

## **Physical Activity Experiences of Boys With and Without ADHD**

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Physical activity experiences of 12 age-matched boys with and without attention-deficit hyperactivity disorder (ADHD) were explored by converging information from Test of Gross Motor Development-2 assessments and semistructured interviews. The knowledge-based approach and the inhibitory model of executive functions, a combined theoretical lens, enabled the description of similarities and differences in experiences that emerged during interviews. Skill assessments indicated boys with ADHD were not as proficient movers as their peers without ADHD. Thematic analysis revealed that boys with ADHD reported playing with friends, paid little attention to detail, possessed superficial knowledge about movement skills, and expressed many negative feelings about physical activity. Task-specific interventions and a wider range of mixed methods research are recommended for future research studies in ADHD.

Excessive activity and persons with attention-deficit hyperactivity disorder (ADHD) have a long-standing historical connection. The German author, Heinrich Hoffman, wrote one of the earliest known references to ADHD in 1865 with his poem "Fidgety Phil" about a boy with behavior and attention problems who could not stay still (Miyahara, Möbs, & Doll-Tepper, 1995). Barkley (1998) stated that excessive activity was a common symptom of the disorder for most of the 1900s and important to understand hyperactivity, the term used for ADHD during the time period of 1960–1970, because a state of constant motion was a key element of the accepted definition of hyperactivity at that time (Chess, 1960). The definition states, "emphasized activity as the defining feature of the disorder, as other scientists of the time would also do" (Barkley, 1998, p. 9). Greater emphasis, however, has been placed on deficits in attention (Douglas, 1999) and a lack of self-control to define ADHD over the past few decades (Barkley, 1997, 1998).

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Excessive activity continues to be a hallmark of the ADHD definition from the Diagnostic and Statistical Manual of Mental Disorders, or DSM-IV-TR (APA, 2000). Six hyperactive symptoms are currently listed in the DSM diagnostic framework: often fidgets with hands or feet or squirms in seat, often leaves seat in classroom or in other situations in which remaining seated is expected, often runs about or climbs excessively in situations where it is inappropriate, often has difficulty playing or engaging in leisure activities quietly, is often “on the go” or often acts as if “driven by a motor,” and often talks excessively. While these symptoms are related to behavior in general, they differ in purpose and outcome from specific movement skills in physical activity contexts. Thus, for the purposes of this paper, movement-related behaviors are distinguished from movement skills. Movement-related behaviors have a personal-social nature where there is limited goal-directed movement associated with performance (Keogh, 1978); while movement skills are observable, goal-directed movements that can be described in quantitative or qualitative terms (Burton & Miller, 1998). For example, there is a difference between standing up and moving around the room while waiting for a turn in a game of monopoly (e.g., movement-related behavior) and using an overhand throw to propel a baseball toward homeplate to strike out a batter (e.g., movement skill). Appropriate movement-related behaviors, as typified in the DSM-IV-TR, serve a much needed social purpose that many children with ADHD may lack; however, these behaviors are not the same as specific movement skills. Thus, the traditional focus on excessive activity as a core component of ADHD may have hampered the investigation of the movement skills of children with ADHD (Harvey & Reid, 1997).

Converging evidence suggests a considerable number of children with ADHD may have difficulties when performing locomotor and object control skills (Harvey & Reid, 2005). Yet there have been few attempts to understand various factors that may influence the fundamental movement skill performance of children with ADHD (Harvey & Reid, 2003). For example, Harvey and colleagues (2007) found methylphenidate (Ritalin) had no significant effect on the movement skill patterns of 22 children with ADHD, between the ages of 6.6–12.5 years, who were assessed on the Test of Gross Motor Development-2, or TGMD-2 (Ulrich, 2000). Significant movement skill differences were found between the 22 children with ADHD and their age- and sex-matched peers, whether the children with the disorder were in either medication or placebo conditions. Since stimulant medication did not seem to improve or affect the performance of these basic physical activity skills, there may be other influential factors to consider. For example, children with ADHD may lack the ability to regulate their skill performances in different movement contexts (Harvey, Fagan, & Kassis, 2003). In fact, Barkley (1997) suggested children with ADHD have difficulties in self-regulation and, more specifically, they may experience an inability to proceduralize (e.g., perform) their declarative knowledge (e.g., personal facts and acquired knowledge about performance). In other words, “ADHD is more a problem of doing what one knows rather than of knowing what to do” (Barkley, 1997, p. 335).

Starkes, Helsen, and Jack (2001) suggested the combination of personal knowledge and movement skill development to better understand the performance of movement skills, which, in turn, underlie sport performance. Thus, personal knowledge is an important factor that facilitates skill performance and expertise,

with a strong emphasis placed on the individual's flexibility of linking performance and knowledge (Wall, Reid, & Harvey, 2007). There is little information available to suggest that children with ADHD possess the factual information necessary to successfully complete movement skills or know when to proceduralize their declarative knowledge about action in appropriate movement contexts (Harvey & Reid, 2005).

Parents and teachers of children with ADHD have also suggested the children have poor movement and sport skills (Harvey et al., 2003). Yet, children with ADHD have not spoken about their perceptions of movement skill proficiency and involvement in play, physical activity, and sports. Thus, it seems that children with ADHD have not been given the opportunity to have their physical activity voices heard. It was reasoned that an interviewing approach would shed light on process-related questions or why something happens (Greene & Hill, 2005), enabling a better understanding of the daily physical activity experiences of children with disabilities and contextual meanings associated with physical activity. Therefore, the purpose of this study was to explore physical activity experiences of children with and without ADHD. The central question posed in this study follows. How do children with and without ADHD participate in physical activity?

