TEACHERS' PERCEPTIONS OF CLASSROOM COORDINATION DIFFICULTIES

TEACHERS' PERCEPTIONS OF CHILDREN'S MOTOR COORDINATION DIFFICULTIES IN THE CLASSROOM

By

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfilment of the Requirements

for the Degree

Master of Science

McMaster University

MASTER OF SCIENCE (2005) (Rehabilitation Science)	McMaster University Hamilton, Ontario
TITLE:	Teachers' Perceptions of Children's Motor Coordination Difficulties in the Classroom
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NUMBER OF PAGES: x, 122

Dedication

This thesis is dedicated to my parents – who, by example, always encouraged their children to surmount difficult challenges. For their unwavering support, encouragement, and steadfast belief in my abilities, I will always be grateful.

Abstract

Children with developmental coordination disorder (DCD) face significant challenges in the classroom setting. Teachers are ideally suited to recognize and refer children with DCD to rehabilitation services. The identification process relies heavily therefore, on an understanding of teachers' perceptions of children who present with DCD. It has been suggested that teachers' perceptions of children in the classroom may be influenced by factors such as child gender, child behaviour and the type of motor concern. The present research attempts to determine whether these factors influence teachers' perceptions of children with DCD. It was found that gender, by itself, did not influence teachers' perceptions, while child behaviour had a significant influence on teachers' perceptions. Findings from this research study suggest that teachers may only "care about" or "notice" motor concerns in the absence of disruptive classroom behaviour. The type of motor concern also influenced teachers' perceptions of children's motor difficulties, and this was shown to be influenced by child gender. Findings from this study have important implications for rehabilitation professionals managing children with DCD in school settings.

Acknowledgements

I would like to acknowledge the following people who were instrumental in making this thesis possible:

- The elementary school teachers of the Thames Valley District School Board for their willingness to participate in this project and for their thought-provoking comments,
- Steve Killip, Research Coordinator, Thames Valley District School Board, without whom the success of this project would never have been realized,
- Cheryl Missiuna, my thesis advisor, for always challenging me beyond what I thought to be the limit of my capabilities,
- Steve Hanna and Laurie Wishart, my thesis committee, for their critical comments, feedback and perspective,
- My family and friends who supported and encouraged me throughout this process,
- My daughters, Madeleine and Monique, for their endless patience,
- And my husband, Jim, for his untiring technical support, his unique perspective as an educator and administrator, his faith in my abilities, and his selfless support of my endeavours.

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Chapter 1

Introduction

A considerable number of school-aged children (approximately 5-7%) have been described as having movement difficulties that limit their classroom potential and affect their long-term academic achievements (American Psychiatric Association (APA), 2000). Everyday functional tasks such as printing, cutting with scissors and copying from the board are really problematic for these children (Benbow, 2002; May-Benson, Ingolia, & Koomar, 2002; Missiuna, 2002; Missiuna, 2003). Secondary to their motor concerns, these same children are known to demonstrate behavioural and social/emotional concerns including, but not limited to: poor self-competency, social isolation and low self-worth (Rose, Larkin, & Berger, 1997; Rose & Larkin, 2002; Schoemaker & Kalverboer, 1994; Smyth & Anderson, 2000). The primary motor limitations described above, along with the commonly associated secondary limitations, are recognized as key features of the motor disorder known as Developmental Coordination Disorder (DCD) (APA, 2000).

While DCD is known to be highly prevalent in the school-aged population, a large proportion of children with DCD are often unrecognized and do not come to the attention of health care professionals (Fox & Lent, 1996; Hamilton, 2002; Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001; Stephenson, McKay, & Chesson, 1991). This is particularly worrisome given the strong longitudinal research that has emerged over the past decade suggesting that children with motor coordination difficulties may go on to develop significant negative secondary consequences (Cantell, Smyth, & Ahonen, 1994; Geuze & Borger, 1993; Losse et al., 1991; Rasmussen & Gillberg, 2000; Schoemaker et

al., 1994; Skinner & Piek, 2001). This recent literature challenges previous beliefs that the motor performance of children with DCD would improve with maturation and experience and, therefore, that they did not warrant intervention (Fox et al., 1996). Documentation of the considerable risk for children with DCD of secondary mental health and psychosocial issues and academic failure has highlighted the need to identify children with DCD as early as possible (Missiuna, Rivard, & Bartlett, 2003). Children identified at an early age may benefit from intervention directed towards education of teachers, parents and children regarding the nature of the disorder, a necessary first step towards prevention of the negative secondary consequences associated with DCD. Recent evidence suggests that instruction in a problem-solving or cognitive approach may also be beneficial for the management of children's motor difficulties (Miller, Polatajko, Missiuna, Mandich, & Macnab, 2001).

Many of the motor difficulties seen in children with DCD can be observed in classroom activities and on the school playground (Cermak, Gubbay, & Larkin, 2002a; Missiuna, 2003). Children with DCD have difficulties tying shoelaces, doing up zippers and buttons, throwing and catching a ball and maneuvering on outdoor playground equipment (Cermak et al., 2002a; Cermak & Larkin, 2002b; David, 2000; May-Benson et al., 2002; Missiuna, 2003). They also demonstrate behavioural difficulties including low frustration tolerance, poor motivation and "off-task" or avoidance behaviours (Missiuna, 2003). Teachers are therefore a significant source of referrals of children with DCD to health care professionals. While teachers do identify and refer some children with DCD, known prevalence rates suggest that they are only referring a small proportion of the

children who have movement problems. It has been shown that teacher-identified samples of children with coordination concerns differ from children who are identified by other sampling methods (Keogh, Sugden, Reynard, & Calkins, 1979). It has also been noted that teachers fail to identify many children with motor difficulties (Dunford, Street, O'Connell, Kelly, & Sibert, 2004; Green et al., 2005; Junaid, Harris, Fulmer, & Carswell, 2000; Piek & Edwards, 1997). This may be due, in part, to the fact that standardized assessment tools that identify motor difficulties are not usually part of a teacher's repertoire. In addition, teachers do not receive formal training in the observation of movement difficulties. Despite this, teachers are the gatekeepers in school systems. They are the individuals who are called upon to identify children who require additional support for a variety of reasons, one of which could be motor concerns. Therefore, teachers' perceptions of children's motor performance have a considerable impact on which children they refer and why they identify certain children as requiring additional assessment. These perceptions are instrumental factors in the overall identification process.

A large body of literature examining teacher perceptions has focused on teachers' expectations of the academic performance of typically developing children (Garrahy, 2001; Li, 1999; Peterson & Bainbridge, 1999; Tiedemann, 2000; Tiedemann, 2002). Studies have also examined the perceptions that result in identification bias of children with developmental disabilities (including children with reading difficulties, learning disabilities and attention deficit disorder (with or without hyperactivity)). Findings from this research have suggested that a key factor that may influence teachers' perceptions is

that of child gender. Studies of children identified as having developmental disabilities have cited a disproportionate number of males to females identified by classroom teachers in comparison with research-identified samples (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990; Shinn, Tindal, & Spira, 1987; Vogel, 1990). Researchers have hypothesized that, as a result of gender bias, females with developmental disabilities may be under-identified (Anderson, 1997; Berry, Shaywitz, & Shaywitz, 1985; Gershon, 2002; Gillberg, 2003; Kratovil & Bailey, 1986; Vogel, 1990; Wehmeyer & Schwartz, 2001).

Findings in the literature describing a gender bias in teacher perceptions regarding children with other developmental disabilities may be extended to the DCD population for several reasons. Prevalence reports for children with DCD suggest that boys outnumber girls in a ratio of approximately 2:1 (APA, 2000). However, studies using different methods of identification find gender ratios that are extremely variable (Kadesjo & Gillberg, 1999; Schoemaker et al., 1994; Tan, Parker, & Larkin, 2001). Teacher-identified samples of children with DCD tend to report quite high numbers of males with prevalence ratios from 3 to 1 up to 5 to 1 (Geuze & Kalverboer, 1987; Geuze & van Dellen, 1990; Missiuna, 1994; Mon-Williams, Wann, & Pascal, 1999; Peters & Wright, 1999). While little research has been done in the area of gender selection bias and motor concerns, the significant numbers of males with DCD being referred has led many researchers to question whether a gender selection bias may also be occurring when children with movement difficulties are identified (Gillberg, 2003; Stephenson et al., 1991; Taylor, 1990). In addition, DCD tends to co-occur with many other developmental

disorders (Dewey, Kaplan, Crawford, & Wilson, 2002; Hill, 1998; Kadesjo & Gillberg, 1998). If the co-occurring developmental disorder is the most prominent difficulty and therefore recognized first by teachers, it is possible that the gender identification bias seen with these co-occurring conditions would impact on the referral rates of children with DCD.

Another factor that is believed to influence teacher expectation is classroom behaviour, particularly disruptive behaviour. Disruptive classroom behaviour may impact teacher perception, or it may be that disruptive behaviour acts as a confound to the gender bias described above. Many researchers have stated that, because males are more active (regardless of whether or not they have a disability) and because they are more likely to disrupt traditional classroom environments, they are more likely to be noticed by classroom teachers (Anderson, 1997; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). Researchers go on to suggest that perhaps it is only in the presence of additional (and often more aggressive) behavioural disturbances in the classroom that children's specific developmental disabilities increase teachers' perceptions of concern resulting in referrals to special education (Anderson, 1997; Berry et al., 1985; Gregory, 1977; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). Given the predisposition for males and females to demonstrate different classroom behaviours, it has been speculated that females with developmental disabilities who are quiet, withdrawn or depressed, are being "missed" (Anderson, 1997; Berry et al., 1985; Gregory, 1977; Kratovil et al., 1986; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). Since children with DCD demonstrate secondary classroom behaviours

(including disruptive behaviour) as well as motor difficulties, an argument can be made that teacher perception of the behavioural problems observed in children with DCD could also influence teacher perception of their motor concerns.

There has been limited investigation of teacher perceptions of the motor abilities of either typically- or poorly-coordinated children (Granleese, Turner, & Trew, 1989; Hay & Donnelly, 1996). Much of the focus of the research investigating motor skill appears to have been on determining the presence or absence of "true", biological gender differences in motor skill ability (Nelson, Thomas, Nelson, & Abraham, 1986; Nelson, Thomas, & Nelson, 1991; Thomas & French, 1985; Thomas & Thomas, 1988; Toole & Kretzschmar, 1993). This work appears to have arisen in response to the age-old question of whether males and females actually demonstrate differences in skills or whether notions about the motor abilities of boys and girls are gender stereotyped. Research investigating possible gender differences in motor skills between males and females has examined a number of fine motor and gross motor tasks looking for differences between males and females in general, and between the genders on type of motor task (Morris, Williams, Atwater, & Wilmore, 1982; Thomas et al., 1985; Toole et al., 1993; Toriola & Igbokwe, 1986; van Beurden, Zask, Barnett, & Dietrich, 2002). It would seem reasonable, then, to assume that a third factor which could impact upon teachers' perceptions of children's motor difficulties might be the type of motor problem that a child is demonstrating (either fine motor or gross motor), as another possible separate factor or as a factor that interacts with the gender factor. While gender differences in motor ability in young school-aged children may be present, they are small.

Despite this, gender-stereotypical thinking with regard to type of motor task assumes that females demonstrate superior fine motor performance and that males demonstrate superior gross motor performance (Carli & Bukatko, 2000; Greendorfer, 1983; Halverson, Roberton, & Langendorfer, 1982; Thomas et al., 1985; Thomas, Michael, & Gallagher, 1993; Thomas et al., 1988; Toole et al., 1993).

