zone group spoke about building rapport with peers during PA. This is the first qualitative study to concurrently explore the PA experiences of children with ADHD/DCD (e.g. A/R-Zone group) and ADHD (e.g., G-Zone group). It is hoped that this pilot study will lead to more research studies in this area to encourage all children with ADHD to lead a healthy and active lifestyle in the long term.

Résumé

Les enfants avec un trouble déficit de l'attention/hyperactivité (TDAH) font souvent face à des défis de comportement à l'activité physique (AP; Harvey et al. 2007) pouvant également interférer avec des difficultés de mouvement, comme des trouble d'acquisition de la coordination (TAC; Sergeant, Piek, & Oosterlaan, 2006). Le but de cette étude pilote était d'étudier les expériences d'AP des enfants avec TDAH qui ont différentes difficultés de mouvement. L'étude a exploré les bonnes et les moins bonnes journées d'AP de six garçons avec TDAH afin d'obtenir une compréhension plus large de leurs expériences d'AP de leur point de vue. Un échantillon de six garçons avec TDAH, de 7 à 12 ans, ont été recrutés d'une clinique de TDAH dans un institut universitaire provincial de santé mentale au Québec, Canada. Un plan de recherche mixte et séquentielle a été utilisé pour comprendre les expériences d'AP des enfants. Au début, deux batterie de tests quantitatifs qui mesurent les habilités liées à des mouvements spécifiques; Movement Assessment Battery for Children-2 (MABC-2) et Test of Gross Motor Developments-Second Edition (TGMD-2), ont été administrés. Les garçons ont été classés en deux groupes, en se basant sur des résultats des MABC-2 test: Amber/Red (A/R)-Zone (n = 3, «à risque» de TAC ou des difficultés de mouvement) et Green (G)-Zone (n = 3, pas de difficulté motrice). Les résultats TGMD-2 ont montré que les deux groupes avaient de pauvres habiletés fondamentales de mouvement. Ces résultats était prévisibles pour le groupe A/R-Zone, mais pas pour le groupe G-Zone. Une nouvelle méthode qualitative et visuelle, qui s'appelle « livre de contes », a également été créé pour cette étude. Cette technique amicale et semi-structurée a permis d'interviewer chaque participant sur leurs expériences. Dans le cadre de cette analyse de cas réalisées lors d'une analyse thématique, cinq thèmes sont ressortis de l'entrevue: activité, connaissance, conscience de soi, les autres et l'entrevue. Les deux groupes partageaient des expériences positives similaires en exécutant des activités de mouvement spécifiques, et en jouant avec leur famille et amis. Quelques différences étaient également présentes. Les garçons dans le groupe A/R-Zone ont connu des comportements sociaux négatifs envers d'autres enfants (ex., exclusion) alors que les garçons dans le groupe G-Zone ont parlé de renforcement de leur relation avec leurs compagnons. Cette étude est la première étude qualitative explorant les expériences d'AP des enfants atteints de TDAH/TAC (ex. A/R-Zone) et le TDAH (ex. G-Zone). Nous espérons que cette étude pilote conduira à d'autres études de recherche dans ce domaine afin d'encourager tous les enfants avec TDAH à mener un mode de vie sain et actif à long terme.

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Chapter 1

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurological behaviour disorder that affects approximately 5% of all school-aged children and youth in North America (American Psychiatric Association [APA], 2013; Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). Children with ADHD may display behaviours of inattention, hyperactivity and impulsivity that can interfere with daily functioning (APA, 2013). More males are diagnosed with ADHD, with the male to female ratio being 2:1 to 9:1 depending on the symptom (e.g., hyperactivity) and setting (e.g., clinic; Rucklidge, 2010). The children may experience challenges with physical activity (PA) due to poor movement skill performance, which in turn, may overlap with movement difficulties (Bart, Podoly, & Bar-Haim, 2010; Harvey & Reid, 2003; Harvey et al., 2009; Pitcher, Piek, & Hay, 2003). For example, 30-50% of children with ADHD may also have comorbid Developmental Coordination Disorder (DCD; Sergeant, Piek, & Oosterlaan, 2006). Hence, similar difficulties in movement skill performance have been found in children with ADHD, DCD and comorbid ADHD/DCD (Dewey, Cantell, & Crawford, 2007; Harvey et al., 2007; Kirk & Rhodes, 2011; Pitcher et al., 2003; Verret, Gardiner, & Beliveau, 2010). However, few research studies have examined the relationship between ADHD and DCD (Pearsall-Jones, Piek, & Levy, 2010b; Sergeant et al., 2006). The following sections briefly review pertinent background information on ADHD, DCD and relevant PA studies, which led to the current pilot study.

Background

Attention-Deficit/Hyperactivity Disorder. The APA (2013) identified three types of ADHD presentations: Predominantly Inattentive (ADHD-PI), Predominantly Hyperactivity/Impulsivity (ADHD-HI) and Combined (ADHD-C). Thus, individuals with ADHD are expected to display persistent age-inappropriate patterns of inattention (e.g., not focusing on demands), hyperactivity (e.g., constantly in motion) and impulsivity (e.g., acting without thinking) that interfere with daily functioning before 12 years. The functional consequences of ADHD may include reduced skill performance, attendance and social challenges in school (APA, 2013; Bejerot, Edgar, & Humble, 2011). Children with ADHD may also experience psychological challenges (Lee, Lahey, Owens, & Hinshaw, 2008), physical problems (Harvey & Reid, 2003; Holtkamp et al., 2004) and cognitive deficits (Barkley, 1997; Emck, Bosscher, Beek, & Doreleijers, 2009; Pastura, Mattos, & Araújo, 2009).

Developmental Coordination Disorder. Five to six percent of North American children, between 5-11 years, may be identified with DCD (Tsiotra et al., 2006; Wright & Sugden, 1996). Children with DCD present with motor difficulties, clumsiness, as well as failure to acquire gross and fine movement skills. However these difficulties are not usually due to identifiable neurological defects (Martin, Piek, Baynam, Levy, & Hay, 2010). The general learning abilities of the child may also be impaired and his or her level of participation in daily activities may be reduced (Summers, Larkin, & Dewey, 2008). Children and teenagers with DCD may also experience psychological (Cairney, Hay, Faught, Mandigo, & Flouris, 2005; Piek, Baynam, & Barrett, 2006), social (Dewey, Kaplan, Crawford, & Wilson, 2002), cognitive (Kirby, Sugden, & Edwards, 2010) and physical problems (Faught, Hay, Cairney, & Flouris, 2005: Fong et al., 2011).

PA Studies. Children require specialized and functional movement skills in order to participate in sports and other forms of PA. Fundamental movement skills (FMS), which include locomotion and object control skills, are necessary for PA and sport participation (Burton & Miller, 1998). Mature FMS patterns are usually achieved with appropriate practice, instruction, feedback and encouragement by the ages of 10-11-years (Ulrich, 2000; Lubans, Morgan, Clidd, Barnett, & Okely, 2010). However, some children with ADHD may have difficulties in FMS performance when compared to typically developing children (Emck, Bosscher, Wieringen, Doreleijers, & Beek, 2012; Harvey & Reid, 2005; Harvey et al., 2007; Verret et al., 2010). For example, Harvey et al. (2007) found that 22 children with ADHD, who were between 6-12 years, scored significantly lower in locomotor and object control skills tests when compared to 20 age-and gender-matched peers without ADHD. Thus, children with ADHD or DCD may also be at risk of developmental delays in movement skill performance and they may experience challenges during PA (Cairney et al., 2005; Cairney, Hay, Mandigo, Wade, Faught, & Flouris, 2007; Harvey & Reid, 2003; Kadesjö & Gillberg, 2001; Pitcher et al., 2003).

There have been few studies to explore why children with movement difficulties participate in less PA and have poorer physical fitness levels than children without these difficulties (Bouffard, Watkinson, Thompson, Causgrove Dunn, & Romanow, 1996; Harvey & Reid, 1997; Rivilis et al., 2011; Cairney, Hay, Veldhuizen, Missiuna, & Faught, 2009). For example, Harvey

et al. (2009) suggested that children with ADHD possessed superficial procedural (i.e., content) knowledge about PA. Harvey (2007) suggested the Activity-Deficit Hypothesis (i.e., Bouffard et al., 1996; Wall, McClements, Bouffard, Findlay, & Taylor, 1985) as a potential explanatory mechanism because poor movement skills and a low sense of motor competence may lead to a lack of PA participation opportunities and poor levels of physical fitness. The resultant lack of knowledge about action tasks may influence a person's ability to be active and healthy. However, few PA researchers have asked the children about their movement skill problems of children with ADHD (Harvey et al., 2009; Harvey, Wilkinson, Pressé, Joober, & Grizenko, 2014). For example, children with ADHD have not been given the opportunity to play an active role in PA research nor had the opportunity to sufficiently voice their PA needs (Harvey et al., 2009). Goodwin (2009) suggested that it is important to enable individuals with disabilities to speak about their experiences to better understand the factors that may influence their PA behaviours. Three qualitative investigations led to the creation of the current pilot study.

Goodwin and Watkinson (2000) explored the inclusive physical activity (IPA) experiences of nine children with physical disabilities (i.e., spinal bifida or cerebral palsy). They found two themes through focus group interviews and drawings: good days and bad days. Good days revealed feelings of belonging, valuing of skillful participation and sharing of PA benefits. Bad days revealed social isolation, restricted participation and questioning of physical selfcompetence. The authors concluded that there is a need to adapt PE pedagogy to attend to the children with disabilities' needs and interests.

Fitzpatrick and Watkinson (2003) explored the past experiences of 12 adults who were physically awkward (i.e., DCD) through semi-structured interviews. The authors found four themes: failing and falling, hurt and humiliation, worrying and wondering and avoiding awkwardness. They concluded that the adults experienced execution difficulties in sports skills (failing & falling), resulting in negative self-evaluation and fear of reactions of others (hurt & humiliation), which led to feelings of guilt and wonder (worry & wondering) and as a further result, they avoided awkward situations and were less active (avoiding awkwardness). They suggested that (a) professionals (e.g., teachers & coaches) should be aware of the potential emotional and social consequences and (b) an emphasis be placed on the importance of addressing the problem of physical awkwardness early.

Finally, Harvey et al. (2009) explored the PA experiences of 12 boys with and without ADHD through FMS assessments and semi-structured interviews. Three categories were formed: deliberate play, knowing about doing and personal feelings. They found the boys with ADHD, with FMS ranging from poor to average, reported different play preferences (e.g., greater preference & participation in individual activities) within the deliberate play category. Superficial procedural knowledge about movement skills was reported within knowing about doing (e.g., they did not use specific action terms or forgot them even though they reported that they knew them). Finally, the children with ADHD reported negative feelings (e.g., exclusion) during PA within the personal feeling category. It was concluded that boys with ADHD and without ADHD spoke about substantially different PA experiences and regulated their PA participation differently. There have been few, if any, qualitative studies that explored the PA experiences of children with ADHD who have a range of movement difficulties (DCD, no-DCD) to gain an indepth understanding of the relationship between ADHD and movement skill performance. It was deemed vital to hear the children's PA voices in this pilot study to better understand the factors that may influence their PA behaviours.

Central Research Question

This study was guided by the following central research question: What are the good and challenging PA experiences of children with ADHD who have a range of movement difficulties? **Significance of the Pilot Study**

There are three reasons why this pilot study is significant. First, despite the growing body of research about children with ADHD and movement skills (Emck et al., 2012; Harvey et al., 2007; Verret et al., 2010), the PA experiences of children with ADHD who have a range of movement difficulties (DCD, no-DCD) have not been studied. Second, there has also been a lack of qualitative and mixed-method PA research of children with ADHD and DCD. More research is clearly required. Third, the present research study extends on the findings of three qualitative research studies about children with ADHD by collecting both qualitative and quantitative data (Harvey et al. 2009, 2012, 2014). This pilot project explores the research methodology needed to fill the gap in the PA literature where few studies have provided a voice and sought out differing perspectives on the overlapping relationship between ADHD and DCD within the context of PA. These factors may serve as important points of understanding for researchers and PA

professionals to develop programs and strategies that encourage children with ADHD to pursue an active and healthy lifestyle.

Strengths

This pilot study followed a sequential mixed methods design and a multiple case study approach. The uses of quantitative and qualitative research methods were expected to broaden our understanding and ensure a high level of validity (Creswell, 2009; Johnson, Onwuegbuzie, & Turner, 2007). First, quantitative data were collected from two movement skills assessment tests and then qualitative data were collected from semi-structured interviews conducted with each child. Parent or guardian data were also collected with a parent checklist and information questionnaire. The FMS were assessed with a valid and reliable movement skill test, the *Test of Gross Motor Development-Second Edition* (TGMD-2; Ulrich, 2000). The pilot study is unique by implementing a new hybrid interview technique, called *storybook-telling interview technique*, which stimulated recall and reflection of PA experiences to provide rich and deep sources of data (Goodwin & Watkinson, 2000; Harvey et al., 2012.). Additionally, we are confident each participant received a reliable diagnosis of ADHD (Harvey & Reid, 2005) because all of the participants were patients of a specialized ADHD out-patient clinic at a local mental health institute.

Limitations

First, the sample size was small, but expected; given it was a pilot study that was designed to work out some of the methodological issues of this new storybook-telling approach. Second, there was a lack of control for some comorbid disorders since some children are likely to be diagnosed with other disorders (e.g., oppositional defiant, conduct, mood, anxiety disorders). Third, DCD is a rarely diagnosed disability since it is a "non-visual" disability and medical doctors in and around the Montreal area do not usually diagnose it. It was decided to use the term probable DCD and movement difficulties to label these children as other researchers have done in the past (Bouffard et al., 1996; Cairney et al., 2007). However, it should be noted that Harvey's past research studies have utilized samples of children with ADHD and other comorbid disorders because they represent a majority of the ADHD population (see Harvey & Reid, 2003, 2005). Finally, there was a lack of control for independent variables such as IQ, socioeconomic status, education levels of parents, etc. These factors are considered as limitations since the variables may affect movement skills and PA participation (Harvey & Reid, 2005).

Operational Definitions

Physical activity is "any bodily movement produced by skeletal muscles that require energy expenditure" (WHO, 2016). PA can take the form of structured/unstructured PA. Structured PA may involve physical education while unstructured PA may involve recreational PA in a park.

Movement skill is the level of proficiency in a specific class of goal-directed movement skill patterns. It can be used as a qualitative expression of movement performance. These FMS are usually categorized within developmental categories (Burton & Miller, 1998).

Motor skills will be used to imply an internal process in which there may be a relationship between movement skill and information processing (Burton & Miller, 1998).

Motor abilities are general characteristics that underlie the performance of an individual's movement skills. The term refers to someone's potential movement competencies instead of someone's actual movement performance. These characteristics are assumed not to be easily modifiable by experience and remain relatively stable across time (Burton & Miller, 1998).

Movement difficulties signify "children without neuromuscular difficulties who fail to perform normative motor skills with acceptable proficiency" (Wall, 1982).

Probable DCD will be used to describe children who score at or below the 5th percentile on the *Movement Assessment Battery for Children-2* (MABC-2; Henderson, Sugden, & Barnett, 2007). Other researchers have used this term because DCD is not commonly diagnosed by medical doctors (Cairney et al., 2005, 2007).

Chapter 2 Literature Review

Introduction

The purpose of this pilot study was to investigate the PA experiences of children with ADHD who have a range of movement difficulties. This chapter explores the history, prevalence, etiology, symptomatology, assessment, comorbidity, functional consequences and treatment of ADHD and DCD to provide the reader with a general background on both neurodevelopmental disorders. It also examines how PA plays a role in ADHD and DCD. More specifically, movement skills and motor abilities in individuals with ADHD will be explored and possible PA facilitators and barriers for children with ADHD or DCD will be discussed. Finally, the new qualitative research method used in this pilot study will be discussed.

Attention-Deficit/Hyperactivity Disorder

History. Descriptions of attention disorders have been recorded since 1775 (Barkley & Peters, 2012). In 1902, English physician George Still, sparked clinical interest in children who exhibited hallmark behaviours such as aggression, inattention and impulsivity. These behaviours were hypothesized to be more apparent with a North American encephalitis epidemic in 1917-1918. As a result, clinicians believed that the hallmark behaviours were related to brain-injury (Barkley, 1997). During the 1940's and 1950's, the behavioural symptoms were referred to as "minimal brain damage" and "minimal brain dysfunction," both referred to a nonspecific deficit in brain function (Frick & Nigg, 2012). The term "hyperactive child syndrome" was created in the 1950's and 1960's, since the symptoms were no longer associated with brain damage (APA, 1968: Barkley, 1997). With growing knowledge, hyperactivity and impulse control became the central symptoms and they played a role in renaming the disorder to attention deficit disorder in the 1980's (APA, 1987; Barkley, 1997). Today, ADHD is defined as a neurodevelopmental behaviour disorder where individuals display behaviours of inattention, hyperactivity and impulsivity that interfere with daily functioning (APA, 2013).

Prevalence. ADHD is a common neurodevelopmental disorder in children, adolescents and adults (Biederman, Petty, Evans, Small, & Faraone, 2010). The worldwide prevalence rate is 5.29% in children and youth (Polanczyk, de Lima, Horta, Biederman, & Rhode, 2007). The ADHD prevalence is estimated to be 5% of school-aged children in North America (APA, 2013). The prevalence rate of elementary-age school children with ADHD ranged from 3.8% to 9.8% in

Quebec (Breton et al., 1999). Prevalence differences have been found between males and females. More males are diagnosed with ADHD and the range of male to female ratio is calculated to be 3:1 to 9:1 depending on the setting (e.g., general population or clinical setting respectively). Boys are more likely to display outward defiance and aggressive behaviours while girls present behaviours that are harder to notice such inattention and daydreaming. Thus, more boys are referred to a psychiatrist for testing and then diagnosed compared to girls (Polanczyk & Rohde, 2007; Rucklidge, 2010).

Etiology. Currently, there is agreement that ADHD is a multidimensional disorder in which neurological, genetic and psychosocial causal factors interact within a person and his/her environment (Coghill, Nigg, Rothenberger, Sonuga-Barke, & Tannock, 2005). Neuroimaging, brain and cognitive interaction as well as family and genetic studies of neuropsychological functions have shown various associations to ADHD (Tannock, 1998). For example, neuroimaging research suggests that atypical frontostriatal pathways and subtle anomalies of brain anatomy (e.g., frontal cortical regions) provide evidence for cognitive impairments (Coghill et al., 2005; Dickstein, Bannon, Castellanos, & Milham, 2006). Genetic studies have demonstrated the family association and heritability of ADHD (Faraone et al., 2005). Biological and environment interactions may also be an important etiological consideration (Dopheide & Pliszka, 2009). For example, prenatal exposure to nicotine (Kahn, Khoury, Nicholas, & Lanphear, 2003), low social class, severe marital conflict, maternal mental disorder and paternal criminality (Biederman et al., 1995; Grizenko, Shayan, Polotshaia, Ter-Stepanian, & Joober, 2008; Laucht et al., 2007) were positively associated to the development of ADHD.

Symptomatology. Individuals diagnosed with this multidimensional disorder may display persistent inappropriate age-related behavioural patterns of attention (e.g., not focusing on demands), hyperactivity (e.g., constantly in motion) and impulsivity (e.g., acting without thinking) that ultimately interfere with daily functions or development (APA, 2013). There are three types of ADHD presentations: Predominantly Inattentive (ADHD-PI), Predominantly Hyperactivity/Impulsivity (ADHD-HI) and Combined (ADHD-C; APA, 2013). Six or more of the behavioural symptoms must persist consistently for at least six months before 12 years of age. The behaviours are usually present in two or more settings, such as at home and at school, and may reduce school and occupation performance as well as interfere with social interactions. The behavioural symptoms must not be present during schizophrenic or psychotic episodes and are

not better explained by another mental disorder (e.g., mood disorder, anxiety disorder, etc.). Finally, children with ADHD experience persistent symptoms and functional impairments into early adulthood (Biederman et al., 2010). Their symptoms may also change over time (i.e. outgrow hyperactivity but show behaviours of inattention instead; APA, 2013).

Assessment. Medical and psychiatric evaluations are conducted, using multiple types of assessments, to establish a diagnosis. Interviews and rating scales from parents, children or adolescents and behaviour observations are used during assessments (Action, 2007). The interviews may be either structured diagnostic interviews (e.g., *Diagnostic Interview Schedule for Children, 4th edition, DISC-IV* [Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000]) or semi-structured interviews (e.g., *Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Present and Lifetime Version*, KSADS-PL [Kaufman, Birmaher, Brent, Ryan, & Rao, 2000]). A popular rating scale is the *Swanson, Nolan and Pelham, IV* (SNAP-IV) screening instrument (Swanson et al., 2001). While no single ADHD assessment is more effective than another, the DISC-IV is considered the *gold standard* based on its psychometric properties (Shemmassian & Lee, 2012). Finally, multiple types of assessments by parents, teachers and children are necessary for a complete understanding of a child with ADHD since measures are dependent on the environment. Parent ratings of ADHD are superior for identifying global impairment and teacher ratings accurately identify peer relationships due to the greater opportunity to observe children's peer interactions (Shemmassian & Lee, 2012).

Comorbidity. ADHD may not be a *pure* disorder since many individuals have also been diagnosed with a comorbid disorder. The term *comorbidity* refers to overlapping of two or more disorders that present at a greater rate than by chance alone (Mash & Wolf, 2012). Approximately 87% of children with ADHD have one or more comorbid disorders and 67% have at least two comorbid disorders (Kadesjö & Gillberg, 2001). These include externalizing and internalizing disorders. Oppositional Defiant Disorder (e.g. not doing what adults tell them) and Conduct Disorders (e.g. rule-breaking) are examples of externalizing disorders whereas mood and anxiety disturbances are examples of internalizing disorders (APA, 2013; Jensen et al., 2001). Frick & Nigg (2012) suggested the hyperactivity-impulsivity dimension may overlap more with externalizing disorders.

Functional Consequences. Functional consequences of ADHD may include social, psychological, academic and physical fitness challenges (Bejerot et al., 2011; Harvey & Reid, 2003; Lee et al., 2008; Roberts, Martel, & Nigg, 2013). First, social relationships are impaired when children with ADHD are poorly accepted (Hoza et al., 2005). Mrug et al. (2007) studied the relationship between specific behaviours of children with ADHD and peer functioning during an intensive summer treatment program. Prior to the program, ratings showed that peers disliked the children with ADHD when they had difficulties following rules, paying attention and following directions. In addition, children with ADHD teased, interrupted others, whined, lied more often, did not share and were more aggressive. Second, children, rejected by peers, reported that they feel more depressed, lonely and dissatisfied (Boivin, Poulin, & Vitaro, 1994; McQuade et al., 2012). Gudjonsson et al. (2009) found that mood instability may be associated with ADHD. For example, individuals with ADHD may get irritated or change moods easily. Long-term emotional pain, damaged self-esteem and disrupted relationships were also reported for children with ADHD (Biederman et al., 2010).

Next, academic performance, even when controlling for comorbid learning disorders, may be impaired in individuals with ADHD (APA, 2013). For example, Pastura et al. (2009) found students with ADHD, specifically ADHD-PI, performed poorly in mathematics and language tasks. People with ADHD may also experience executive functioning deficits (e.g., working memory, self-regulation, internalization of speech and reconstitution) that are, in turn, hypothetically linked to behavioural inhibition and control by allowing goal-directed actions and tasks to persist through internally represented information and self-directed actions (Barkley, 1997, 2007). It is believed that individuals with ADHD have a disrupted executive functioning because their inhibition of behaviours is poor (Barkley, 1997; Shaw et al., 2007). Finally, a review by Harvey and Reid (2003) found differences in physical fitness indicators to be associated with ADHD: greater resting heart rate, increased body fat, reduced flexibility and strength and lower aerobic capacity. The authors noted that there was a lack of research on physical fitness in children with ADHD. Moreover, the studies reviewed had relatively small sample sizes and broad age ranges, which may contribute to inconsistency in study findings. Nevertheless, Harvey and Reid (2003) suggested children with ADHD may be at risk of poor physical fitness. Further, Cortese et al. (2015), in a recent meta-analysis, suggested that there is a significant association between ADHD and being obese or overweight.

Treatment. Stimulant medications (SM), behaviour therapy (BT) and combined therapy (CT; more than one type of treatment) have been used to help individuals with ADHD overcome their daily challenges (Greenhill et al., 2002; Chronis, Jones, & Raggi, 2006; MTA Corporative Group, 1999). Methylphenidate (i.e., Ritalin), dextroamphetamine, mixed-salts amphetamine and pemoline (PEM) are examples of SM that are available for clinical use (Greenhill et al., 2002). These SM alter the activity in the prefrontal cortex, which plays a role in executive functioning, by compensating for a dopamine deficit (Greenhill et al., 2002; Barkley, 1997). The SM binds to the dopamine transporter and increases the synaptic dopamine. Stimulants are the most effective short-term treatment for individuals with ADHD (Rosch et al., 2015). The beneficial effects may include the improvement of ADHD symptoms, the enhancement of attention and improvement of deficits in response inhibition (Greenhill et al., 2002). They may also be temporary or decrease when the medication is stopped and may not help everyone (Barkley, 2006; Greenhill et al., 2002; Pelham et al., 2000). Lastly, the side effects of SM include weight loss, decreased appetite, sleep problems, headache and stomachache (Dopheide & Pliszka, 2009).

Parent training (e.g., teaching techniques to help manage disruptive behaviours), classroom management (e.g., teachers utilize a reward program), peer intervention (e.g., social skill training implemented) and summer treatment programs are examples of BT (Miranda, Jarque, & Tarraga, 2006). For example, summer treatment programs for medicated children with ADHD show improvement in ADHD symptoms, peer relationships, self-esteem, rule following and good sportsmanship (Hantson et al., 2012; Pelham et al., 2000). Additional treatments include family counseling, support groups and individual counseling (Smith, Barkley, & Shapiro, 2006). Cognitive-behavioural techniques have been used during counseling and symptom improvement for ADHD have been reported (Sprich, Burbridge, Lerner, & Safren, 2015). The most effective short-term treatment for children with ADHD, to-date, was a large multimodal clinical trial intervention that included concurrent medication with parent training and intensive interventions (MTA Corporative Group, 1999).

Developmental Coordination Disorder

History. DCD has been described with various terms across different disciplines and different theoretical frameworks. At the beginning of the 20th century, studies identified the motor abilities of these children and described them along a continuum from "very clever" to "very awkward" where the focus was on intellect and motor ability (Bagley, 1901). In 1940s, the term

"developmental apraxia" or "abnormal clumsiness" was used (Orton, 1937). Later, the terms "minimal cerebral dysfunction", minimal brain dysfunction and "minimal cerebral palsy" were denoted by minor brain damage that caused motor coordination or planning difficulties. Pediatric neurologists, neuropsychologists and therapists used this nomenclature (Cermak & Larkin, 2002). Adapted PA researchers used terms, such as "physically awkward" and "movement difficulties," to describe the behaviours (Wall, 1982). Multiple terms and vague definitions have led to an inconsistency in identification among researchers and clinicians, making it difficult to compare groups of children across different settings. As a result, in 1994, the term DCD was endorsed and is still present in the DSM today (Blank, Smits-Engelsman, Polatajko, & Wilson, 2011; APA, 2013). DCD is a neurodevelopmental motor disorder and is characterized by motor difficulties, clumsiness and failure to acquire gross and fine movement skills (APA, 2013).