## Method

### Participants

Twelve boys with and without ADHD, ages 9–12 years, participated. The six boys with ADHD were part of a larger clinical investigation about the effects of stimulant medication on various behaviors of children with ADHD at an urban Canadian psychiatric hospital. Each child with ADHD had a formal DSM-IV diagnosis of ADHD made by a qualified child psychiatrist (Lahey et al., 1994). Identification of each child with ADHD was also based on consensus between two child psychiatrists on a variety of diagnostic information that included the parent report of the Diagnostic Interview Schedule for Children, computerized version; or DISC-IV (National Institute of Mental Health, or NIHM, 1998); the Child Behavior Checklist (Achenbach, 1991); the Conners Global Index Parent Questionnaire, or CGI-P (Conners, 1997a); and the Conners Global Index Teacher Questionnaire, or CGI-T (Conners, 1997b). Each boy with ADHD was matched by age ( $\pm 6$  months) to a boy without ADHD from a local elementary school. The six boys without ADHD were identified by the physical educator and classroom teacher as having no major cognitive, behavioral, emotional, or learning difficulties and were considered of average intelligence. The school principal also confirmed that the children had not been identified for any special educational services. One parent of each participant without ADHD was interviewed on the DISC-IV (NIHM, 1998) and the CGI-P (Conners, 1997a) to provide more information and rule out ADHD. Thus, the qualitative sampling strategy was a mixed purposeful sampling where extreme case sampling (e.g., children with ADHD) and typical case sampling (e.g., children without ADHD) were combined (Patton, 2002). Boys were selected for the study because fewer females would be able to participate, given the high ratios of males to females in clinical ADHD populations, and physical activity experiences based on sex would most likely be different (Harvey & Reid,

2005). Each group of Canadian boys consisted of five White males and one Black male (Hodge, Kozub, Robinson, & Hersman, 2007).

All boys were between the ages of 9.7 and 12.5 years to improve the reliability of verbal reports given their age (Schneider & Pressley, 1997). The average age for the boys with ADHD was 10.9 years, while the average age of their peers without ADHD was 11.1 years. There was an average age difference of 3.2 months at the time of interviewing. To ensure individual understanding of the interview questions, each child demonstrated a total IQ score of 70 or greater on the Wechsler Intelligence Scale for Children, or WISC-III (Wechsler, 1991). The IQ scores of boys without ADHD were calculated with a short form version of the WISC-III (Donders, 1997). The IQ scores for boys with ADHD ranged from 88 to 117 ( $M = 100.2$ ) and the IQ scores for boys without ADHD ranged from 88 to 127 ( $M = 110.7$ ). University, hospital, and school board ethics approvals were received, with informed consent obtained from the participants and their parents before data collection.

## Theoretical Lens

The knowledge-based approach (Wall, McClements, Bouffard, Findlay, & Taylor, 1985) and the inhibitory model of executive functions (Barkley, 1997) were used as the theoretical lens to describe the physical activity experiences of the children in this study. The knowledge-based approach is a unique theoretical blend of developmental, educational, and sport psychology that emphasizes the importance of developmental factors, theories of expertise, and self-regulation for the individual acquisition of movement skills. For example, expertise research suggests the importance of an individual's ability to identify salient cues from the physical environment and their own personal movements to perform in a more proficient manner (Wall et al., 2007). Furthermore, the knowledge-based approach affords the opportunity to understand how individuals may develop their own unique levels of proficiency in specific movement- or sport-specific skills (Wall et al., 2007). Hence, there is a descriptive advantage when using the approach to understand movement skill proficiency and describe associated physical activity experiences.

The knowledge-based approach has been labeled as a significant conceptual framework in adapted physical activity (APA) research (Reid, 1992) and it was linked to the inhibitory model of executive functions (Barkley, 1997) because the latter grand theory describes the complexities of self-regulatory behaviors, with specific reference to ADHD. Multiple perspectives could be drawn from the experiences of the children with ADHD as both theories share many important commonalities such as the value of a developmental perspective, the role of language in child development, and shared terms from cognitive science (e.g., declarative and procedural knowledge). For example, this study provided an opportunity to describe a movement-based relationship between declarative knowledge and procedural knowledge of children with and without ADHD. Taking necessary time to reflect on the purpose and outcomes of movement skills, which may be a difficulty for some children with ADHD and children with movement difficulties (Harvey et al., 2003; Wall, 2004), is related to an awareness of the important metacognitive skills of error deduction, planning, and monitoring of actions (Wall et al., 2007).

Subjective feelings about physical activity, or affective knowledge (Wall et al., 1985), could also be explored as many psychological constructs are related to physical activity performance (Carron, Hausenblas, & Estabrooks, 2003).

Creswell (1998) suggested that triangulation can make use of multiple and different theories to “shed light on a theme or perspective.” Thus, both theories afforded a deeper understanding of the physical activity experiences of the children with ADHD, with thick and rich descriptions of relationships between ADHD and physical activity, lending strength to the inferences made in the study (Creswell, Plano Clark, Gutmann, & Hanson, 2003; Patton, 2002).