All three factors, - child gender, child behaviour and specific type of motor problem - may influence teachers' perceptions of children's motor abilities and motor difficulties. The relationship between each of these factors and teachers' perceptions may not be straightforward. It is possible that an interaction of some or all of these factors influences teachers' perceptions and, ultimately, the referral process. To date, no research has examined this specific set of factors with respect to teacher perception of motor coordination difficulties.

DCD is a chronic health condition that is highly prevalent in the school-aged population. Identification of children with motor coordination difficulties is critical to successfully prevent the negative secondary consequences that can accompany the primary motor limitations. Teachers are in a unique position to identify children with motor concerns when coordination difficulties interfere with school performance. However, little is known about what it is that teachers notice in the classroom and what compels them to refer children to health care professionals for additional assessment and intervention. If early identification processes are to be improved, research into the factors that influence teachers' perceptions and their decisions to refer children with movement problems is necessary. The purpose of this study is to determine whether

teachers' concerns about children who demonstrate motor difficulties in the classroom are influenced by child gender, child behaviour and the type of motor difficulty. Knowledge gained from teacher perceptions may inform efforts to educate classroom teachers and special educators about children with DCD in order to facilitate early identification of *all* children with DCD, both males and females.

Chapter 2

Review of Literature

This chapter is organized into three sections. The first section reviews the literature regarding Developmental Coordination Disorder. The history of the disorder is described and the literature regarding prognosis, clinical presentation, and issues related to the identification of DCD is reviewed. The second section outlines the educational literature regarding teacher perception of academic achievement in typically developing children and the influence of teacher perception in the identification of children with developmental disabilities. The role that child gender and child behaviour may play in the formulation of teacher perception in both of these populations is also described. The third section outlines the literature regarding possible gender differences in the motor abilities of typically developing children and reviews the role that the type of motor task may have in influencing perception of motor ability. Finally, the literature reviewed is extended to discuss teachers' perceptions of children with motor coordination difficulties and the potential influences that child gender, child behaviour and the type of motor task may have on their perceptions.

Development Coordination Disorder (DCD)

Historical Background

Since early in the 20th century, a specific cluster of symptoms, loosely termed childhood motor "clumsiness", has been recognized and documented (Orton, 1937). The early literature describes a group of children, who, due to poor motor coordination, were

more awkward or "clumsy" in the childhood motor activities that develop naturally and effortlessly in more typically developing children (Orton, 1937). Remarkably little attention was given to these children for a period of over 50 years. A tremendous amount of research in the area of children and motor coordination difficulties has been conducted over the past two decades, however, by multiple professionals with varying perspectives. During this time, while the descriptions of children's primary motor limitations have remained essentially unchanged, the labels used to describe them have not. Historical terms used to characterize children with motor difficulties have included, but are not limited to: Developmental Dyspraxia (Cermak, 1985), Clumsy Child Syndrome (Cratty, 1994; Gubbay, 1975) and Perceptuo-Motor Dysfunction (Laszlo, Bairstow, Bartrip, & Rolfe, 1988). More recent terms include Developmental Dyspraxia (Miyahara & Register, 2000), Minor Coordination Dysfunction (Watter, 1996), DAMP (Deficits in Attention, Motor and Perception) (Kadesjo et al., 1998), physically awkward (Causgrove Dunn & Watkinson, 1996) and Simple/Complex Minor Neurological Dysfunction (Hadders-Algra, 2002). The use of multiple terms to describe the disorder has made the understanding and identification of children with DCD a more complex process. In 1994, through an international consensus process, the term Developmental Coordination Disorder (DCD) was given formal recognition as an official movement disorder and this term is now officially recognized (APA, 2000). The term DCD is now more frequently used but older terminology still lingers (Peters, Barnett, & Henderson, 2001).

Now officially acknowledged as a movement disorder, DCD is a diagnosis of exclusion. Specific diagnostic criteria have been formulated and are outlined in the

Diagnostic and Statistical Manual of Mental Disorders (APA, 2000). These criteria state that:

1. There is a marked impairment in the development of motor coordination and a delay in motor skills.
2. Significant functional motor difficulty is present and impacts on academic achievement and/or daily living skills.
3. Coordination difficulties are not due to other neurological/medical disorders or to pervasive developmental disorder.
4. If cognitive impairment is present, the motor difficulties exceed what would be expected.

Prevalence rates for children with DCD have been estimated at approximately 5-7% of school-aged children with research performed in many countries around the world confirming that large numbers of children are affected by this chronic health condition (Gillberg, 1998; Iloeje, 1987; Kadesjo et al., 1999; Wright & Sugden, 1996). It is also commonly accepted that males outnumber females in a ratio of approximately 2:1 (APA, 2000).

Prognosis

Strong evidence is mounting that indicates that children with DCD are not only at risk due to their motor coordination difficulties but are likely to suffer from significant secondary consequences without remediation (Losse et al., 1991; Rasmussen et al.,

2000). A recent longitudinal study suggests very poor outcomes in terms of psychosocial functioning including a higher rate of psychiatric disorders and substance abuse, especially for children who have motor problems and co-occurring attention and/or hyperactivity problems (Rasmussen et al., 2000). Several studies have shown that, over time, children with DCD are more likely to demonstrate poor social and physical competence, academic and behaviour problems, poor self-esteem and low self-efficacy (Cantell et al., 1994; Geuze et al., 1993; Losse et al., 1991; Schoemaker et al., 1994; Skinner et al., 2001). In addition, they are less likely to be physically fit or to participate voluntarily in motor activity (Bouffard, Watkinson, Thompson, Dunn, & Romanow, 1996; Watkinson et al., 2001) and are more likely to be socially isolated and excluded (Smyth et al., 2000). Recent investigation of muscle strength in young children with movement difficulties (ages 6 and 9) demonstrates the early onset of decreased strength in these children (Raynor, 2001). This confirms earlier work demonstrating poor physical health including decreased power and overall endurance in children with DCD (O'Beirne, Larkin, & Cable, 1994). Risks of decreased physical fitness and reduced physical activity participation in children with movement difficulties have been postulated and are currently being studied (Cairney, Hay, Faught, Mandigo, & Flouris, 2005).

Clinical Presentation

Motor Difficulties

Children with motor coordination difficulties that are characteristic of DCD

demonstrate variations in movement force, speed, direction and timing (Henderson, Rose, & Henderson, 1992; Missiuna, 1994) and appear to exhibit both motor control and motor learning deficits. Research conducted in the area of motor control indicates that children with DCD demonstrate increased reaction times, and increased movement times during task performance with an over-reliance on feedback or closed loop strategies of control in comparison with more mature, anticipatory strategies (Geuze et al., 1987; Geuze et al., 1990; Goodgold-Edwards & Cermak, 1990; Henderson et al., 1992; Huh, Williams, & Burke, 1998; Johnston, Burns, Brauer, & Richardson, 2002; Smits-Engelsman, Wilson, Westenberg, & Duysens, 2003; Smyth, 1991). Other studies have demonstrated that children with DCD exhibit poor timing and sequencing control and that they activate inappropriate neuromuscular strategies (Geuze, 2003; Huh et al., 1998; Johnston et al., 2002; Williams, Fisher, & Tritschler, 1983). Clinically, their poor ability to anticipate during movement, combined with their inaccurate timing, may explain why children with DCD are much slower and less accurate in their movements when compared to their peers. It is these same altered motor control strategies that may explain another characteristic feature of the disorder, that of poor movement quality.

With respect to motor learning deficits, children with movement difficulties are noted to be variable and inconsistent in their performance when compared to their typically developing peers (Goodgold-Edwards et al., 1990; Missiuna & Mandich, 2002). Children with DCD have been shown to demonstrate the ability to learn simple motor tasks with repeated opportunities but the quality of their motor performance does not reach a normative level (Missiuna, 1994; Wilson, Maruff, & Lum, 2003). Children with

DCD have also been noted to have difficulty when learning novel motor skills, and when required to generalize and transfer learned skills to new contextual situations (Bouffard, Reid, & Sawler, 2005; Missiuna, 1994). It is suggested that children with DCD remain in an early stage of learning, relying on cognitive processing during task performance, such that their movement skills do not become "automatized" (Goodgold-Edwards et al., 1990; Missiuna et al., 2002). Their lack of engagement in "open loop" or feed-forward mechanisms has been implicated as the deficient process (Smits-Engelsman et al., 2003; Smyth, 1991). Other research has demonstrated that children with motor coordination difficulties have a limited ability to understand task demands and incorporate cues from the environment in task performance (Geuze et al., 1987; Goodgold-Edwards et al., 1990).

The motor control and motor learning deficits exhibited by children with movement problems are demonstrated in gross motor, fine motor and/or self-care tasks that are common to both home and school environments (Missiuna, Pollock, Law, Walter, & Cavey, 2005). Specific examples of the motor difficulties seen in children with DCD in each of these types of tasks will now be provided.

Gross Motor Difficulties

The descriptive literature depicts children with DCD as children who look "awkward" or "clumsy" and frequently bump into objects and/or people around them (Cermak et al., 2002a; David, 2000; May-Benson et al., 2002; Missiuna, 2003). Children with movement problems knock things over more often than one would expect of a child

their age (May-Benson et al., 2002). They may have trouble maintaining their balance, especially on uneven surfaces or when climbing stairs and may trip or fall frequently. Parents often report a history of children struggling to learn to ride a tricycle or bicycle (Cermak et al., 2002b; Missiuna, 2003). Poor coordination in timing and overall poor quality of movement can be seen in gross motor activities such as: running, skipping, jumping and team sports as well as ball skills including catching and throwing (Barnhart, Davenport, Epps, & Nordquist, 2003; David, 2000; May-Benson et al., 2002). Children with DCD have difficulty predicting and responding to objects that move in their environment (Goodgold-Edwards et al., 1990). In the school setting, children with DCD are often socially isolated and the last to be chosen for team sports (Cermak et al., 2002b). This is especially evident in sports such as soccer and baseball. On school playgrounds, they can be observed avoiding outdoor playground equipment and in general, being less physically active than their peers (Bouffard et al., 1996). They tend to withdraw from physical activities both in physical education class and on the playground and may demonstrate avoidance behaviours (Cairney et al., 2005; Watkinson et al., 2001).

Fine Motor Difficulties

While children with DCD may demonstrate both fine and gross motor difficulties, fine motor difficulties can be seen easily in the classroom setting as they interfere with academic achievement. In the classroom, children with DCD are observed to have difficulty with printing and/or handwriting: this is noted as one of the most frequently

cited concerns at school (Barnhart et al., 2003; Miller et al., 2001). Cutting with scissors, and gluing/pasting during art activities are also areas of concern. In addition, children with DCD may demonstrate immature drawings compared to their typically developing peers (Lord & Hulme, 1988). Children with DCD experience difficulty with activities requiring fine eye-hand precision and so have difficulties accomplishing many daily activities including: shoelace tying, cutting with a knife and fork, opening drink containers and dressing skills such as doing up snaps, zippers and buttons on clothing, all of which are readily observable in the classroom environment (May-Benson et al., 2002). They are often the last to get ready for recess or physical education class, which may be related to both self-care difficulties and/or avoidance behaviours (Cermak et al., 2002a; Missiuna, 2003).

Behavioural and Emotional/Social Difficulties

Children with movement difficulties significant enough to impact upon their functional daily living skills often have related behavioural difficulties. They may lack motivation and become angry, aggressive, frustrated, or give up easily. They may rush through tasks, or be unusually slow. Avoidance and "off-task" behaviours are a frequent solution to motor coordination difficulties, especially in the classroom (Cermak et al., 2002a; Cermak et al., 2002b; Missiuna, 2003). Children with movement problems may, alternatively, act out in class, disrupting the teacher and/or others (May-Benson et al., 2002).