Prevalence. Various prevalence rates have been found among children who have movement difficulties (e.g. probable DCD). According to the DSM-V, DCD prevalence is suggested to be 5-6% for North American children from 5 to 11 years (APA, 2013). Other studies have reported 8% and 13% rates for Canadian and Greek children respectively (Tsiotra et al., 2006). Based on a UK population study of 6,990 children, 7-8 years, the prevalence rate of DCD was 1.8% and probable DCD prevalence rate was 4.9% (Lingam et al., 2009). The range of prevalence rates may be due to different cultures, assessments, cut-offs and criteria being used to identify probable DCD (Lingam et al., 2009; Tsiotra et al., 2006). Finally, the current suggested male to female ratio in individuals with DCD is between 2:1 and 7:1. This ratio range is likely dependent on gender, assessment test used and test bias (Pearsall-Jones, Piek, & Levy, 2010a).

Etiology. Finding the cause(s) for DCD has been challenging due to its diversity (Barnhart, Davenport, Epps, & Nordquist, 2003). It is currently believed that DCD originates from abnormalities in *soft signals* in the brain (i.e., minor neurological dysfunction; Blank et al., 2011). Abnormalities can be a product of a combination of one or more impairments in motor programming, timing, proprioception or sequencing of muscle activity (Barnhart et al., 2003). Various abnormalities have been found in neuroimaging, behavioural, genetic and environmental studies (Fallang, Saugstad, GrØgaard, & Hadders-Algra, 2003; Pearsall-Jones et al., 2008; Zwicker, Missiuna, & Boyd, 2009). A review article on neural correlates of DCD suggested possible sites of neuropathology: cerebellum, parietal lobe, corpus callosum or basal ganglia. The authors concluded that most of the studies suggest that the cerebellum and/or its network of

connections is involved in DCD. Most of the reported studies were behavioural investigation (e.g., motor adaptation test) and only two neuroimaging studies were reported in the review. Neuroimaging studies are important to confirm the neural correlates of DCD and compare the morphological difference in the children's brains. Therefore, they suggested that more neuroimaging and behavioural investigations of learning-related changes studies are needed (Zwicker et al., 2009). Next, a monozygotic twin study on individuals with DCD suggested environment influences individual's with DCD due to the greater prevalence of pre- and perinatal oxygen perfusion complications in DCD twins (Pearsall-Jones et al., 2008). Other factors, such as preterm birth and low birth weight, were associated with poor motor control and DCD regardless of minor neurological dysfunction reflected in brain scans (Fallang et al., 2003).

Further, the overlap of DCD with ADHD suggests a shared etiology of atypical brain development (Pearsall-Jones et al., 2010b). There are currently two theories that guide the comorbidity phenomena: Atypical Brain Development (ABD) hypothesis and Deficits in Attention Motor Control and Perception (DAMP; Visser, 2003). The ABD hypothesis suggested that brain dysfunctions underlying the deficits, such as ADHD and DCD, are diffuse and not localized (Kaplan, Wilson, Dewey, & Crawford, 1998). The DAMP hypothesis, stemming from the terminology minimal brain damage, suggested a strong relationship between attention problems, DCD and perceptual disorders (Kadesjö, B., & Gillberg, 1998). Kadesjö and Gillberg (1998) suggest that a generalized disorder, like ADHD, underlies DAMP. The authors also argued that, instead of studying discrete disorders, the combination of symptoms should be studied. Note there has been little neuroimaging evidence in the field of DAMP and no causal links were established (Gillberg, 2003; Visser, 2003). Goulardins et al. (2015) found little evidence supporting shared etiology because some studies with well-defined samples have suggested that ADHD and DCD have a non-shared etiology. Therefore, the authors concluded that ADHD and DCD are separate disorders. In conclusion, DCD may fall on a continuum of movement disorders and not as a discrete category (Pearsall-Jones et al., 2010a). However, extensive research is still needed to understand the underlying relationship between DCD and ADHD, with the etiology of DCD still unclear.

Symptomatology. DCD, a heterogeneous disorder with unknown etiology, has four diagnostic criteria. The first criterion, outlines motor difficulties present in the individual that may manifest as clumsiness (e.g., dropping or bumping into objects & running awkwardly) and

can cause difficulty in the acquisition and execution of basic motor abilities (e.g., difficulty imitating body positions & using scissors inaccurately or slowly; APA, 2013). The second criterion is met if these difficulties interfere with activities of daily life, such as academic achievement, leisure and self-care, appropriate to chronological age (APA, 2013). The third criterion, defines the onset of symptoms being at an early developmental period. However, DCD is not commonly diagnosed before the age of five due to variations in motor skill acquisition rates (APA, 2013). The last criterion is met if the motor difficulties cannot be explained by other disabilities, such as cerebral palsy, hemiplegia or muscular dystrophy. If intellectual disability is present and the motor difficulties are greater compared to mental age, then no discrepancy criterion is specified (APA, 2013). According to the DSM-V, DCD does not have distinct subtypes, however, individuals may be impaired to varying degrees (APA, 2013; Macnab, Miller, & Polatajko, 2001). Finally, children with DCD are not expected to grow out of clumsiness since DCD is a long-term disorder (Cantell, Smyth, & Ahonen, 2003), with motor impairments varying with age (APA, 2013).

Assessment. Several forms of assessment are used to evaluate if the child meets the DCD diagnostic criteria. There is currently no gold standard to assess DCD. Therapists, psychiatrists and doctors use development history, questionnaires and performance tests to establish the diagnosis of the child (Gabbard, 2012). According to Rivilis et al. (2011) there are two types of assessments, performance and questionnaires. Performance assessments are conducted with standardized tests including the MABC-2 (Henderson et al., 2007), Bruininks-Oseretsky Test of Motor Proficiency-Second Edition (BOTMP-2; Bruininks & Bruininks, 2005) and McCarron Assessment of Neuromuscular Development (MAND; McCarron, 1997). The Developmental Coordination Disorder Questionnaire (DCDQ; Wilson et al., 2009), completed by the parents, is one of the questionnaires used in DCD assessment. During clinical assessment, a history is taken from the parents', teachers' and child's reports and clinical examinations. This protocol ensures no presence of medical conditions that may impair motor ability (Blank et al., 2011). It is often difficult to compare findings among research studies due to differences in types of assessments performed which leads to a lack of stability in the conclusions (Spironello, Hay, Missiuna, Faught, & Cairney, 2009). Other problems may include learning effects when a test is repeated, cultural differences were certain skills are valued over others and subjective judgments from teachers and parents. Hence, multiple assessments completed by multiple people are

recommended (Blank et al., 2011). Finally, it is important to note that medical doctors do not commonly diagnose DCD.

Comorbidity. A child with DCD may be diagnosed with a comorbid disorder since pure DCD is rare. Several comorbid relationships exist between DCD and other disorders, such as ADHD and LD, though estimates of overlap vary. Kaplan et al. (1998) reported that 16% of children are pure DCD cases, 12.4% of children with DCD meet criteria for ADHD, 27.2% of children with DCD meet criteria for Reading Disability (RD) and 28.4% of children with DCD meet criteria for both ADHD and RD. The authors concluded that this reflects underlying ABD and there are semi-random clusters of symptoms that may be related to motor, attention and learning. For example, Sergeant et al. (2006) reported a 30-50% comorbid relationship between ADHD and DCD while Kadesjö and Gillberg (2001) reported a 50% overlap. Furthermore, it has been suggest that DCD, in severe or moderate forms, may occur at similar high rates in both severe and moderate forms of ADHD. Pattern of overlap may depend on ADHD subtypes and comorbid disorders may serve as a measure of severity (Gillberg, 2003).

Functional Consequences. Individuals with DCD may also experience social, psychological, cognitive and physical fitness challenges (Cairney et al., 2007; Lingam et al., 2010; Rivilis et al., 2011; Tseng, Howe, Chuang, & Hsieh, 2007). First, clumsy children are likely to be less socially accepted among peers due to social problems. They may act like the "class clown" to gain recognition or are more introverted than peers without probable DCD (Schoemaker & Kalverboer, 1994; Tseng et al., 2007). For example, children with DCD and suspected DCD were reported to have more internalizing and social problems (e.g., does not get along with other children) than children without DCD (Tseng et al., 2007). Second, children with DCD may feel incompetent, depressed, frustrated or anxious (Cairney et al., 2005, 2007).

Third, some school-age children with DCD showed poorer outcomes in scholastic achievements (Cantell et al., 2003). In their population-based cohort study, Lingam et al. (2010) found significant differences between children with probable DCD and control subjects in a spelling and reading task. DCD is also found to be associated with deficits in both visuospatial short-term and working memory (e.g., problems storing, manipulating relevant visual, special information in mind; Alloway, Rajendran, & Archibald, 2009). Additionally, the combination of ADHD and DCD was significantly associated with poor social functioning, high levels of depressive symptoms and low academic performance: both currently and later in life (Rasmussen & Gillberg, 2000; Green, Baird, & Sugden, 2006).

Finally, research has reported that children with DCD have poor physical fitness and may be at risk of obesity and cardiovascular disease (Faught et al., 2005; Fong et al., 2011). More specifically, Rivilis et al.'s (2011) systematic review of 40 studies on physical fitness and PA noted that children with DCD have poor body mass composition, low cardiorespiratory fitness, poor muscle strength and endurance, low anaerobic capacity and power in PA. The authors concluded that PA outcomes are negatively affected by poor motor proficiency.

Treatment. Therapeutic approaches in occupational therapy and physical therapy have been used to help individuals with DCD. The bottom-up and top-down approaches are therapeutic treatments based on current etiology (Barnhart et al., 2003). The bottom-up approach focuses on correcting underlying deficits through activation of neuronal functioning (e.g., Sensory Integration Therapy; Barnhart et al., 2003; Blank et al., 2011). The top-down approach focuses on cognitive tasks, problem-solving skills and skill practice required in order to successfully perform the task, by engaging the child (e.g., Cognitive-Orientation to Occupational Performance; Blank et al., 2011). While individualized approaches have been effective, collaborative interventions where others (e.g., parents & teachers) are involved have been beneficial (Sugden & Chambers, 2003). Movement skill interventions that involve top-down approaches, child-initiated learning, school or home-based approach and practice have been suggested to be effective for children with probable DCD (Pless & Carlsson, 2000). Kirk and Rhodes (2011) reviewed a total of 11 studies on motor skill interventions for preschoolers with developmental delays. They suggested the school setting was the most favorable location and approaches that focused on child-initiated learning, produced the most significant improvements in movement skills. Finally, Poulsen and Ziviani (2004) stated that applying a holistic view of the child promoted success.

PA, ADHD and DCD

Participation in a variety of everyday activities, such as PA, is important to children's development and may influence health, quality of life and future health outcomes (WHO, 2016). PA is any bodily movement produced by skeletal muscle resulting in energy expenditure (WHO, 2016). For children, PA participation can take the form of structured (i.e., formal) or unstructured activity (i.e., informal). Structured or organized activities in children can include physical education (PE) classes whereas unstructured or free time activities can be recreational activities

played during recess (Cairney et al., 2005; Bouffard et al., 1996).

PA has repeatedly been shown to be associated with numerous physical, mental and social benefits (Atlantis, Barnes, Fiatarone, & Singh, 2006; Breslin et al., 2012). More specifically, children with ADHD have been shown to benefit from PA. Individual wellbeing may be improved (Gawrilow, Stadler, Langguth, Naumann, & Boeck, 2013) as well as inhibition responses, attention and social interactions (Barnard-Brak, Davis, Sulak, & Brak, 2011; Gawrilow et al., 2013; Verret, Guay, Berthiaume, Gardiner, & Beliveau, 2012). Improvements in cognitive performance and movement skills have also been found (Gapin & Etnier, 2010; Varret et al., 2012). Generally, children with disabilities do not participate often in PA (Shields, Synnot, & Kearns, 2015; Woodmansee, Hahne, Imms & Shields, 2016). More specifically, boys with ADHD were found to spend less time in daily PA than boys without ADHD (Harvey et al., 2009).

Movement Skills and Motor Abilities. An individual's physical body needs to move in order to participate in PA and gain the related benefits. The term, "movement skills", is used when specific changes in the position of any part of the body are goal-directed and observed externally (Burton & Miller, 1998). Movement skill is the level of proficiency in a specific class of goal-directed movement pattern and can be used as a qualitative expression of movement performance (e.g., kicking or running). The term, "motor abilities" is used to describe an internal process in which there is an implied relationship between motor skill and information processing. Motor abilities are general characteristics (e.g., balance or hand-eye coordination) that underlie the performance of an individual's motor skills (Burton & Miller, 1998).

FMS, such as locomotion and object control skills, form a movement skill class categorized within a developmental category (Burton & Miller, 1998). FMS emerge between ages one and seven and the mature form of FMS are usually achieved by 10-to-11-year-olds with appropriate practice, encouragement, feedback and instruction (Burton & Miller, 1998; Lubans et al., 2010). Children who do not receive sufficient instructions and practice may demonstrate poorer skills (Goodway & Branta, 2003; Kirk & Rhodes, 2011). FMS are essential to participate in PA and sports that require specialized and functional movement skills. Moreover, research has shown significant positive associations between FMS and PA participation in youth (Lubans et al., 2010). FMS may only predict a small portion of PA participation (Okely, Booth, & Patterson,

2001). Consequently, social and psychological factors are also important to explore (Harvey et al., 2009; Poulsen, Ziviani, Johnson, & Cuskelly, 2008).

Movement Skills and Motor Abilities in ADHD. Many people may have believed that individuals with ADHD are competent in movement skills due to their overactivity (Harvey & Reid, 1997). However, according to Harvey and Reid's (2003) review article on PA studies from 1949 to 2002, ADHD was associated with poor movement skills and motor abilities. Movement skills studies found that FMS were significantly lower for individuals with ADHD when compared to individuals without ADHD. Research has also found poor fine motor coordination and impaired timing and accuracy when visual motor performance and finger tapping were assessed (Harvey & Reid, 2003). In the following section, movement differences between children with and without ADHD (intergroup), medication effects on performance as well as motor abilities in children with ADHD/DCD and between type of ADHD presentations will be discussed (intragroup).

Intergroup. Recent research has continued to show that many children with ADHD experience movement skill and motor ability difficulties (Harvey et al., 2007; Neto, Goulardins, Rigoli, Piek, & Oliveira, 2015; Verret et al., 2010). FMS studies have found skill differences between children with ADHD and their peers without ADHD (Harvey et al., 2009; Pan, Tsai, & Chu, 2009). For example, Harvey et al. (2007) compared FMS of 22 children with ADHD to 22 age-and gender-matched peers without ADHD using the TGMD-2 (Ulrich, 2000). Children with ADHD, 6-12 years, scored significantly lower in the FMS criteria of the locomotor and object control skills compared to their peers without ADHD. The authors concluded that children with ADHD might be at risk for developmental delays in FMS performance. Another study by Verret et al. (2010), with a larger sample size (n = 70), compared FMS among three groups (control [n = 27], with ADHD on medication [n = 24] and with ADHD off medication [n = 19]) using the TGMD-2. The authors found that children with ADHD both on and off medication, 7-12 years, performed significantly lower in locomotor skills compared to the control group.

Medication. Some studies have explored medication effects on movement and motor skills in children with ADHD. Stimulant medication may enhance the functioning of attention and improve deficits in response inhibition (Greenhill et al., 2002). While limited research into the effects of stimulant medication on movement skills exists, Harvey et al. (2007) hypothesized that TGMD-2 scores would be significantly higher for children with ADHD when they were on

medication than when they were not on medication. A two-week, double-blind, placebocontrolled, crossover, randomized research design was used to observe the effects of medication on FMS performance and no significant effect of medication on movement skill patterns was found. Despite the small sample size, the medication was well controlled for. Another study has found similar results, however, without controlling for the effects of stimulant medications (Verret et al., 2010).

In related research, Brossard-Racine et al. (2012) explored the effects of three-month use of stimulant medication for 49 newly diagnosed children with ADHD with or without movement difficulties at baseline. The MABC was used to measure manual dexterity, ball skills and balance. The authors found that motor ability scores improved for some of the children. However, some children still performed poorly (55.1%) after three months, suggesting that other factors may influence movement problems. Note that Brossard-Racine et al. (2012) also did not include a control group (e.g., without medication) to take into account the effects of medication or maturation. However, this study's findings supported previous results; even when behaviour is treated with medication, movement difficulties are still present in children with ADHD (Harvey et al., 2007; Verret et al., 2010).

Intragroup. Some research shows that children with ADHD and comorbid DCD (ADHD/DCD) perform poorly in motor skills when compared to peers without disabilities (Goulardins et al., 2015). For instance, Dewey et al. (2007) examined the motor and gestural skills of children with Autism Spectrum Disorder (n = 49), DCD (n = 46), DCD/ADHD (n = 38), ADHD (n = 27) and no disability (n = 78). The motor abilities were assessed with the BOTMP-SF test and the gestural skills were tested with the Gestures Test. The BOTMP-SF measures motor proficiency, such as static and dynamic balance, reaction time and bilateral coordination (Bruininks, 1978). Children with DCD and ADHD/DCD demonstrated significantly lower scores than children with no developmental problems or ADHD only. In addition, there were no significant gender differences. Findings in which children with ADHD/DCD performed lower in movement skill performance have been found previously. For example, Pitcher et al. (2003) found boys with ADHD/DCD had slower reaction times and higher force output (i.e., timing and force dysfunction) compared to an ADHD group on a finger tapping motor skill task. Pitcher et al. (2003) also found children with ADHD/DCD performed poorly all the fine motor tests of the Purdue Pegboard compared to children with ADHD only. Moreover, motor ability differences

have been found between children with different ADHD sub-types/presentations (Piek, Pitcher, & Hay, 1999). Pitcher et al. (2003) found that boys with ADHD-HI did not differ from the control group in their motor skills score. Their scores also showed that boys with ADHD-PI and ADHD-C had poorer fine motor abilities (i.e., lower manual dexterity & ball skills) than the control group.

There are a few studies that measured gross and fine motor skill performance within clearly defined groups of children with and without ADHD (e.g., Emck et al., 2009). Hence, there are methodological issues to take into account when synthesizing the research knowledge. For example, different sample sizes were used in each study, with mostly small samples, which would influence the power of the significant group differences found. Inclusion criteria (i.e., gender, age, diagnostic criteria) and movement tests (MABC and Purdue Pegboard test) were also different for each study, further illustrating poor consistency and validity among the motor ability studies (Piek et al., 1999; Pitcher et al., 2003).

In conclusion, the myth that children with ADHD do not face PA difficulties is still being dispelled. Further, children with ADHD may experience PA challenges, such as failing in PE and sports (Harvey & Reid, 2003), due to movement skill and motor ability difficulties (Harvey et al., 2007; Pitcher et al., 2003). Poor motor abilities and movement skills in children with ADHD may result from dysregulated, dysfunctional or delayed neural mechanisms (Brossard-Racine, Majnemer, & Shevell, 2011) similar to those in children with DCD. Furthermore, the PA challenges may be a result of lack of practice and insufficient skill learning (i.e., lack of experience; Buffard et al., 1996). Thus, studies should be conducted to explore FMS, motor abilities and PA experiences that may overlap between ADHD and DCD.

Possible Influential Factors for PA Participation of Children with ADHD or DCD

Movement skill difficulties may not only influence the children's PA experiences but also PA participation. Various theories have been developed to understand how children with and without DCD participate in PA (Wall, 2004; Wall et al., 1985). Harvey and Reid (2003, 2005) suggested that future PA researchers should use theoretical models to perform research for children with ADHD. For instance, they recommended the use of Activity-Deficit Hypothesis (Bouffard et al. 1996) and Knowledge-Based Approach (Wall et al., 1985) to help explore the movement behaviour in children with ADHD (Harvey & Reid, 2003, 2005).

Activity-Deficit Hypothesis. Bouffard et al. (1996) proposed the Activity-Deficit

Hypothesis to suggest that children with movement difficulties find it challenging to participate in PA because of a lack of opportunities to practice and learn movement skills, which may lead to low perceived motor competence and motivation, in turn, to poor levels of physical fitness. A vicious cycle of poor performance would continue over time. Wall (2004) then proposed the Developmental Skill-Learning Gap Hypothesis. It suggested that this vicious cycle of poor performance may widen the gap in skill performance for children with movement difficulties in comparison to their peers without disabilities (Wall, 2004). For example, Cairney et al.'s (2009) study explored the participation trajectories of children with probable DCD and found that the children participated less in free-play activities over time than children without probable DCD. The Activity-Deficit Hypothesis (Bouffard et al. 1996; Wall, 1982; Wall et al., 1985) and Knowledge-Based Approach (Wall et al., 1985) provide the basis to Wall's hypothesis. Both of these theories are important to help understand the children's movement behaviours because they may be an explanation for the movement skill difficulties of children with ADHD (Harvey & Reid, 2003, 2005). Further, by understanding their movement behaviours, it may help fill the gap in the PA literature for children with ADHD and DCD.

The Activity-Deficit Hypothesis suggests that children with movement difficulties spend less time being active and are less vigorously active than their peers without movement difficulties from a similar cultural and sociocultural background. This behaviour often makes it even more challenging for the children to acquire the very expertise they need to participate in PA. As a result, their social interactions, levels of PA and physical fitness and health may decrease (Bar-Or, 1983; Wall, 1982). For example, Bouffard et al. (1996) found children with movement difficulties excluded themselves from social interactions, spent less time on playground apparatus and were less vigorously active than their peers without movement difficulties during unstructured PA (e.g. recess). Further, Cairney et al. (2005) discovered that children with DCD participated in fewer organized and recreational play activities than children without DCD. Unfortunately, the Activity-Deficit Hypothesis has not yet been tested in relation to children with ADHD (Harvey & Reid, 2003; Harvey et al., 2009, 2014).

Knowledge-Based Approach. The Knowledge-Based Approach to human action provides the foundation for Wall's theorizing. It states that the individual's structural capacity (i.e., anatomy & physiological potential, in part influenced by genetic endowment & environment) and past experiences (i.e., learning opportunities and practice) determine the quantity and quality of

the knowledge performance (Wall et al., 1985; Wall, Reid, & Harvey, 2007). Knowledge plays an important role in the control and execution of action and it is gained through experiences that increase over time (Wall et al., 1985). Wall et al. (2007) suggested that motor development can be acquired by five types of knowledge about action: procedural (e.g. knowing how to act), declarative (e.g., storage of information), affective (e.g., subjective feelings attached to actions), metacognitive knowledge (i.e., self-awareness) and skills (i.e., self-regulation skills). All types of acquired knowledge about action interact with each other during learning and performance and in turn, the influence development and execution of human action.

Wall et al. (1985) suggested that children with movement difficulties experienced low self-efficacy, exclusion and lack of interest, which may be reflected in their difficulties in procedural, declarative, affect and metacognitive knowledge. Harvey et al. (2009, 2012) have suggested that knowledge plays a role in PA participation for children with ADHD. For example, Harvey et al. (2009) used the TGMD-2 and found that the boys with ADHD had poor to average FMS and weak declarative knowledge. For instance, they did not use specific action terms or forgot them even though they reported that they knew the terms. Harvey et al. (2009, 2012) also found that boys with ADHD had a superficial content knowledge about the benefits of participating in PA and observing others in order to improve skill performance. There may be a mismatch between knowing and doing that may affect specific FMS, sport skills or game performance (Harvey et al., 2014). It remains unclear whether children with ADHD have accurate information needed to complete movement skills successfully (Harvey & Reid, 2005).

PA Facilitators and Barriers. Environmental, cognitive, social and psychological factors may facilitate or hinder FMS performance and PA participation for children with ADHD or DCD (Cairney et al., 2005; Harvey et al., 2009; Poulsen et al., 2008). Possible PA facilitators and barriers for children with ADHD or movement difficulties are discussed below.

Environmental. Structures (e.g., access to gyms via ramps) and objects (e.g., modified equipment) may play a role in PA participation (Goodwin & Watkinson, 2000; Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004). A few studies have explored the environmental factors facilitating PA for individuals with ADHD (e.g., accessible locations & good weather; Harvey et al., 2012). Yet environmental constraints, such as high cost, time of the year, poor weather and lack of resources and equipment, space or location, have also been reported to affect PA

participation for children with ADHD (Harvey et al., 2012, 2014). Few studies have explored the influence of environment factors for individuals with movement difficulties.

Cognitive. Attention to detail, planning and self-regulation (i.e., executive functioning) may help with PA performance; however, cognitive skills have been found to be challenging for many children with ADHD which, in turn, may affect FMS performance and PA participation (Harvey & Reid, 2003; Harvey et al., 2009). For example, Harvey et al. (2009) found six boys with ADHD, 9-12 years with FMS ranging from poor to average, reported paying little attention to detail and did not discuss deliberate planned specific practice procedures to improve their FMS and PA skills. More recently, Harvey et al. (2014) found that it was not always the case that the children with ADHD, 9-12 years, experienced self-regulation problems in PA. However, the children were conscious of their physical inabilities and recognized PA constraints.

Further, deficits in executive functioning have also been found in individuals with DCD (Fong et al., 2011; Kirby et al., 2010). For example, Kirby et al. (2010) suggested that children with DCD have more difficulties in planning, executing and correcting their movements compared to children without DCD. In addition, they were also more inconsistent in their movement patterns. Deconinck et al. (2006) explored one-handed catching behaviours and found differences between nine boys with DCD, 6-8 years, and nine typically developing boys. They suggested that the motor problems of the children with DCD maybe due to level of task execution problems (i.e., knowing how to control the timing of the catching movement but failing to apply knowledge correctly). Further, Mackenzie et al. (2008) found that the children with DCD faced more challenges when the task demanded more integration of different information (mainly during arm movement to changing constraints, in real time (Blank et al., 2011).

Social. Peer interactions and adult behaviours towards children with disabilities may play a critical role in determining whether a child participates in PA or not (Goodwin & Watkinson, 2000; Rimmer et al., 2004). Inclusion and friendships can facilitate PA participation for children with ADHD and movement difficulties (Harvey et al., 2009; Lee, Dunn, & Holt, 2014; Spencer-Cavaliere & Watkinson, 2010). Adult's behaviours, such as coaches' instructions, can also make a child feel included and foster participation (Spencer-Cavaliere & Watkinson, 2010).

Studies have found that children with ADHD or DCD may participate less in PA due to bullying (Bejerot et al., 2011) and social exclusion (Piek et al., 2006; Poulsen & Ziviani, 2004).