## Procedure

A concurrent mixed methods design was used since both qualitative and quantitative data were collected at the same time (Creswell et al., 2003); however, the qualitative data were given a higher priority in this study (Creswell et al., 2003). The initial plan was to use a completely open-ended interview approach and inductive data analysis (Sparkes, 2003). Our pilot interviews indicated, however, that children with and without ADHD, between the ages of 9 and 12 years, had difficulty expressing specific examples when asked open-ended questions about their physical activity experiences. Thus, a two-step approach was developed to explore the children’s physical activity experiences. First, the children were assessed on their fundamental movement skills to provide a descriptive layer of information about skill performance levels. Second, the children were interviewed on their physical activity experiences, with the movement skill test results unavailable to interviewer. A description of the movement skill assessment and the interview process follows.

**Movement Skill Assessment.** All participants were tested on the TGMD-2 (Ulrich, 2000), an instrument designed for children 3–10 years, that includes six locomotor skills (e.g., run, gallop, hop, leap, horizontal jump, and slide) and six object control skills (e.g., striking a stationary ball, stationary dribble, catch, kick, overhand throw, and underhand roll). There are three to four performance criteria on each of the 12 fundamental movement skills. Two test trials were administered per movement skill (Ulrich, 2000). A mark of 0 (absent) or 1 (present) was scored for each performance criterion observed on each of the 2 trials. These marks were then added to obtain a raw score for each individual skill. The raw scores were summed to obtain separate subtest scores for locomotor skills and object control skills. The raw scores of all 12 movement skills were then added to produce a total score which, in turn, is converted into the Gross Motor Quotient or GMQ (Ulrich, 2000). All TGMD-2 assessments were videotaped with a SONY Mini DV Digital Handycam (DCR-TRV18 NTSC) video recorder.

**Interview.** Schneider and Pressley (1997) suggested a two-part strategy for interviewing children. The approach began with structured questions, designed to acquire descriptive information about a participant’s prior knowledge and was followed by less-structured questions, designed to acquire deeper levels of knowledge. Thus, the child could focus on specific questions that, in turn, would act as a warm-up to respond to less-structured questions.

Seventeen questions in our interview guide were developed from the Physical Activity Monitor Questionnaire, or PAMQ (Craig, Cameron, Russell, & Beaulieu, 2000), and an expert performance approach (Ericsson, 2003). The PAMQ represented current information about the physical activity experiences of Canadian children at the time of data collection. Twelve highly-structured questions (e.g., 5-point Likert scale) focused on individual participation in, and preferences for, specific individual and group activities as well as various aspects of play, practice habits, and observational learning. Examples follow: Which of the following activities have you played, at least once, within the last 12 months (swings, slides, teeter-totters, bicycling, swimming, roller-blading, running or jogging, skateboarding, skating, hockey, football, basketball, soccer, baseball)? Do you ever set up any of these games to play or practice with other children? Probes, or follow-up questions, were created to provide clarity and more information about individual responses (Merriam, 1998). Thus, the boys were probed for examples of games (e.g., What games do you like to set up? Do you play on any teams or in any organized sports?), targets (e.g., Do you ever set up special targets to practice?), domain-specific vocabulary (e.g., Do you ever use special words to remember how to practice skills or moves?), modeling (e.g., Do you ever watch someone else play a game so that you can learn how to play that game better?) and about the rationale for their choices (e.g., Why do you like this game, target, model, etc.). A less-structured approach was used for the five other questions: What is your special way of practicing activities or games on your own? Which activity or games do you practice? What do you like the most about physical education class? What do you like the least about physical education class? How do you feel if the physical education teacher asks you to show a skill or move in front of the whole class?

The complete interview guide was reviewed by three experts in physical education, 3 university professors with doctoral degrees in physical education (PE), with a minimum of 10 years PE teaching and research experience at the university level. After full agreement was reached with the expert panel on the final format of the interview guide, pilot interviews were conducted where some of the original pilot participants spoke in detail about their individual physical activity experiences. Since the approach was deemed successful, the interview guide was then ready for use with the study participants. All of the participants were interviewed during the morning by the lead author in a safe, private, and comfortable setting at each data gathering site (e.g., interview room at the hospital, physical education teacher's office at school).

## Data Analysis

The results of the movement skill assessment and interview data were compiled and analyzed concurrently. Distinct individual and group profiles of physical activity experiences for boys with and without ADHD were developed from this information. Likert scale responses were averaged first, followed by the coding of interview transcriptions into data units to develop the categories of physical activity experience. This process led to a deeper understanding from a narrow focus on specific physical activity information (e.g., structured questions) to a general

exploration about personal physical activity experiences (e.g., less-structured questions).

**Movement Skill Assessment.** Onwuegbuzie and Teddlie (2003) suggested that quantitative data can be incorporated in a mixed methods design, with a greater focus on qualitative analysis, if the numerical data are qualitized. Since there is a descriptive scale within the TGMD-2 to interpret individual skill performance for the locomotor skills, object control skills, and the total GMQ scores (see Table 1), the test's descriptors were used to describe and "qualitize" the boys' performance on the TGMD-2.