Feelings of low self-worth, and poor self-esteem are common in children with

DCD (Piek, Dworcan, Barrett, & Coleman, 2000; Rose et al., 1997; Skinner et al., 2001). In comparison to a control group, children with DCD aged 8 to 10 years and 12 to 14 years perceived themselves to be less competent and had lower scores in scholastic competence, athletic competence and self-worth. Both groups of children with DCD were also found to be more anxious than their typically developing peers (Skinner et al., 2001). This confirmed earlier results found in a study by Schoemaker & Kalverboer (1994) where children with DCD were found to be anxious and introverted. Rose, Larkin & Berger (1997) also had similar findings with respect to self-perception of competence and self-worth for children of similar ages and noted particularly poor scores in scholastic competence and self-worth for girls who had movement problems. These researchers emphasized the ramifications of poor coordination for all children on their social and emotional health, but emphasized the effect for girls in particular.

In another study examining the social difficulties of children with DCD, Smyth & Anderson (2000) found that children with movement difficulties tended to be isolated on the school playground and to have a limited social network. Recent qualitative work recounting the childhood memories of adults with movement coordination difficulties underscores the significant feelings of failure, fear, anxiety and embarrassment that often accompany childhood experiences of motor impairment (Fitzpatrick & Watkinson, 2003).

Identification of Children with DCD

Identifying children with DCD has been problematic for a number of reasons. Many of these reasons concern the nature of the disorder itself. Firstly, as was reviewed earlier, children with DCD have been described in the literature using a wide range of

differing terminology, often determined by the theoretical perspective or discipline of the researcher. Secondly, children with DCD are a very heterogeneous group and may exhibit quite different clinical presentations, a factor borne out by the number of theories proposed regarding the etiology of the disorder (Dewey, 2002; Hoare, 1994). In addition, children with DCD may present with one or several of a range of other developmental disorders which may also affect their symptomatology and the nature of the path they will ultimately take towards identification of their particular set of difficulties (Dewey et al., 2002; Kadesjo et al., 1999; Kadesjo et al., 1998; Kaplan, Wilson, Dewey, & Crawford, 1998). Finally, identifying children with DCD is difficult for reasons other than those described above that relate to the identification process. Identification is inextricably linked to the individuals who are involved in the process and is subject to the influence of their perceptions and potential bias. Each of these factors will now be discussed in more depth.

Etiology and Possible Subtypes of DCD

Research conducted using both motor control and motor learning paradigms has investigated the possible etiology responsible for the varied clinical presentation of DCD. Despite extensive research in this area, etiology remains poorly understood (Visser, 2003). Dwyer and Mackenzie (1994) found children with movement difficulties demonstrated visual perceptual deficits including difficulties determining object size and position as well as difficulties with visual memory and limited ability to use visual rehearsal strategies. Others have documented kinesthetic perceptual difficulties with

poor proprioceptive function and an over-reliance on visual information (Laszlo, 1989; Smyth, 1998). Further work investigating the role of sensory integration in the impairment seen with DCD found poor "mapping" of visual and proprioceptive information (Mon Williams, Wann & Pascal, 1999). Other research evidence confirms a number of possible sub-types categorized based on the area of deficit including visual, visual perceptual or kinesthetic difficulties (Dewey & Kaplan, 1994; Hoare, 1994). This work has suggested that several sub-types of DCD may exist with at least one cluster of children demonstrating both kinesthetic and visual difficulties. In fact, some children may demonstrate predominantly gross motor deficits, others fine motor deficits and still others will show impairment in both types of tasks (Maeland, 1992). Thus the specific etiology of their movement difficulties may differ in children with DCD, which in turn, will affect their motor presentation.

Co-occurring Conditions

Co-existing disorders are known to be present in a significant proportion of children with DCD (Dewey, 2002; Kadesjo et al., 1998; Kadesjo et al., 1999; Kaplan et al., 1998). Commonly co-occurring developmental disorders include learning disabilities, attention deficit disorder with or without hyperactivity (ADHD, ADD) and speech and articulation difficulties. In a study by Kadesjo and Gillberg (1999), half of the children with moderate or severe ADHD also had co-occurring DCD. Kaplan et al. (1998) found that 56% of children with DCD had co-morbid learning disabilities and that 41% had ADHD. In another study, 33% of children identified as having learning disabilities also

demonstrated movement problems (Sugden & Wann, 1987). Other research shows a correlation between children demonstrating Specific Language Impairment (SLI) and DCD (Cermak, Ward, & Ward, 1986; Hill, 1998; Hill, Bishop, & Nimmo-Smith, 1998; Hodge, 1998). An extensive review of the literature regarding motor coordination difficulties and speech impairment conducted by Hill (2001) and work by Kaplan and colleagues (1998) propose a theoretical link between these two seemingly unrelated disorders which may share common "atypical brain development". While it is accepted that children with DCD may follow one of two distinct pathways – that of "persistence" or "resolution" (Cantell et al., 1994), children with co-occurring disorders are felt to have a poorer prognosis with persistence of difficulties as children age (Rasmussen et al., 2000). The presence of other behavioural disorders such as ADD/ADHD complicates the presentation of motor difficulties in the classroom.

Classroom Teachers as "Gatekeepers" to Identification

In addition to characteristics relating to the nature of DCD and potential co-occurring conditions, issues related to the identification process itself may also render identification of children with DCD more difficult. There are many possible sources of "error" including accuracy and bias on the part of those involved in the identification process. Classroom teachers and special educators may be one such source of inaccuracy and bias in the identification process.

Children with DCD are commonly under-recognized, although some children are identified at school age because of academic failure (Fox et al., 1996; Hamilton, 2002;

Miller et al., 2001; Stephenson et al., 1991). Classroom and/or special education teachers are typically the initial source of referral of children with motor coordination difficulties to other health care professionals, acting in the role of "gatekeeper". These referrals may occur when poor skill development interferes with classroom work and overall academic performance (Sugden & Wright, 1998). While teachers do identify children with DCD, they do not identify the same children as are found in research-identified samples (Keogh et al., 1979). This may be because teachers are not formally trained to observe motor abilities or because teachers have a limited number of identification tools that they can use with children with movement difficulties. Checklists that have been developed to assist teachers are often lengthy (Henderson & Sugden, 1992) and while they have been shown to demonstrate high specificity (Junaid et al., 2000; Kourtessis, Ellinoudis, Kiparissis, Papalexopoulou, & Kioumourtzoglou, 2005), they have been shown to have poor sensitivity, failing to identify 86% of the children in one study who were determined to be at risk for motor problems (Junaid et al., 2000). Teachers in the study by Green, Bishop, Wilson, Crawford, Hooper, Kaplan and Baird (2005), indicated that they were not able to observe several skills from the MABC checklist in the classroom setting, in accordance with the teachers in the study by Junaid et al. (2000). In addition, these teachers' ability to correctly identify children with movement difficulties was poor. A recent study examining referrals to occupational therapy from several referral sources including teachers showed that teachers and educational psychologists correctly identified children with DCD in only 20% of the cases of children referred for services (Dunford et al., 2004). Piek and Edwards (1997) found a similar result with classroom

teachers only identifying 25% of the children found to have DCD. A slightly better result was found for the identification of children by physical education teachers with a correct rate of identification of 49%. Many authors have now concluded that teacher checklists are not likely to be useful in identifying children with DCD (Green et al., 2005; Junaid et al., 2000).

While teachers do not have extensive expertise in motor assessment for the purposes of identification of motor difficulties, nor a wide variety of measurement tools to choose from, nonetheless they are required to identify children who are struggling in the classroom and might benefit from additional support. It is for this reason that teachers' perceptions of motor problems become important. The following section reviews the literature on teacher perception and discusses the influence of two different factors on teacher perception: child gender and child behaviour.

Teacher Perception

Role of Child Gender in Teacher Perception

Influenced by a second wave of feminist thinking, much of the educational literature of the early 1980s through to the late 1990s emphasized issues of gender in the school setting, both with typically achieving students and those with developmental disabilities (Anderson, 1997; Gershon, 2002; Gregory, 1977; Jacklin, 1989; Kratovil et al., 1986; Shinn et al., 1987; Thompson Prout & Frederickson, 1991; Tiedemann, 2002; Vogel, 1990; Wehmeyer et al., 2001). Some of this interest in gender resulted from the growing concern by researchers in the field of education that females were

underachieving academically, especially in subjects such as math and science. Since schools, and teachers in particular, are felt to play an important role in gender socialization, even in the early preschool years (Allensworth & Byrne, 1982; Fagot, Rodgers, & Leinbach, 2000; Grossman & Grossman, 1994), attention has been directed towards investigation of the classroom teacher and teacher judgment or perception. Research in this area has emphasized teacher perception regarding the academic abilities of typically developing students and investigation of teacher perceptions that might lead to identification bias in students who are struggling academically, and/or who have behavioural or emotional concerns (Shaywitz et al., 1990; Shinn et al., 1987; Tiedemann, 2002; Vogel, 1990). Tiedemann (2002) conducted a study examining the beliefs of 48 teachers towards 288 third and fourth grade male and female typically achieving students. These researchers hypothesized a gender bias in teacher perception and investigated teachers' beliefs about boys and girls mathematical abilities. They found that teachers who held stereotypical beliefs (as determined by their responses to a gender stereotype questionnaire) differed in their perceptions of both the academic competency of, and effort required by, boys and girls despite the fact that these children performed equally well in terms of mathematical ability. These teachers were found to favour boys in both their perceptions of boys' abilities and resources. In addition, the teacher gender bias found was noted for the group of lower achieving girls and boys but not the group that excelled in mathematics, indicating that the level of student performance was an important mediating factor in teachers' perceptions.

With regard to children with developmental disabilities, several authors have been

concerned with what is perceived to be a gender bias in identification of children with developmental disorders, leading to an uneven distribution of males as compared with females in referrals to special education, which disadvantages both males and females (Anderson, 1997; Gershon, 2002; Kratovil et al., 1986; Shaywitz et al., 1990; Shinn et al., 1987; Vogel, 1990; Wehmeyer et al., 2001). In the study by Shinn, Tindal and Spira (1987), more males than females were referred for reading difficulties despite the fact that no significant differences were found in the reading ability of males and females involved in the study. The authors of this study concluded that there may be other characteristics, in addition to the developmental concerns observed, such as child behaviour and motivation, that might also influence teachers' decisions to refer children for special education services. In an epidemiologic study by Shaywitz, Shaywitz, Fletcher & Escobar (1990) differences were found between research-identified and school-identified samples of children with reading disabilities, with greater numbers of boys to girls found in the school-identified samples when compared with the research-identified samples. Conclusions of a study by Berry, Shaywitz and Shaywitz (1985) suggest differing profiles of concern exist for boys and girls with attention deficit disorder, with the potential for girls to be "missed" due to a gender identification bias. Work by Gershon (2002) regarding children with ADHD indicate similar findings with the suggestion that teachers pay more attention to disruptive than inattentive behaviours and under-identify females with attention deficits who demonstrate more subtle behavioural concerns. As a result, females who are identified are often more severe in their presentation (i.e they often have co-occurring disabilities), and are identified at a

younger age than males with similar developmental disabilities (Berry et al., 1985; Vogel, 1990).

Very little published research has investigated teachers' perceptions of motor ability, either of typically developing children or children with motor concerns (Granleese et al., 1989; Hay et al., 1996; Kirby, Davies, & Poynor, 2005). Work by Granleese and colleagues (1989) examined the role of teacher perception of physical competence and its relationship to the self-perceptions of typically developing girls and boys. A study by Hay and Donnelly (1996) suggests that teachers may be biased in their perceptions of the physical competence of typically developing girls, but not in their perceptions of boys and their physical abilities. Teachers observed children during physical education classes and recess and completed an evaluation of children's physical competence as well as their participation in, and enjoyment of physical activities. Teachers were asked to provide ratings of their actual observations of children and also completed a section on their perception of how the child might respond to particular situations involving physical activities. Teachers tended to over-rate the competence of boys whereas they were more accurate with their observations of girls. These results seem to suggest that teacher perception was a factor in teacher ratings of competence in physical activity and that these perceptions were biased in favour of boys. This finding contrasts with the earlier study by Granleese and colleagues (1989) who found no difference in teacher ratings of girls' and boys' competence in physical activity. Clearly, further research in this area is required.