For example, Bejerot et al. (2011) found that university students with ADHD reported long duration and high frequency of victimization due to poor social skills and PE performance when they were children. Harvey et al. (2009) also reported about a boy with ADHD who suggested that he had been excluded due to poor FMS. Spencer-Cavaliere and Watkinson (2010) also found 11 children with movement disabilities who reported they would feel less included if they did not gain entry into PA, did not feel like a legitimate participant and did not have friends. However, inclusion may also dependent on the behaviours of others, such as a coach and teacher (Harvey et al., 2009; Lee et al., 2014; Spencer-Cavaliere & Watkinson, 2010). For example, Harvey et al. (2009) found that the boys with ADHD experienced aggressive behaviours in PA settings and would be scolded for their misbehaviour. Hence, PA professionals may find it more challenging to include and teach children with behaviour problems (Hodge et al., 2009; Kos, Richdale, & Hay, 2006) and as a result, they may exclude the children from PA (Wilkinson, Harvey, Bloom, Joober, & Grizenko, 2012).

Psychological. Feeling of enjoyment and belonging may facilitate PA performance and participation (Goodwin & Watkinson, 2000; Spencer-Cavaliere & Watkinson, 2010). Harvey et al. (2014) found that children with ADHD reported to enjoy organized activities since they would be working in groups and make friends. In addition, children with movement difficulties reported to feel included and important when they contributed to their PA teams (Spencer-Cavaliere & Watkinson, 2010). On the other hand, children with ADHD have expressed negative feelings, such as frustration and hurt, during PA (Harvey et al., 2009), which may have influenced their participation and movement skills. Harvey et al. (2009) found six boys with ADHD reported 50% more negative feelings than six boys without ADHD. These feelings, for example, were related to a participant's lack of skill and being excluded due to poor movement skill (Harvey et al., 2009). Performance anxiety has also been reported in children with ADHD (Harvey et al., 2014). Further, children with DCD have expressed negative feelings as well. They may experience feelings of loneliness (Poulsen & Ziviani, 2004) and low enjoyment (Liberman, Ratzon, & Bart, 2013) due to poor performance and exclusion. For example, Poulsen et al. (2008) discovered that as motor abilities decreased in boys with DCD, there was an increase in loneliness and a decrease in perceived freedom in leisure and life satisfaction as shown in self-reported questionnaires. In addition, Cairney et al. (2007) investigated the differences of enjoyment during PE between children with and without DCD along a scale. The authors found that children with DCD reported

lower enjoyment and suggested that poor movement skills, low fitness and low perceived competence were influencing enjoyment of PE. Also, perceived competence measured by a questionnaire, accounted for greatest proportion of the effect of DCD on enjoyment. However, other authors have found that children with DCD did not report lower enjoyment compared to children without DCD (Fong et al., 2011; Jarus, Lourie-Gelberg, Engel-Yeger, & Bart, 2011).

Finally, perceived motor competence has been found to be different between children with ADHD (Harvey et al., 2009) and children with DCD (Cairney et al., 2005). Harvey et al. (2009) found that boys with ADHD overrated FMS performance or provided socially desired responses. The authors suggested that socially desired responses might act as defense mechanisms to conceal a personal lack of skill. This may be a limiting factor because socially desired responses might prevent the children from seeking help to improve their movement skills. However, children with DCD have reported negative self-perception of motor competence (Cantell, Smyth, & Ahonen, 1994; Piek et al., 2006). Cairney et al. (2007) used questionnaires and found low levels of perceived competence or self-efficacy in boys and girls towards PA that largely accounted for inactivity in children and adolescents with DCD. More recently, Liberman et al. (2013) found children with DCD had a low sense of coherence (i.e., optimism), hope and effort, which may be reasons why their perceived competence and PA participation are low.

While some facilitators may break the vicious cycle of the activity deficit, the barriers may perpetuate the cycle and increase the skill gap between the individuals with and without DCD. In other words, the environmental, cognitive, social and psychological barriers may lead to reduced PA participation and fewer opportunities for skill practice. Thus, movement skills may not improve and negative outcomes may be experienced (i.e., Developmental Skill-Learning Gap Hypothesis). Unfortunately, increased inactivity in children with ADHD or DCD may increase risk of obesity (Fong et al., 2011; Holtkamp et al., 2004) and poor fitness (Rivilis et al., 2011; Harvey & Reid, 2003).

In conclusion, a few studies have reported possible factors that may influence the PA participation and physical fitness level of children with ADHD (Harvey et al., 2009, 2014; Harvey & Reid, 1997) or movement difficulties separately (Cairney et al. 2007, 2009; Rivilis et al., 2011). Based on the literature review, some findings overlapped between the two groups (Harvey et al., 2009; Spencer-Cavaliere & Watkinson, 2010) but the PA experience of children with ADHD who have a range of movement difficulties (DCD, no-DCD) have not been studied.

Further, only three qualitative research studies have provided a voice and sought out the PA perspective of children with ADHD (Harvey et al., 2009, 2012, 2014). However, differing perspectives between ADHD and ADHD/DCD within the context of PA have not been explored. It is important to listen to these individuals' needs and interests in order to develop programs and strategies to facilitate the PA facilitators and hinder the PA barriers so that the children can pursue an active life.

Description of New Qualitative Research Method

Individual voices are critical in the process of improving learning and participation in PA (Goodwin, 2009). Researchers should listen to and celebrate the insights and opinions of children with disabilities (Fitzgerald, Jobling, & Kirk, 2003). Hence, Goodwin (2009) suggested it is important to enable children with disabilities to voice their PA experiences to better understand the factors that may influence their PA behaviours. Various qualitative studies have explored the PA experiences of children with disabilities. This pilot study used a new hybrid method, called the storybook-telling interview technique, to gain the perspective of children with ADHD and ADHD/DCD. The method combined the participant-generated drawing technique by Goodwin and Watkinson (2000) and the scrapbook interview technique by Harvey et al. (2012). The qualitative studies that influenced the creation of the new qualitative method and the rational for the use of the method are discussed below.

Goodwin and Watkinson (2000) explored the inclusive physical education (IPE) experiences of nine children with physical disabilities (i.e., spinal bifida or cerebral palsy). Two themes emerged through a focus group interview and drawing research process: good days and bad days. Good days revealed feelings of belonging, valuing of skillful participation and sharing of PA benefits. Bad days revealed social isolation, restricted participation and questioned physical competence. By carefully listening to the children's voices, this study shed light on what constitutes positive and negative IPE experiences.

Lee et al. (2014) recently investigated the youth sports experiences of six males with ADHD (mean age = 22 years). Through two semi-structured interviews, the authors found that the participants retrospectively spoke about challenges and benefits associated with sport participation. The challenges included de-concentration, impulsivity and reduced skill performance. The benefits were social interactions and stress/energy release. The authors also discovered that supportive coaches, understanding teammates and personal coping strategies enabled the participants to gain sports participation-related benefits.

Three mixed-method studies, with a primary emphasis on qualitative methodology have explored the possible learning and social mechanisms accounting for the movement skill difficulties in children with ADHD (Harvey et al., 2009, 2012, 2014). The studies included movement skill measures (e.g., TGMD-2 and MABC-2) and semi-structured interviews. The participants' ages were between 9 and 11years, with a formal diagnosis of ADHD made by a qualified child psychiatrist. Multiple PA measures were suggested to provide a more complete understanding of PA behaviour, help enhance the quality of the research design and compensate for the weakness of the other measures (Cervantes & Porretta, 2010; Harvey & Reid, 2005).

Harvey et al. (2009) explored the PA experiences of 12 boys with and without ADHD through TGMD-2 assessments and semi-structured interviews. Three categories were formed: deliberate play, knowing about doing and personal feelings. The authors found that the boys with ADHD, with FMS ranging from poor to average, reported different play preferences (e.g., greater preference for & participation in individual activities) within the deliberate play theme. Weaker procedural knowledge about movement skills (e.g., they did not use specific action terms or forgot them even though they reported that they knew them) was reported within the knowing about doing theme. Finally, the boys with ADHD reported negative feelings (e.g., exclusion) during PA in the personal feeling theme. The authors concluded that boys with and without ADHD expressed different PA experiences and regulated their PA participation differently.

Finally, Harvey et al. (2012, 2014) sought to understand how children with ADHD regulate their PA participation with a concurrent scrapbook interview approach. The authors used a concurrent mixed method design to investigate the PA experiences of 10 children with ADHD. TGMD-2 and MABC-2 were used to assess movement skills. A daily record sheet and the concurrent scrapbook interview technique (Harvey et al., 2012) were used to help the children voice their experiences. The authors found that many of the children had poor movement skills and three themes emerged from the interviews: context (e.g., PA settings), play (e.g., types of PA) and organization (e.g., PA planning). The authors stated that the children experienced exclusion from PA and lacked conceptual understanding of the purpose and goals of PA participation. They also suggested that some children with ADHD chose and organized their own PA whilst other did not.

PA stories may be one part of the picture that may explain why children with ADHD and/or

movement difficulties participate less in PA and have poor movement skills. For example, Harvey et al. (2009) state that all children with ADHD have not been given the opportunity to sufficiently voice their PA needs and interest. Further, Carvantes and Porretta (2010) suggested that little attention has been given to children with multiple disorders and reflect our limited understanding of their PA needs and wants. Unfortunately, no study has been conducted to hear the PA experiences of children with ADHD and ADHD/DCD concurrently. Therefore, it was timely to explore the PA experiences of children with ADHD who had a range of movement difficulties in order to gain a deeper understanding of the relationship between ADHD, FMS and PA participation.

Storybook-Telling Interview Method. This pilot study used a method combining participant-generated drawing (Goodwin & Watkinson, 2000) and the scrapbook interview technique (Harvey et al., 2012). This new hybrid method, called storybook-telling interview technique, was used in the pilot study to let the perspective of the children with ADHD and ADHD/DCD be heard. Visual methods may allow the child to be at the center of the research process (Clark, 2011) by reducing the power imbalance between the child and the researcher (Phoenix, 2010). They also stimulate memory recall and discussions (Marshall & Rossman, 1999). Due to better results, visual methods have increasingly been used to study the perceptions and experiences of children with and without disabilities (Cope, Harvey, & Kirk, 2014; Goodwin & Watkinson, 2000; Harvey et al., 2014). For example, Goodwin and Watkinson (2000) used participant-generated drawings to explore the IPE perspectives of children with physical disabilities. This method enabled the children to explain why they drew their picture on what physical education meant to them. The authors suggested that the participant-generated drawings provided a stimulus for discussion, generated important information, helped to overcome uneasiness and increased participation. In addition, Harvey et al. (2012) developed a scrapbook interview method for children with ADHD that combined visual research methods approach (e.g., photo elicitation & collage) and a cognitive talk-aloud method (e.g. stimulated recall & stimulated reflection task) to ensure more descriptive interview responses. It addressed the difficulties that children with ADHD may have in short-term memory and story telling because they provided less organized, cohesive and accurate information than children without ADHD (Tannock, Purvis, & Schachar, 1993).

Conclusion

Children with ADHD may be at risk of FMS delays (Harvey & Reid, 2003). As a result, children with ADHD, who either have or do not have comorbid DCD, may experience challenges, such as minimum enjoyment and social difficulties, during PA (Cairney et al., 2005, 2007; Harvey & Reid, 2003). Consequently, children with ADHD and DCD may participate less and practice fewer PA which may further affect cognitive, social, psychological and physical functioning and development (Cairney et al., 2009; Emck et al., 2009; Harvey & Reid, 2003). To date, there are no studies that have investigated the different environmental and personal factors of children with ADHD and ADHD/DCD. Despite the evidence that psychological and social factors strongly influence PA participation, there is a lack of research, from a learning and social perspective about all children with ADHD in PA (Harvey et al., 2009, 2014).

The current pilot study enabled the perspectives of the children with ADHD, who have a range of movement difficulties, to be heard and it investigated PA factors by interviewing them about their PA experiences. A voice was provided to the children by letting their stories be heard through a new method, the storybook-telling interview technique, created for the study. Further, the study provided a point of reference for professionals to potentially improve the PA participations in children with ADHD who have a range of movement difficulties.
Chapter 3

Method

This study explored the PA experiences of children with ADHD who have a range of movement difficulties. This chapter will describe the participants, instruments, data gathering procedures and analysis. A sequential mixed-method design was used to construct a holistic picture of PA experiences for the study's participants. The qualitative data were prioritized over the quantitative data (Qual-quan). This design was expected to provide rich and deep answers to the central research question (Creswell, 2009; Teddlie & Tashakkori, 2013).

Participants

A convenience sample of six boys with ADHD was recruited from the PMHUI. Initially, the sample was to be larger to strengthen the study (n = 10-15). It was also supposed to include girls with ADHD because they are currently underrepresented in PA studies. However, due to time constraints, only six boys participated in the study. Each participant was referred to the study by the treating child psychiatrist. Each boy with ADHD: (a) was 7-12 years, (b) met the DSM-IV diagnostic criteria for ADHD (Lahey et al. 1994) and (c) did not have a medical condition, such as Cerebral Palsy, which may have accounted for movement and PA difficulties.

Each respective caseworker from each boy's day treatment program team assisted with the participant recruitment at the PMHUI. Each boy with ADHD participated in an intensive day treatment program where they attended morning therapy sessions and academic classes in the afternoon or vice versa. Each respective caseworker provided relevant study information to potential study participants by including a recruitment letter in the communication book that was exchanged daily between the boy's parents/guardians and caseworker (see Appendix A). The parent or guardian indicated whether or not they and their boy wished to learn more about participation in the study by filling in the check boxes on the recruitment letter (i.e., yes/no). The sealed letter was returned to each respective caseworker who, in turn, provided it back to the primary investigator (PI). If there was agreement to be contacted, the PI then contacted interested parents/guardians by telephone and/or email to schedule a meeting to discuss the research study (see Appendices B & C).

Instruments

Two quantitative movement skills assessments were conducted to gain information about each participant's movement skill performance. Qualitative data was gathered through a visuallybased, semi-structured, interview to gain an in-depth understanding of the boys' experiences.

Quantitative. The MABC-2 test (Henderson et al., 2007) was used to assign the boys into groups while the TGMD-2 (Ulrich, 2000) test was used to assess the FMS of each boy. The MABC-2 assessed motor abilities and identified if any individual motor impairment existed (Henderson et al., 2007) while TGMD-2 assessed the FMS of each boy (Ulrich, 2000). The TGMD-2 provided a more complete picture and deeper understanding of each boy's movement skill performance.

Movement Assessment Battery for Children-2. The MABC-2 assesses motor abilities and identifies the existence of motor impairment. It consists of two components: a test and a parent checklist, which have been standardized with a large, representative and normative sample (Henderson et al., 2007). The MABC-2 is also the most widely used assessment tool for DCD (Geuze, Jongmans, Schoemaker, & Smits-Engelsman, 2001; Wuang, Su, & Su, 2011).

The MABC-2 is a product-oriented test for which norms of the motor tasks are available. It assesses motor abilities in three domains: manual dexterity, ball skills and balance (Henderson et al., 2007). There are three manual dexterity tasks, two aiming and catching tasks and three balance tasks. The eight tasks are representative of and adapted to the level of each age band (3-6, 7-10, & 11-16 years). For example, children, 3-6 years, are asked to walk with heels raised whereas children, 7-10 years, are asked to walk heel-to-toe forwards.

Raw scores are obtained by observing the child's performance on a number of trials for each task on each subtest. For example, the scores are based on how long it takes to perform a task (i.e., seconds) or the number of correct responses performed for a task. The raw scores are recorded from the child's best performance on each item and then summed to obtain age-specific standard scores and further converted to percentiles. A total test score (TTS) is then calculated by summing the eight item standard scores. A high TTS signifies a high level of impairment. The TTS is further converted to a standard score and a percentile rank.

The MABC-2 has a three-color "Traffic Light" system to assist with score interpretation. A TTS percentile score at or above the 16th percentile is in the Green (G)-Zone to indicate that the individual does not have movement difficulties. Percentile scores, between the 6th and 15th percentile, are considered to be in the Amber (A)-Zone and indicate that the individual is at risk of having movement difficulties (Henderson et al., 2007). Percentile scores, at or below the 5th percentile, are in the Red (R)-Zone to indicate that the individual is highly likely to have

movement difficulties (Henderson et al., 2007).

This test has been deemed to be valid and reliable. The authors reported that the first edition of the MABC may be considered as generalizable to MABC-2 (Henderson et al., 2007). While there is a great deal of research available regarding the validity and reliability of the MABC (Henderson et al., 2007), it should be noted that there are few validity and reliability data available for the MABC-2 (Brown & Lalor, 2009). However, it is widely accepted and used in the adapted PA and occupational therapy research domains.

Validity was established with the use of logical, content, criterion and construct validity. Henderson et al. (2007) stated that logical validity, also known as face validity (Thomas, Nelson, & Silverman, 2011), was established by feedback from a wide range of professionals and content validity was attained with the use of an expert panel. Next, criterion validity was reported through three unpublished studies (Barnett, Henderson & Sugden, 2007; Kavazi, 2006; Siaperas, Holland, & Ring, 2007 as cited by Henderson et al., 2007). For example, Henderson et al. (2007) reported that Siapera et al. (2007) found children with Asperger syndrome had movement difficulties. This finding was consistent with other studies that used the MABC to document movement difficulties in children with Asperger syndrome (e.g., Green et al., 2002). Finally, Ellinoudis et al. (2011) claimed that the MABC-2 demonstrated construct validity since their study's MABC-2 results were similar to another study that used the MABC (Ellinoudi et al., 2008). Goodness-of-fit indices suggested a satisfactory fit to the three-domain test model of the MABC-2 (Comparative Fit Index [CFI] = 0.957). Furthermore, correlations between the three subtest domains (r = 0.26 -(0.48) and the total scores (r = 0.70 - 0.74) supported the MABC-2 design (Ellinoudis et al., 2011). In other words, the correlations between the three domains were expected to be small because the domain skills were different in function. Furthermore, the correlation between the skills and the total scores was expected to be high since the same construct was being measured (i.e., impaired motor skills).

Henderson et al. (2007) also stated that the MABC-2 test is reliable. Reliability was established through test-retest, inter-rater reliability and internal consistency techniques. These authors reported that two out of three unpublished studies examined the reliability of fine-motor tasks, utilized in the first MABC, that were retained in current MABC-2 (e.g., turning pegs; Chow, Chan, Chan, & Lau, 2002; Faber & Nijhuis-Van der Sanden, 2004; Visser, Jongman & Volman, 2004 as cited by Henderson et al., 2007). Chow et al. (2002), a published study, retested seven motor abilities scores and found moderate-to-high test-retest reliability coefficients (Intraclass Correlation Coefficient [ICC] = 0.62 - 0.92). Ellinoudis et al. (2011) found that ICC for test-retest reliability was good-to-strong (0.73 - 0.96) for all test items except for drawing trail, which was moderate (0.66). Next, Chow et al. (2002) demonstrated strong inter-rater reliability (ICC = 0.92 - 1.0). Lastly, the results for internal consistency techniques could be considered as moderate because Ellinoudis et al. (2011) revealed the following correlation coefficients for manual dexterity ($\alpha = 0.51$), aiming and catching ($\alpha = 0.70$) and balance ($\alpha = 0.66$). The authors suggested that further research, with a larger sample size, is required to confirm the internal consistency claims.

The MABC-2 parent checklist provides information about how a child performs daily tasks at school and home. It focuses on the factors that may influence an individual's participation in motor ability-related activities (Henderson et al., 2007). A parent is asked to choose, on a 0-4 Likert scale, how well their child performs the motor abilities in unchanged (e.g., 'hops on either foot') and changing (e.g., 'rides a bicycle with no stabilizers') environments for the first two sections. The ratings are summed to obtain the Total Motor Score (TMS), which determines whether the child is perceived as being categorized in the R-, A- or G-Zone based on the Traffic Light system. In the last section, the adults tick "yes" or "no" if non-motor behaviours (e.g., inattention) do or do not interfere with daily activity skills. The ratings were not summed but the PI produced an overall perception of how the observed behaviour(s) influenced the movement skill performance. The authors suggested that the parent checklist is valid and reliable (Henderson et al., 2007). Burton and Miller (1999) recommended the use of both the test and parent checklist in order to yield a more comprehensive motor ability assessment.

Classification of Participant Groups. The TTS from the MABC-2 test (Henderson et al., 2007) was used to assign the participants into two groups: (a) A/R-Zone and (b) G-Zone. This procedure was performed on the basis of the respective TTS and associated MABC-2 percentile rank. For example, if the boy had a TTS at or below the 5th percentile, he was deemed to have severe movement difficulties (Henderson et al., 2007) and, thus, was classified in the A/R-Zone group. If the boy had a TTS score between the 6th and 15th percentile, he was deemed at risk of having a movement difficulties (Henderson et al., 2007) and thus, was also placed in the A/R-Zone group. Finally, if the boy had a TTS at or above the 16th percentile, he was deemed to have no movement difficulties (Henderson et al., 2007) and thus, was placed in the G-Zone group.

Test of Gross Motor Development-Second Edition. The TGMD-2 measures commonly used FMS in PA settings (Burton & Miller, 1998; Lubans et al., 2010; Ulrich, 2000). It is a normand criterion-referenced test that assesses six locomotor skills (i.e. running, galloping, hopping, leaping, horizontal jumping, & sliding) and six object control skills (i.e. striking a stationary ball, stationary dribbling, catching a ball, kicking a ball, the overhead throw, & underhand ball roll). This test is designed for children, between 3-10 years, where three to four mature skill performance criteria are assessed for each FMS (Ulrich, 2000). The test administrator designates a score of zero if a skill criterion is absent or a score of one if the skill criterion is present. The raw scores within each specific skill are summed to obtain raw scores which are then summed to obtain a total subtest score for locomotor and object control skills respectively. The total subtest scores for locomotor and object control skills are then converted to separate standard scores, with associated percentile and age-equivalent scores based on normative data (Ulrich, 2000). The total subtest standard scores are then summed into a Gross Motor Quotient (GMQ) and associated percentile score.

The TGMD-2 is a valid and reliable test (Ulrich, 2000), which has been used for children with ADHD (Harvey et al., 2007; Verret et al., 2010), intellectual disabilities (Simons et al., 2007), visual impairments (Houwen, Hartman, Jonker, & Visscher, 2010) and children who are typically developing (Evaggelinou, Tsigilis, & Papa, 2002). Validity was established with the use of content, criterion and construct validity. Content validity was met since three content experts agreed on the selected skills (Ulrich, 2000). Predictive validity, a sub-type of criterion validity (Thomas et al., 2011), was established by the moderate-to-strong correlations (object control: 0.41, locomotor: 0.63) found between the TGMD-2 subtests and the basic motor generalization subtest of the Comprehensive Scales of Student Abilities (Hammill & Hresko, 1994). More recently, Houwen et al. (2010) explored the psychometric properties of the TGMD-2 in 6-12 year-old children with visual impairments. They also found that the TGMD-2 showed criterion validity since the correlation coefficients between TGMD-2 object control skills subtest and MABC ball skill subtest varied from fair-to-strong depending on the age group. For example, there was a significant and strong correlation between the TGMD-2 and MABC subtests for children who were 4-6 years and 11-12 years (r = 0.8 & r = 0.76 respectively). There was also a significant and moderate correlation between TGMD-2 and MABC subtests for children who were 7-8 years and 9-10 years (r = 0.57 & r = 0.45, respectively). Finally, construct validity of

the test was demonstrated since there were: (a) significant correlations between subtests and age, (b) differences between groups of children with various skill abilities, (c) significant moderate correlations between the two subtests and (d) exploratory and confirmatory factor analyses performed (Ulrich, 2000). Construct validity was also established because Houwen et al. (2010) found object control skills test items were significantly correlated (r = 0.32 to r = 0.73) as were locomotor skills test items (r = 0.44 to r = 0.76). In addition, a significant correlation between both gross motor subtests yielded r = 0.81, supporting the TGMD-2 design. Furthermore, significant partial correlations were also found between age and subtest scores (locomotor skills: r = 0.36, object control skills: r = 0.53) where older children performed better. Finally, there was a significant effect of sex on the object control skills subtest ($F_{(l, 71)} = 8.54$, p = 0.005) but it was not found for locomotor skills (Burton & Miller, 1998) and the results supported the developmental construction of the TGMD-2 design (Houwen et al., 2010).

Ulrich (2000) also demonstrated that TGMD-2 was a reliable test. Reliability was established through test-retest method, inter-rater reliability and internal consistency. First, testretest method was performed and content sampling reliability (i.e., homogeneity of test items) was met since all of the reliability coefficients for the subtests reached or exceeded r = 0.80(Houwen et al., 2010; Ulrich, 2000). In addition, all of the reliability coefficients for the demographic subgroups exceeded r = 0.90. Test-retest reliability was claimed since reliability coefficients were significant and high (locomotor skills: r = 0.88, ICC = 0.86; object control skills: r = 0.93, ICC = 0.87, & GMQ: r = 0.96, ICC = 0.92, respectively). Second, inter-rater reliability of TGMD-2 was performed and a coefficient of r = 0.98 was found for both subtests and the GMQ (Ulrich, 2000). Houwen et al. (2010) also found inter-rater reliability was adequate for locomotor skills (ICC = 0.82), object control skills (ICC = 0.93) and GMQ test scores (ICC = 0.89). Based on the Cronbach's coefficient alpha, internal consistency was found on all locomotor and object control skills subtests for children from 3 to 10 years ($\alpha \ge 0.76$). In addition, the reliability coefficients for the GMQ scores for children from 3-10 years were even larger ($\alpha \ge 0.80$). When the demographic subgroups were investigated, all of the reliability coefficients exceeded $\alpha = 0.90$ (Ulrich, 2000). Internal consistency was considered to be acceptable since Cronbach's alpha ranged from $\alpha = 0.85$ to $\alpha = 0.91$, with $\alpha = 0.71$ for locomotor skills and $\alpha = 0.72$ for object control skills (Houwen et al., 2010).

Qualitative - Storybook-Telling Interview. The boys' perception of PA was explored by asking each boy to create a small storybook of their PA experiences. This concurrent picturemaking and scrapbook interview process is a new hybrid qualitative method, based on the visual recordings technique (Goodwin & Watkinson, 2000) and the scrapbook interview method (Harvey et al., 2012) created for first-time use in this study.

Visual Recordings. Visual research methodologies may stimulate memory recall and discussion (Marshall & Rossman, 1999; Phoenix, 2010). According to Prosser (1998), images, such as photographs and drawings, can make a great contribution to research. Visual methods may also allow the child to be at the center of the research process (Clark, 2011). For example, Goodwin and Watkinson (2000) explored the physical education perspectives of children with physical disabilities. Participant-generated drawings were used for data collection purposes (e.g., visual recordings). This method enabled each child to talk about physical education experiences and explain why he or she drew their picture. They found that children talked about bad and good days in physical education. Good days revealed feelings of belonging, participation benefits and intrinsic and external rewards. Bad days revealed social isolation, perceived lack of competence by others and lack of support. The authors suggested that the participant-generated drawings provided a stimulus for discussion, generated important information, helped to overcome uneasiness and increased participation during the interview process.