**Interview.** There were two levels of data analysis (Merriam, 1998). First, each interview was treated as part of a comprehensive within-case analysis where the researcher learned as much as possible about the individuals at each site (e.g., hospital and school). Second, a cross-case analysis was performed where the researcher compared the physical activity experiences captured during each interview. Verbatim transcriptions of interviews were performed and a line-by-line analysis was conducted where similar words and phrases were identified as data units. Similar data units were then labeled with tags to reflect their underlying meaning (Côté, Salmela, & Russell, 1995). Similar tags were grouped together to form properties, which, in turn, formed dimensions of higher abstract categories (Côté et al., 1995). Thus, there was a resultant increase in the magnitude of abstract conceptualization from data units to categories.

## Trustworthiness

Triangulation, member checks, and explicit statements of the researcher's biases were aspects of trustworthiness for the current study (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005; Sparkes, 2003). Triangulation included three sources of information to describe the physical activity experiences of the participants: (a) individual fundamental movement skill level, (b) the interview data, and (c) parental input where each parent was asked to complete various questions

**Table 1** Descriptive Ratings for TGMD-2

Subtest Standard Scores	Gross Motor Quotient	Descriptive Ratings
17–20	>130	Very Superior
15–16	121–130	Superior
13–14	11–120	Above Average
8–12	90–110	Average
6–7	80–89	Below Average
4–5	70–79	Poor
1–3	<70	Very Poor

Adapted from Ulrich (2000).

based on the 2000 PAMQ (Craig et al., 2000) to gain a more complete description of the physical activity experiences of children with and without ADHD.

Child and parent member checks were important for establishing credibility (Brantlinger et al., 2005; Creswell, 1998). The content of each interview was summarized into a single page summary statement and read back to each child within three to four days after the conclusion of the interview. Each individual was provided the opportunity to verify the accuracy of the summary statement and to add or delete any information they felt necessary. Furthermore, each child's summary statement was made available to a parent so she or he could speak to the content of their child's verbal reports.

Finally, the lead author's life experiences and his underlying assumptions about movement skill performance and ADHD were described as they guided the methods and interpretations used in this study. Biographical information was shared because his lived experience lends credibility to the interpretations of the children's interviews (Sparkes, 2003). Thus, as lead author, I am a Caucasian male, who has been a life-long resident of the same working neighborhoods as the participants. For example, I lived and went to elementary school and high school within an eight-city-block radius of both data collection sites. I performed three years of PE teacher training and taught PE to children with ADHD in this region for 12 years. Thus, I am very familiar with many local mannerisms, colloquial expressions, and possess extensive first-hand knowledge of the specific physical activity habits relative to this area. As an adult, I continue to live in this same community. This variety of personal and professional experiences about children with ADHD leads to the contention of being a trustworthy research instrument.

## Results

### Movement Skill Assessment

The boys with ADHD were not as proficient movers as their peers without ADHD (see Table 2). Note that all names, used in the text and Table 2, are fictional to ensure participant confidentiality. Common names for males were used to maintain a human touch to the boys' experiences. According to the descriptors provided in the TGMD-2 (Ulrich, 2000), fundamental movement skill performance of the boys with ADHD ranged between poor to average (e.g., GMQ), with below average to poor locomotor skills and average to very poor object control skills. The fundamental movement skills of the boys without ADHD ranged from average to above average, with average to above average locomotor and object control skills.

### Interview

Each Likert-scale question was averaged to compare responses between the boys with and without ADHD. There were 2,188 data units for all of the transcribed interview data, with 1,044 data units for the boys with ADHD and 1,154 data units for the boys without ADHD. The complete transcriptions of four participants, two boys from each group, were randomly selected for peer review by a graduate APA student, with 81.6% complete agreement reached. Three categories resulted from



**Table 2** Qualitized TGMD-2 Scores of Boys With and Without ADHD

Participants	Locomotor Scores		Object Control Scores			GMQ Scores		
	Raw	Standard	Descriptor	Raw	Standard	Descriptor	Total	Descriptor
ADHD								
Larry	42	9	A	32	3	VP	76	P
Gord	31	4	P	30	3	VP	61	VP
Claude	43	9	A	41	7	BA	88	BA
Randy	39	7	BA	47	12	A	97	A
Bob	38	7	BA	36	5	P	76	P
Billy	43	9	A	45	10	A	97	A
No-ADHD								
Dale	47	13	AA	46	11	A	112	AA
Mike	48	13	AA	48	13	AA	118	AA
Fred	47	13	AA	44	10	A	109	A
Jim	40	8	A	47	12	A	100	A
Ted	45	11	A	44	10	A	103	A
Chad	47	13	AA	46	11	A	112	AA

Note. VP = Very Poor; P = Poor; BA = Below Average; A = Average; AA = Above Average; GMQ = Gross Motor Quotient

the interviews: deliberate play, knowing about doing, and personal feelings. They are described below with specific references made to the appropriate properties.

***Deliberate Play.*** The first category was named deliberate play to convey the importance of play in the development of movement skill proficiency (Côté, Baker, & Abernathy, 2003) and reflect the deliberately planned activities of the six boys without ADHD. Interview questions explored the children's perceptions of individual activity preferences, participation in various activities, organizational aspects of play, and participation time.

There were three major similarities between boys with and without ADHD. First, most of the boys did not consider their formal and informal physical activity time as practice. Instead they referred to this time as play. Next, both groups of boys reported that they took part in PE class in school most of the time. Finally, all boys were asked to indicate which individual activities and group activities they played, at least once, within the last 12 months, and how much they liked playing this activity. Most of the boys had participated in all of the activities in the past 12 months. The boys with ADHD, however, reported a greater preference for and participation in individual activities (e.g., swings and slides, bicycling, swimming, and roller-blading) than their peers without ADHD, who, in turn, preferred and participated in more group activities (e.g., hockey, football, and baseball).