Role of Child Behaviour in Teacher Perception

The belief has long been held that boys and girls behave differently from an early age with girls tending to be more quiet and calm than boys of the same age and boys tending to be highly excitable in comparison with girls (Grossman et al., 1994; Maccoby & Jacklin, 1978). These behaviours are differentially expressed in the later years in the classroom setting with boys being more noisy, energetic, disruptive and prone to anger and aggression and girls being quieter, more polite, passive and less physically active (Francis, 2000; Grossman et al., 1994; Maccoby et al., 1978). As a result, many have hypothesized that boys (with and without disability) are more likely to be noticed by classroom teachers because their behaviours are less conducive to the traditional learning environment (Anderson, 1997; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). Researchers have stated that boys spend more time interacting with their teachers, both positively and negatively, and get more attention overall from their teachers than do girls (Allensworth et al., 1982; Einarsson & Granstrom, 2002; Fagot et al., 2000; Francis, 2000; Gregory, 1977; Grossman et al., 1994; Thorne, 1993). In a recent study examining the number of times boys and girls interacted with their teachers, researchers found that boys had more frequent verbal communication with their teachers, however, there was no indication of whether those interactions occurred as a result of poor behaviour (Einarsson et al., 2002).

The differences seen in the classroom behaviour of boys and girls are believed to influence teacher perception and have often been cited as one of the reasons why boys are more often referred for special education by their teachers for learning, behavioural

and/or emotional concerns than are girls with similar types of concerns (Anderson, 1997; Berry et al., 1985; Gregory, 1977; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). In fact, some have wondered whether children with developmental disabilities are identified not just because of the influence of gender, but because of the way in which gender is confounded by behaviour. That is to say, it may not be just the child's gender that influences teacher perception but the different behaviours exhibited by males and females that also play a role. Many have indicated that disruptive behaviour is a strong reason for teacher referral, a trait that is more often linked to boys, including boys with developmental disabilities (Anderson, 1997; Berry et al., 1985; Shaywitz et al., 1990; Vogel, 1990). In a retrospective chart review of the students referred to special education, Wehmeyer & Schwartz (2001) found that behavioural reasons were listed as reasons for referral in approximately 20% of boys referred but only 3% of girls. This was the case even when objective teacher classroom observations indicated no differences in behaviour between males and females. In her review article, Anderson (1997) outlines the contributions made by many researchers on the question of differences in behaviour by gender, including the ways in which boys and girls deal with challenge or conflict. Girls are described in the literature as being more passive, and conforming and are said to be more likely to become quiet, withdrawn or depressed in difficult situations. Boys, on the other hand, are said to be more likely to become angry or aggressive and in so doing, often disrupt a classroom environment (Grossman et al., 1994). This has also been shown to be true for children with ADHD, with girls with ADHD demonstrating "internalizing behaviours" and boys with ADHD demonstrating "externalizing

behaviours" (Gershon, 2002). Teachers spend more time overall in classroom management of boys who are demonstrating "difficult" behaviour and rate boys as having more behaviour problems (Shaywitz et al., 1990). Girls often get overlooked, despite having similar challenges. Gregory (1977) examined teacher perception with regard to gender and behaviour by using hypothetical descriptions of children with learning or behavioural concerns. She found that teachers were more likely to refer boys than girls for special education services, despite having identical problems. Girls who were withdrawn were very unlikely to be referred with aggressive boys very likely to be referred. Vogel (1990), in a review of the literature examining gender differences in children with learning disabilities, concluded that teachers were observed to identify and refer children more on the basis of associated behavioural problems than on academic concerns. She argued that profiles of disability and behaviour demonstrated by females may differ from the commonly accepted presentations, because any descriptions of the characteristics of the disorder are based on samples where males predominate. Females who are actually identified may represent only the most severe cases, that is, with classroom behaviors that are most likely to be noticed (Kratovil et al., 1986).

It may be difficult to separate out the influence of gender and the role of gender in determining behaviour, both of which, influence teacher perception. As Wehmeyer et al. (2001) summarized "Biases about behavior are a form of gender bias,..." (p. 43). Teachers may be responding differentially to boys and girls in the classroom, recognizing those whose behaviour disrupts the learning environment. If this is true, there are implications for children with motor difficulties who do not present with accompanying

disruptive behaviours, in that they may not raise teachers' level of concern significantly enough to warrant referral to special education or rehabilitation services.

Gender and Type of Motor Task

Research examining the role of gender in motor performance has investigated real or perceived gender differences (Nelson et al., 1986; Nelson et al., 1991; Thomas et al., 1985; Thomas et al., 1993; Thomas et al., 1988; Toole et al., 1993). Girls have traditionally been felt to be more adept than their male counterparts in the early years, excelling in activities requiring fine motor dexterity and good balance (Greendorfer, Lewko, & Rosengren, 2005; Toole et al., 1993; Vogel, 1990). Even so, gender differences tend to be small in the younger years and age is believed to be a much more important factor than gender in motor performance differences (Morris et al., 1982; Toriola et al., 1986). The trend favouring girls with respect to motor skill development in the early years, however, appears to reverse as children age, with boys becoming more skilled in general and in large gross motor movements than girls of similar ages and with greater overall gender differences seen (Greendorfer et al., 2005; Toole et al., 1993; Ulrich, 1987).

Recently, with an increased emphasis on participation in physical activity for all children, combined with the established vulnerability of girls to decreased levels of participation (Craig, Goldberg, & Dietz, 1996; Lirgg, 1991; Trost et al., 1996; Vilhjalmsson & Kristjansdottir, 2002), the role of gender in sports and sport socialization has been more heavily debated (Coakley, 1987; Eccles & Harold, 1991; Greendorfer,

1980; Greendorfer, 1983; Greendorfer et al., 2005; Vilhjalmsson et al., 2002). While it had been argued in the past that true gender differences exist, recent research confirms that, with the exception of throwing, gender differences prior to puberty are small (Nelson et al., 1986; Nelson et al., 1991; Saakslahti et al., 1999; Thomas et al., 1985). Some would propose that, because females and males are treated differently even as infants, it is difficult to sort out real gender differences from differential socialization and that differences in early motor skills are most likely influenced by environment (Carli et al., 2000; Thomas et al., 1985; Thomas et al., 1988). It is the position of these authors that gender stereotypical messages regarding motor activities and participation in physical activity, sent to children at young ages by parents, are reinforced by teachers in the classroom and on the school playground. They imply that teachers accept, subtly reinforce and help to magnify gender differences in motor performance, whether or not they exist, through their perceptions, expectations and encouragement. Toole and Kretzschmar (1993) and Greendorfer (1983) also concur with this line of reasoning, emphasizing the role of teacher expectation on gender differences in motor skill. Other researchers have implicated the positive effects of increased encouragement and opportunity from significant others based on societal expectations. In a study by Nelson et al. (1991), girls who were followed longitudinally for 3 years with respect to their throwing abilities did not change substantially in their developmental skill level or "form". The authors suggest that they may not have had as many opportunities for practice of this skill, one that is culturally very relevant for boys. In a study by van Beurden et al. (2002), mastery levels of proficiency in primary school children were

attained in hopping, galloping and balance for girls but in throw and kick for boys, reflecting the typical activities that children are expected to, and do, engage in. Halverson and colleagues (1982) demonstrated that girls showed significant developmental lag (5 years) behind boys but also self-reported significantly less time spent in throwing practice than boys. In the quantitative analysis performed by Thomas et al. (1993), both boys and girls demonstrated improvement of performance in throwing form with practice, suggesting that biological factors may not be the only factor explaining girls' poorer performance in throwing performance.

Based on the above review of literature on gender and its role in the perception of motor ability, specifically as gender relates to performance on different types of motor tasks, it is possible that child gender may interact with teachers' knowledge and/or perceptions of motor skill performance. If so, it seems plausible that teachers' perceptions of children's motor skills in different types of motor tasks may be influenced by gender stereotypes.

Teacher Perception and Children with DCD

While there is a little information on teacher identification of children with DCD, there is no published literature concerning the role of possible gender or behaviour bias in teacher perception and identification of children with movement problems. One very recent study investigated teacher and parent concerns in girls and boys with motor coordination problems (Kirby et al., 2005). Results of this study suggest that teachers have different concerns regarding boys and girls, with teachers more focused on the

academic performance of female children and the ability of male children to plan and control their behaviour, suggesting differences in teacher perception related to child gender.

As described previously, DCD prevalence studies indicate that males outnumber females in a ratio of at least 2:1 (APA, 2000). However, depending on the sample size, the manner of identification, and the measurement tools used, this ratio can be quite variable (Kadesjo et al., 1999; Tan et al., 2001). In a study by Iloeje in Nigeria (1987), the ratio of boys to girls with DCD was 1.2: 1. Studies utilizing teacher-identified samples, have consistently demonstrated ratios of boys to girls ranging from just over 3:1 up to 5:1, suggesting that gender may influence classroom identification of children with movement difficulties (Geuze et al., 1987; Geuze et al., 1990; Miller et al., 2001; Missiuna, 1994; Mon-Williams et al., 1999; Peters et al., 1999). Gillberg (2003) said, "Boys are overrepresented; girls are currently probably underdiagnosed" (p. 904). In the past, justifications for disparate prevalence ratios included a higher male vulnerability to developing neurological disorders (Stephenson et al., 1991). The discrepancy in prevalence rates in clinical samples versus research-based samples found with children with movement disorders is similar to that found in samples of children with ADHD (Gershon, 2002). In fact, comparisons have been made among several different developmental disorders including specific language impairment, attention deficit disorder, and learning disabilities, all with greater numbers of males than females (Cermak et al., 1986; Hill et al., 1998; Kadesjo et al., 1999; Robinson, 1991; Stephenson et al., 1991; Wehmeyer et al., 2001). Since many of the developmental disabilities

studied in this research co-occur with developmental coordination disorder, a teacher-identification gender bias may also impact upon teachers' ability to recognize and refer children with DCD.

With respect to children with movement concerns and classroom behaviours, it has already been stated that children with DCD may exhibit many behavioural and emotional/social difficulties, which can be observed readily in the classroom setting. Several researchers have questioned whether boys with movement difficulties are more likely to be noticed, not because of their primary movement impairment, but because of their associated social and behavioural problems (which could include the hyperactivity seen in co-occurring ADHD), with the suggestion that girls who do not demonstrate disruptive classroom behaviours must have more severe motor difficulties in order to be noticed (Stephenson et al., 1991; Taylor, 1990). Boys with motor difficulties have been shown to have a greater incidence of difficulty coping with failure in comparison with girls as well as a higher incidence of behaviour problems (Taylor, 1990). Of particular interest is that this gender discrepancy in behaviour remained stable throughout the several years over which the study was conducted. If, as researchers have suggested, teachers are already prone to notice the classroom disturbances of typically developing boys, it would seem reasonable that teachers might be particularly sensitized to notice disruptive behaviour demonstrated by boys with co-occurring movement difficulties. Whether or not teachers also notice the accompanying motor concerns is an unanswered question and is the focus of the present research study.