Scrapbook Interviewing. Children with ADHD may experience difficulties in story telling and interviews have provided qualitative information by prompting individuals to recall past events and reflect on them (Harvey et al., 2012, 2014; Tannock et al., 1993). For example, Harvey et al. (2012) conducted a pilot study for children with ADHD in which they developed a scrapbook interview method. It combined a visual research methods approach (e.g., photo elicitation, collage) and a cognitive talk-aloud method (e.g. stimulated recall / stimulated reflection task) to ensure descriptive interview responses. Each child was asked to make a PA scrapbook with a research assistant (RA) in order to (a) recall the PA event from the photograph(s) that were taken for each child by a parent or friend and (b) reflect on the associated experience during the event to build a more detailed response. This visually-based interview method was based on four theoretical assumptions. First, PA images are assumed to be constructions of each child's PA reality at that time. These realities are co-constructed with the RA who is supposed to guide the child to speak about that individual's unique experiences and

not allow the adult's own biases to over-rule the child's perceptions about PA during the interview. Second, the images provide each child with a means to explore the research topic of PA. Third, the images also serve as a resource to access other topics of interests. For example, the relationship between PA and self-regulation was explored. Lastly, it is important that each child's personal opinions and voice are heard and respected during the interviews.

Storybook-Telling. The combination of the visual recordings technique (Goodwin & Watkinson, 2000) and the scrapbook interview method (Harvey et al., 2012) was expected to foster a descriptive and deep discussion about the boy's PA experiences. It was called storybook-telling since it is a new hybrid method that was created for first-time use in this study.

The boys created a storybook about their PA experiences based upon their hand-made drawings and/or magazine cutout collages. The boys' experiences were explored from the perspectives of their good and not so good PA experiences (Goodwin & Watkinson, 2000) while semi-structured questions were posed to have each boy reflect on their PA story (Harvey et al., 2012). Since children with ADHD may have working memory difficulties (Barkley, 1997), this hybrid method was expected to prompt memory by stimulating recall and reflection (Harvey et al., 2012).

First, the boy was prompted by the PI to talk about his positive experiences whilst concurrently creating images depicting good PA experiences. More specifically, the boy was asked open-ended questions about his pictures (e.g., Tell me why this activity would be a good PA day?). The boy's experiences were further explored by discussing (a) the activity (i.e., Is this is an activity that you usually play? Why?), (b) their participation (i.e., How often do you play this activity? Why?), (c) their environment (i.e., Where would you play this activity?) and (d) their feelings (i.e., Why would this activity make you feel good?). Next, the boy was asked to create pictures of not so good PA experiences. Questions, related to challenging experiences, explored the boy's experiences (e.g., Tell me why this activity would not be so good a PA day?). Further, questions about activity (e.g., Is this an activity that you usually play? Why not?), participation (e.g., How often do you play this activity?), environment (e.g., Where would you play that activity?) and feelings (e.g., Why would this activity make you feel not so good?) were posed. Follow-up and probe questions were also used to clarify and obtain further details during the interview (see Appendix D for the interview protocol).

Data Gathering Procedures

A flowchart on data-gathering procedures is shown in Figure 3.0 (see Appendix E). The quantitative data collection took place first, followed by qualitative data gathering. The MABC-2 test (Henderson et al., 2007) was used to assign the boys into groups while the TGMD-2 (Ulrich, 2000) test was used to assess the FMS of each boy. A semi-structured interview was then conducted with each boy during the week that followed. Data were gathered, from 9am to 12pm during the weekdays, in an isolated gymnasium at the PMHUI. One week prior to the testing day, the PI reminded the parent/guardian about the FMS assessment in order to have gym clothes and a pair of running shoes sent with their boy to ensure unfettered FMS performance and the appropriate filming of FMS. She also reminded the parent/guardian to have the boy follow a usual daily routine. For example, each boy continued to take prescribed medication(s).

Quantitative. The MABC-2 test (Henderson et al., 2007) and TGMD-2 (Ulrich, 2000) were administered on the same day. A counterbalanced procedure was used to control for any testing order and learning effects (Howell, 2011; Roediger & Karpicke, 2006). Thus, participants were tested on the TGMD-2 and then MABC-2 or vice versa. Two testing rooms were set up prior to the assessments. Each test was administered according to the respective test guidelines. The MABC-2 test took approximately 20-30 minutes to conduct. The test administrator provided a verbal description and physical demonstration of each task. Each boy was also given one practice attempt for each task and no assistance was provided. The TGMD-2 was performed oneon-one with each participant and test administrator. The test administrator provided a verbal description and physical demonstration of each FMS to each participant. If the boy did not understand the skill after the test trial, a second demonstration followed. The boy performed two trials for each of the 12 FMS. Each trial was videotaped with a digital video recorder to ensure accuracy during analyses (Harvey et al., 2007). The TGMD-2 testing lasted between 20-40 minutes (Harvey et al., 2007). Each parent/guardian also completed the MABC-2 parent checklist and an information questionnaire (see Appendix F for the information questionnaire) while the boy completed the movement skills assessment. The RA explained the parent checklist and assisted the parent/guardian to complete it within approximately 30 minutes.

Qualitative. The storybook-telling interview procedure explored each participant's PA experiences through drawing and collage. An experienced adapted PA researcher trained the PI to conduct effective interviews for children with ADHD in order to ensure the quality of results

(Maxwell, 2013). The PI arranged each participant's interview to be held during a weekday through the boy's caseworker who, in turn, would be contacted three days before the interview as a reminder of the meeting date, time and place. The conference room at the PA research lab was set up with drawing and collage materials on the table before the interviewer (i.e., PI) met the boy. The PI greeted each boy at the hospital unit and guided them to the conference room.

Each boy was prompted to talk about their PA experiences whilst concurrently creating images depicting PA experiences. Colored pencils and markers, paper, sport magazine cutouts, glue, scissors and stickers were provided for each boy's use. The PI asked open-ended questions about their PA experiences based on the picture created and followed the interview protocol. Each interview was approximately 45 minutes to provide each boy with enough time to respond to the questions at his own pace. The interviewer did not interrupt the picture making process nor made judgments on the picture being created. Instead, the interviewer only assisted in the construction of each boy's PA story. The PI only aided in the process of making the picture when a boy required assistance. For example, the PI offered to help if the boy had trouble cutting an image of his choice from a sport magazine to use in a collage. This procedure was put into place to (a) account for the fine-motor challenges that some children with ADHD faced and (b) facilitate the respondent-generated research process (Harvey et al., 2012). Once the interview was completed, the interviewer asked if the boy had anything else to add.

Each interview was videotaped with a digital video recorder for the purposes of transcription and to capture nuanced body language. For example, the boy's body language might imply something different from what he said (e.g., "a child could state that she or he liked to participate in a PA but then roll her or his eyes during the discussion of the PA;" Harvey et al., 2014, p. 6). Once the interview was over, the PI returned the participant back to the hospital unit and thanked him for participating in the study.

No data were gathered prior to approval from the PMHUI Research Ethics Board. The study had been explained thoroughly to each parent/guardian and boy before informed consent/assent was obtained from each boy and one of their parents (see Appendices G & H). Various techniques were used during the study to ensure each boy's well being and protect their privacy. First, the PI reminded each participant that he could stop the movement performance tests and storybook-telling interview at any time and for any reason. Each boy was also instructed that there were no right or wrong answers and to answer any questions as best that they could

during the interview. No boy was coerced to provide answers if they seem very uncomfortable or unwilling to provide an answer. All personal identifiers from the interview data (e.g., names, places, etc.) were also changed to pseudonyms to protect participant confidentiality.

Data Analyses

A mixed-method approach was used in order to provide a complete analysis of the research phenomenon (Creswell, 2009). A broader understanding of PA experiences was expected to emerge from all of the data sources (Yin, 2009).

Quantitative. Raw test scores are listed in a descriptive table to represent each participant's TGMD-2 locomotor, object control and Gross Motor Quotient (GMQ) scores as well as the standard scores and associated test descriptors for each group.

Qualitative. Verbatim transcription of each videotaped interview was completed to prepare and organize the data from each semi-structured interview. A within-case analysis was performed and followed by a between-case analysis (Yin, 2009). A within-case design served to analyze the interview data that was collected from each group of boys with ADHD. A between-case design was also performed to identify the similarities and differences between the groups. Between-case analysis, or cross-case synthesis, addressed whether the themes from the cases supported any broader pattern of conclusion (Yin, 2009).

A thematic analysis was conducted on the interview data (Braun & Clarke, 2006). First, all transcripts were read a few times to familiarize the PI with the interview data. Second, important words and phrases were reviewed and identified to produce initial meaningful codes. Third, the initial codes were regrouped into codes and then, into broader sub-themes in an iterative manner. Next, these sub-themes were re-reviewed and organized to represent themes. The final step of the analysis was to select compelling interview extracts to best represent the PA experiences of the boys with ADHD. The Nvivo 10 qualitative software program was used to manage the data.

Mixed. Quantitative and qualitative results were mixed during the last phase of analyses, which led to the discussion of the findings. The TGMD-scores were utilized to support the self-reported stories from the boys and illustrate the group differences and similarities in FMS performance and PA participation. Further, the themes from the groups were interpreted in relation to each boy's movement skill performance from TGMD-2 and MABC-2 test results.

Reliability and Validity

Various methodological procedures were included in the study to establish the reliability, validity and credibility of the research findings.

Quantitative. Reliability was established by a counter-balanced method for the administration of the two movement skill tests. Hence, the movement skills tests were collected by alternating the TGMD-2 and MABC-2 test administration to control for order and learning effects (Howell, 2011; Lewis-Beck, Bryman, & Liao, 2004; Roediger & Karpicke, 2006). The PI was also considered as a reliable tester because she was trained to conduct the MABC-2 by an experienced doctoral student from the supervisor's research lab. She was also trained in scoring the TGMD-2 videotaped performance of children during her undergraduate degree.

Qualitative. Data triangulation, memoing, a critical friend approach and researcher positioning were used to establish credibility. Data triangulation was the first component of trustworthiness. It was conceived as the building of PA story through various sources of data (Sparkes & Smith, 2014). Five sources of information were used to understand the PA experiences of the boys with ADHD with movement difficulties; MABC-2, TGMD-2, storybook images, interview data and the MABC-2 parent checklist. For example, the TGMD-2 and MABC-2 scores will identify each boy's movement skill level. The storybook-telling procedure will further explore individual PA experiences through pictures, drawing and collage. Lastly, the parent answers on the MABC-2 parent checklist will help to confirm some of the PA experiences of each boy with ADHD. Hence, data triangulation will help achieve the goal of credibility by enhancing the researcher's ability to assess the accuracy of the findings and enrich the results (Creswell, 2009; Sparkes & Smith, 2014).

The second component to establish trustworthiness was memoing. Researchers use memos to engage with research, clarify their own thinking, articulate their assumptions and perspectives about the research and challenge their interpretations of the data (Birks, Chapman, & Francis, 2008). Thus, the PI used memos to record her thoughts about the research process during the study. For example, the PI self-reflected after each interview about any perceived power balance between her and the boy to ensure that the boy's voice was heard and formed the basis of the findings. Memoing increased the credibility of the research process and findings (Birks et al., 2008; Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005; Long & Johnson, 2000; Luttrell, 2009).

The third component of trustworthiness was the "critical friend" approach where the university supervisor, who is familiar with this phenomenon, reviewed and provided critical feedback on the thematic analysis and challenged the interpretations of the findings. For example, the supervisor encouraged the PI to reflect on alternative explanations and interpretations of the interview data. This procedure was used to increase the credibility of the results by enhancing reflexive self-awareness (Brantlinger et al., 2005; Maxwell, 2013; Sparkes & Smith, 2014).

Finally, the last component of trustworthiness was researcher positioning. Qualitative researchers use this approach to (a) demonstrate to the reader that the researcher is a credible research instrument and (b) convince the reader about the quality of the data (Creswell, 2009; Sparkes & Smith, 2014). Researcher positioning is a method where the PI states personal and professional assumptions and life experiences in order to contextualize the researcher in relation to research phenomenon. Hence, as the PI, I have experience working with children with and without disabilities as an educator and camp counselor. I have also worked with children with ADHD in physical education and clinical settings. For example, I taught swimming, dance and other PA to children with disabilities and was a teacher's assistant for an adapted PA course at University for two semesters. I was also trained to assess TGMD-2 movement skills, analyze ADHD movement skills data and transcribe interviews at the CHAMPS PA lab during the last year of my undergraduate studies in Kinesiology. I further took the opportunity to familiarize myself with children with ADHD through hands-on interaction and movement skill observation in the Play-to-Learn Service-Learning Project for children with ADHD at the PMHUI for one year. I suggest that I have met a form of prolonged engagement with this specific population of children (Creswell, 2009; Maxwell, 2013). Finally, I also have experience in the administration of executive functions tests and physical fitness tests for children with ADHD.

Chapter 4

Results

The quantitative and qualitative results were analyzed separately. First, TGMD-2 scores indicated the FMS performance for the A/R-Zone and G-Zone groups. Next, thematic within-case analyses were performed on the storybook-telling interview data. Third, cross-case analyses of the data were also performed.

Quantitative

The boy's locomotor, object control and overall FMS scores on the TGMD-2 are provided below. Table 4.0 demonstrates the TGMD-2 subtest raw scores of the boys in each group. The locomotor and object control raw scores of the group ranged from 24-36 respectively (see Table 4.0). Table 4.1 represents the TGMD-2 standard scores and percentiles of the boys in each group. The range of locomotor standard scores for the groups was between 5-7, with percentile scores ranging between 5-16. The range of object control standard scores for the groups was between 1-11, with percentile scores ranging between <1-63. The sums of standard scores ranged between 6-15 for the groups (see Table 4.1). Finally, table 4.2 illustrates the Gross Motor Quotient (GMQ) scores of the participants in the group that ranged from 58-85, with percentile scores ranging between <1-16 and TGMD-2 test descriptors labeled from below to *poor* and *very poor* (see Table 4.2).

Table 4.0

| Participant | Locomotor | Object Control |
|----------------|-----------|----------------|
| Amber/Red-Zone | | |
| 1 | 36 | 34 |
| 2 | 35 | 24 |
| 3 | 35 | 36 |
| Green-Zone | | |
| 4 | 33 | 46 |
| 5 | 37 | 38 |
| 6 | 29 | 37 |

TGMD-2 Subtest Raw Scores of Boys with ADHD

Table 4.1

| | Subtest Standard Score | | |
|----------------|------------------------|----------------|-----------------------|
| Participant | Locomotor | Object Control | Sum of Standard Score |
| Amber/Red-Zone | | | |
| 1 | 6 (9) | 5 (5) | 11 |
| 2 | 5 (5) | 1 (< 1) | 6 |
| 3 | 5 (5) | 5 (5) | 10 |
| Green-Zone | | | |
| 4 | 5 (5) | 11 (63) | 15 |
| 5 | 7 (16) | 7 (16) | 14 |
| 6 | 5 (5) | 7 (16) | 12 |

TGMD-2 Standard Scores and Percentiles of Boys with ADHD

Note. (x) = Percentile

Table 4.2

Gross Motor Quotient Scores of Boys with ADHD

| Participant | GMQ | Descriptive Ratings* |
|----------------|---------|----------------------|
| Amber/Red-Zone | | |
| 1 | 73 (3) | Poor |
| 2 | 58 (<1) | Very Poor |
| 3 | 70 (2) | Poor |
| Green-Zone | | |
| 4 | 85 (16) | Below Average |
| 5 | 82 (12) | Below Average |
| 6 | 76 (5) | Poor |

Note. (x) = Percentile, GMQ = Gross Motor Quotient

* Descriptive ratings provided by the TGMD-2 manual (Ulrich, 2000)

Qualitative

The storybook-telling interviews were conducted to hear the participants' perspectives about their PA experiences. A thematic analysis was conducted with the interview data. Table 4.3 illustrates the data reduction process for each respective group which led to the formation of five overarching themes: (a) *Activity*, (b) *Knowledge*, (c) *Self-Awareness*, (d) *Other People* and (e) *Interview*.

Table 4.3

Thematic Analysis

| Zone | Initial Codes | Codes | Sub-Themes | Themes |
|-----------|---------------|-------|------------|--------|
| Amber/Red | 417 | 61 | 21 | 5 |
| Green | 321 | 57 | 21 | 5 |

Each overarching theme is discussed below with a description of associated sub-themes by providing participant quotes that best represent their PA experiences. The results of the A/R-Zone and G-Zone group will be presented together because the overarching themes emerged in a similar fashion. The results for each theme will be presented in the following order. The A/R-Zone group results are discussed first, followed by a discussion of the G-Zone group results. There were three overarching themes where both similar and unique sub-themes emerged (e.g., Self-Awareness, Knowledge, Other People). Unique sub-themes are described at the end of each of these overarching themes. There were two overarching themes where only similar sub-themes emerged (e.g., Activity, Interview). Cross-case analyses of each overarching theme were also performed between both zones. A cross-case analysis table is presented at the end of each individual theme to identify the similarities and differences between the groups.

Activity. The first overarching theme to emerge was Activity, which referred to the participants' perceptions of the context for participation in various PA. It contained three similar sub-themes: *Type of Activity, Time* and *Location*.

Type of Activity. The first sub-theme, Type of Activity, represents the participants' perceived structure of the PA that they discussed.

A/R-Zone. The participants spoke about formal (i.e., structured) and informal games (i.e., unstructured, pick-up games) as well as group and individual PA. They also mentioned sedentary

activities. They spoke about different types of formal group PA (e.g. basketball [P1], football [P1], badminton [P3], floor hockey [P3]). Participant 3 elaborated on how he played badminton and hockey: "A part de frapper la balle et la, faire 'Tuck!' à terre, c'est tout". "Bien on essaye de prendre la puck et on la shoot dans but des l'autres. Moi c'est mon but et ça c'est le but des autres et j'essaie de shoote la puck dans cette but là". They also talked about formal individual PA (e.g., obstacle race [P2], pool [P3]). Participant 2 spoke about an obstacle course: "I am so use to going down ski hill. Instead, I go up the ski hill. When I was doing the Spartan race".

They also discussed different types of informal group PA (e.g., tag [P1, P2], "ouvert soccer", shooting hoops [P1]). Participant 1 explained: "Quand on joue la tag, on touche les autres". Participant 2 also stated:

It's like manhunt so go, you go give time for people to hide, like one person counts and then the other, one person hides and the other person counts and that person has to hide so like basically, who ever is, there is only one person allowed to go hide all the time.

Participant 1 elaborated on how he played basketball with his friends and what he meant by

"ouvert soccer": "On lance le ballon. Chacun notre tour".

Les deux goaleur et moi, j'ai la balle. Je, je essaye de kicker la balle dans le but. Après moi, je fais une kick ici, une kick ici, puis une kick ici, comme nous sommes juste trois.

Participant 2 spoke about the types of informal individual PA (e.g., skiing, skating [P2]). He

specifically mentioned skiing:

This some guy thought it would be fun to go cause they saw how fun it was to sled and they were like 'Hey, what if we could do that standing up?' So they decided to make skis and they were like 'Oh my gosh this is so much fun!' and some person made it into a sport but it's very dan.... some one time, it can be very dangerous though like, I did learn that it's dangerous.

Lastly, participant 3 spoke about participating in sedentary activities: "Parce que j'ai passé la journée, la majorité du temps jouer dans maison". "Rien, j'écoute la télé ou je dorme".

G-Zone. The participants also spoke about formal and informal games as well as group or individual PA. The participants spoke about the types of formal group PA (e.g. soccer [P4], floor hockey [P4], water basketball [P4]), ice hockey [P5], baseball [P6]). They also elaborated on types of formal individual PA (e.g., karate [P4], high jump [P4], swimming [P4-6]). Participant 4 explained what he did during his karate class: "Like push ups, sit ups, fighting, practicing

movements, this thing called kata. It's like you do a series of movements, so it's like first kata, second kata, third kata and you, you have to practice those for tournaments".

They also elaborated on the types of informal group (e.g., pool party [P5]) and individual PA (e.g., diving [P4]), swimming [P4-6], "snorkelling" [P5]). Participant 5 spoke about having a pool party with his class: "Ça va être un party piscine". Participant 4 provided more information about a diving activity during PE: "We just like swim and throw heavy objects in the deep end and have to go get it and yeah". Participant 6 spoke about swimming in a lake: "On nage, bouge les bras, on bouge les mains pas mal ça". Participant 5 spoke about snorkelling:

Puis je prends mon tuba et je suis comme 'Du du...' là, je regarde les poissons et une fois, c'est cool! C'est en camping. J'étais grand comme je suis mais j'avais 7 ans, j'avais mon tube, gros tube là, puis un gros masque là, puis là, avec mes palmes. J'allé nager en arrière de la chaloupe de mon grand-père. Il avait un banc de poissons. Regarde, il avait un banc de poissons. Il était là, gros de même, comme 'Chuuu!'.

Time. The second sub-theme, Time, represents the participants' perceptions about durations, frequency and occasion of PA.

A/R-Zone. The participants' spoke about how long, how often and when the participant participated in PA (e.g., times of day, days of the week and days off of school). They first explained the lengths of time (e.g., duration) they would be physically active for and why. Participant 3 spoke about playing badminton: "Bien tout le temps de la gym à peu près, une heure". "Non. C'est pas long, c'est vite". Participant 2 spoke about skiing:

Well, you get really cold and you don't ah... you get super freezing, more when you are hungry because when you get super cold, you're on top of the mountain... just saying, you won't be skiing for very long. Because it's, it's so cold and like your body is just telling you "No!" then you get cold, I got the flu or something.

The participants spoke about the number of times they would participate in PA if at all. Participant 2 spoke about the times he skied: "Ah well probably 27 times, sometimes even more. Depends". Participant 3 talked about opportunities to play hockey: "Que j'ai joué deux, 10, 20 peut être". Participant 1 mentioned that he played soccer: "Non c'est 10 fois par mois parce que on aime jouer au soccer" (P1). Participant 2 said he and his family would go skiing sometimes: "Well, we don't usually do it but we do it like a lot, like sometimes". Some participants played or skated rarely: "C'est rare que je joue" (P1) "It can be rare" (P2).

Lastly, the participants spoke about the times of day, days of the week and days off of school that they participated in PA. For instance, participant 2 spoke about the time of day he

played soccer: "At lunch time, recess or daycare, which I don't go anymore". Participant 1 stated that he played basketball during recreation: "Pendant, c'est la recréation". Next, participant 3 stated the day of the week he would play badminton: "Chaque mardi pendant le gym". Participant 1 further spoke about playing soccer on weekends: "Pendant la fin de semaine, juste pendant les fins de semaine". He then spoke about playing soccer during days off of school: "Non, des des fois quand quand on a des congés, on va à la cour d'école".

G-Zone. The participants spoke about how long, how often and when they participated in PA (e.g., days of the week and months of the year). They first explained how long (e.g., duration) they would play PA. Participant 5 spoke about the length of time spent playing hockey: "Mais attend, une heure, chaque une heure toute la semaine, il sera juste le hockey, aller au hockey, aller au hockey, c'est une heure". Participant 6 said:

Eh oui, ça (tennis) dure au moins quatre semaines, non pas quatre semaines, deux semaines ce match, ce cours là. Pas comme deux semaines pendant ça on arrête là, mais comme deux semaines de cours. Je pense, ça dure une heure ces cours la.

Participant 4 mentioned when he started karate and soccer: "Three years ago. Yea four, three years ago". "Since I was four".

The participants spoke about the number of times they would participate in PA. Participant 4 mentioned he would do karate "Four times a week". He also talked about how often he would play soccer and PA (e.g., high jump) during PE: "There would be two practices every week and one game a week". "Four times but once like once, you know how I said one sport for every month, we only played it once". Participant 6 spoke about the number of times he played basketball: "Peut-être eh 15, 16 fois et ça le basket. Ca, je pense que c'est sept fois". Participant 5 stated the number of times he played hockey: "Bien parce que c'est trois fois par semaine, quand je suis avec mon équipe, bien, ce rendu que maintenant c'est 300, trois fois par semaine, 300 fois par semaine, c'est beaucoup trop". Participant 6 suggested he sometimes played baseball and soccer and why: "Je ne joue pas très souvent, mais j'ai déjà joué". "Oh! Le plus avec, bien il y a aussi le hockey, mais le hockey ce n'ai pas celui que je joue plus souvent. C'est que je joue le (soccer) plus souvent".

Lastly, the participants spoke about the days of the week and months of the year when they participated in PA. They spoke about the days of the week for PA participation: "Gym on Tuesdays and swim (class) on Thursdays" (P4). "Bien, d'habitude c'était vendredi pour moi, d'habitude le hockey c'était le vendredi, samedi, dimanche" (P5). "Bien maintenant ça va être les

samedis (natation), pas tous les samedis de la vie le, mains en fait ça veux dire" (P6). Lastly, participant 4 spoke about the months of the year he played PA. He suggested that every month the hospital PE program would focus on a different PA: "Yea like, last month, because every month we would do a different sport".

Location. Finally, the third sub-theme, Location, represents the participants' perceptions about locations where PA may be performed.

A/R-Zone. The participants spoke about the indoor and outdoor places where they played PA. Participant 3 spoke about playing badminton indoors at the hospital's gymnasium: "Bien au Rec center". They also talked about playing PA outside on school/hospital property and in other public spaces. Participant 1 spoke about playing basketball on the schoolyard and soccer on the hospital's field: "Dans le cour d'école". "Dans le terrain de l'école". Participant 3 suggested why he played field hockey on the hospital's field: "Sur le terrain. Il n'y a pas de glace à l'école là. Il n'y a pas de glace à l'école". Participant 1 discussed why he would sometimes be unable to use the schoolyard: "Non, aussi des fois dans le cours d'école, il y'a un porto qui indique que ça on peux pas, des fois on peut pas aller au terrain basket". "Oui, des fois quand on a congé parce que, parce que des fois ils nettoient le terrain basket". Participant 2 mentioned where he would go skiing: "Well, anywhere else, we would go to Owl's Head, we go to Olympia, Jay Peak".

G-Zone. The participants spoke about the indoor and outdoor places where they played PA. They spoke about playing PA indoors in specific neighbourhood facilities. Participant 4 mentioned that his karate classes were located on a main road in a specific neighbourhood: "It's like a big main street in Lachine somewhere. I forgot where it is". Participant 5 explained that his hockey practices were in his neighbourhood and the hockey games were played in other arenas: "Dorval, mais surtout les pratiques sont à Point-Claire". "Les games sont n'importe où". Participant 4 spoke about badminton or swimming that was played, respectively, at the hospital's gymnasium or pool: "Yea, like ah there is ah, there is a gym and the other side there is a pool, so we do that". Next, a participant spoke about playing PA outdoors in public spaces. Participant 6 talked about playing PA in a park: "La parc… parce que il est proche de chez nous. Il y a deux, trois parcs bien et deux parcs plus proche de chez nous". He also swam in a lake and in the sea: "Eh, au Lac Bleu eh, ah quel autre? C'est souvent au Lac Rouge, eh au Republic, oui c'est pas mal ça".