There were other physical activity differences between the groups. The boys with ADHD reported to spend approximately 30 min less time in daily physical activity than boys without ADHD as indicated by both the child and parent questionnaires. The children with ADHD also reported the organization of few activities, engagement in less spontaneous play, and participation in few organized sports compared with the boys without ADHD.

Both groups of boys spoke about different types of play experiences. For example, the boys spoke about times and places where they played or practiced their movement skills with friends (e.g., group play property), alone (e.g., solitary play property), in specific physical activity contexts (e.g., play settings property), or not at all (e.g., no play property). Data from the group play property indicated the boys with ADHD spoke in much more detail about playing with peers. Yet they also indicated that they often play alone, whereas the children without ADHD made no such references in the solitary play property. The boys without ADHD differed from their peers with the disorder because they referred to a variety of physical activity contexts (e.g., play settings property) that, in turn, linked their practice and play experiences with substantial involvement of their family or friends. For example, Mike without ADHD mentioned, "Well, I don't usually practice by myself. I take my sister or my mom. Because, for most of the sports you need more than one person to practice." While our results indicated more differences than similarities between the boys, both groups spoke about playing with peers. Both groups of boys spoke sparingly about not playing all.

***Knowing About Doing.*** The second category was labeled "knowing about doing" as the boys spoke about their skill performance and learning. The boys with ADHD spoke about their leisure skills, the first property of knowing about doing, when they mentioned playing cards and creating make-believe games with their siblings while the boys without ADHD did not refer to leisure participation. The second property of knowing about doing was movement skills where data

units reflected general descriptions of movement skill performance, including examples and explanations about special practice targets during play and specific vocabulary for particular actions (e.g., domain-specific terms). The boys with ADHD reported that they often used targets to practice, whereas boys without ADHD responded that they did not use targets very often. As specified during the probes, however, the practice targets of the boys with ADHD were often associated with inappropriate social behaviors like throwing objects at others in an aggressive manner. For example, Larry with ADHD mentioned that his special target in football is to get someone to stand up so he could throw a football to hit the person. On the other hand, the boys without ADHD used more socially desirable and appropriate practice targets. For example, Jim without ADHD spoke about his football experience: “Well, I take a bucket and I hang it to the fence and shoot a football through it.” When asked for clarification, he responded, “I said I take a bucket, I shoot football in it. Sometimes I run to shoot the football in it, just in case there’s somebody rushing you.” When the issue was probed further, he stated, “Like say if someone’s running after you and you are like trying to shoot the ball. You are going to have to run left if he is coming at you by that way (points to his right), so you’re gonna have to shoot it diagonally.” Jim mentioned after his summary statement that he tries to practice just like he plays in a game. Thus, while the participants with ADHD reported a greater use of practice targets in play than their peers without ADHD, our discussions indicated that the targets were often socially inappropriate.

The boys without ADHD reported that they often used domain-specific vocabulary while their peers with ADHD mentioned they did not use specific action terms very often. The differences between the groups were associated with the depth and use of the terms articulated. The boys with ADHD reported knowing specific action terms, but they either did not use them or forgot the words entirely. For example, Bob with ADHD stated,

Well like the meaning of slap shot. I know what it means, but yeah sometimes I’ll use words like that, but that’s the only thing. Like in football people say dive and I know what it means but I don’t use it. When I try to tell somebody something I don’t really use special words.

Furthermore, Randy with ADHD mentioned, “Well sometimes I name some of my things like I give it a name and afterwards I forget the name that I give it. So I have to give it a new name over and over and over and over and over.” Yet, the boys without ADHD knew and used many specific action terms in the appropriate contexts. For example, Chad without ADHD used the term Cross 34 in football, and after being asked what the word meant to him, he elaborated:

Yeah. There’s two running backs in the back [field] and the first goes this way [motions across the table with his left hand] so the defense thinks I’m going to go this way [motions right hand in same direction as the left hand] but I’m going this way [motions right hand across table and left arm in opposite direction].

Jim without ADHD also used football-specific terminology. He stated, “Only when I’m playing with my friend Tom because he tells me plays to do. And I just

go down like, say if I, it's like a post pattern. It tells you to go up and turn right or on the left side, turn left."

The third property of knowing about doing was modeling. The boys without ADHD reported watching someone play a game very often to learn how to play and improve compared with boys with ADHD who often observed others in action. Data units reflected either a general observation of a group of people playing a game to improve movement skills or a specific focus on the performance of an individual person, or a particular group of people, to improve movement skill performance. The boys without ADHD made rich and deep references to the specific observation of particular models than the boys with ADHD. For example, the boys with ADHD mentioned they would watch a sport on television but not usually observe any one specific person as frequently as the boys without ADHD. The boys without ADHD, however, observed specific learning models (e.g., mother, siblings, sport celebrity) and provided the reasons for selecting these people to watch. For example, Dale watched his older brother play hockey because he was learning how to perform body checks. In addition, he mentioned the observation of a teenager, a 15-year-old elite hockey player, because that person was good at stick-handling and checking. Ted without ADHD also provided some deep insight about his observational learning practices: "After I play, it's a lot of games, there's another team that plays after me, an older team and I watch them play and I see how they use the stick and shoot. They're older than me and better skilled." When asked for clarification, he replied, "Yeah. I don't watch someone with lower skills than me because I won't learn that much." Thus, the boys with ADHD seemed unaware of the benefits of observation to skill improvement.