While all motor tasks are readily observable in the school setting, fine motor tasks

may be the type of activity that classroom teachers have the most experience with and which they may observe most frequently. Gross motor tasks, which can be demonstrated in physical education class and on school playgrounds, may be less familiar to teachers who are not specialists in this area. As a result, teachers may have less knowledge of appropriate developmental skill levels for children in gross motor activities. Teachers may also have different perceptions of the motor abilities of girls and boys and have stereotypical expectations of their performance level on different types of motor tasks, based on their gender. Teachers' level of concern regarding the motor difficulties of boys and girls could therefore by influenced by the type of motor difficulty demonstrated by children in their classroom.

To date, there is no research literature that specifically investigates teachers' perceptions of children with motor difficulties nor any literature that examines the potential influences of child gender, child behaviour and type of motor task on teacher perceptions of motor concerns.

Summary

Given that DCD is now formally recognized as a chronic health condition that affects a significant number of children, it is important to study the processes of identifying these children to ensure that they are accurate and effective and enhance the quality of life for children with DCD. Identification occurs most often at school age. The literature regarding teacher perception suggests that teacher biases regarding child gender and child behaviour may influence their referral decisions. Research investigating

perceptions of motor skill suggests the type of motor task may also influence teachers' perceptions. No information is available regarding the possibility of teacher identification bias in any of these areas with respect to children with movement disorders. However, it seems reasonable to suspect that biases may be occurring in the classroom identification of children with DCD. Examining teachers' perceptions of children with motor concerns will enable researchers and clinicians to better understand why teachers make the decisions they do regarding identification and referral to other health service providers. Such information is critical to enhance earlier identification of all children, both boys and girls, with movement difficulties in the classroom.

Study Purpose

The purpose of this study is to answer three research questions:

1. Does child gender influence teachers' perceptions of children who present with motor concerns in the classroom?

Extending the literature describing a gender bias in teacher perception of typically developing children and a gender referral bias by teachers of children with developmental disabilities, as well as the DCD literature describing disproportionate gender prevalence ratios, it is speculated that teachers will demonstrate a gender bias in their perceptions of children with motor difficulties. That is, teachers will report more concern about boys than girls demonstrating classroom motor difficulties. This will be reflected in higher ratings of degree of concern, importance of intervening and likelihood of referral for boys

than girls with similar movement problems.

2. Does the influence of child gender on teachers' perceptions of children who present with motor concerns in the classroom depend on whether disruptive or non-disruptive behaviours are present?

While a gender bias has been found in the literature on teacher perception, some researchers have speculated that the influence of gender on teacher perception may depend on whether disruptive or non-disruptive behaviours are present. This question attempts to address that suggestion. It is speculated that teachers will be more concerned about children whose motor difficulties are accompanied by disruptive behaviour, than children whose motor difficulties are accompanied by non-disruptive behaviour. It is also believed that gender will play a role such that the trend seen with respect to child behaviour will be greater for boys than girls. Research on children with DCD has suggested that boys who have motor difficulties may be more apt to demonstrate disruptive behaviours in response to their motor problems than girls with similar motor challenges. The literature on teacher perception of child behaviour supports the above proposal as disruptive classroom behaviour has been implicated as a strong indication for referral, particularly for boys.

3. Does child gender interact with the type of motor concern to influence teachers' perceptions of children who present with motor concerns in the classroom?

It is proposed that teachers will be more concerned overall about gross motor difficulties than fine motor difficulties. It is also suggested that teachers will be more concerned about boys demonstrating gross motor difficulties than fine motor difficulties and more concerned about girls demonstrating fine motor difficulties than gross motor difficulties, based on gender stereotypes. If teachers are influenced by social stereotypes, as researchers have suggested, they will be most concerned when boys, who are expected to excel at gross motor activities, demonstrate motor difficulties in this area and likewise, when girls demonstrate difficulties in fine motor activities, since these are activities at which girls are assumed to excel.

Chapter 3

Methodology

Design

The design used in this research study was an experimental, randomized, factorial design (see Figure 1). This research methodology permitted manipulation of the independent variables of gender (male, female), behaviour (externalizing, internalizing) and type of motor problem (fine motor, gross motor). Internalizing behaviours, for the purposes of this study, refer to non-disruptive behaviours. These were defined as behaviours that might be demonstrated by children experiencing motor difficulties, and that could be observed and managed by the teacher within the classroom. An example of an internalizing behaviour would be "complains of a stomachache in gym class". Alternatively, externalizing behaviours, for the purposes of this study, refer to disruptive behaviours. These were defined as behaviours that might be demonstrated by children with motor difficulties, and could be observed by classroom teachers but that disrupted the learning environment. These behaviours would need to be managed outside the classroom as well as by the classroom teacher. An example of an externalizing behaviour would be "assumes the role of 'class clown' to avoid doing classroom work".

The dependent variables used in this study were teacher ratings of the degree of concern about: 1) each motor problem, 2) each behavioural concern, 3) their perceptions of the importance of intervening, and 4) the likelihood that they would refer a child to school health services (likelihood of referral).

Procedure

Based on clinical and research descriptions of children with DCD, a total of eight case scenarios were devised (see Appendices 1 through 4). These scenarios described hypothetical children who had both motor coordination difficulties and behavioural concerns. There were four case scenarios with two versions of each. These versions differed in order to not make the purpose of the study obvious, but were otherwise designed to be as equivalent as possible. Four case scenarios described a male child and four described a female child. There were four possible sets of case scenarios with two case scenarios in each set (see Figure 1 and Appendices 1 through 4). Sets of case scenarios were determined by gender, behaviour and version (either version 1 or 2) and were randomly distributed.

Each teacher received a total of two case scenarios (one set). Both case scenarios in a set were of the same child gender, but differed with respect to version (specific motor items) and child behaviour. Scenarios within a set were arranged in random order.

Teachers were asked to read the case scenarios and then, for each scenario, to complete three rating scales regarding the concerns outlined in the scenarios (see Appendix 5 for an example of a rating scale). Teachers were also asked to complete a short, one-page demographic profile concerning the grade level taught, their number of years of experience, and typical referral patterns to special education or rehabilitation services (see Appendix 6). This teacher profile data was gathered for purposes of

Figure 1: Study Design

Gender	Behaviour	Version (*)
Male (M)	Externalizing (E)	Version 1 (V1)
		Version 2 (V2)
	Internalizing (I)	Version 1 (V1)
		Version 2 (V2)
Female (F)	Externalizing (E)	Version 1 (V1)
		Version 2 (V2)
	Internalizing (I)	Version 1 (V1)
		Version 2 (V2)

* Versions 1 and 2 contained different fine and gross motor items

Set 1: male child, externalizing behaviours, version 1 of motor problems (MEV1), male child, internalizing behaviours, version 2 of motor problems (MIV2)

Set 2: male child, externalizing behaviours, version 2 of motor problems (MEV2), male child, internalizing behaviours, version 1 of motor problems (MIV1)

Set 3: female child, externalizing behaviours, version 1 of motor problems (FEV1), female child, internalizing behaviours, version 2 of motor problems (FIV2)

Set 4: female child, externalizing behaviours, version 2 of motor problems (FEV2), female child, internalizing behaviours, version 1 of motor problems (FIV1)

describing the study sample. All teacher demographic questionnaires were anonymously completed and returned and assigned identifying codes for data entry.

Sample Size Calculation

The sample size calculation performed for this study employed guidelines previously established for a repeated measures design (Diggle, Heagerty, Liang, & Zeger, 2002). As this was an exploratory study, several values had to be estimated in order to calculate sample size. Test-retest reliability of the rating scales (intraclass coefficient) was not known, and so a moderate value of 0.5 was chosen. It was estimated that the smallest mean difference that would be important was 2 points on the rating scale. In order to detect this mean difference with power set at 0.8 and a significance level of 0.05, it was calculated that approximately 63 teachers per gender group or 126 teachers (total) were required for this study.

Consent

Following ethics approval from the Research Ethics Board at McMaster University in Hamilton, Ontario, Canada, the project was presented to, and approved by, the Research Coordinator of the Thames Valley District School Board. Teachers who volunteered to participate signed a letter of informed consent that was returned with the packages (see Appendix 7).

Sampling Procedure

Elementary teachers of children in Grades 1, 2 and 3 within the Thames Valley District School Board (TVDSB) (n=752) were invited to participate in this research project. Elementary schools recruited from this school board (n=148) encompassed the counties of Elgin, London, Middlesex and Oxford in Southwestern Ontario.

Principals of elementary schools within the school board were contacted by letter to explain the study and purpose of the project. Principals were asked to distribute packages (each containing a letter of information for teachers, consent form, teacher demographic questionnaire and 2 case scenarios each, with accompanying rating scales) to all primary teachers in Grades 1, 2 and 3 within their schools. Teachers from all 148 schools in the Thames Valley District School Board were invited to participate. At the start of the research study, the Research Coordinator from the school board also contacted principals by email, indicating that the school board had approved the study and encouraging the participation of teachers in their schools. Several weeks after distribution, a reminder flyer was sent to the school secretaries requesting distribution of the flyer to teacher mailboxes if the principals had distributed the surveys within their schools. All teacher consent forms, rating scales and teacher demographic questionnaires were returned to the school board office by the school board courier system.

Inclusion Criteria

Teachers were included in the study if they were currently teaching in Grades 1, 2 or 3 and were employed by the Thames Valley District School Board. Teachers who currently had literacy or special education responsibilities but who were also teaching, or had previously taught in, Grades 1, 2 or 3 were also included.

Exclusion Criteria

Teachers from grades other than 1, 2 and 3 were excluded from participation in the study.

Participants

Of the 752 survey packages distributed to 148 schools, 152 packages were returned and completed, a response rate of 20.2%. Five packages did not meet inclusion criteria and were, therefore, excluded from the analyses so the total number of survey packages included in this study was 147. Teachers responding represented 75 schools (51% of the total number of schools) with school name data missing on an additional 3 survey packages. The average number of teachers participating per school was 2 and the number of teachers participating at each school ranged from 1 to 7. The demographics of the teacher participants in this study are outlined in Table 1. There were 7 male teachers (5%), and 139 female teachers (95%) in the study sample (gender data for 1 teacher was

Table 1: Demographic Characteristics of Teacher Participants (n=147)

Demographic Characteristic	Total (n)	Total %
Gender		
Male	7	4.8
Female	139	94.6
Main Teaching Responsibilities		
Primary Division	142	96.6
Other	5	3.4
Years Teaching		
10 or more years	75	51.0
Less than 10 years	68	46.3
Years Teaching in Primary Division		
10 or more years	63	42.9
Less than 10 years	81	55.1
Teaching Responsibilities		
Classroom	133	90.5
Classroom and/or other	11	7.4
Highest Degree Level		
Baccalaureate	126	85.7
Other	17	12.2
Additional Qualifications		
None	64	43.5
Primary +/or special education qualifications	80	54.5
Teach, or Have Taught, Physical Education		
Yes	129	87.8
No	15	10.2
Number of Children Responsible For		
Less than 20 children	39	26.5
Greater than 20 children	102	69.4
Average Number of Referrals Per Year		
Up to 5 referrals	142	96.6
Greater than 5 referrals	2	1.4

missing). The majority of teacher participants (97%), held main responsibilities in the primary division, Grades 1, 2 and 3. Fifty-one percent (51%) of teachers had taught for 10 or more years, with 43% having taught in the primary division for 10 or more years. Most were classroom teachers (91%) with a baccalaureate level of education (86%). Many (54%) had additional qualifications (e.g. 11% with additional primary qualifications, 31% with special education qualifications and 12% with both primary and special education qualifications). Eighty-eight percent (81%) of teachers surveyed were either teaching physical education during the time of the survey or had taught physical education previously. Class sizes were average for an Ontario school board, with 69% having class sizes greater than 20 children. Ninety-seven percent (97%) of teachers reported making 0-5 referrals per year of children whom they believed required additional assessment or services, with only 1% of teachers referring between 5 and 10 children per year.