A cross-case analysis of the first overarching theme was performed to identify the similar and different PA contexts between the zones. While there were many similarities across the groups, *Sedentary Activities* (A/R-Zone: Type of Activity Sub-Theme) was the main difference between the zones (see Table 4.4).

Table 4.4

Cross-Case Analysis of Activity Theme

| | Codes | | |
|------------------|--|--|--|
| Sub-Themes | Amber/Red Zone | Green Zone | |
| Type of Activity | Formal Group Activities Formal Individual Activities Informal Group Activities Informal Individual Activities Sedentary Activities | Formal Group Activities Formal Individual Activities Informal Group Activities Informal Individual Activities | |
| Time | DurationFrequencyOccasion | DurationFrequencyOccasion | |
| Location | IndoorOutdoor | IndoorOutdoor | |

Knowledge. The second overarching theme to emerge was Knowledge, which referred to the participants' knowledge about the roles, terminology, actions and skills required to participate in PA. It contained four similar sub-themes: *Skill Performance, Lack of Content Knowledge* and *Accident* and three unique sub-themes: *Option* (A/R-Zone), *More* and *Purpose* (G-Zone).

Skill Performance. The first sub-theme, Skill Performance, represents the participants' perceptions about the purpose, skill level difficulty and performance for FMS and sport skills.

A/R-Zone. The participants spoke about the purpose of PA skills, PA skill level difficulty and performance of skills during PA. Participant 1 explained the purpose for dribbling a basketball: "Pour essayer de lancer la balle dans le but". Participant 2 explained the purpose for cross-country skiing and ski poles: "It's like skiing but not downhill, you're walking". "That's

why you have poles. You push yourself and you also, for making turns, the poles help". The boys also spoke about skill level difficulty. Participant 3 suggested that playing badminton was easy. Participant 2 talked about jumping with skis and how difficult it was to perform the skill: "How you do normal jumps except more difficult cause if you, you go off a high ramp."

I cross one of them, I put one of the skis onto, I went like, I went like, all you have to do is this... except it's not that easy because you have skis on so you got to go like this, you have to put your leg like this...

The participants further discussed how they would perform a PA skill. Participant 2 said jumping was difficult but he would try a ski jump: "I try to do some of the cool tricks, I can do, I can do a cross like this". Participant 3 expressed how he would return the shuttlecock during badminton: "On est comme, 'Bon enfin!' Bien, si non on essai 10 fois et puis la on est comme, 'Enfin! J'ai vient juste a réussir". They also spoke about failing during a PA skill performance. Participant 2 spoke about doing a ski jump and not succeeding many times: "And then, I failed a whole bunch of times". He also talked about failing a jump whilst skating: "Yea, we play tag and you can jump but it's not like I can do a spin... but one time I failed. The one time you go up...". Participant 3 discussed how another player failed a shot during a badminton game: "Il essaie de la prendre mais ça punge un mur puis il est comme ...".

G-Zone. The participants spoke about the purpose of PA skills, PA skill level difficulty and performance of PA skills. Participant 5 explained the purpose of "échappée" or *breakaway* in hockey: "Genre comme, il n'y a personne, tout le monde est en derrière et il vient avec la rondelle. Il savaient, tout le monde sont là là, puis il a un qui arrive là avec la rondelle". Participant 4 elaborated on the positions he played in his soccer league: "Either attack or defense". He also explained the difference between an attacker and defender: "No, if you're attacker you're scoring the goal. Defense is stopping them from scoring the goal". Participant 4 explained the water basketball game he played with his classmates: "Ah we can like play water basketball, kind of. Like, we have two nets and we stay on one side and we try to score on the other net". Participant 4 spoke about the level of difficulty when playing ice hockey: "Ice is, it's you play with equipment and it's harder and there is like puck and skates but floor hockey you have a ball and you run and you can't body check". Participant 5 discussed performance of PA skills as he joined a higher skilled hockey team:

Puis là, là il m'a pris. Il fallait que je joue bien pour y aller. J'allais aux quelques pratiques mais j'étais encore avec les Pirates. Quelque pratiques avec les Cowboys mais j'étais encore avec les Police puis j'étais assez bon pour y aller, puis là, j'aillais dans l'équipe.

Participant 4 spoke about not being able to dance and perform a serve in badminton well: "One, I can't dance". "And ... I don't like hit it properly in the middle".

Lack of Content Knowledge. The second sub-theme, Lack of Content Knowledge, represents a potential lack of content knowledge about PA.

A/R-Zone. The participants spoke about not knowing PA terminology or how to explain PA. Participant 1 spoke about not knowing the name of a specific PA skill and PA rules. He was unable to use the word *dribbling* when he spoke about this basketball skill: "Je ne sais pas". He was also unable to describe how to play soccer: "Je ne sais pas, comme d'habitude".

G-Zone. The participants spoke about not knowing PA terminology or how to explain a PA. They spoke about not knowing the name of a sport and implement or how to describe related terms. Participant 6 did not know the terms *baseball* and *racket*: "Parce que je joue ah ah football, pas football, attendre, je ne sais pas comment s'appelle cet truc là mais...". "Bien, il faut frapper la balle avec un manche. Je ne sais pas comment s'appelé cette truc". Participant 5 described swimming as "not sporty enough". He also had difficulty explaining what this term meant: "Bien, c'est juste que, pour moi, je ne sais pas comment le dire, je

Accident. The third sub-theme, Accident, represents the participants' perceptions of falling and getting injured during PA participation.

A/R-Zone. The participants spoke about falling and getting hurt during PA. Participant 2 spoke about falling during running, skiing and skating: "Or when you're running around the gym and you get a burn because you fall. It happened to me right here. See that?".

Yea, I have control but sometimes I go out of control and I go "Whoaaaa know what they feel!" cause like, you start feeling wobbly, you start going like this and then you go make a turn and it goes like "Weezzzeee" when the skiers go super fast, they don't stop, they go so fast that they "Pffeeee" and like "Boom!"

Yea and you can spin, and one time I was like running away from my sister and I needed to go hide in the tag game and I ended up like tripping over this one piece of ice and I was like "Wuhuuuuu!"

Participant 2 also talked about injuring his nose when his peers kicked the ball into the air:

... one time my nose was bleeding because they booted the ball and I was like this cause I was like "Oh it's coming...!" I jump in the air and it hit me right in the nose and I was like "Oh my god it hurt like a... it hurt like a nail!" It feels like somebody just smacked you in the face as hard as they could.

He would also get hit in the face by a soccer ball or on the head by a basketball: "Well, because then I don't want to play soccer anymore because I don't know if I will get hit in the face again. It's not like funny when it hurts".

Um... when I am playing basketball and they throw the basketball and it goes into the hoop, it hits me in the head cause sometimes you are like trying to, hits the hoop and it doesn't really go in, it flies back and hits you in the head.

G-Zone. The participants only spoke about getting hurt during PA. Participant 5 spoke about getting hit by the puck or injuring his arm whilst playing hockey: "Puis dé fois c'est ici. T'es pas protégé. T'es jamais protégé ici alors, une fois ça aller 'Pung!' Puis là j'essaie 'Uh wah... Je suis capable!' Hum, ça fait mal".

Puis dé fois ça passe entre mes jambes. J'ai tournique avec ma, puis il y a un qui a tiré, j'étais sur le traque, puis là j'ai fait, là il y a un qui fonce, je l'avais encore, il fonce mais il avait, je conge avec mon menton et là j'ai reviré. Après ça, j'ai tout engourdi mon bras.

Unique Sub-Theme: Option. The fourth sub-theme, Option, represents the A/R-Zone participants' perceptions of having an alternative activity. The participants spoke about doing other activities instead of being lonely. Participant 2 explained that he would go indoors, home or to an indoor Water Park when he felt lonely whilst skiing: "Well, cause well, when you get like lonely, you want to go away". He also spoke about leaving or going somewhere else to do other activities whilst skiing: "Yea, you can go off with one of your, you can go off with other people, you can like". He also talked about playing soccer with someone else and doing other activities: "I am just 'Ok again and bye!' If they are going to be like that, if they start arguing over something, I go play a different game, I play soccer with somebody else". "Not really, because there is a lot more things to do. Play tag, run around, talk your friends, look for a, different types of animals".

Unique Sub-Theme: More. The fifth sub-theme, More, represents the G-Zone participants' perceptions about PA being more physically active. Participant 5 talked about moving more during hockey: "Oui, les mouvements, il y a beaucoup plus des mouvements dans hockey". "Parce que la rondelle bouge partout, de fois tu dois parce que, dé fois tu fais de jouées, te comme 'Ah!" Participant 5 said that a hockey goalie does many things: "Au hockey, gardien de

but ... tu as bien plus d'affaires que joueur, affaire que joueur". Participant 6 spoke about moving a lot during a football match: "Eh bien parce qu'on bouge plus et parce que sinon, fais juste des passes, c'est poche ça!"

Unique Sub-Theme: Purpose. Finally, the sixth sub-theme, Purpose, represents the G-Zone participants' perceived purpose and benefits of participating PA. Participant 4 spoke about participating in karate because it keeps him in-shape: "And it like keeps me in shape". Participant 5 talked about the purpose of practicing hockey: "Parce que si tu pratiques pas là, sais tu deviens pas bon pour le, pour le game. C'est pas juste des pratiques, il y a dé games".

A cross-case analysis of the second overarching theme was performed to identify the similar and different PA knowledge between the zones. While there were many similarities across the groups, *Falls* (A/R-Zone: Accident Sub-Theme) was the main difference between the zones (see Table 4.5).

Table 4.5

| | Codes | |
|------------------------------|---|---|
| Sub-Themes | Amber/Red Zone | Green Zone |
| Skill Performance | Skill PurposeSkill Level DifficultyPerforming Skill | Skill PurposeSkill Level DifficultyPerforming Skill |
| Lack of Content Knowledge | TerminologyExplanation | TerminologyExplanation |
| Accident | HurtFalls | • Hurt |
| Option* | Other Things to DoGoes Somewhere Else | |
| More* | | More MovementsMore Things to Do |
| Purpose* | | In ShapePractice |

Cross-Case Analysis of Knowledge Theme

*Unique Sub-Theme

Self-Awareness. The third overarching theme to emerge was Self-Awareness, which referred to the participants' perceptions of their feelings, preferences, motives and behaviours towards PA. It contained five similar sub-themes: *Feelings*, *Likes or Dislikes*, *Chooses*, *Fun* and *Alone* and two unique sub-themes: *Asocial Behaviour* and *Attitude* (A/R-Zone).

Feelings. The first sub-theme, Feelings, represents the participants' perceived emotional reactions about PA.

A/R-Zone. The participants spoke about feeling afraid, angry and happy during PA. Participant 2 spoke about jumping with skis and feeling afraid:

But I did it once and I didn't want to do it again because I was afraid. I did it once and my parents weren't really looking and I was like "Uhhh!" It was not a very good, it's not, it's, it's just doing this.

Participant 2 spoke about a basketball hitting his head by accident and feeling angry: "You're angry for a short second and you're like 'Oh it's not their fault.' but if they do it on purpose, then it gets even worse". Participant 3 said that he felt happy when he successfully returned the shuttlecock whilst playing badminton: "Ah! Content".

G-Zone. One participant spoke about feeling afraid or angry in PA. Participant 5 spoke about being afraid of heights when he drew a diving board during the interview: "J'ai dessiné le tremplin parce que j'aime pas les hauteurs. Pour ça, j'ai jamais été sur un manège". He also spoke about being angry during a hockey game: "Genre comme eh, bien té plus, té plus fâché là. Agressif, agressif faut que il soit comme sens avec l'adrénaline fâché là avec l'adrénaline. Tu dis au moins tu vas pas passer!"

Likes or Dislikes. The second sub-theme, Likes or Dislikes, represents the participants' perceptions of being fond of a PA or not.

A/R-Zone. The participants spoke about which PA they liked or did not like and why. They expressed positive feelings towards the PA that they participated in. "I love skiing, I love skiing, skating" (P2). "I like playing tag" (P2). "Parce que j'aime jouer le basket" (P1). "Puis j'aime aussi faire jouez au baseball, je, je aime ca maintenant de jouer au baseball" (P1). "Parce que j'aime ça. J'aime ça jouer au badminton" (P3). "Parce que il y une ballon. J'aime tout les active qui a une ballon" (P1). Participant 1 also said that he liked kicking, a specific skill, when he played a soccer game and throwing, another specific skill, when he played basketball: "Parce que, parce que j'aime ça lancer". The participants also provided reasons for positive feelings about

PA. "Parce que il dit toujours oui quand je veux jouer" (P1). "It's only fun when we get on the mountain. The skiing part is fun, the other part no" (P2). Participant 3 expressed that playing hockey would be better if he was with his friends instead of other children who were not part of his preferred social group: "Ah… et voilà! Si sont pas là, ça sera encore mieux".

The participants also expressed negative feelings towards the PA that they participated in. Participant 2 "hated" his cross-country skiing experience. Participant 3 stated that he didn't like playing hockey with classmates he didn't get along with: "Parce que je n'aime pas ça. Parce que on se s'entend pas... parce qu'ils veulent juste jouer au hockey. C'est de la schnutt le hockey". The participants also did not like getting prepared to participate in PA. Participant 2 did not like getting dressed for skiing: "It's so bad, I hate it, I hate it, when, gonna get dressed and everything and that's when it's all ehhh". The participants also provided reasons for negative feelings towards PA. Participant 3 said he didn't play badminton usually because he did not like to sweat: "Bien, j'aime pas ça avoir chaud". Some participants described PA as uninteresting. Participant 2 talked about cross-country skiing as being boring: "I had to do it once at school when I was like, this is the most boring thing in the world!" Participant 3 said hockey was boring because he participated with classmates he didn't like to play with: "Bien. C'est long puis, il faut courir puis c'est plate"."Bien c'est encore plus plate quand je suis avec eux".

G-Zone. The participants spoke about which PA they liked or did not like and why. They expressed positive feelings towards the PA that they participated in. "I like to do karate" (P4). "Not really, just like playing soccer" (P4). "Genre comme, le hockey c'est mieux pour moi, parce que genre, tu sais pas quoi qui va arrive" (P5). "Parce que j'aime ça, je ne sais pas comment s'appelle là, comme bouger le puck" (P5). "Oui, le goaleur, c'est ça que j'aime" (P5). "J'aime ça être sportif, j'aime les sports" (P5). "Oui j'aime six sports là. En fait, j'aime presque tous les sports là" (P6). The participants also provided reasons for positive feelings about PA. Participant 4 explained why he preferred getting a brick underwater during swim lessons in PE: "Free time to get the brick because I prefer to go underwater instead of like, swimming, like over water". Participant 5 said: "Parce que c'est sportif puis j'aime ça le sport. Joues souvent au vélo, pis au soccer avec mon ballon. C'est pour ça j'ai jamais une ligue de soccer, juste joue du hockey".

Parce que pour moi, j'aime ça mes eh, m'active, puis je trouve que moi c'est mon meilleur sport le hockey parce qu'il, le jeu arrête moins comme, comme le football, ça arrête trop vite et le soccer aussi. Il y a trop d'arrêts qui sont trop longs alors j'aime mieux le hockey. (P5)

"Parce que j'aime ça. C'est un peu dure d'être défenseur, jouer aller juste qu'à l'autre but, mais j'aime beaucoup être goaleur" (P5). "Tennis. Pourquoi j'aime le match, parce que on lance plus, plus comme, on peut lancer, on peut plus comme lancer loin. On peut plus faire qu'est ce que on veut" (P6). "Bien parce qu'on les lance dans le panier de basket. C'est pour ça" (P6).

The participants also expressed negative feelings towards the PA that they participated in. "I don't really like badminton" (P4). "Et tennis aussi. Mais le tennis aussi j'aime pas vraiment ça" (P6). "Dans la piscine, j'aime moins les lunettes. J'aime mieux un masque, des lunettes ... Parce que j'aime mieux pas avoir de l'eau dans le nez, sinon il faut souffler dans l'eau sinon"(P5). They also provided reasons for negative feelings about PA. They described PA as boring, annoying and weird. Participant 6 spoke about going to the pool: "Eh! Parce qu'on fait de chose plus comme ennuyante, plus poche, plus eh, plus poche, c'est fatigant". Participant 4 said: "Two, I just don't like, it's also awkward, cause I just don't like dancing, it's weird".

I dunno, it's just like, I don't really like it (high jump) that much. It's just like... it's also like badminton pretty boring and repetitive but it is also like weird, like you jump backwards and you can't stop which is really hard. I just wouldn't play it. (P4)

Furthermore, participants suggested that PA was repetitive and not physically demanding. Participant 5 spoke about swimming laps as being repetitive: "Ouai mais c'est juste que tu bouges mais c'est toujours la même affaire pendant toutes les longueurs". "You just lift the birdy and hit it and hit it and you keep on hitting it. That's it" (P4). "Bien, c'est pas que j'aime pas nager. J'aime nager dans ma piscine, j'aime, c'est pas assez, il y a pas assez de force" (P5).

Chooses. The third sub-theme, Chooses, represents the participants' choice of PA. The participants spoke about the reasons for their choice of PA.

A/R-Zone. The participants expressed their choice of PA. Participant 1 said that he would say "Oui" when his friends asked him to play basketball with them. Participant 2 also stated why he chose to play soccer: "Um not very often, I play it when I wanna". "Well, well, if they want me to play, well if they say 'You're going go…' if I see one of my friends playing I'll go play… they all know". He also spoke about choosing to be with his family for skiing: "We say 'We are going skiing!'" Participant 3 and his friends chose badminton: "Parce que on aime ça".

G-Zone. The participants expressed their choice of PA. "When I was smaller, all my friends would be doing soccer and my mum thought it would be fun to do it with my friends so I started doing it. I liked it, so I continued" (P4). "Well like on free time you can do what ever you want,

so I chose to either go underwater get the brick or shoot (at the) basketball net" (P4). "Bien c'est comme, on avait un genre de papier par la poste 'Si vous voulez jouer le hockey!' Papa ma demandé, puis j'ai dit oui" (P5). "Puis c'est moi qui a décidé d'être goaleur" (P5). Participant 4 also spoke about the process of choosing whom to play with in soccer: "No like, how it works is, if you want to be with someone, you have to write your name with them so they can put you on the same team for the league". They also chose not to participate in a PA: "Like when other people dance, I'll watch but I won't ever do it" (P4).

Fun. The fourth sub-theme, Fun, represents the participants' perceptions of being amused or not being amused by various PA.

A/R-Zone. The participants spoke about PA being fun, having fun during PA with other people or vice versa, comical events during PA and PA not being fun. They also said why different PA were fun. Participant 2 spoke about having a good time skiing: "I just like it, it is a lot of fun and um you, it's like, it's something I find fun". "You ski, you go fast, you can do tricks". "I was like … It's so much fun going downhill". "You go like 'Shweeesh!' because you can, you go faster". He also spoke about soccer: "It's a lot, it's fun being in the nets. So you can get block all the goals". "That soccer is a lot of fun".

The participants also said they had fun with other people. Participant 3 said that he and his friends would have fun when they played badminton: "Bien s'amuser". "Yea, because I like to play with my friends. I love playing with my friends because it is so much fun" (P2). "Parce que j'aime ça, jouer avec eux" (P1). Participant 2 spoke about having fun when his friends and family skied with him: "Yea, it is a lot of fun with many people involved". He also had a good time when he participated in PA with his peers: "Like at my other school it was like if I came, that's when the fun happen because... now everybody is missing me".

The participants further spoke about funny PA events. For instance, participant 3 explained how he and his friends would laugh when playing badminton together: "On rit, parce que les autres se plaignent toujours. Parce que nous sommes toujours comme njeh njeh njeh". Participant 2 suggested skating was funny: "It's so funny because like I always fall". Despite some PA were described as fun, participant 2 spoke about PA not being fun and why: "I like soccer but it's not that fun when like you got everybody arguing about neh neh neh". "Well it's not so much fun when do jump. I learned from going super fast I would go off a jump 'Prewww!' boom my skies went 'Pffeed!' to the ground" (P2).

I am not going to do over skiing. Skiing can get really boring after... when you get cold, that's when skiing is not fun, skiing is not fun when you are cold. (P2)

G-Zone. The G-Zone participants spoke about PA being fun and having fun with others. They further provided reasons why PA was fun. Participant 4 explained why he thought joining karate with his family was fun: "I dunno, we just all joined in and it's fun because we get to fight each other". He also spoke about playing with peers in swimming, hockey and soccer: "Because it is fun to do and also cause I play (water basketball) with my friends". "It's (hockey) fun because it's almost like soccer, kind of, like you can do almost anything you want and yeah, it's just fun". "Like um… in practices we would do like do a practice game (soccer) and we would see who can hit the top left corner as much as you can and that would be fun because we all push each other". Participants did not discuss comical events and a PA not being fun.

Alone. The fifth sub-theme, Alone, represents the participants' perceptions of playing a PA alone.

A/R-Zone. A participant talked about playing group PA alone. Participant 1 said he would sometimes play football alone: "Des fois, je joue tout seul". He also spoke about his feelings when he was alone: "Parce que quand je suis tout seul, je me sens seul".

G-Zone. One participant spoke about playing different group activities alone. Participant 6 said he played hockey and soccer alone: "Bien parce que c'est ennuyant faire presque tout seul. Souvent en hockey, j'ai déjà joué tout seul, aussi du soccer, ça non".

Unique Sub-Theme: Asocial Behaviour. The sixth sub-theme, Asocial Behaviour, represents the A/R-Zone participants' asocial behaviours and perceived asocial behaviours towards others. It also represents self-perceptions of their own asocial behaviours. A participant spoke about asocial behaviours during PA participation. Participant 2 said that it was funny to see someone else get hurt during a game of tag or property be damaged during PA. "Well, because sometimes it is funny to watch the other person fall. When they try to run after you".

I would, I won't laugh at that but I would laugh for one minute because it is kinda funny. It's funny that they (were) booting (punting) the ball and it actually cause they always joke around when they hit Miss Sheren's car.

The participants spoke about retaliating to bullies and getting into trouble. Participant 2 called a bully names in the schoolyard: "Well, Jan calls me the yellow whore or oven, and I am like 'Jam, jam, jam!" He would also get into trouble at school when there were arguments about

playing soccer: "Well, there are a lot of arguments that happen and we end up getting in trouble. There is a lot of talking about soccer and like". "Well, it used to be that I had to be in conversation and then, it's all my fault because I was the bad kid at one point and I tried to change but they're not, they're not willing to change". "They (teachers) are like 'You're not, we will treat you like a normal kid, don't...!' I am not like the other kids. The other kids don't have problems with focusing. And I get into trouble because I am not focusing".

Unique Sub-Theme: Attitude. Finally, the seventh sub-theme, Attitude, represents the A/R-Zone participants' perceived attitude about themselves or others towards PA. The participants spoke about not being a bad loser. One participant spoke about his and his peers' attitudes about winning a game. Participant 1 said he wouldn't be a bad loser unlike the other players during a football game: "Parce que moi je veux, moi je ne veux pas gagner, parce que je suis pas un mauvais perdant comme eux". "Que je ne suis pas un mauvais perdant comme eux. Ils veulent toujours gagner".

A cross-case analysis of the third overarching theme was performed to identify the similarities and differences in self-awareness between the zones. While there were many similarities across the groups, *Happy, Fun with Him, Funny, Not Fun* and *Lonely* (A/R-Zone: Feelings, Fun, Alone Sub-Themes) and *Annoying, Weird, Not Enough, Likes Team Position* and *Stays Out* (G-Zone: Likes or Dislikes, Chooses Sub-Themes) were the main differences between zones (see Table 4.6).

Other People. The fourth theme to emerge was Other People, which referred to the participants' insights about the influences of peer and adult involvement in PA. It contained four similar sub-themes: *Others' Asocial Behaviours, Doesn't Choose, Adult's Influence* and *Play With* and three unique sub-themes: *Acknowledgement from Others* (A/R-Zone), *Supportive Behaviours from Others* and *Building Rapport* (G-Zone).

Others' Asocial Behaviours. The first sub-theme, Others' Asocial Behaviour represents the participants' perceived asocial behaviours from and between other people.

A/R-Zone. The participants spoke about others bullying, ignoring, rejecting and other asocial behaviours. Participant 2 spoke about a peer bullying him in the courtyard:

I wish he was here cause cause he just, I can't say what he says. I can't say it in this room because his foul language, bullying um... trying to hurt me and he ends up getting himself hurt because I know self-defence.

Table 4.6

| | Codes | | |
|--------------------|---|---|--|
| Sub-Themes | Amber/Red Zone | Green Zone | |
| Feelings | AfraidAngryHappy | AfraidAngry | |
| Likes or Dislikes | Prefers Likes Group Activities Likes Individual Activities Likes Skill Likes Sports Doesn't Like (Hates) Boring | Prefers Likes Group Activities Likes Individual Activities Likes Skill Likes Sports Doesn't Like (Hates) Boring Annoying Weird Not Enough Likes Team Position | |
| Chooses | • Chooses | ChoosesStays Out | |
| Fun | Fun Activities Fun Thing(s) Fun with Others Fun with Him Funny Not Fun | Fun ActivitiesFun Thing(s)Fun with Others | |
| Alone | Plays AloneLonely | Plays Alone | |
| Asocial Behaviour* | DemonstratesBulliesGetting into Trouble | | |
| Attitude* | • Not a Bad Loser | | |

Cross-Case Analysis Self-Awareness Theme

*Unique Sub-Theme

I can't do it in the schoolyard. I can't do self-defence in the schoolyard so he decides to pick on me. He kicks me well... he can't pick on me. It's funny that he tries to cause I am a lot stronger than him and I am like "You know what, no stop!"

Participant 3 spoke about how his classmates ignored him during a hockey game: "Bien je leur dis 'Allo!' et ils font comme si je suis pas là. Et voilà". "Bien parce qu'ils m'écoutent pas". "Bien rien, on est contre. Je leur parle pas là… comme je leur dis 'Bravo' et sont comme 'Hum quoi? J'ai entendu quelque chose?" They further spoke about friends or peers rejecting their suggestions or presence during PA. Participant 1 stated that his friends would say *no* when he suggested a game: "Parce que je trouve pas les jeux. A chaque fois que je dis un jeu, ils dissent non". Participant 3 provided a response when classmates ignored him during a hockey game: "Rejeté". Next, the participants spoke about their peers taking the ball from them and arguing during PA. Participant 1 suggested why he didn't like playing football with his peers: "J'aime pas ça parce que tout le monde m'enlève le ballon". "Parce qu'il veut toujours gagner". Participant 2 talked about arguments during games of soccer: "Cause one person wants to be in nets and they are all arguing about who wants to be in nets".