The question about observational learning sometimes led the participants to imagine themselves in different game situations, the fourth property of knowing about doing, and personal theories, the fifth property. The two groups of boys made similar verbalizations about imaginary game situations and personal theories. For example, the boys with and without ADHD recalled (a) play or game situations with reference to the specific movement skills they used or were trying to learn and (b) causal attributions for practice effects on performance.

The sixth and final property of knowing about doing was self-awareness where data units reflected an awareness of individual skill levels, game regulations, and action strategies. Overall, the self-reflections accurately reflected the individual skill levels of the boys with and without ADHD on the movement skill assessment. For example, the fundamental movement skills of boys with ADHD ranged between poor to average for the GMQ. Randy's performance on the TGMD-2 was described as below average in locomotor skills and average in object control skills (see Table 2). He knew that he could not perform movement skills like many peers of his own age group. In fact, he stated, "I know how to catch a ball and throw a ball, but sometimes when I throw, it doesn't go far because, like in a baseball game, I have to throw the ball to somebody. I can't throw it that far." Bob's performance on the TGMD-2 was described as below average in locomotor skills and poor in object control skills (see Table 2). He knew that he was less proficient in movement skills when compared with his friends. "My friends like soccer and I like playing soccer, but I'm just not good at it. I like playing. I'll play. It doesn't bother me, but I'm not good at it."

The overall fundamental movement skills of the boys without ADHD on the TGMD-2 ranged between average to above average and their statements also reflected their individual skill levels. For example, Fred's performance on the TGMD-2 is described as above average in locomotor skills and average in object control skills (see Table 2). He compared his movement skills to his peers in the following way: "It depends what I'm playing. Sometimes, well the same or better." Furthermore, he also knew that parts of skill performance may be automatized. For example, Fred remembered domain-specific terms for particular moves but then forgot the terms after being accustomed to performing the related actions. While all of the boys without ADHD referred to their movement skill learning strategies, most of their peers with ADHD did not do so at all. In contrast to the boys with ADHD, the boys without ADHD deliberately planned specific practice procedures to improve their play skills. For example, Chad without ADHD spoke about throwing a football at a black mark on a park fence and a basketball into plastic bins to deliberately improve his throwing and shooting accuracy.

Another interesting difference observed between the boys with and without ADHD was when they were asked to compare their movement skills to other children in their PE classes. The boys without ADHD reported their skills to be the same or better when compared with their peers while the boys with ADHD reported their movement and sport skills were better to much better when compared with other children in PE class, whether the comparison group was children with ADHD or not. Thus, in the context of peer comparisons in PE class, it seems that the boys with ADHD may have either overrated their skill performance or provided socially desirable responses, while the boys without ADHD were fairly accurate about their movement skill proficiency.

**Personal Feelings.** The third category was called personal feelings where the boys spoke about their feelings related to movement skills and physical activities. Interview questions explored feelings associated with movement skills in PE. Positive affective responses, the first property, indicated enjoyable mental states while negative affective responses, the second property, indicated distressing mental states. The positive affective statements were similar for the two groups as they related to specific activities and behaviors of peers in PE class. For example, Claude with ADHD stated that he liked playing (a) basketball because "I like bouncing it a lot. I like dribbling the ball" and (b) volleyball "because it's fun." He mentioned that playing together with other children was important to him because of "making new friends and its fun." Mike without ADHD also focused on ball sports and making friends. For example, he said, "I really like soccer because it's fun to play and it's a competitive sport, but all other, like all friends can play soccer . . . and it's a very calm game."

Both groups, however, also made negative affective responses related to specific activities and behaviors of their peers in PE class. In addition to making almost twice as many statements indicating negative feelings about specific activities than their counterparts, the boys with ADHD made strong and deep references to negative feelings attached to physical activities. For example, Randy with ADHD found many games to be boring and often his negative feelings were related to a lack of skill, with children singling him out for his poor skill proficiency. He mentioned that he would be picked last for football games and he did

not like to be “tackled and knocked down to the ground,” “hit in the stomach by the football,” and avoided being passed to by the quarterback. Boys without ADHD also made negative affective responses related to specific movement skills but they did not seem to get ridiculed. For example, Jim without ADHD mentioned that he did not like gymnastics activities and when other children were “picked on” in physical education class. Yet, he did not feel personally singled out for ridicule.

Responses about prosocial behavior, the third property, demonstrated an individual’s positive social behaviors related to movement skills and responses about asocial behavior, the fourth property, indicated an individual’s negative social behaviors related to movement skills. Both groups spoke about prosocial behavior and physical activity in a similar fashion. For example, all of the boys spoke about (a) children who would encourage peers by cheering and clapping, (b) having some choice in activities with fun games to play, and (c) trying to behave in PE class to play as much as possible. The boys with ADHD, however, provided thick descriptions of asocial behaviors related to their movement skills. They would often refer to being reprimanded for their misbehavior and often blamed other children for behavior problems that would decrease their own personal enjoyment of physical activity and time spent in PE.