Instruments

Case Scenarios

In each scenario, there were sixteen items describing behaviours of children that could be of potential concern: four items indicating behavioural concerns, eight concerns about fine motor abilities, and four concerns about gross motor abilities.

Gender

There was an identical number and type of case scenarios for each gender, with the names of the children altered to reflect the gender of the child.

Behavioural Concerns

The behavioural concerns, as described earlier in this section, were one of two types – either externalizing or internalizing. A listing of these concerns is found in Table 2. In order to ensure that the behavioural items were appropriately categorized, lists with externalizing and internalizing behavioural items and their corresponding definitions were given to a sample of five classroom teachers and five school-based therapists. Good to excellent agreement was found between the coding of the two different types of behaviours by teachers and therapists. For 3 out of the 4 internalizing behaviours, at least 8 out of the 10 individuals agreed. It was felt that the fourth behaviour would become clear in the context of the written case scenario and was therefore not changed. For 3 out of the 4 externalizing behaviours, at least 7 out of the 10 individuals agreed. For the fourth externalizing behaviour, the wording was changed to decrease ambiguity.

Table 2: Listing of Behavioural Concerns by Type of Case Scenario

Externalizing Case Scenario	Internalizing Case Scenario
Frequently gets out of chair, disturbs classmates	During seatwork, often "fidgety", inattentive
Assumes the role of "class clown" to avoid work	Frequently complains of being tired
Acts aggressively towards others in/out of classroom	During free play, avoids art activities
Bumps and pushes classmates, including when in line	Complains of a stomach ache in gym class

Motor Concerns

Motor concerns included fine motor concerns and gross motor concerns. A listing of motor concerns by version of motor problem is found in Table 3. Examples of fine motor concerns included " when printing, he/she holds her pencil awkwardly and presses so hard on the page that he/she often rips it" and "is always late for recess, as he/she needs assistance to manage buttons and zippers on his/her outdoor clothing". Gross motor items included " he/she is unable to throw a ball at targets even short distances away" and "his/her movements are awkward and clumsy, and he/she frequently trips and stumbles, especially on the playground". The motor items in each of the paired case scenarios were not identical but were designed to ensure equivalence of the items. There were two versions of each case scenario. The entire group of motor items alternated between the versions, with the type of behavioural concern remaining the same (such that the motor items were counter-balanced with the type of behavioural concern across case scenarios (see Figure 1).

Rating Scales

Three rating scales were devised to measure teacher perceptions in this study. All three ratings used a similar 10-point Likert scale.

Degree of Concern (DC)

Teachers were asked to read the two case scenarios, and for each scenario, to rate the degree of concern that they would have regarding each of the motor problems and

Table 3: Listing of Motor Concerns by Version of Motor Problem

Version 1	Version 2
Fine Motor Concerns	
When printing, holds pencil awkwardly	Demonstrates jerky, laboured hand movements
Presses so hard on the page, that he/she rips it	Frequently sharpens pencil; breaks lead often
Work is slow, effortful; can't complete on time	Takes a long time with work; spends recess in class
Printing is illegible, letters poorly formed/aligned	Has trouble copying math from board; work is sloppy
Difficulty cutting accurately with scissors	With art activities, has difficulty pasting
Artwork lacks detail, difficult to interpret	Creative drawings are immature compared to peers
Last to get ready for gym	Always late for recess
Unable to tie shoelaces independently	Needs assistance with buttons, zippers
Gross Motor Concerns	
Unable to catch a ball thrown to him/her	Needs individual instruction with new motor skills
Requires physical guidance to learn new motor skills	Unable to throw a ball to a short distance target
Movements awkward/clumsy	With physical activities, body appears quite tense
Frequently trips, stumbles especially on playground	Frequently bumps into objects in his/her path

behavioural concerns found in the case scenario. For this rating scale, a rating of 1 indicated "not at all concerned" and a rating of 10 indicated "extremely concerned".

Importance of Intervening (II)

Teachers were also asked to rate how important they perceived it was to intervene for each of the motor and behavioural concerns outlined in the case scenario. For this rating scale, a rating of 1 indicated "not at all important (to intervene)" and a rating of 10 indicated "extremely important (to intervene)".

Likelihood of Referral (LR)

Following this, teachers provided a single global rating, considering all items, of how likely they would be to refer the child described in the scenario to another professional for assessment and/or intervention. Again a 10-point Likert scale was used with 1 being "not at all likely (to refer)" and 10 being "extremely likely (to refer)".

Data Management

Completed scenario rating scales and teacher demographic questionnaires were assigned identifying codes. All data were entered into the statistical program, SPSS, Version 12.0.

Defining the Variables

Variables were defined and coded and raw scores were entered into the database. In situations where two responses were given for an individual item on the rating scales, the lower of the two scores was taken.

Summary variables were created for individual teachers for degree of concern and importance of intervening total scores, total motor scores, total fine motor scores, total gross motor scores and total behavioural scores. These calculated variables were created by averaging scores across categories (e.g. total motor degree of concern scores for each teacher were created by summing and averaging degree of concern ratings for all motor items for both case scenarios; total fine motor importance of intervening scores for each teacher were created by summing and averaging importance of intervening ratings for all fine motor items for both case scenarios, etc.). For several of the analyses, summary variables were calculated for each teacher *by type of case scenario* by summing and averaging scores for each case scenario separately. The likelihood of referral rating was a single score. A summary likelihood of referral score was calculated for each teacher by summing and averaging the likelihood of referral ratings for both case scenarios. A separate likelihood of referral score was also calculated for each type of case scenario.

Data Checking and Cleaning

Following data entry, frequency distributions for each variable were plotted to check the database and ensure that the data were complete and accurate. Data entries were re-examined for possible errors or missing data. For any individual item (motor or

behavioural), no more than 3% of the total number of items (across all teachers) was missing. In addition, there were no individual items that were systematically missing across the sample of teachers. When an individual item score was missing, the mean score for that item, taken across all scenarios containing that item, was calculated and imputed. For example, if the degree of concern score was missing for a behavioural item from the externalizing case scenario, the average of all teachers' scores for that particular behavioural item, from the externalizing case scenario, was used. Missing scores for likelihood of referral were also replaced with mean scores for all teachers who had received the same scenario.

Reliability Check

A second rater performed a reliability check, entering a random sample of 10% of the data, and coding it independently. There was 100% agreement between raters.

Chapter 4

Results

This chapter presents the results of all analyses performed. The first section presents a summary of the number and type of survey packages completed. Results of the analyses performed to determine whether the study findings were affected by either the order of presentation of behavioural condition within the packages, or the version of motor problem within a case scenario, are presented. The second section presents the results of the analyses used to address each of the primary research questions outlined in Chapter 2.

Number and Type of Completed Survey Packages

Eligible survey packages (n=147) represented responses from teachers in 78 out of 148 schools in total, or 52.7% of all elementary schools in the TVDSB. Of the 147 packages completed, there was an almost equal distribution of packages of each experimentally-manipulated gender scenario; 73 (49.7%) packages contained male gender case scenarios and 74 (50.3%) packages contained female gender case scenarios. The breakdown of number and type of completed survey packages by gender, order of presentation of behavioural condition within the packages, and version of motor problem within the case scenarios is presented in Table 4. These data show roughly equal numbers in all categories of comparison (gender, order of presentation of behavioural condition and version of motor problem), suggesting that study results were not likely confounded by these factors. However, to further ensure that these factors

Table 4: Number and Type of Completed Survey Packages (Total n = 147)

Gender of Case Scenario			Version of Motor Problem		Total (n)
			1	2	
Male	Order	Externalizing, Internalizing	17	19	36
		Internalizing, Externalizing	15	22	37
		Total	32	41	73
Female	Order	Externalizing, Internalizing	19	17	36
		Internalizing, Externalizing	16	22	38
		Total	35	39	74

did not influence the results, separate analyses were performed using the order of presentation of behavioural condition within survey packages and the version of motor problem within case scenario as factors.

Effect of Order of Presentation of Behavioural Condition

Teacher survey packages varied by the order of presentation of the two different behavioural conditions (externalizing and internalizing), so it was important to determine whether the order of presentation of behavioural condition could have affected the results. One-way analyses of variance (ANOVAs) were conducted using the order of presentation of behavioural condition as a factor. Results of analyses using degree of concern scores and importance of intervening scores were non-significant, suggesting that these rating scores were not affected by the order of presentation of the behavioural condition. A significant result was found for the analysis using likelihood of referral score for the internalizing behaviour case scenario ($F(1,145) = 7.07$, $p = 0.009$). These

data show that the mean scores for likelihood of referral for internalizing behavioural case scenarios were significantly greater when the internalizing behaviour was followed by the externalizing behaviour than when the scenarios followed the reverse order. This suggests that teachers' likelihood of referral scores for the internalizing behavioural situation may have been slightly affected by the order of presentation.

Effect of Version of Motor Problem

One-way ANOVAs were also conducted using the version of motor problem as a factor to determine whether the version of motor problem could have influenced the results. All of these analyses were non-significant, confirming that the version of motor problem within the case scenario had no effect on scores for degree of concern, importance of intervening or likelihood of referral.

Experimental Variables

The purpose of this study, as outlined in Chapter 2, was to address three primary research questions. In this section, these questions are categorized under the headings: Child Gender, Child Gender and Child Behaviour, and Child Gender and Type of Motor Concern. Each research question is reviewed and the results of the analyses used to address each research question are presented.

Child Gender: Research Question #1

Does child gender influence teachers' perceptions of children who present with motor concerns in the classroom?

To answer this research question fully, it was important to examine the influence of child gender in four key areas. The first area investigated most directly answers the above research question and examines the influence of child gender on teachers' perceptions of children's *motor concerns*. A one-way ANOVA was performed with child gender as the independent variable, and the average of all motor ratings (for both case scenarios) as the dependent measure for degree of concern ($F(1,145) = 0.016$, $p = 0.90$) and importance of intervening ($F(1,145) = 0.002$, $p = 0.96$). Results of these analyses were non-significant, suggesting that gender, by itself, did not influence teachers' perceptions of children's *motor concerns*.

A second area of investigation, which also bears directly on the research question, examined the influence of child gender on teachers' perceptions of the likelihood that they would refer a child for additional assessment and/or intervention. A one-way ANOVA was performed with child gender as the independent variable and the average likelihood of referral rating (using both case scenarios) as the dependent measure ($F(1,145) = 0.595$, $p = 0.44$). Results of this analysis were non-significant, suggesting that child gender, by itself, did not influence teachers' perceptions of how likely they would be to refer a child for additional assessment and/or intervention.

It was also possible to examine the influence of child gender on teachers'

perceptions of children's concerns (overall). A one-way ANOVA was performed with child gender (male, female) as the independent variable, and the average of all motor and behavioural ratings (for both case scenarios) as the dependent measure for degree of concern ($F(1,145) = 0.051$, $p = 0.82$) and importance of intervening ($F(1,145) = 0.055$, $p = 0.82$). Results of these analyses were non-significant, suggesting that child gender did not influence teachers' perceptions of children's concerns overall.

A fourth area that was investigated was the influence of child gender on teachers' perceptions of children's *behavioural concerns*. A one-way ANOVA was performed with child gender as the independent variable and the average of all behavioural ratings (for both case scenarios) as the dependent measure for degree of concern ($F(1,145) = 0.242$, $p = 0.62$) and importance of intervening ($F(1,145) = 0.701$, $p = 0.40$). Results of these analyses were non-significant, suggesting that child gender, by itself, did not influence teachers' perceptions of children's *behavioural concerns*.