It's a... cause I, so one person is like "I'm in nets!" and I said, I didn't but I didn't go in nets yet but I said "I hadn't been in nets yet"... and then they are like "Yes, you've been" and then I am like "Ok bye!" So they end up saying "Oh you've been in nets so you're not going in nets!" Like they are always arguing who's going to be in nets, whose this - whose that - whose that - so annoying.

Participant 3 elaborated on the reasons why he would argue and not want to be with classmates who may be looking to make trouble during a hockey game: "Bien ok, parce qu'on à toujours des conflits". "Parce que on se s'entend pas. Parce qu'ils veulent juste jouer au hockey. C'est de la schnutt le hockey". "Ouai puis moi, je veux juste pas être avec eux ils cherchent le trouble". Participant 2 explained the consequence of his peers kicking a soccer ball:

Like, they're booting (punting) the ball and I go, ... they're booting the ball, I ask them to stop it because it keeps on. It's gonna hit Miss Sheren's car. One time it hit Miss Sheren's car and it, and the alarm went off and it was like...

G-Zone. The G-Zone participants spoke about others who tried to distract, bully and argue with them. Participant 5 played in a hockey league and suggested how spectators distracted him during a hockey game: "Puis de, tu sais dé fois à Montréal bien, dans les Villes ils disent 'Carey Price, Carey Price!' C'est pas pour m'encourager, c'est pour me décourage". "Découragé, il me déconcentre, c'est pour quoi ils disent ça à l'autre équipe le nom". "Parce que bien il faut rester

concentré dé fois, ça te déconcentre... mais eux ils essayent de te déconcentrer, mais de fois ça marche pas là". Participant 4 further stated peers bullied other children by name calling during high jump in PE: "Because people call the others kids 'Babies!' if they put the bar low and yeah". He also spoke about peers who argued about the height of a high jump bar: "Well we like line up and we go one at a time and sometimes there would be arguments because how they set up the bar for like some kids it's lower and some kids it's is higher and yeah".

Doesn't Choose. The second sub-theme, Doesn't Choose, represents the participants' perceptions that someone else chooses a PA to participate in.

A/R-Zone. Participants spoke about friends, peers and family who may choose a PA to participate in. They stated that their friends would decide if they could join a PA and which PA was chosen to participate in. Participant 1 spoke about friends agreeing to let him play basketball and choosing the PA to play: "Parce que quand je vais jouer avec, ils disent, ils disent toujours oui". "C'est pas moi qui choisit. C'est mes amis". "Parce que, parce que moi j'aime les jouer... parce que moi je décide jamais les jeux". Participant 2 said his peers asked him to play soccer and he did not initiate a game: "I go play it. Well, I don't choose it. They just invite me. I don't ever say... 'Let's play soccer!" Participant 3 also stated that his friends chose the game to play: "Bien non, ce sont mes amis qui ont choisit ensemble. Sauf ça se donne toujours au badminton". He also spoke about his peers deciding which PA to play: "Bien c'est eux qui décident, 'Hey, on vas jouer le hockey fait que tu joues avec nous!""

Finally, the participants spoke about their family members who may choose the PA. Participant 1 said his mother signed him up to play baseball: "Je suis nerveux parce que cette été ma mère vas m'inscrire dans en course de baseball". He also suggested his brother would choose to play football with him: "Non mais des fois, bien oui j'aime pas ça parce que mon frère, c'est lui qui décide toujours". "Il dit toujours, oh! On joue au football" Participant 2 also expressed that his parents chose skating for his sister and him: "Well, we ask to skate, sometimes we get to… well it's all up to my dad and mum, they don't want to go skating, they don't go skating".

G-Zone. The participants spoke about their teachers and families choosing a PA for them. Participant 4 explained how a PE teacher chose the type of PA he participated in: "The Phys Ed teacher chooses every month". Participant 6 spoke about his parents choosing a PA: "C'est ma mère parce qu'elle a choisi qu'on va avoir un cours. C'est ma mère qui m'a inscrit. C'est ma mère qui a décidé qu'on a un cours". *Adult's Influence.* The third sub-theme, Adult's Influence, represents the participants' perceptions of the effects of adults on PA participation.

A/R-Zone. Participants spoke about getting permission from an authority figure to participate in PA. Participant 1 spoke about asking the school director to use the school field to play soccer during the weekends: "C'est l'école. Parce que on la demandé en premier". "La directrice. On a demandé est-ce qu'on peut jouer la fin de semaine sur le terrain soccer et elle a dit oui". Participant 3 spoke about asking the teacher for permission to play badminton: "Bien on demande si on peut jouer, puis il pousse le bâton ". The participants also explained teacher involvement in PA. Participant 2 described how a teacher intervened during a soccer argument:

Because they are always arguing and then, I am like, and then, the teachers have to intervene and I am like "Ok what is it this time? There is always something!" and like, just like, all we have to do is not play soccer as easy as don't play soccer if you're gonna argue.

Participant 3 spoke about the teacher obligating him to play with his classmates: "Puis en plus,

j'ai pas le goût jouer avec eux mais c'est l'prof qui nous oblige".

G-Zone. Participants spoke about the influences of an authority figure on PA participation. They talked about their parents' involvement in PA participation. Participant 6 elaborated on his parents telling him where he could play PA:

Eh bien, pourquoi chez moi? Parce que mes parents me disent, on peut pas vraiment de fois aller... parce que meton, meton ils y a des invités qui arrivent et on est meton, ca prend une heure ça aller là... au Lac Blue ou après reviens, bien eux arrive dans 15 minutes, bien là eux ils vont attendre, attende ils ont pas la clé, c'est ça.

The participants explained how fathers influenced PA participation. Participant 4 suggested he chose karate: "Because me and my dad started doing it and then, after I wanted to try so I did and

I liked it". Participant 5 also elaborated on his father's influence to start playing hockey:

C'est juste que, de fois, j'écoute mon père quand il me donne des truques. Mon grand-père était un goaleur, puis moi, je suis un goaleur et mon père était goaleur. Je suis la troisième génération de ma famille, puis mon père des fois, il peut plus jouer parce qu'il s'est cassé le tendon quand, quand on été, et quand il joue au hockey parce qu'il a fait catché, puis hum...mon grand-père est trop vieux, puis...

He further spoke about his father getting upset during a hockey game:

C'était mon tour d'aller cette game là, mais le coach, mais c'est le président du le, de hockey de Vaudreuil, il dit "Je veux voir mon goaleur jouer!" alors lui ben, il y a mis joueur, puis là papa était vraiment fâché parce que au début il y a fait un deal que ça sera

chacun son tour. Il n'y a pas, eh donné son promesse, alors ils veulent plus jamais aller dans les chambres pour (ne) pas faire la chicane.

They also spoke about their mother's involvement in PA experiences. Participant 4 suggested he didn't play soccer: "Because my mum didn't sign me up for soccer this year". They further elaborated on teachers' involvement in PA. Participant 4 spoke about his PE teacher asking about student preference for PA:

Well, we can like, when if they can't think of anything, they will ask us what we want to do this month and then we will like give suggestions and then they will pick one that like most people want it.

He also explained what tasks the teacher demonstrated, taught and asked for during PE: "Well like the, the, the... gym teachers are swim teachers and they sometimes show us how to get stuff and yeah". "Yea, it is high jump and then, learning how to jump properly and stuff like that". "Hm... gives us tasks to do like, put like stuff like, try to put the ball over the bench and then after that we would play like a game and then, it would be free time".

Play With. The fourth sub-theme, Play With, represents the participants' perceptions of whom they participate with in PA.

A/R-Zone. Participants spoke about playing with siblings, friend(s) and peers from another social group during PA. Participant 1 talked about playing football with his brother and explained why he wouldn't feel good when he played: "Avec mon frère. Parce que lui a déjà jouer au football". "Parce que c'est toujours lui qui gagne. Parce que il est plus grand, il a 17 ans. Il est plus grand que ma mere". Participant 2 spoke about skiing and skating with his sister and family: "She always comes (skiing)". "Even when she doesn't want to". "Sometimes she doesn't want to go skiing and then she has this hissy fit or like". "And sometime she is like, well when we get on the mountain she is like 'Ah this is so much fun!' and then she can be 'Nhnh, I don't like it!"

The participants also described PA participation with friends. Participant 1 played soccer: "Avec mes amis". Participant 2 went skiing with friends: "We go with lots other people like Claire and Sophie". "They are friends". He also played soccer with a best friend: "I only play if Jack were to invite me to play. I play with him". Participant 3 also talked about playing badminton with friends: "Bien parce que je suis avec mes amis, puis joue une activité qu'on aime tout". "John. Sarah, ça dépend. Ça depend". "John c'est une personne, bien c'est une de mes amis là". Participant 1 also spoke about PA with his friends: "Et des fois Sebastian amène son chien". "Non, de fois il cour quand on a, quand on joue au d'autre chose. Il y a des fois avec Alexis avec
sa balle, il lance avec son chien". "Sebastian aime ça... être goaleur... goal, je vous dire". "Des fois Jack, parce que il veux juste jouer au soccer pas au basket. Parce que il n'aime pas ça lancer les ballons". Participant 2 also elaborated on PA with his friends: "Lucas broke his ribs because he went super, flying in the air. He did a yard sale, it's not called a yard sale, it's called a drop, or I tried to do a trick. I tried to do a flip and I went like this...". He then explained that he would play with his friends because he likes them: "Because they are friends. You're basically asking why are playing with somebody you like to play". Participant 3 also explained why he would play with his friends: "Parce que c'est amusant. Parce que on rit ensemble là". The participants then spoke about playing PA with other children who were not part of their social group. Participant 3 expressed that he did not have a good PA day because he was playing hockey with his classmates that he didn't like and who were not his friends: "Parce que je suis avec Andrew, Owen, puis Daniel". "Bien mes pires ennemis". "Parce que je suis pas avec mes amis".

G-Zone. Participants spoke about playing with family members, friends and people they did not know during PA. Participant 4 spoke about doing karate and going to a dance party with his family: "My dad, my mum and my sister". Participant 5 said he would go swimming with his family: "Bien avec ma famille". Participant 6 spoke about playing ball sports with family:

Avec qui je joue, bien là, je joue avec mon frère, eh... avec des amis de mon frère, et avec mes amis, et avec mon père, et pas vraiment avec ma mère, elle connait pas, elle est pas bon avec ces jeux apparemment.

He further explained why he played with his brother: "parce que parfois mon frère veut ou que moi j'ai le goût de jouer alors on joue".

The participants also expressed that they played with friends during various sports. Participant 4 spoke about playing soccer with his friends: "Yea, sometimes my friends, we try to get on the same team". "My friend John and my friend Bradley. John has been playing with me since 3 to 4 (years ago) and Bradley playing with me since 2 years ago". Participant 6 elaborated on why he would play various ball sports with his friends: "Pourquoi je joue avec mes amis? Eh bien, parce qu'ils ça vient, je pas encouragé meton, ils ça vient tout seul". They further spoke about playing with peers during PA. Participant 4 stated that he played badminton or water basketball with his classmates: "Anyone else in my class like Mario, Jason, Aiden, Lorne, Scott… those people". "Or I used to play with a guy named Danny but he left". He explained why he played with these peers: "Because Danny liked playing basketball and Aiden also likes playing basketball". Participant 5 spoke about swimming with his class: "Puis je nage avec ma classe, quand, les mardis". He then spoke about the school's swim party:

À la place de faire éducation physique ça va être un party piscine. Il va avoir l'autre groupe de Justin, il va avoir l'autre groupe de Justin qui va venir, on va être 12, même, même, pas juste 12, 15 parce que Hilary mon professeur va être là.

Finally, the participants spoke about playing with people they did not know during PA. Participant 6 swam with people he didn't know during a swimming class: "Bien! Avec des personnes eh, parce que je connais pas vraiment les noms, parce que avant c'était des personnes que je connais pas du tout. Ça fait même pas une cent que je connaissais". "Bien avec qui, bien avec des étrangers, des personnes, avec qui bien je le sais pas encore vu les personnes, je juste vu 2, 3". Participant 5 expressed that he played against various hockey teams in his league: "Bien ça dépend. Je joue contre n'importe quelle équipe". "Parce que dé fois c'est comme dans le nationale, sont pas toujours dans notre ville sont de fois aux l'autres villes".

Unique Sub-Theme: Acknowledgement from Others. The fifth sub-theme, Acknowledgement from Others, represents the A/R-Zone participants' perceived acknowledgment from others. Only participant 3 stated that he felt good because his friends understood him during PE: "Bien. Au moins, ils me comprend". "Bien ils comprend quand je parle. Sont pas comme 'Neh qu'es-ce tu dis?' comme ah ah…".

Unique Sub-Theme: Supportive Behaviours from Others. The sixth sub-theme, Supportive Behaviours from Others, represents the G-Zone participants' perceived supportive behaviours from others. Only participant 5 expressed that his peers, family members and the spectators would encourage him during a hockey game: "Eh bien, bien moi je joues dans le finaliste puis je entendre des perde. En peu découragé, mais j'étais pas beaucoup découragé. Je me suis encouragé pendant mais les gars (garçon) font les buts". "Parce qu'il y a plein de personnes pour m'encourager: mon père, ma mère, ma sœur".

J'avais beaucoup le goût d'être goaleur parce que je suis dans but là, puis un goaleur tu savais c'est le joueur le plus important de l'équipe, puis le plus encouragé. C'est lui le plus resp..., que les spectateurs encouragent le plus.

Unique Sub-Theme: Building Rapport. The seventh sub-theme, Building Rapport, represents the G-Zone participants' perceptions of building rapport with others during PA. They spoke about getting closer to peers and making friendships. Participant 4 spoke about making friends in karate class: "Like my Sensei invited me to his house a lot sometimes and made lots of

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friends there". Participant 5 spoke about choosing to play hockey to make friends and why: "Je ne sais pas, ça commence de même, parce que je voulais beaucoup d'avoir des amis et ils étaient gentils les amis au hockey".

Puis moi, j'aime ça avoir des amis alors, surtout à cause de ça, parce que j'avais un mauvais comportement alors, quand je un bon comportement, parce que je un bon comportement au hockey avant j'avais un bon comportement au hockey alors bien je veux jouer au hockey. Je veux avoir des amis comme ça. Alors je je décidé de jouer au hockey pis sportif. (P5)

Dans la piscine, c'est un sport individuel. C'est pas en équipe, parce que moi je veut avoir des amis, puis la piscine t'as pas une équipe t'as moins de chance de faire des amis quand t'es dans la piscine. (P5)

He also confirmed that he had more friends due to participation in hockey:

Puis, j'ai plusieurs amis à cause de ça, avant j'avais pas beaucoup d'amis parce que je j'en perde beaucoup, j'avais un mauvais comportement bien là fait que j'avais un bon comportement au hockey alors c'est ça pour ça j'ai fait plein d'amis. Bien alors, je je me suis habitué avoir des bons comportements quand je les invite chez moi. (P5)

A cross-case analysis of the fourth overarching theme was performed to identify the similarities and differences in self-awareness between the zones. While there were many similarities across the groups, *Ignored, Rejected, Took Ball, Friends* and *Classmates* (A/R-Zone: Other's Asocial Behaviours, Doesn't Choose Sub-Themes) and *Teacher, Father's* and *Mother's Influence* and *Playing with Someone They Don't Know* (G-Zone: Doesn't Choose, Adult's Influence, Play With Sub-Themes) were the main differences between the zones (see Table 4.7).

Interview. The fifth overarching theme to emerge was Interview, which referred to the participants' perceptions of the storybook-telling process. It contained the two sub-themes: *Storybook Creation* and *Storybook Content*.

Storybook Creation. The sub-theme, Storybook Creation, represents the participants' perceptions about the process of developing the storybook.

A/R-Zone. The participants provided thoughts, asked questions and expressed their feelings about the process of assembling the storybook. They voiced their thoughts about the process of developing the hand-drawn PA pictures. Participant 2 spoke about the pen colours: "It can't be that colour. I don't know what colour". Participant 3 also provided a reason for his pen colour choice: "Hmm, orange, pour ça c'est le moins clair possible. Ah, il y'a deux et voilà! Je peux pas

Table 4.7

| | Codes | |
|--|--|--|
| Sub-Themes | Amber/Red Zone | Green Zone |
| Other's Asocial Behaviours | Argue Bullied Ignored Rejected Took Ball | ArgueBullyingTrying to Distract |
| Doesn't Chooses | FamilyFriendsClassmates | FamilyTeacher |
| Adult's Influence | TeacherPermission | TeacherFather's InfluenceMother's Influence |
| Play With | Plays with FamilyPlays with Friend(s)Plays with Enemies | Plays with Family Plays with Friend(s) Plays with Classmates Plays with Someone They Don't Know |
| Acknowledgement from Others* | • Understood | |
| Supportive Behaviours from Others* | | • Encouraged |
| Building Rapport* | | CloseMakes Friends |

Cross-Case Analysis of Other People Theme

*Unique Sub-Theme

faire plus claire que ça". He also did not know how to draw himself playing badminton: "Mais, je sais pas comment faire ça". Participant 2 expressed what he wanted to create: "Cause like, it's hard to do a big picture. I was gonna do a really fancy picture and I was like it's gonna take an hour. We don't have an hour". He also said why he couldn't add another image to the picture: "I can't really add anything cause I did it so big. It's like".

Participant 2 asked questions about the drawing and collage process used to create the PA pictures. He asked for instructions while creating a picture about skiing: "I don't know what I am

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going to need oh so far, oh my god, I need to do, well do I have to do the chairlifts and everything?" "Does it have to be very distinctive?" "Where do I draw?" He also asked what collage was: "What's that?" He also asked about interview procedures: "How much time do we have? Is it videotaped? Is it drawing?"

The participants also expressed positive and negative feelings about developing the PA pictures. Participant 3 spoke about positive feelings while making a drawing: "Ufff... j'aime trop faire des bonhommes". They also expressed negative feelings about the drawing process and their pictures. "I am so bad at drawing" (P2). "I am not very good at drawing"(P2). "Because the drawing is very horrible, I am just saying that right now" (P2). "Ok um, oh my god... this looks even stupider" (P2). "Ah, moi je trouve ça laid" (P3).

G-Zone. The participants provided thoughts, asked questions and expressed their feelings about the process of assembling the storybook. They voiced their thoughts about the process of developing the hand drawn PA pictures. Participant 5 stated that he didn't know what to draw: "Je ne sais pas quoi faire". Participant 6 then spoke about the process of making a picture by cutting and sticking pictures from a magazine: "Ok, je colle différentes choses, ça va aller plus vite, je vais coller toutes les choses". "Bien mince, pas grave colle comme ça. C'est collé!" The participants further expressed their paper colour choices used in the development of the PA picture. "Just white" (P4). "Je vais prendre orange" (P5). Participant 6 expressed the challenge of having too many coloured pens and paper to choose from: "Comment on peut choisir quand il y a beaucoup trop choses? Il prend trop longtemps pour tout choisir ça". "Je vais prendre ce crayon là, ça c'est difficile".

They also asked questions about the drawing and collage process used to create the PA pictures. Participant 4 asked if he had to draw to make the PA picture: "I draw?" When he expressed negative feelings about drawing with colours, the interviewer asked if he liked doing collage. He wasn't sure what collage meant so the interviewer explained the technique. He then responded with: "Oh I haven't done that". Participant 6 also asked about the collage process: "Coupe ça. Et on va faire quoi avec ça?" "Ah ok. Et pourquoi on va la coller?" "Eh! Que ce qu'on fait la dessus là?" Participant 5 asked if there was a sticker of a hockey puck available for his PA picture: "Bien, je sais je peux utiliser, il y a pas des rondelles de hockey là-dans?" The participants also asked about the instructions of the interview. For example, participant 5 clarified if he would be telling about his PA experiences with images: "Avec des images?" Participant 6

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asked if he could talk about his experiences instead of drawing: "C'est parce que, eh aussi je peux pas te le dire en place?"

The participants also expressed negative feelings about the picture making process. Participant 4 talked about his ability to make a picture: "No. I am not really good with colours". "Oh, I can't really draw dancing". Participant 6 spoke about drawing skills: "Je ne suis pas bon dans representation". "L'activité physique. J'ai pas bon en dessin". "Ok! Je suis pas très bon". Participant 4 further expressed negative feelings about the high jump image: "Yea, I messed up". However, he expressed positive feelings towards the interview process: "Thank you, it was fun".

Storybook Content. The sub-theme, Storybook Content, represents the participants' perceptions about the recall of the hand-drawn pictures and comments about their good and not so good PA day pictures.

A/R-Zone. The participants recalled their PA experiences by talking about the composition of the PA pictures. They recalled and reflected PA experiences by talking about the image or action that was drawn for their own individual storybook. Participant 1 said he would add a peer to his PA picture: "Je vais ajouter Alexis". Participant 3 wanted to draw a hockey puck : "Attend, il manque la grosse puck". The participants also spoke about the images in their pictures. "Le but" (P1). "Le soleil" (P1). "It's a helmet" (P2). "This is the slope see" (P2). "Ça c'est la puck" (P3). "Oui à part d'attendre. Un filet ne truc minouche qu'il vole et voilà!" (P3). Participant 2 then provided his thoughts about his drawing: "But my poles are a little too short". Participant 1 explained why he did the drawing: "Parce que mon ami porte un tuck (baseball cap) de pingouin". The participants would sometimes provide physical demonstrations to explain their images or actions in PA. Participant 1 showed how to dribble a basketball and kick a soccer ball: "Je fais ça [does a dribbling gesture]". "Parce que on kick la balle comme ça [stands up and shows how to kick]". Participant 2 also showed how an individual spins with skates: "Yea, you go like this [rotates on the chair and moves hands up]".

The participants spoke about their good or not so good PA days by reflecting on their handdrawn and/or collage PA pictures. Good PA day pictures included soccer, basketball (P1), skiing, skating (P2) and badminton (P3). Participant 2 clarified if a good PA day involved his favourite PA and a fun PA: "Physical activity? Like or my favourite activity activity?" He then explained what was happening in a good PA day picture: "Skiing and I have poles". "And there is a rest of the jump back there". "Well, I am going off a jump here, that's why I am in the air". However,

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they also talked about not so good PA days where pictures included: football (P1), soccer (P2) and hockey (P3). Participant 2 asked if a not so good PA day meant "Something I don't like?" Participant 3 spoke about playing hockey with some of his peers: "Regardes Alex, il est tellement petit. C'est le petit point là". "Le petit point avec un petit bâton. Le bâton est plus gros que lui".

G-Zone. The participants recalled their PA experiences by talking about the composition of the PA pictures. They recalled and reflected on PA experiences by talking about the image or action that was drawn for their own individual storybook. Participant 5 drew a puck and a goalie's leg pads: "Hmm, peut-être une rondelle". "Bien je pourrais dessiner des pad". Participant 4 recalled his PA: "I don't know, I just drew karate". He also elaborated on the images that he drew of a person and a water basketball net in the storybook: "Yea, it could be anyone". "Yea it's like the baby, like not the baby nets but you know those plastic nets". Participant 5 spoke about swim goggles: "Il est moitié bleu et moitié vert". Participant 6 pointed to images to help him talk about his ball sports experiences: "Eh bien, cé la même chose que ça". "C'est ça mon mieux". Participant 5 provided a reason for drawing a hockey image: "C'est correct. Je vais faire un dessin. Moi, je suis gardien de but alors moi je vais faire un but".

The participants spoke about their good or not so good PA days by reflecting on their handdrawn and/or collage PA pictures. Good PA day pictures included: karate, water basketball (P4), soccer (P4, 6), hockey (P4-6), baseball and football (P6). Participant 4 clarified what a good PA day involved: "Like, I draw, like, like what I enjoy doing?" Participant 5 explained what was happening in the good PA day picture: "Eh bien, bien moi je joues (hockey) dans le finaliste pis j'entendre des perde, en peu découragé, mais j'étais pas beaucoup découragé. Je me suis encouragé pendant mais les gars (garçon) font les buts". However, they also talked about not so good PA days where pictures included: badminton, high jump, dance (P4) and swimming (P5, 6). Participant 4 clarified what a not so good PA day involved: "So like lazy days? Or like…" He also spoke about "playing badminton" in his not so good PA day picture.

A cross-case analysis of the final overarching theme was performed to identify the similarities and differences about the interview process between the zones. While there were many similarities across the groups, *Skill Demonstration* (A/R-Zone: Storybook Content Sub-Theme) was the main difference between the zones (see Table 4.8).

Table 4.8

| | Codes | |
|--------------------|---|---|
| Sub-Themes | Amber/Red Zone | Green Zone |
| Storybook Creation | Drawing or Collage ProcessQuestions and Comments | Drawing or Collage ProcessQuestions and Comments |
| Storybook Content | QuestionsInformation about PictureSkill Demonstration | Questions Information about Picture |

Cross-Case Analysis of Interview Theme

Chapter 5

Discussion

The purpose of this pilot study was to explore the PA experiences of boys with ADHD who have a range of movement difficulties. The implications of the within-case findings are presented below (e.g., A/R-Zone, G-Zone), followed by the between case findings about the boys' PA experiences.

Fundamental Movement Skill Performance

The TGMD-2 results indicated similarities and differences between the groups. The A/R-Zone and G-Zone groups of boys with ADHD demonstrated poor FMS. The A/R-Zone group's GMQ scores were described as *poor* to *very poor*. This result was expected because the boys were identified and categorized as being at risk to have probable DCD or movement difficulties according to the MABC-2 test results. The G-Zone group's GMQ scores were described as *poor* to *below average* because the boys demonstrated poor FMS performance. The locomotor sub-test scores were low for both groups. The low FMS test scores for the G-Zone group were not expected since these boys were identified as not having motor skill impairments on the MABC-2 test. However, the object control sub-test scores for children with ADHD (Harvey & Reid, 1997; Harvey et al., 2009, 2007). For example, Harvey and Reid (1997) found TGMD-2 locomotor and object control skills were performed "below average" by 19 children with ADHD (7-12 years). Verret et al. (2010) found two groups of boys with ADHD on (n = 24) and off (n = 19) medication, 7-12 years, performed significantly lower on the TGMD-2 locomotor skills test compared to the control group of boys (n = 27; Verret et al., 2010).

Similar to this study's findings for the boys' poor performance on the TGMD-2 and MABC-2 tests, Harvey et al. (2014) found 8 out of 10 children with ADHD, 9-12 years, performed below the 25th percentile of the GMQ on the TGMD-2 sub-tests. They also found that, 5 out of 10 children scored at or below the 15th percentile on the MABC-2 test (i.e., being at risk for having movement difficulties). Interestingly, previous studies have not investigated the FMS differences between children with ADHD and ADHD/DCD. This type of research is highly recommended because differences in fine motor skill performance have only been investigated between the groups. For example, Pitcher et al. (2003) found significant differences on a finger tapping motor skill task between boys with ADHD/DCD and ADHD. Pitcher et al. (2003) also

found boys with ADHD/DCD performed poorly on fine motor tasks compared to boys with ADHD only.