Yet, both groups spoke about children insulting each other, calling each other names, talking over the teacher’s voice, fooling around in class, cheating, fighting, and hurting others. For example, Larry with ADHD mentioned he liked to play a game called “British Bulldog” because you get to run into people. This aggressive behavior was also mentioned by the children without ADHD. For example, Mike without ADHD mentioned the “Pirate Ship” game, “Because there’s always the, well, people are sharks and they’re running after people and they don’t care. They’ll run into them and they’ll like hurt them to get them. They’ll like go smack into them.”

## Discussion

To our knowledge, this was one of the first studies to provide a voice for children with ADHD in relation to their physical activity experiences. The implications of the research for children with ADHD and recommendations for future research are presented in the discussion.

### Implications

Distinct individual and group profiles of physical activity experiences for the boys with and without ADHD were developed from the movement skill assessments, interviews, and ensuing analyses. Movement performance differences between the boys with and without ADHD were consistent with previous research (e.g., Harvey & Reid, 2003). Most of the boys with ADHD resembled novices in movement skill performance, while their peers without ADHD were performing skills in a developmentally appropriate manner.

The interview results indicated similar experiences for the boys with and without ADHD who considered their formal and informal physical activity time as play instead of practice, a finding consistent with the retrospective views of

experts who recalled their childhood physical activity experiences (Côté et al., 2003). Most of the boys had participated in similar activities over a year-long period and spoke about playing with peers, a pleasant surprise because children with ADHD are well-known for having difficulty with social relationships (Litner, 1999).

Substantial differences in physical activity experiences emerged between the boys with and without ADHD from the interviews. For example, the boys with ADHD rarely organized opportunities to play or be active with other children. In fact, they seemed to enjoy being involved in a variety of different activities, especially individually-oriented sports or leisure activities. Furthermore, the boys with ADHD seemed to devote little time to acquire the specific details of physical activities, whereas their peers without ADHD would purposely learn much about their activity of interest. Perhaps the boys' testimonials are reflections of the nature of ADHD. As the inhibitory model of executive functions (Barkley, 1997) would suggest, the boys with ADHD lacked the necessary problem-solving abilities required of carefully planned behavior, namely, attention to detail, adequate reflection time, and the need to delay immediate gratification. For example, a lack of attention to detail emerged in our interview data and most of the boys with ADHD resemble novices in movement skill performance. From a knowledge-based perspective (Wall et al., 1985), we would hardly expect the boys to demonstrate highly proficient movement skill levels when it seems that they participated in many different activities, spending minimal amounts of deliberate time in learning and practicing the intricacies of basic physical movements, sport skills, and recreational activities.

Our interview discussions about domain-specific vocabulary also demonstrated substantial differences between the two groups with regard to selective attention. The boys with ADHD knew different action terms but clearly indicated they would not use these terms with their peers. The boys without ADHD, on the other hand, knew that they would use the action terms in the appropriate contexts of play or sports and they would also stop using certain terms after a skill had been automatized. The boys with ADHD are likely to experience communication problems in play if they do not realize, as their peers without ADHD understood, that domain-specific terminology is required for proficiency in both individual skill performance and team game performance. It seems the boys with ADHD knew many action terms, but they possessed a superficial understanding of both movement skills and the purposes for the actions within broader contexts. For example, the boys with ADHD spoke about practice targets which, in turn, were often socially undesirable. A person with ADHD will have difficulty making new friends if he tries to hit people with a football for the sake of fun and practice. In addition, this same person will not be able to fine-tune throwing skills to other people and will lack sufficient deliberate play and practice time to become a highly proficient performer (Côté et al., 2003). The boys with ADHD also seemed unwilling or unable to use their domain-specific knowledge about action in the appropriate contexts. However, proficient skill performance is important to children with ADHD as Lopez-Williams and colleagues (2005) found that athletic performance is a significant predictor of peer acceptance in children with ADHD.

Results of the mixed methods analyses indicate substantial semantic differences in the depth of declarative knowledge between the boys with and without

ADHD, leading to the contention that the boys with ADHD leaned heavily on using superficial domain-specific terminology to convince others that they know what to do in different sports and at a high performance level. For example, the boys with ADHD reported they were more proficient movers and learners than suggested by the fundamental movement skill assessment data. This behavior is hypothesized to be a “faking” phenomenon, where a person is not highly proficient at a skill but can provide a socially desirable response. The term is not meant to be pejorative; rather, it reflects a distinct form of affective knowledge required when one may try to detract others’ attention away from a personal lack of specific skill or skills (e.g., a defense mechanism).

Another example of the superficiality of acquired knowledge about action for the boys with ADHD was observed in the choice of observational learning models. Not surprisingly, boys without ADHD were able to demonstrate their preference for particular observational learning models. Most of the boys with ADHD, however, did not name a specific person observed to learn how to become a more proficient mover or player. Even when probed for more information, the boys did not articulate why it would be important to watch others to learn from. Yet, the boys without ADHD did mention the rationale for choosing specific learning models. Most likely, the boys with ADHD were unaware that proficient skill performance also includes a depth of skill acquisition knowledge. Clearly, they were unaware of the benefits of observational learning to skill improvement. It would seem the typical symptom combinations of impulsivity, inattention, and overactivity present formidable impediments to the development of the movement skill performance and proficiency of children with ADHD.