In summary, with respect to the question: "Does child gender influence teachers' perceptions of children who present with motor concerns in the classroom?", the results of these analyses suggest that teachers in this study did not demonstrate a gender bias (due to gender alone) in their perception of children with motor concerns. Gender, by itself, did not influence teachers' perceptions of children's motor concerns, or the likelihood that teachers would refer a child for additional assessment and/or intervention. In addition, gender did not influence teachers' perceptions of children's concerns (overall), or teachers' perceptions of children's individual behavioural concerns.

Child Gender and Child Behaviour: Research Question #2

Does the influence of child gender on teachers' perceptions of children who present with motor concerns in the classroom depend on whether disruptive or non-disruptive behaviours are present?

To answer this research question, four related questions were addressed. Each will now be reviewed.

The first question addressed which was most relevant to this research question was: Does the influence of child gender on teachers' perceptions of children's motor concerns depend on the presence of disruptive behaviour? A two-way repeated measures ANOVA was performed with child gender and behaviour as the independent variables and the average of all motor ratings (for each case scenario) as the dependent measure. For degree of concern, there was no main effect of gender ($F(1,145) = 0.016$, $p = 0.90$), there was no main effect of behaviour ($F(1,145) = 0.651$, $p = 0.42$) and no interaction between gender and behaviour ($F(1,145) = 0.074$, $p = 0.79$). For importance of intervening there was no main effect of gender ($F(1,145) = 0.002$, $p = 0.964$), a main effect of behaviour with a mean difference of 0.14 for male case scenarios and 0.18 for female case scenarios ($F(1,145) = 4.799$, $p = 0.03$) and no interaction between gender and behaviour ($F(1,145) = 0.069$, $p = 0.79$). These results are plotted in Figures 2 and 3. For importance of intervening, the influence of child behaviour was significant, suggesting that child behaviour did influence teachers' perceptions of the importance of intervening with children's motor concerns, in the presence of disruptive behaviours.

Figure 2: Mean Degree of Concern
(Motor Concerns)
(Gender by Behavioural Condition)

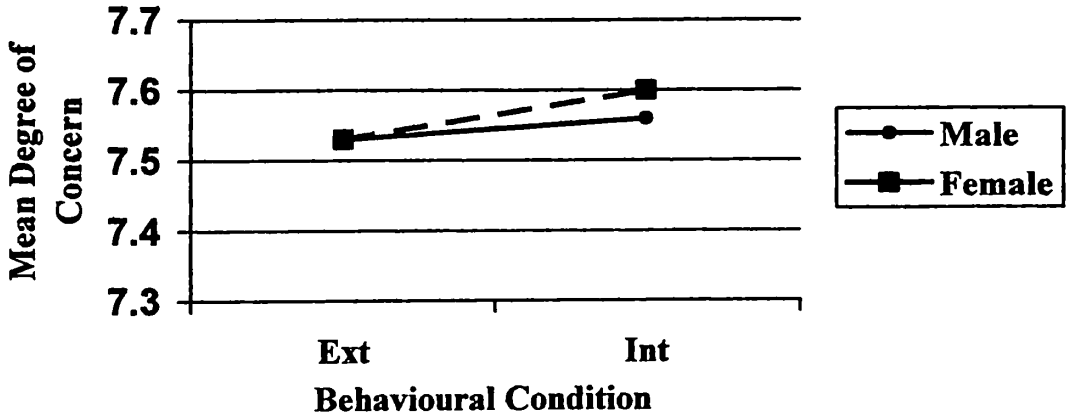
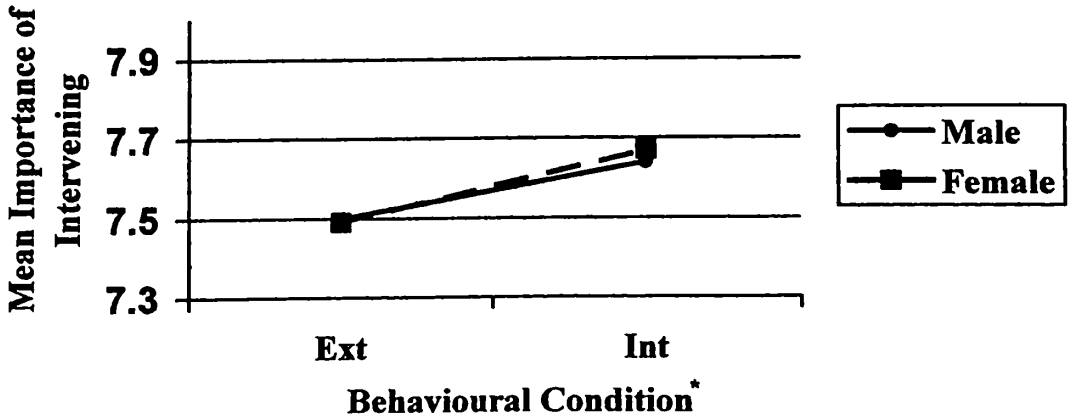


Figure 3: Mean Importance of Intervening
(Motor Concerns)
(Gender by Behavioural Condition)

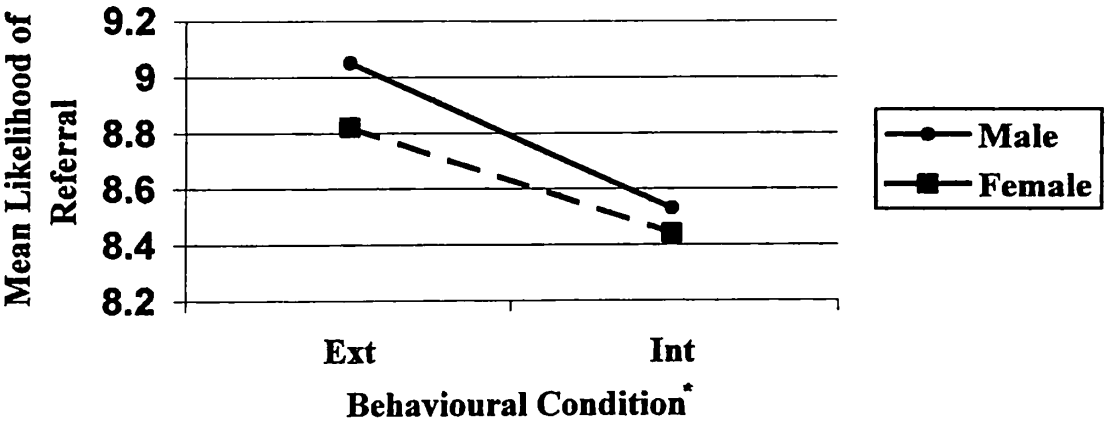


* *significant main effect of behaviour*

A second question addressed regarding the influence of child gender and child behaviour was: Does child gender, in the presence of disruptive child behaviour, influence how likely a teacher would be to refer a child for additional assessment and intervention? A two-way repeated measures ANOVA was performed with child gender and child behaviour as independent variables and the average likelihood of referral rating (for each case scenario) as the dependent measure. There was no main effect of gender ($F(1,145) = 0.595$, $p = 0.442$), a significant main effect of behaviour with a mean difference of 0.52 for male case scenarios and 0.38 for female case scenarios ($F(1,145) = 9.888$, $p = 0.002$) and no interaction between gender and behaviour ($F(1,145) = 0.228$, $p = 0.633$). These results are plotted in Figure 4. Results of this analysis suggest that child behaviour, but not child gender, influenced teachers' perceptions of likelihood of referral. The influence of child behaviour did not vary by gender.

A third question addressed was: Does child gender influence teachers' perception of the extent to which a child is disruptive? A two-way ANOVA was performed with child gender and child behaviour (internalizing, externalizing) as the independent variables and the average of all motor and behavioural ratings (for each case scenario) as the dependent measure. For degree of concern, there was no main effect of gender ($F(1,145) = 0.051$, $p = 0.82$), there was a main effect of behaviour with a mean difference of 0.44 for male case scenarios and 0.34 for female case scenarios ($F(1,145) = 41.53$, $p = 0.00$) and no interaction between gender and behaviour ($F(1,145) = 0.671$, $p = 0.41$). Results were similar for importance of intervening as there was also no main effect of gender ($F(1,145) = 0.055$, $p = 0.82$), a main effect of behaviour with a mean difference

Figure 4: Mean Likelihood of Referral (Gender by Behavioural Condition)



* *significant main effect of behaviour*

of 0.42 for male case scenarios and 0.40 for female case scenarios ($F(1,145) = 35.44$, $p = 0.00$) and no interaction between gender and behaviour ($F(1,145) = 0.02$, $p = 0.89$). These results are plotted in Figures 5 and 6. For these analyses, only the influence of child behaviour was significant, suggesting that child behaviour influenced teachers' perceptions of the extent to which a child was disruptive.

A fourth question addressed was: Does the influence of child gender on teachers' perceptions of children's behavioural concerns depend on the presence of disruptive behaviour? A two-way repeated measures ANOVA was performed with child gender and child behaviour as the independent variables and the average of all behavioural ratings (for each case scenario) as the dependent measure. For degree of concern, there was no main effect of gender ($F(1,145) = 0.242$, $p = 0.62$), there was a main effect of behaviour with a mean difference of 1.87 for male case scenarios and 1.58 for female case scenarios ($F(1,145) = 228.33$, $p = 0.00$) and no interaction between gender and behaviour ($F(1,145) = 1.637$, $p = 0.20$). For importance of intervening there was no main effect of gender ($F(1,145) = 0.701$, $p = 0.40$), a main effect of behaviour with a mean difference of 2.09 for male case scenarios and 2.14 for female case scenarios ($F(1,145) = 286.66$, $p = 0.00$) and no interaction between gender and behaviour ($F(1,145) = 0.026$, $p = 0.87$). These results are plotted in Figures 7 and 8. Results were similar for degree of concern and importance of intervening with a strong main effect of behaviour, suggesting that child behaviour did influence teachers' perceptions of children's behavioural concerns in the presence of disruptive behaviours.

Figure 5: Mean Degree of Concern
(All Items of Concern)
(Gender by Behavioural Condition)

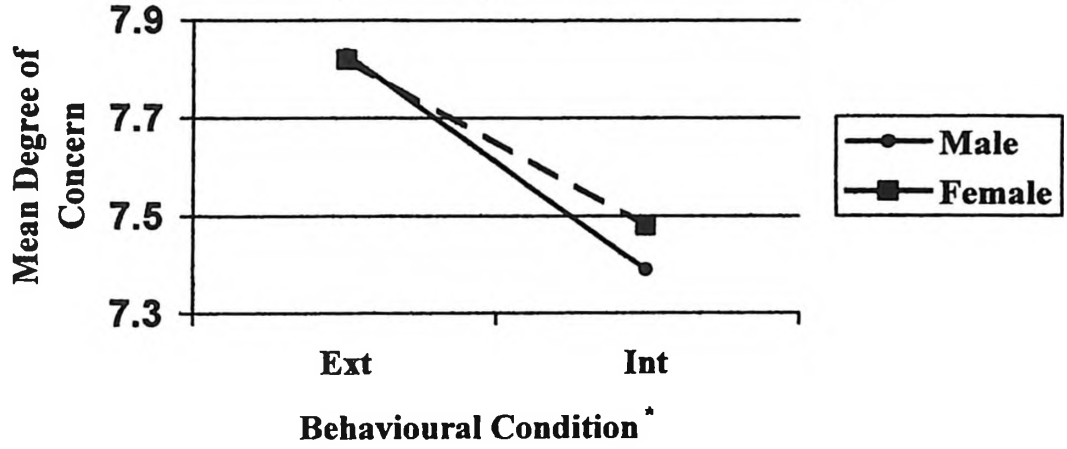
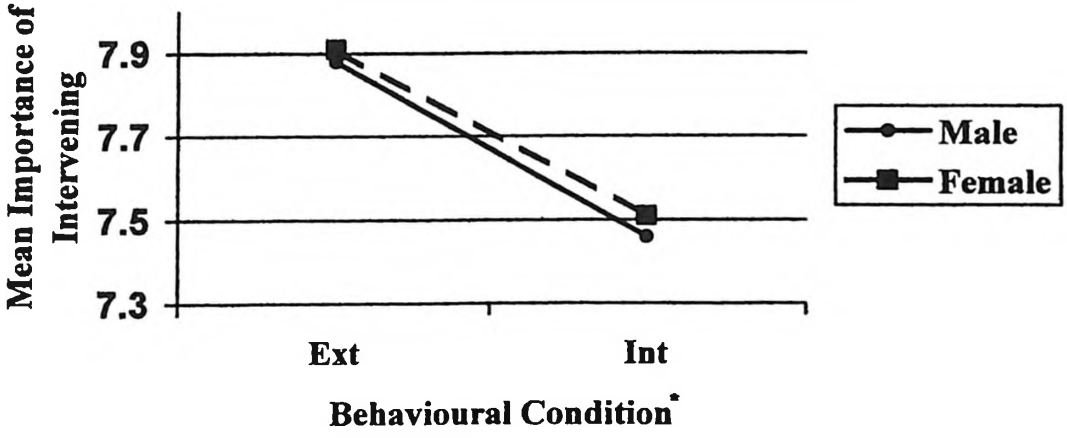