More research is required to explore and understand the movement skill differences between children with ADHD and ADHD/DCD. For example, results of PA studies have been questioned from a measurement perspective (Harvey & Reid, 2005). Hence, it is important to note that the tests, used in the current study, measured different outcomes (i.e., TGMD-2: process-oriented; MABC-2: product-oriented) and skills (e.g., TGMD-2: FMS; MABC-2: motor skills). Hence, future studies should measure the concurrent validity between the tests so that researchers, professionals and parents may acquire a more precise understanding of the FMS challenges that boys with ADHD may face. Clearly, this study's findings provide additional support to suggest that children with ADHD demonstrate poor FMS (Dewey et al., 2007; Harvey & Reid, 2003; Harvey et al., 2007, 2014; Pitcher et al., 2003; Verret et al., 2010). Further, the Activity-Deficit Hypothesis (Bouffard et al., 1996) may be an explanation for the poor FMS of children with ADHD and ADHD/DCD. This hypothesis was used to help explain the boys' movement skills and explore the differences between the groups in the storybook-telling section below. This approach might be useful in future research projects since it may help understand the movement skill differences between children with ADHD and ADHD/DCD.

Storybook-Telling

The boys' PA experiences were explored during the storybook-telling interview. Five overarching themes emerged: (a) Activity, (b) Knowledge, (c) Self-Awareness, (d) Other People and (e) Interview. The findings from each overarching theme are discussed from the within-case and between-case perspectives respectively.

Activity. The boys in the A/R-Zone group spoke about PA frequency and types of PA that they participated in. The PA frequency in this group ranged from once a week, "sometimes" to "rarely". Previous studies have explored the PA frequency in children with ADHD. For instance, Harvey et al. (2009) found six boys with ADHD, 9-12 years, self-reported that they spent less time in daily PA than six age- and gender-matched peers without ADHD. Johnson and Rosen (2000) also found 34 boys with ADHD, 6-17 years, participated in significant shorter time PA periods than 41 boys without ADHD. Few to no research studies have explored the PA frequency in children with ADHD/DCD or DAMP. However, PA frequency studies found children with probable DCD, 9-11 years, participated less in play activities than children, 9-11 years, without

probable DCD (Cairney et al., 2009). The boys in the A/R-Zone group also participated in various types of PA (e.g., <u>individual</u>: an obstacle race, skiing, skating; <u>group</u>: basketball, football, badminton, floor hockey, tag). Similarly, Harvey et al. (2009) found that boys with ADHD reported to prefer and participate in individual activities. Christiansen (2000) also found boys with DAMP, 11-12 years, primarily participated in individual activities.

The boys in the G-Zone group also spoke about PA frequency and types of PA participation. The PA frequency in this group was more than once a week (i.e., 3-4 times a week). Generally, children with disabilities do not participate regularly in PA (Shields et al., 2015; Woodmansee et al., 2016), which may prevent them from obtaining the physical, psychological and social benefits of PA participation (Atlantis et al., 2006; Gawrilow et al., 2013). Children with ADHD also tend to participate less frequently in PA (Harvey et al., 2009). The G-Zone group of boys also participated in various types of PA (e.g., <u>individual</u>: karate, swimming, diving; <u>group</u>: soccer, floor & ice hockey, water basketball, baseball). These findings were expected because children with ADHD (Harvey et al., 2012, 2014) and children without movement difficulties have been reported to participate in both types of PA (Kremer, Trew, & Ogle, 1997).

There were similarities and differences between the groups for PA frequency and types of PA. The A/R-Zone group had lower PA frequency than the G-Zone group. The groups reported similar types of PA participation (e.g., soccer, badminton, floor hockey). However, different individual PA was reported (<u>A/R-Zone</u>: obstacle race, skiing, skating; <u>G-Zone</u>: karate, swimming, diving). Further, sedentary activities were reported only by the A/R-Zone group. These findings are similar to findings in which children with movement difficulties may spend less time being active (Bouffard et al., 1996; Cairney et al., 2005), in turn, supporting the use of the Activity-Deficit Hypothesis (Bouffard et al., 1996; Wall, 1982; Wall et al., 1985) to understand the PA behaviours of children with ADHD (Harvey & Reid, 2005).

More research is warranted to explore the PA frequency differences between children with ADHD and ADHD/DCD. Future studies should also explore the intensity and proportion(s) of PA for the children. This pilot study did not account for the intensity of PA, however, a few studies have explored PA intensity for children with ADHD (Gapin & Etnier, 2010) and ADHD/DCD (Baerg et al., 2011). For example, Gapin and Etnier (2010) explored the relationship between PA intensity and executive function performance in 18 boys with ADHD, 8-

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12 years. They found that high minutes of moderate-to-vigorous PA were significantly and positively correlated with better executive functioning performance on the Tower of London planning task. Baerg et al. (2011) also found that 20 boys with DCD and 16 males with ADHD/DCD, 12-13 years, were less active than 48 children in the control group. By understanding the PA intensity, one may know if the children are meeting the daily minutes of moderate-to-vigorous PA in order to accrue health benefits. Next, no analysis was conducted during the pilot study to understand if the group spent more time playing individual or group PA. By exploring the proportional differences, one may understand their PA preferences. Few to no research studies have compared the types of PA the children participate in. Therefore, more research is warranted to explore the similar and different types of PA for the groups to understand why they participate in the group and individual as well as formal and informal PA. Finally, more research is needed to explore the Activity-Deficit Hypothesis for children with ADHD to better understand their PA behaviours. Some of these boys have reported low PA participation and may be at risk of activity deficits and the related poor outcomes. As a result, future studies need to not only support the findings of their movement behaviours but also explore the specific factors suggested by the hypothesis that may lead to this vicious cycle of poor movement performance.

Knowledge. Knowledge plays an important role in the control and execution of human action that may be gained through learning and experience (Wall, 1982; Wall et al., 1985). Various types of knowledge about PA emerged from the interviews. The boys in the A/R-Zone group discussed the purpose of FMS as well as skill level(s) which suggests that they possess declarative knowledge (i.e., factual knowledge) and procedural knowledge (i.e., knowing how to perform) about human action (Wall et al., 1985). However, they demonstrated a lack of deeper PA/FMS content knowledge. For example, the boys demonstrated a lack of PA declarative knowledge because they did not know specific PA terms and rules. Similarly, Harvey et al. (2009) found that six boys with ADHD, 9-12 years, demonstrated superficial content knowledge about the benefits of PA participation, sports-specific skills and observational learning. The current study finding may be due to potential limited recall of information (Barkley, 1997) and/or a lack of exposure to PA teaching and participation (Lubans et al., 2010; Wall et al., 1985). The participants did demonstrate some knowledge about PA and FMS performance. For example, they talked about trying and failing FMS as well as falling and getting injured during PA. The factors that contributed to getting injured, other than falling, were (a) performing a new

movement skill poorly, (b) engaging in a risky PA and (c) not paying attention to the PA at hand. Falling and getting injured were previously reported for children with ADHD (Harvey et al., 2009, 2012).

The boys in the G-Zone group also discussed the purpose of FMS as well as skill level(s), which suggests that they possessed declarative and procedural knowledge about human action (Wall et al., 1985). For example, they demonstrated a range of PA and FMS content knowledge by discussing the purpose and benefits of PA participation. Deeper PA knowledge was found by Harvey et al. (2014) who described the active role that children with ADHD played when planning PA. The boys also demonstrated a lack of content knowledge because they did not know specific PA terms or how to explain them. Superficial knowledge is supported by Harvey et al.'s (2009) findings. Next, the participants did demonstrate some knowledge about their PA and FMS performances. Only one participant in the G-Zone group spoke about getting injured. The factors that contributed to the injury were (a) stopping a puck during ice hockey and (b) lacking supportive gear for protection. Findings on getting injured in PA were previously reported for children with ADHD. For example, Harvey et al. (2009) found that a child with ADHD reported getting hurt when he attempted a new skill or PA.

Similarities and differences about knowledge as well as falling and getting injured can be observed between the groups. The participants demonstrated a lack of PA and FMS content knowledge. The G-Zone group possessed specific PA content knowledge (e.g., about PA benefits) while the A/R-Zone group did not report it. This knowledge difference may support the Knowledge-Based Approach due to possible indications of different PA experiences and different frequency of PA participation for the groups (Lubans et al., 2010; Wall et al., 1985). This finding may also support the Activity-Deficit Hypothesis because it suggested that children with movement difficulties find it challenging to participate in PA because of a lack of opportunities to practice and learn movement skills. This may lead to challenges to acquire the knowledge they need to participate in PA. As a result, a vicious cycle of poor performance would continue over time and thus, some boys with ADHD might have acquired more knowledge than others and better movement skill performance due to experience alone.

As expected, all of the A/R-Zone group reported falling during PA. For example, the balance skill scores were lower in the A/R-Zone group compared to the G-Zone group if we take the MABC-2 test results into account. Poor balance has previously been reported for children

with DAMP (Christiansen, 20000) and may be related to falls in children with DCD (Fong et al., 2016). Both groups discussed getting injured during PA participation.

To conclude, few to no research studies have explored the PA and FMS knowledge for children with ADHD and ADHD/DCD. Therefore, more research should be conducted to explore relationships between PA content knowledge and associated FMS performance within and between the groups. PA and FMS knowledge-based strengths and weaknesses may be better understood so that PE and PA professionals can address them during programming. Hence, these professionals may incorporate individual and group strategies to (a) be aware of the consequences of physical inactivity, (b) encourage PA participation to combat lack of PA participation and (c) address the problem of poor movement skill execution early for all children with ADHD. According to Barkley (1997, 2006), children with ADHD may experience point-of-performance problems where they may know what to do (declarative knowledge) but are unable to perform what they know (procedural knowledge). Lee et al. (2014) found that young men with ADHD felt they knew how to perform sports but could not perform what they knew because of their ADHD. However, more research is warranted to explore this phenomenon for children with ADHD and ADHD/DCD as researchers can explore potential mismatches between what the children do and what they know. While this study's findings are preliminary, future studies should also explore the possible causes of injuries in PA for all children with ADHD.

Self-Awareness. The boys in the A/R-Zone group used specific terms to express positive feelings about PA experiences (e.g., happy, like, love, fun) and provided reasons for the feelings. They also reported their choices of PA and described associated asocial behaviours.

The reasons for experiencing positive feelings for boys in this group were: inclusion, playing with friends and performing a specific skill during PA. Harvey et al. (2009) also found boys with ADHD expressed positive feelings about playing with friends and performing specific PA. More recently, Harvey et al. (2014) found children with ADHD, 9-12 years, reported to enjoy organizing PA since they would be playing in groups and making friends. Few studies have explored positive self-perceptions in PA as reported by children with ADHD/DCD. However, children with disabilities (e.g., cerebral palsy, gross & fine motor problems, DCD), 8-12 years, reported feeling included and important when they contributed to PA teams (Spencer-Cavaliere & Watkinson, 2010).

The boys in the A/R-Zone group also used specific terms to express negative self-

perceptions about PA experiences (e.g., afraid, angry, hate, not fun, lonely). The reasons for experiencing negative feelings were: boredom, asocial behaviours of peers, playing with someone outside their social circle, getting dressed for a PA, getting into accidents and sweating. For example, a boy in this group reported lack of interest because he was playing with peers who were not in his social circle and ignored him. Similarly, boys with ADHD have expressed negative feelings, such as frustration and feeling hurt, during PA (Harvey et al., 2009). For example, boys with ADHD reported 50% more negative feelings than boys without ADHD. These feelings were expressed when PA games were boring, individual skill was lacking and the boys felt excluded due to poor skill performance (Harvey et al., 2009). Finally, the boys also spoke about their choice of PA that involved family and friends. The implications of playing PA with these individuals are discussed in the Other People theme. The only other study to explore choices in PA found children with ADHD chose and organized their own PA whilst others participated in PA that were in front of them with little to no organization at all (Harvey et al., 2014). Finally, the boys in the A/R-Zone group described their asocial behaviours in their PA experiences that have been commonly reported misbehaviours of children with ADHD (Barkley, 1997, 2006). Not surprisingly, children with ADHD have previously described asocial behaviours in PA studies. For example, Harvey et al. (2009) found boys with ADHD spoke about aggressive behaviours in PA settings and they would be scolded for misbehaviour.

The boys in the G-Zone group also expressed positive and negative feelings about PA experiences and provided reasons for the feelings. They also reported their choices of PA and used specific terms to describe positive self-perceptions about PA (e.g., like, fun). The reasons for experiencing positive feelings were: performing a specific skill, being active, doing what they wanted to do and playing with friends and family. Previous studies reported positive feelings for children with ADHD in PA such as: performing specific PA (Harvey et al., 2009), working in groups and making friends (Harvey et al., 2014) The boys in this group also used specific terms to express negative self-perceptions about PA (e.g., afraid, don't like). The reasons for experiencing negative feelings were: boredom, annoyance, strange, repetition and not physically demanding enough. Boredom in PA has been identified for boys with ADHD due to a lack of performing FMS adequately (Harvey et al., 2009). The current study also found boredom was related to PA that was perceived as being repetitive or not physically demanding enough. Finally, the boys in this group spoke about choice of PA. As suggested above, previous research found

mixed results for PA organized by children with ADHD (Harvey et al., 2014). The boys also chose to play with family and friends. The implications of playing PA with these individuals are discussed in the Other People theme.

Similarities and differences about self-awareness were present between the groups. The participants shared similar positive and negative feelings towards PA. Positive feelings were related to performing FMS and playing with family and friends. However, the boys in the G-Zone group expressed feelings about being active and doing what they wanted. While both groups perceived PA negatively due to boredom, their reasons for being bored in PA differed. For example, one boy in the A/R-Zone group reported boredom because he was playing with peers who were not in his social circle and ignored him whereas the boys in the G-Zone group suggested boredom was related to PA being repetitive or not physically demanding enough. Different reasons related to negative feelings were also reported (A/R-Zone: arguing with peers; G-Zone: performing a "weird" skill, high jump). The Activity-Deficit Hypothesis states that poor movement skills may elicit negative affective responses, or vice versa, which may lead to low perceived motor competence and motivation. In turn, it may lead to reduced social interaction, decreased levels of PA and poor levels of physical fitness (Bouffard et al., 1996). The reported negative feelings by the boys in the A/R-Zone group may support this hypothesis and thus, these feelings may perpetuate the vicious cycle of poor performance. Perhaps research studies should further explore the similar and different feelings and motivational factors associated with the boys' movement skill performance in both groups to gain a better understanding of their movement skill performances.

Next, both groups spoke about choosing a PA to perform by themselves or with family and friends. However, the participants in the G-Zone group also spoke about not participating in a PA. Different reasons were provided for the choice of PA (<u>A/R-Zone</u>: were given the opportunity by their friends to play, wanted to join their friends; <u>G-Zone</u>: they liked the PA, were given the opportunity to choose which PA they could play and join a sports team). Future studies should explore the possible reasons why the children choose to participate in PA to increase motivation and participation in an active lifestyle (Harvey et al. 2009, 2012, 2014). For example, Harvey et al. (2014) found that some children with ADHD chose PA of their own accord. Still, few research studies have explored decision-making behaviour in PA for children with ADHD/DCD and DCD.

While both groups reported playing group PA alone, only the boys in the A/R-Zone group reported demonstrating asocial behaviour and possessing good and poor attitudes during PA. A boy in the A/R-Zone group also discussed his peers and his/their attitude during PA (i.e., not being a bad loser). Children with ADHD have previously described asocial behaviours in PA studies (Harvey et al., 2009). A caring attitude has also been previously reported for children with ADHD (Harvey et al., 2014). However, little to no research studies have explored perceptions of winning and losing attitudes for children with ADHD. Hence, good sportsmanship seems like a fertile research area for future ADHD studies. Perhaps research studies should be conducted to measure the effects of behavioural therapy interventions to help reduce asocial behaviours in PA. For example, summer treatment programs, that have combined behaviour therapy interventions and PA, for medicated children with ADHD showed improvement in ADHD symptoms, peer relationships, self-esteem, rule following and good sportsmanship (Hantson et al., 2012; Pelham et al., 2000). These approaches may improve the PA experiences of children with ADHD.

Other People. The boys in the A/R-Zone group spoke about the people they played with, social behaviour of other people, other people's choice of PA and adult influence over PA experiences. First, the boys reported participating in PA with siblings (e.g., skating with sister), friend(s) (e.g., soccer with best friend) and peers from another social group (e.g., ice hockey with "enemies"). Previously, Harvey et al. (2014) found children with ADHD played with friends during free time and participated in leisure activities with family members. Harvey et al. (2009) also found boys with ADHD reported to play PA with friends (e.g., soccer). However, few studies have explored the play behaviour of children with ADHD/DCD in PA. Next, the boys in the A/R-Zone group also recalled asocial and prosocial behaviours that peers demonstrated towards them. Asocial behaviours were: being bullied, ignored, rejected by peers, as well as argumentative behaviours during PA participation. Feelings of exclusion in PA have previously been reported by children with ADHD. For instance, Harvey et al. (2009) found a boy with ADHD reported being singled out by his peers due to his poor skill proficiency. Few studies have explored these behaviours in children with ADHD/DCD. Prosocial behaviour, reported by this group, was being understood by friends. Other types of prosocial behaviours have been previously reported where boys with and without ADHD spoke about children who cheered and clapped for them and their peers in PA settings (Harvey et al., 2009). Third, the boys in the A/R-Zone group reported their friends, classmates or family chose the PA they participated in.

Similarly, Harvey et al. (2014) found that some children with ADHD participated in the PA that was in front of them with little organization. Finally, the boys elaborated on adult influences over PA experiences. Authority figures, such as a school principle or teacher, permitted the participants to use a facility or play a specific PA. Teachers also became involved when (a) participants and peers were arguing or (b) a boy was obliged to play with classmates outside his social circle. Previous studies have reported other people, such as teachers, have an influence on the PA experiences. For instance, Harvey et al. (2014) found teachers and family members would assist in the PA planning of children with ADHD. Few to no research studies have explored the different influences of other people on children with ADHD and/or ADHD/DCD and DCD.

The boys in the G-Zone group also spoke about the people they played with, social behaviours of other people, other people's choice of PA and adult influence over PA. First, they reported participating in PA with family members (e.g., ball sport with father and brother), friend(s) (e.g., soccer with friends), classmates (e.g., badminton with classmates) and people they didn't know (e.g., swimming classes with strangers). Playing with these groups of people has been previously reported by children with ADHD (Harvey et al., 2014; 2009). Next, the boys recalled peers' asocial and prosocial behaviours demonstrated to them or other peers. Asocial behaviours were demonstrated by peers and game spectators (e.g., distracting, bullying, arguing). Prosocial behaviours were demonstrated by peers, family members and game spectators (e.g., encouraging). Asocial and prosocial behaviours have been previously described by boys with ADHD (Harvey et al., 2009). Third, the boys in this group reported that teachers and parents chose the PA they participated in. Finally, they elaborated on the influence of teachers and parents over their PA experiences. The teachers asked what PA that the boys with ADHD wanted to play and then taught the PA to them. However, the parents influenced the location where the boys played the PA and the specific PA the boys participated in. Parents have previously been found to influence children with ADHD's PA experiences. For example, Harvey et al. (2012) found that the parents of children with ADHD helped to plan PA opportunities. Yet, they also found that parent's work schedule was a barrier to PA participation. Further, individuals who have high skill performance abilities often have parents who influence the individual's skill development as well as guide and lead the individual to participate in a variety of activities (Côté, Baker, & Abernathy, 2003).

Similarities and differences in PA experiences emerged from the groups. All of the

participants played PA with similar groups of people: a family member, friend(s) and classmates. The justifications for participating with their family and friends were preference and enjoyment. The boys in A/R-Zone group, however, reported playing with peers from other social groups whereas the boys the G-Zone group spoke about participating in a public PA with people they didn't know. Next, all of the participants spoke about other people demonstrating asocial behaviour during PA (e.g., arguing & bullying). The boys in the A/R-Zone group, however, reported to be involved in arguments and being bullied whereas the boys in the G-Zone group suggested they were not involved in arguments. They also reported peers were bullied by other children. Different asocial behaviours were also reported by the groups (A/R-Zone: peers ignoring, rejecting, taking the ball away from them; G-Zone: spectators distracting them during a sports game). Asocial behaviours demonstrated by others have been reported by children with ADHD or movement difficulties (Harvey et al., 2009; Spencer- Cavaliere & Watkinson, 2010). Further, both groups spoke about prosocial behaviour but different types of behaviours were demonstrated by the groups (A/R-Zone: friends understanding them: G-Zone: peers, family members & spectators encouraging them). Prosocial behaviours demonstrated by their peers have also been reported in previous research study (Harvey et al., 2009). Previous studies have found children with ADHD expressing similar thoughts (Harvey et al., 2014; Lee et al., 2014). Only the boys in the G-Zone group reported building rapport with others. A participant expressed that making friends was a reason for participating in a group PA. Unlike any other APA research study to-date, they reported getting closer to peers and developing relationships during PA participation. Therefore, asocial and prosocial behaviours may be factors that respectively perpetuate or break the Activity-Deficit Hypothesis vicious cycle (Bouffard et al., 1996). In turn, this may lead to movement skill differences between the groups.

Both groups also spoke about other people choosing a PA for them. They both expressed that their families would decide the PA they participated in. Nevertheless, different groups of people decided and organized PA for each group (<u>A/R-Zone</u>: friends & classmates; <u>G-Zone</u>: teachers). This study's findings, where boys with ADHD did not plan their PA, support the results of Harvey et al. (2014). Next, the participants shared stories about authority figures affecting their PA participation and experience. Both groups spoke about how teachers influenced their PA experiences. The boys in the A/R-Zone group spoke about a school director permitting the use of school facilities to play PA. Whereas the boys in the G-Zone group described how their

parents determined where and what PA the boys played, introduced the PA to the child and were involved emotionally during a PA game.

Future studies should explore the groups of people that children with ADHD and ADHD/DCD play PA with and how these people influence PA experiences. One may further understand the factors that may hinder or facilitate PA participation. Professionals may then be able to avoid factors that bring about negative PA experiences and implement factors that encourage positive PA experiences. For example, PA professionals may teach prosocial behaviours in PA to children with and without disabilities as well as address asocial behaviours.

Interview. The boys in the A/R-Zone group asked questions about the drawing and collage process during the storybook-telling interview. They expressed negative feelings about their PA pictures and spoke about having poor drawing skills. These thoughts and feelings may have been experienced because the boys had poor fine motor skills. For example, according to the MABC-2 test results, the boys' manual dexterity scores were very low (below the 5th percentile). Poor fine motor skills have been previously reported for children with ADHD (Brossard-Racine et al., 2012; Neto et al., 2015; Pitcher et al., 2003). Pitcher et al. (2003) also found that 50 boys with ADHD-PI and 38 boys with ADHD-C, 7-12 years, scored poorer in the MABC fine motor tasks (i.e., lower manual dexterity) than 39 males in a control group. Most recently, Neto et al. (2015) found that 50 children with ADHD, 5-10 years, scored lower in fine motor tasks (e.g., drawing trail, threading) of the Motor Development Scale compared to 150 children without ADHD.

Next, the boys in the A/R-Zone group demonstrated that the storybook-telling technique (i.e., a visual method) stimulated memory recall and reflection on their PA experiences. The visual method was useful because it prompted their memory on PA, which may be difficult for children with ADHD due to potential limited recall of information (Alloway et al., 2009; Barkley, 2007). The method also helped each child to reflect and talk about PA experiences (e.g., Harvey et al., 2012, 2014). This new method was useful because Tannock et al. (1993) suggested that children with ADHD had difficulties in story telling: their stories were less organized, cohesive and accurate than children without ADHD.

The participants in the G-Zone group also asked questions about the drawing and collage process during the storybook-telling interview. They stated that they did not know what to draw and also expressed negative feelings about their PA pictures and drawing skills. These thoughts and feelings may be because the boys have poor fine motor skills. However, according to the

MABC-2 test results, all of the boys scored above the 15th percentile on the manual dexterity tasks which, in turn, suggests that they did not have fine motor impairments. Next, the boys in the G-Zone group also demonstrated that the storybook-telling technique stimulated memory recall and reflection on their PA experiences. The storybook-telling interview technique adds to the visual research methods used to encourage children with ADHD to relay PA experiences (Harvey et al., 2012, 2014).

Many similarities and differences emerged between both groups. Both groups shared their thoughts about assembling the PA pictures, asked question about the drawing and collage process and expressed positive and negative feelings about the picture making process. One boy in the A/R-Zone group expressed that he liked to draw whereas a boy in the G-Zone group expressed that he enjoyed the interview process overall. Yet, both groups shared negative feelings about their individual drawing skills to make pictures. However, both groups recalled and reflected on PA experiences by talking about individual pictures or images. Both groups also spoke about their good and not so good PA days. A good PA day in the A/R-Zone and G-Zone group included individual and group PA. The common group PA was playing soccer with friends. A not so good PA day in the A/R-Zone group only included group PA and in the G-Zone group it included individual and group PA. Further, only the participants in the A/R-Zone provided physical demonstrations to explain their images or actions in PA. Few to no research studies have explored the use of physical demonstration by children with and without ADHD during interviews. However, performing movements may have helped the boys in the A/R-Zone recall and reflect on their PA experiences.

Overall, it is important to keep in mind that children with ADHD may have fine motor skill difficulties and thus, it would be important to extend the visual method to improve their research experience. For example, the interviewer can first teach the children about collage as it may be new to them. They may also wish to create images with just a collage or increase the influence of collage in the mixed media technique. It is important to note that the interview would have to assist in cutting the images during the interview due to possible fine motor challenges. Next, future studies could explore the children's PA experiences with adding a protocol that encourages physical movement during story telling to help them recall their PA experiences (i.e., body memory; Fuchs, 2012; Koch, Fuchs, & Summa, 2014) and possibly enrich the data. Furthermore, it would be important to find out how the process could be made more enjoyable so that the

children may have fun during the research process. In turn, we would expect to gain richer and deeper qualitative data.