The boys with ADHD also seemed to incorporate an external attributional response style in physical activity. In fact, the boys expressed many negative aspects of physical activity and seemed overreliant on external causes for movement success and failure. For example, they blamed other children for behavior problems that would decrease their own personal enjoyment of physical activity and PE. The inhibitory model of executive functioning (Barkley, 1997) suggested persons with ADHD may experience difficulties when trying to gain emotional self-control and, in turn, negative affective thoughts would likely lead to avoidance behaviors. Thus, a knowledge-based perspective (Wall et al., 1985) would argue physical awkwardness and learned helplessness are suitable constructs to explain the boys’ expressions. For example, one of the boys with ADHD said that he would feel embarrassed if he performed a skill incorrectly because the other children might laugh or the teacher might get angry. He also mentioned that he gets hurt often when attempting novel physical skills and activities. While knowing he could not throw a ball in a direct line or accurately at a target, he did not seek help to learn for fear of being ridiculed. When teaching sessions were offered on how to throw a ball, the boy suggested that the lead author would not be able to make available the sufficient time to help. Thus, the effects of physical awkwardness and learned helplessness or low skill proficiency and intense feelings of inability seemed to be present. Interestingly enough, it took approximately 90 min to teach this boy how to throw a ball (e.g., 3 sessions of 30 min). He did not understand the ideas of force regulation and point of release in the skill of overhand throwing.



To summarize, the groups of boys spoke about very different physical activity experiences and they did not regulate their physical activity involvement in a similar manner. Contrary to the suggestion that children with ADHD possess sufficient factual domain-specific knowledge but cannot perform what they know (Barkley, 1997), limited physical activity experiences and acquired knowledge were apparent in the boys with ADHD. They possessed a superficial understanding of various knowledge factors underlying both movement skills and sport skills. For example, the children with ADHD knew the domain-specific terms for different actions and games, but they lacked a deeper understanding of associated concepts. In other words, the children may indicate to their peers and adults appropriate movement skill terminology but may not possess a complete understanding of the factors underlying movement performance. Such superficial differences in skill, procedural knowledge, and declarative knowledge have been found in soccer between adults with physical disabilities who were experienced spectators of soccer and their peers without disabilities who had 14–15 years of playing experience (Williams & Davids, 1995).

## Recommendations for Future Research

While the study is limited in its power to generalize (Patton, 2002) and focused solely on boys' experiences, three important research issues, germane to ADHD, have emerged. First, planning and monitoring of specific actions are critical to ensuring skilled performance over time (Wall et al., 2007). If the boys with ADHD are novice-like in their planning and monitoring of physical activity because they do not prepare or plan activities as our data suggest, their movement skills are likely to remain low. If this is correct, many children with ADHD may be affected by a developmental skill-learning gap, where children with less physical skill may have limited opportunities to become involved in physical activities and experience minimal success as they grow old (Harvey & Reid, 2005). The skill proficiency gap between children with less and more physical skill would widen over time as environmental constraints and other situational demands become more complex in various movement contexts (Wall, 2004). Other important factors, identified by researchers as important in the context of skill proficiency and physical activity, include (a) practice methods in free play and deliberate play contexts (Côté et al., 2003), (b) necessary domain-specific practice time and instruction (Ericsson, 2003), (c) self-regulated learning (Wall et al., 2007), and (d) high levels of motivation (Côté et al., 2003). It may be worthwhile to develop studies related to these factors to gain a thorough understanding of the relationship between ADHD and skill performance and learning.

Next, it may be beneficial to devise task-specific intervention programs for children with ADHD to improve their movement skills (e.g., Hodge, Murata, & Porretta, 1999) and in so doing, they may participate more readily in physical activity. This recommendation is grounded by the realization that the boys with ADHD named few specific learning models or other people from which to draw valuable information. Highly skilled performers often have parents or significant others who exert a significant influence on their skill development. In fact, these adults often guide and lead the child to become involved in a variety of activities,

with a gradual withdrawal of direct involvement as individual skill and sport proficiency increase (Côté et al., 2003). Since many children with ADHD experience social problems at home (Grizenko & Pawliuk, 1994) and have trouble establishing and maintaining social relationships (Litner, 1999), there may be minimal guidance and support from significant others to learn important skills (e.g., play, social, academic, etc.). Clearly, children with ADHD would benefit from the watchful and attentive eyes of significant others like parents, friends, teachers, coaches, and volunteers. Participation in ADHD-sensitive PE classes and after school or recreational programs may provide opportunities to participate in supportive learning and performance environments. Future research should investigate the influence of these mentors and community-based programs on the functional skill performance of children with ADHD. Hence, there may be positive and practical benefits of using an expertise approach when understanding the skill development of children with ADHD.

Finally, we should increase the range of qualitative research methods used to gain more insightful information about the skill learning and performance of children with ADHD. For example, the use of the probes in our interview format was important since the quality of 8–16 year-old children's recall of physical activity improves with verbal prompting (McKenna, Foster, & Page, 2004). Yet there is also the possibility of using a wide range of inductive qualitative research methods in ADHD research (e.g., drawing, collage, art work, etc.) to provide more opportunity for the children's physical activity experiences to be voiced. Our findings will lead to more in-depth research about the self-regulatory behavior of children with and without ADHD in different physical activity contexts. Most importantly, this study has led to a preliminary understanding of the concomitant issues associated with the physical activity experiences of children with ADHD.

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