Limitations

There were several limitations for this study of which we were aware of from the start. For example, the sample size was small, excluded females and lacked control for comorbid disorders. As previously noted in Chapter 1, Harvey's past research studies utilized samples of children with ADHD and other comorbid disorders because they represented a majority of the ADHD population (see Harvey & Reid, 2003, 2005). There was also a lack of control for independent variables such as IQ, socioeconomic status, education levels of parents, etc. These factors were considered as limitations since they may have affected movement skills and PA participation (Harvey & Reid, 2005). However, there were other limitations that emerged during the study that we did not anticipate. Information about interrelationships between themes did not emerge in the analysis. For example, the interaction between the boys' type of activity and their feelings about the type were not evident. Perhaps the study should have asked the participants to make the link directly during the storybook-telling interview since the results indicate potential interrelationships between the themes. The boys in the pilot study reported positive feelings about different types of PA (A/R-Zone: formal & informal group PA, informal individual PA; G-Zone: formal group PA, formal & informal individual PA) and negative feelings about different types of PA (A/R-Zone: formal group PA; G-Zone: formal individual PA & informal group PA). The study should have also explored if there were more positive or negative feelings with one type of PA over another. Next, information about interrelationships between themes and the information from the parent questionnaire did not emerge. For example, the interconnection between the adult's influences reported by the boys and the parents' PA participation information did not arise in the analysis. Therefore, future studies should explore potential interrelationships during data collection and analyses to gain a better understanding of the children's PA experiences (Creswell, 2009).

Conclusion

The purpose of this pilot study was to investigate the PA experiences of boys with ADHD who have a range of movement difficulties. It explored the good and challenging PA days of boys with ADHD to gain a broader understanding of their PA experiences. The participants discussed the PA context, demonstrated different types of knowledge about PA, spoke about their

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feelings, motives and behaviours towards PA and other people's involvement in PA experiences. The participants also shared their perceptions about the storybook-telling interview process. Many similarities emerged from the A/R-Zone and G-Zone group. For example, both groups related their positive feelings to performing a specific skill and playing with family and friends during PA. A few differences were also present. For example, the boys in the A/R-Zone group experienced asocial behaviours from their peers (e.g., exclusion) whereas the boys in the G-Zone group spoke about building rapport with peers during PA. This last point is a new and key finding in this research area. Further, the parent checklist and questionnaire confirmed the participant's stories. Overall, these findings may be reasons to understand why boys with ADHD, who are or aren't at risk of movement difficulties, participate more in PA. Unfortunately, the sample size was small and replication is warranted. Nevertheless, these insights are substantial because little is known about the boys' PA needs and wants. Further, these initial findings may provide professionals with a preliminary understanding of what factors influence the boys' PA experiences positively and negatively. They can also help professionals to develop programs that may encourage boys with ADHD and DCD to lead a healthy and active lifestyle in the long term.

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Appendices

Appendix A



RECRUITMENT LETTER

The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

By Anne-Catherine Knecht, BSc. (MA McGill University Student), Dr. William J. Harvey, Ph.D. (Associate Professor McGill University; Research Associate DMHUI), Gordon Bloom, Ph.D. (Associate Professor McGill University), Ridha Joober, M.D., Ph.D., (Professor McGill University; Senior Researcher DMHUI), & Natalie Grizenko, M.D. (Associate Professor McGill University; Clinical Researcher; Medical Chief)

(McGill University and Douglas Hospital Research Centre)

Dear Parent or Guardian,

My name is Anne-Catherine Knecht and I am a master's student at the Department of Kinesiology and Physical Education of McGill University. The purpose of this letter is to ask if you and your child are interested in participating in a physical activity (PA) research study that I am planning to run at the Douglas Mental Health University Institute. I believe your child will enjoy taking part in this study and with your child's participation we will understand their PA needs.

The goal of my research is to understand the PA experiences of children with Attention-Deficit/Hyperactivity Disorder (ADHD). Many children with ADHD may experience challenges when they are trying to participate in daily PA and I am exploring some of these challenges from the specific viewpoints of the children at the Choices in Health, Action, Motivation, Pedagogy and Skills (CHAMPS) PA lab at the Douglas Mental Health University Institute.

If you and your child agree to participate in the study, your child would be asked to do two different movement skills tests: Movement Assessment Battery for Children-2 and Test of Gross Motor Development-2. It will take approximately 60 minutes to complete. These tests are commonly used across North America. These skills will be videotaped to help us observe the quality of their movements. I think your child will have fun performing these skills since he/she uses them to play.

I would also like to conduct an interview with your child so that he/she may describe his/her PA experiences by creating a storybook with drawings and/or magazine cutouts about their PA experiences. I will ask your child to talk about good and not-so-good PA experiences in PA. Questions will be asked about (a) his/her activity, (b) his/her participation, (c) his/her

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environment and (d) his/her feelings. The interview will be about 45 minutes long and it will be videotaped so that I can accurately transcribe the interview. I believe your child will enjoy making a storybook and talking about his/her experiences.

Further, you will also be asked to complete a Parent Checklist of the Movement Assessment Battery for Children- 2 and an information questionnaire. The Parent Checklist will focus on different factors that may affect your child's ability to participate in PA and the questionnaire will ask questions about your age, occupation and current physical activities. It takes about 30 minutes to finish.

Please indicate if you and your child are interested in participating in this study.

If YES, then I will contact you by email and/or telephone. If NO, thank you for taking the time to read my note.

Please tick the box to indicate your choice

□ YES Please provide your: (a) name: _____

(b) email address: _____

(c) telephone number:

□ NO

Anne-Catherine Knecht, BSc Master's Candidate, Adapted Physical Activity Douglas Mental Health University Institute Verdun, Quebec, Canada (514) 761-6131 ext. 2125 anne-catherine.knecht-boyer@mail.mcgill.ca

William Harvey, Ph.D. Associate Professor, Director of CHAMPS PA lab Department of Kinesiology and Physical Education McGill University, Montreal, Quebec (514) 398-4184 ext. 0477# william.harvey@mcgill.ca

Appendix B

Telephone script for contacting participants when the Parent/Guardian is interested in participating in the study

Hi Mr./Mrs. Blank,

My name is Anne-Catherine Knecht and I am a master's student at the Department of Kinesiology and Physical Education of McGill University. I am calling from the ADHD clinic at the Douglas Mental Health University Institute. How are you?

Thank you for reading the brief letter about my study for children with ADHD and their physical activity experiences. You had agreed that I may contact you to set up an appointment so I can explain my research to you. Is this a good time for you to speak?

Are you still interested in taking part? If so, when would be the best time for you and your child to come to the CHAMPS physical activity lab? Here is a list of available days and times that I can offer to meet you:

Thank you for agreeing on this meeting. I will send you an email with the specific information and consent forms for you to read before our meeting.

I will also ask that you please remember to bring your child's gym clothes and running shoes to our first meeting as I will test your child's movement skills right away if you agree to participate in the study. Please make no changes to your child's daily routine as there are no special requirements for this study if you agree to participate. For example, your child would continue to take his or her prescribed medication(s).

If you have any questions or concerns, do not hesitate to contact me by email (anne-catherine.knecht-boyer@mail.mcgill.ca) or by telephone (514) 761-6131, ext. 2125.

Thank you and I look forward to meeting you.

Appendix C

Email script for contacting participants when the Parent/Guardian is interested in participating in the study

Subject: ADHD Research – Meeting & Additional Information

Dear Mr./Mrs. Blank,

My name is Anne-Catherine Knecht and I am a master's student at the Department of Kinesiology and Physical Education of McGill University. Thank you for reading the brief letter about my study for children with ADHD and their physical activity experiences. You had agreed that I may contact you to set up an appointment so I can explain my research to you.

I am emailing you to set up an appointment with you and your child so I may explain my research in greater detail. Are you still interested in taking part? If so, when would be the best time for you and your child to come to the CHAMPS physical activity lab? Here is a list of available days and times that I can offer to meet you:

I have attached the information and consent forms that explain the research study and specific procedures that I would put into place.

Can you please remember to bring your child's gym clothes and running shoes to our first meeting as I will test your child's movement skills right away if you agree to participate in the study. Please make no changes to your child's daily routine as there are no special requirements for this study if you agree to participate. For example, your child would continue to take his or her prescribed medication(s).

If you have any questions or concerns, do not hesitate to contact me by email (anne-catherine.knecht-boyer@mail.mcgill.ca) or by telephone (514) 761-6131, ext. 2125.

Thank you and I look forward to meeting you.

Sincerely,

Anne-Catherine Knecht

Appendix D

Evaluation Tool: Semi-Structured Interview Protocol

The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

| Time of interview: | |
|--------------------|--|
| Date: | |
| Participant ID#: | |

Protocol

- 1) The interviewer will proceed by turning on the video camera while saying:
 - a. Thank you for being here today. We are now going to make pictures on your happy and challenging physical activity experiences. You can make the pictures however you like with the materials you see in front of you.
 - b. When you and I make the pictures, I will be asking you questions about the picture and other things.
 - c. Are you ready? Do you have any questions?
 - d. Alright, grab anything that you like to use and make something that can tell me about a good physical activity day first!
- 2) The interviewer will then proceed with these following questions for clarification:
 - a. Tell me why this activity would be a good PA day? What is going on here?
- 3) The interviewer will also use these follow-up and probe questions:
 - a. Is this an activity you usually play? Why?
 - b. How often do you play this activity? Why?
 - c. How do you choose which activity to play?
 - d. Who do you play this activity with? Where do you play this activity?
 - e. Why would this activity make you feel good?
- 4) Once each picture is completed, the child will be asked to create pictures capturing a challenging PA day.
 - a. Tell me why this activity would not be so good a PA day? What is going on here?

- 5) The interviewer will also use these follow-up and probe questions:
 - a. Is this an activity you usually play? Why not?
 - b. How often do you play this activity? Why?
 - c. How do you choose which activity to play?
 - d. Who do you play this activity with? Where would play this activity?
 - e. Why would this activity make you feel not so good?
- 6) Once all the pictures are completed, the interviewer will ask if each participant has any other information to add. The video camera will be turned off and the participant will be thanked.







Figure 3.0 Study design, instruments, measurements and analysis procedures of the pilot study.

Appendix F

Evaluation Tool: Parent Information Questionnaire

The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

| Date: | | |
|---|--|--|
| Child's Name: | | |
| Parent Name: | | |
| Date of birth: (Day/Month/Year) | | |
| 1. Where were you born? | | |
| 2. What is your marital status? | | |
| 3. What is your occupation? | | |
| 4. What is your spouse's occupation? | | |
| 5. What is the highest education level that you have achieved? | | |
| 6. What is the highest education level that your spouse has achieved? | | |
| 7. Family income level: | | |
| □ <\$20.000 | | |
| □ \$20.000 - \$29.999 | | |
| □ \$30.000 - \$39.999 | | |
| □ \$40.000 - \$59.999 | | |
| □ \$60.000 - \$79.999 | | |
| □ \$80.000 - \$99.999 | | |
| □ ≥ \$100.000 | | |

PHYSICAL ACTIVITY EXPERIENCES

8. Do you currently participate in any types of physical activity? (Please tick)

 \Box YES \Box NO

9. If yes, which physical activities you participate in?

10. How long do you participate in these physical activities?

11. If no, why not?

Appendix G



INFORMATION

Protocol 14/37: The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

By Anne-Catherine Knecht, BSc. (MA McGill University Student), Dr. William J. Harvey, Ph.D. (Associate Professor McGill University; Research Associate DMHUI), Gordon Bloom, Ph.D. (Associate Professor McGill University), Ridha Joober, M.D., Ph.D. (Professor McGill University; Senior Researcher DMHUI), & Natalie Grizenko, M.D. (Associate Professor McGill University; Clinical Researcher; Medical Chief)

(McGill University and Douglas Mental Health University Institute)

Dear Parent or Guardian,

We are asking for the participation of your child or the child that you represent, in a research project. Before signing the information/consent form to accept that the child you represent participates in the project, please take the time to carefully read and understand the following information.

This form may contain words that you do not understand. Please ask any questions to the researcher or any other members of the research team to explain any words or information that is unclear to you.

Who is conducting this study?

My name is Anne-Catherine Knecht and I am a master's student at the Department of Kinesiology and Physical Education at McGill University under the supervision of Dr. William J. Harvey. I am conducting a research study at the Douglas Mental Health University Institute in the Choices in Health, Action, Motivation, Pedagogy and Skills (CHAMPS) Physical Activity lab under Dr. Harvey's supervision. All movement skill testing and interviews will take place in the CHAMPS Lab at the Douglas Mental Health University Institute.

What is the nature and objective of the study?

This study will explore the physical activity (PA) experiences of children with attentiondeficit/hyperactivity disorder (ADHD) who experience movement difficulties. The study will use two movement skills assessments and a qualitative storybook-telling interview to understand a range of the PA experiences of children with ADHD. We expect to have 10 to 15 children with ADHD from the Douglas Mental Health University Institute who will participate in the study.

What is the purpose of this study?

The purpose of this research study is to understand the PA experiences of children with ADHD. Previous studies have shown that children with ADHD may have difficulties when performing everyday play skills like skipping, hopping and catching, kicking or throwing a ball. These types of skill challenges have often been linked to children who may be considered as awkward or who have a Developmental Coordination Disorder (DCD). In other words, children demonstrate moderate to severe movement difficulties that may significantly interfere with their activities of daily living and every day play skills. It is important to gain more information of the PA challenges of these children by providing a way for the children to express their experiences.

I would like to explore the everyday play skill challenges of children with ADHD by observing their movement skills with two popular movement skill tests and listening to their PA stories. With the information collected from the movement tests and the stories, we would like to look at the various experiences of children with ADHD who have a range of movement difficulties in order to learn how to develop more child-friendly ways of teaching movement, play and sport skills and activities.

What will your role be in the study?

I will hold the first meeting with you and the child that you represent. The child you represent will be asked to complete two movement skill tests during the first meeting. These tests are used safely every day in schools, hospitals and clinics across Canada and The United States. The first test is called the Movement Assessment Battery for Children-2 and it will take approximately 20 - 30 minutes to complete. Occupational therapists and researchers use this test to identify and describe the movement difficulties of children. It assesses manual dexterity (e.g., threading a lace in and out a board), ball skills (e.g., catching bean bags) and balance skills (e.g., walking heels raised on a small balance beam). The skills tests are all made for each child's specific age level. The second test is called the Test of Gross Motor Development-2 and it takes 20 - 40 minutes to complete. Professional physical education teachers safely and commonly use this test across North America. Each child will be asked to perform six locomotor skills (e.g., run, gallop, hop, leap, horizontal jump and slide) and six object control skills (e.g., striking a stationary ball, dribbling, catching, kicking, overhand throw and underhand roll). The Test of Gross Motor Development-2 skills will be videotaped to more accurately measure each child's skills and observe the quality of each child's movement skills. Each child will perform each skill at their own pace and according to each test's guidelines. You, the parent/guardian, will be asked to complete the Parent Checklist of the Movement Assessment Battery for Children- 2 and an information questionnaire. This Checklist focuses on what factors that may influence the child you represent's ability to participate in PA and the questionnaire will ask questions about your age, occupation and current physical activities. It should take about 30 minutes to complete in total.

The child you represent will be asked to participate in an interview about his or her PA experiences at the <u>second meeting</u> that will be held one week later. The child you represent will be asked to create a storybook with drawings and/or magazine cutouts on their PA experiences during the interview. The interviewer will ask the child you represent to talk about their good and challenging PA experiences. Questions about (a) his/her activity (i.e., "Is this an activity that you

PHYSICAL ACTIVITY EXPERIENCES

usually play?"), (b) his/her participation (i.e., "How often did you play this activity?"), (c) his/her environment (i.e., "Where would you play this activity?") and (d) his/her feelings (i.e., "Why would this activity make you feel good?") will also be asked. The interview will be about 45 minutes long and it will be videotaped. I will pick up the child you represent from the unit before the interview and then walk him/her back to the unit once the interview is completed. Thus, the research project will take place in two meetings. Each meeting will be approximately 40-60 minutes long and the total length of time will be approximately 2 hours.

Once the meetings are completed and the data have been collected and analyzed, I will contact you again to provide feedback based on the information found in the study.

What will my child do?

- Make no changes to his/her daily routine prior to the two meetings
- Wear gym clothes and running shoes for the first meeting
- Complete the assent form with your assistance
- Perform the two movement skills tests during the first meeting
- Participate in the storybook telling interview during the second meeting

What will I do?

- Sign the consent form if my child and I agree to participate in the study
- Complete the Parent Checklist and information questionnaire during the first meeting

Are there any risks to participating?

There are few risks involved in the movement skills tests and these tests are conducted safely every day in North America. Dr. Harvey further ensures a stable testing environment because he provides training for all of his lab's graduate student testers and interviewers to make sure the child you represent is safe. Finally, if the child you represent suffers from any injury during testing, we will alert the hospital unit's nurse who will provide the proper care for the injury and, if necessary, refer him or her to a local public health facility. Again, the child you represent should enjoy participating in this study as it involves everyday play skills and the making of a storybook.

Are there disadvantages associated in this study?

There are no foreseen disadvantages to taking part in the study. It will take approximately 2 total hours of missed school classes or therapy.

What are the benefits of participating in this study?

Your participation in the study will lead to a deeper understanding of the PA experiences of children with ADHD. It is hoped that the study results will encourage PA professionals to develop child-friendly programs that may encourage children with ADHD to lead healthy and active lifestyles for a lifetime. As a result, we are asking for you and the child you represent's participation in this research project.

Compensation for participating in this study

I will provide a 1 hour of PA counseling with you and the child you represent after the study has been completed. The counseling session can be done in person or over the phone. There is no monetary compensation for participation in the study.

Withdrawal from the study

Participation in this study is completely free and voluntary. Please take the time necessary to reflect on your decision and discuss the study with the child you represent before signing the consent form. You can also decide not to participate. You and the child you represent also have the right to withdraw at any time and for any reason from the study. If you sign the form below, you and the child you represent can still withdraw at any point during the study, by informing the researcher in charge of the project or one of the other members of the research team. Your decision to withdraw from the study will not change the services or the quality of care provided to the child you represent. Also, if you and the child you represent withdraw from the study, the information that was already collected during the project will be stored as long as necessary, to ensure your confidentiality as well as the child you represent's confidentiality to meet the regulatory requirements. The information will be destroyed after 7 years conforming to regularity requirements. If modifications are necessary to the procedure of the study, you will be immediately informed orally and by writing.

Confidentiality

During the participation of you and the child you represent, the research team will only collect and record the information required for the study. Information collected during the study will be available to the research team only. However, with your permission, I can share the information with the child you represent's doctor or treating team. I understand the importance of confidentiality and thus, the child you represent's identity will be secured. The child you represent's name will not appear on any presentation or publication. You and the child you represent's data will be specifically identified by a code that will be provided on all documentation to protect your identity. All data and analyses will be available to Dr. Harvey, his research team and me. Information (such as movement scores, pictures and videos) will be kept in a locked and secure filing cabinet at the CHAMPS PA Lab in the Douglas Mental Health University Institute for 7 years after the end of the research project. All of the data, pictures and videos will be destroyed after this time.

Additional Information:

If you would like to have more information about the progression of the research project or want to discuss your participation, you can contact Anne-Catherine Knecht at (514) 761-6131 ext. 2125 or Dr. William J. Harvey at (514) 398-4184 ext. 0477# who will be able to answer your questions. If you have any questions about you and the child you represent's participation rights, you can contact the Douglas Hospital Ombudsman at (514) 761-6131, ext. 3287.

Non-Waiver of Legal Rights

By accepting to participate in this study, you are not waiving any of your legal rights nor discharging the researchers, the sponsor or the institution, of their civil and professional responsibility.

Compensation in case of Injury and Rights of the Research Project

If your child or the child that you represent should suffer any injury related to the research project, the child will receive the appropriate care and services for the medical condition without any charge to you.

Control of Ethical Aspects of the Research Project

The Ethics Research Board of the Douglas Mental Health University Institute approved this research project and guarantees the follow-up. Further, it will first approve any review and amendment made to the information/consent form and to the study protocol.



PARENT OR GUARDIAN CONSENT FORM

The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

By Anne-Catherine Knecht, BSc., Dr. William J. Harvey, Ph.D., Gordon Bloom, Ph.D., Ridha Joober, M.D., Ph.D., & Natalie Grizenko, M.D.

(McGill University and Douglas Mental Health University Institute)

I, ______, agree to have my child or the child I represent _______ participate in the ADHD and DCD study carried out by Anne-Catherine Knecht and Dr. William J. Harvey from McGill University.

By signing this form:

- 1. I understand that the purpose of the study is to improve knowledge about physical activity (PA) experiences of children with ADHD.
- 2. I confirm that my child or the child I represent has agreed to take part in this study.
- 3. I agree to bring my child or the child I represent to the first meeting to perform two movement skills assessment tests at the CHAMPS PA Lab located in the Douglas Mental Health University Institute. I further agree my child will attend another meeting during academic or treatment hours to complete a 45-60 minute long interview with the principal investigator.
- 4. I agree to complete the Parent Checklist and the information questionnaire during the first meeting.
- 5. Both my child or the child I represent and I can stop participation in the study at any time and for any reason without affecting any current or future services or care for my child and me.

In my capacity as legal representative, I have read the information/consent form. I recognize that the research project was explained to me, that my questions were answered and that I was given adequate time to make a decision. I agree that my child or the child I represent will participate in this research project according to the conditions specified above. A dated and signed copy of the present information/consent form was given to me.

| Name of the child or the child I represent | | |
|--|------------------------------|--|
| Name and signature of parent or guardian | Date | |
| Verbal consent of the child unable to sign, but able to understand th | e nature of the study: | |
| □ YES □ NO | | |
| Name and signature of parent or guardian | Date | |
| I chose to allow the child I represent results to be made available to doctor: | the child's treating team or | |
| □ YES □ NO | | |

Name and signature of parent or guardian

CONSENT FOR RECORDING

Nature and Objectives of the Research Project

The purpose of the study is to explore the physical activity experiences of children with ADHD and movement difficulties. The objective is to understand their experiences by using different types of data collection that will be videotaped to improve the accuracy of our study. We will videotape the child you represent's movement skills during the Test of Gross Motor Skills-2 assessment and videotape the interview conducted with the child you represent. The Test of Gross Motor Skills-2 has 12 skills that are used in physical activity: six locomotor skills (e.g., run, gallop, hop, horizontal jump and slide) and six object control skills (e.g., striking a stationary ball, dribbling, catching, kicking, overhand throw and underhand roll). During the interview, the child you represent will share his/her story about his/her physical activity experience while creating a storybook.

Date

Use of Videotaped Movement Skills and Storybook Telling Interviews

The goal of the videotaped movement skill test and interview is to allow us, the researchers, to get more accurate movement skills measures and to transcribe the interviews word-by-word and further review the interview to improve the information being analyzed.

Confidentiality

The digital recordings will be saved onto a password protected electronic file and stored under a coded number. The movement skill scores will be written on a scoring sheet and stored in a locked cupboard at a lab in the child you represent's folder. The interview transcript will be written in a digital format and saved on an electronic file in the lab's locked filing cabinet as well. Only the research team will have access to the digital recordings at the lab and only the principle investigator will be able to decode the participant digital recordings. The recordings will be deleted from the computer after 7 year.

Consent

 \Box I accept the child I represent to be videotaped during the movement skill testing and interview?

COMMITMENT AND SIGNATURE OF THE RESEARCHER

I have explained the information/consent form to the subject's legal representative. In addition, I have answered the questions that the legal representative had and I have indicated that he or she can withdraw from the study at any time without compromising any future care.

I also explained the study protocol to the participant so that he or she can understand. The child understood the protocol and did not contest. The research team and I will respect the responsibilities outlined in the information/consent form and commit to give a signed copy of this form to the legal representative.

Name and signature of the person in charge of the study

Signature of the person who obtained the consent if different from the researcher in charge of the research project.

I have explained to the research subject the terms of the present information/consent form and I answered all his questions.

Name and signature of the person who obtains the consent

Date

Date

Date

Appendix H



ASSENT FORM

The Physical Activity Experiences of Children with Attention-Deficit/Hyperactivity Disorder and Movement Difficulties

By Anne-Catherine Knecht, BSc. (MA McGill University Student), Dr. William J. Harvey, Ph.D. (Associate Professor McGill University; Research Associate DMHUI), Gordon Bloom, Ph.D. (Associate Professor McGill University), Ridha Joober, M.D., Ph.D. (Professor McGill University; Senior Researcher DMHUI), & Natalie Grizenko, M.D. (Associate Professor McGill University; Clinical Researcher; Medical Chief)

Why are we running this study? The study will help us understand how children with ADHD play every day and feel about taking part in physical activities. We want to know about the physical activity experiences of children with ADHD by doing two everyday play skills tests and by listening to the physical activity stories that you have to tell us. The study should help teachers and doctors to create more child-friendly ways of working with children with ADHD.

What are you going to be asked to do in the study?

- 1. You will be asked to do two movement skills tests on the first day.
 - You will be asked to do skills that you use when you play, like running, hopping, jumping, dribbling a ball, hitting a ball and catching a ball. It should be fun to do this test. It won't take too long to finish, about 20 to 40 minutes. This test will be videotaped to allow us to improve our data analysis.
 - You will be asked to do another test. The movements during this test are finger movements (e.g., threading a lace in and out of a board), ball skills (e.g., catching bean bags) and balance (e.g., walking heels raised on a small balance beam). This test should be fun as well and it will take about 20 to 30 minutes to finish.
- 2. One week later, you will be asked to make a storybook to tell us your physical activity experiences.
 - The interview will be fun since you will be asked to create a storybook with magazine cutouts and color pens on your physical activity stories while you talk. I will ask you to share your own stories about your good and not-so-good physical activity experiences. You and I will be videotaped to make sure that we have all the details of the stories that you tell us. I think it will be a fun interview and I will listen as best as I can so you can share your stories.

What if you don't want to participate? You do not have to participate. If you do participate, you can also tell me (the person in charge) or your parent that you want to stop at any moment and for any reason. You are not forced to take part in the study.

What do you get if you participate in the study? You will have a fun experience because you will get to perform the skills that movements you use everyday to play in the gym or on a playground. Also, you will share your stories and create your own storybook on physical activity. When you finish, I will give you and your parent/guardian advice about various physical activity programs that you may like to take part in.

Are there any dangers if you participate in the study? There are no dangers if you participate in this study. A trained adult will be watching you do the movement tests to make sure you are safe. If you do get hurt, you will be cared for right away.

Who will see your test scores and interview information? Only the research team will see your test scores, pictures, videotaped movements and videotaped interview. Your parent or guardian may ask for the test scores to be shared with your Doctor or treatment team. Your name will not be written down on the test score sheets and pictures. The test scores and pictures will be kept in a locked file and the videos will be password protected on a computerized file. Your scores and videos will be destroyed after 7 years.

What if you have questions?

If you have any questions about this study, please call or contact: Anne-Catherine Knecht at (514) 761-6131 ext. 2125 Dr. William J. Harvey at (514) 398-4184, ext. 0477# Douglas Mental Health University Institute at (514) 761-6131, ext. 3287.

By signing this form I agree that:

- 1. The study has been explained to me and the research team answered all my questions.
- 2. I understand that I do not have to participate and I can stop doing the tests at any time and for any reason.
- 3. If I have any question I can call Anne-Catherine Knecht or Dr. William J. Harvey at any time.
- 4. I can also call the Ombudsman at the Douglas Mental Health University Institute at any time.

I agree to participate

Name

Signature

Date

Name of person who obtained assent

Name

Signature