Figure 6: Mean Importance of Intervening
(All Items of Concern)
(Gender by Behavioural Condition)



* *significant main effect of behaviour*

Figure 7: Mean Degree of Concern
(Behavioural Concerns)
(Gender by Behavioural Condition)

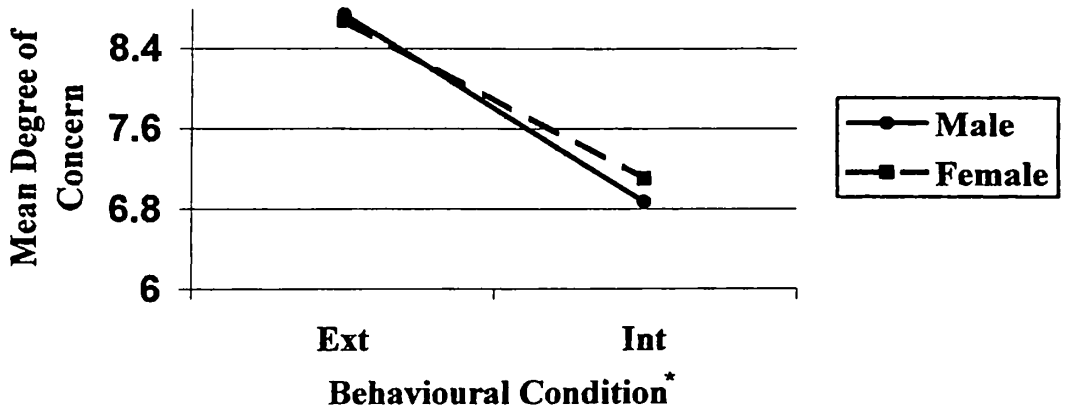
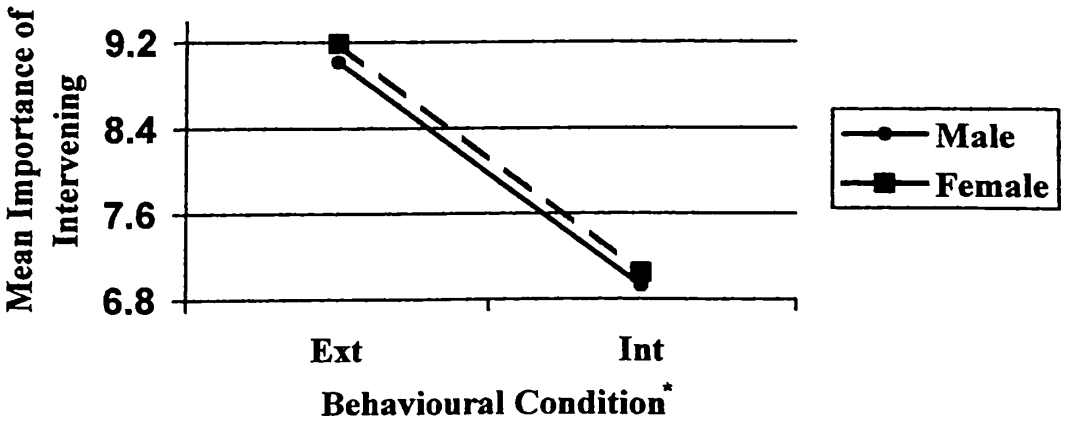


Figure 8: Mean Importance of Intervening
(Behavioural Concerns)
(Gender by Behavioural Condition)



* *significant main effect of behaviour*

What is very interesting to note in the data described above is that for both males and females, while non-significant, teachers tended to perceived more concern about, and tended to report it more important to intervene with, the motor difficulties found in the *internalizing* behavioural condition than the motor items in the externalizing behavioural condition. Although the results were non-significant for degree of concern ratings, significant results were found for importance of intervening and the pattern demonstrated with both of these scores was consistent. For behavioural difficulties, the opposite was true. Teachers perceived significantly more concern about, and reported it significantly more important to intervene with, the behavioural difficulties in the *externalizing* behavioural condition than the internalizing behavioural condition.

In summary, with respect to the question: "Does the influence of child gender on teachers' perceptions of children who present with motor concerns in the classroom depend on whether disruptive or non-disruptive behaviours are present?", analyses performed to address this question revealed no significant main effects of gender or interactions between gender and behaviour. Analyses did demonstrate, however, that behaviour had a significant influence on: 1) teachers' perceptions of children's motor concerns in the presence of disruptive behaviours (importance of intervening), 2) teachers' perceptions of likelihood of referral, 3) teachers' perceptions of the extent to which a child was disruptive, and 4) teachers' perceptions of children's behavioural concerns in the presence of disruptive behaviour.

Child Gender and Type of Motor Concern: Research Question # 3

Does child gender interact with the type of motor concern (fine motor or gross motor) to influence teachers' perceptions of children who present with motor concerns in the classroom?

In order to investigate this research question, three separate questions were addressed. The first question that most directly answered this research question was: Does the type of motor concern (fine motor or gross motor) influence teachers' perceptions, only if they are boys? A two-way repeated measures ANOVA was performed with child gender and type of motor concern (fine motor or gross motor) as independent variables and the average of all motor ratings (for both case scenarios) as the dependent variable. For degree of concern, there was no main effect of gender ($F(1,145) = 0.008$, $p = 0.929$), a main effect of type of motor concern with a mean difference of 0.4 for male case scenarios and 0.33 for female case scenarios ($F(1,145) = 52.35$; $p = 0.000$) and an interaction between gender and motor ($F(1,145) = 3.874$, $p = 0.051$). For importance of intervening, there was no main effect of gender ($F(1,145) = 0.000$, $p = 0.998$), a main effect of type of motor concern with a mean difference of 0.37 for male case scenarios and 0.31 for female case scenarios ($F(1,145) = 21.746$; $p = 0.000$) and no interaction between gender and type of motor concern. These results are plotted in Figures 9 and 10. Results of these analyses suggest that the type of motor concern influenced teachers' perceptions. While child gender alone did not influence teachers' perceptions, the influence of the type of motor concern did vary by gender.

Figure 9: Mean Degree of Concern
(Motor Concerns)
(Gender by Type of Motor Concern)

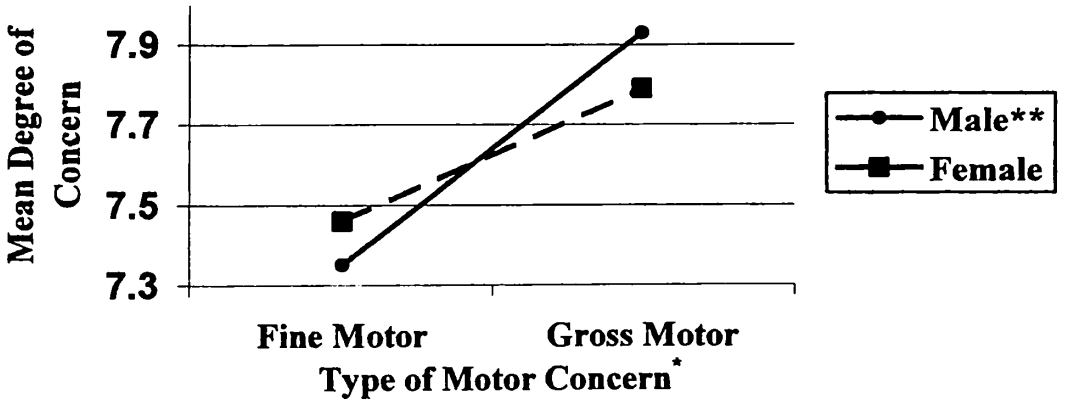
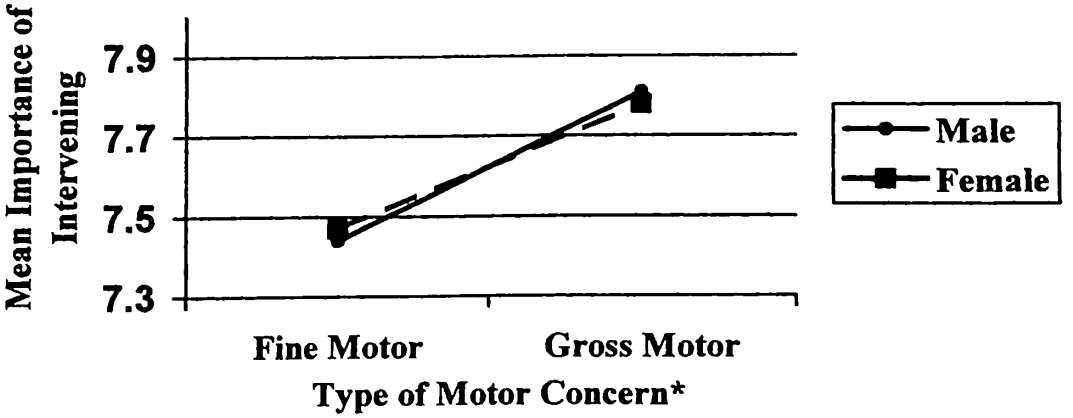


Figure 10: Mean Importance of Intervening
(Motor Concerns)
(Gender by Type of Motor Concern)



**significant main effect of type of motor concern*
***significant interaction between gender and type of motor concern*

A second question addressed was: Does child gender influence teachers' perceptions of children's fine motor concerns? A one-way ANOVA was performed with child gender as the independent variable and the average of all fine motor ratings (for both case scenarios) as the dependent measure for degree of concern ($F(1,145) = 0.301$, $p = 0.584$) and importance of intervening ($F(1,145) = 0.019$, $p = 0.891$). Results of these analyses were non-significant, suggesting that child gender did not influence teachers' perceptions of children's fine motor concerns.

A third question addressed was: Does child gender influence teacher's perceptions of children's gross motor concerns? A one-way ANOVA was performed with child gender as the independent variable and the average of all gross motor ratings (for both case scenarios) as the dependent measure for degree of concern ($F(1,145) = 0.455$, $p = 0.501$) and importance of intervening ($F(1,145) = 0.018$, $p = 0.894$). Results of these analyses were non-significant, suggesting that child gender did not influence teachers' perceptions of children's gross motor concerns.

Since child behaviour was found to have a significant influence on teachers' perceptions in previous analyses in this research study, it was important to further investigate whether the significant interaction found between child gender and the type of motor concern varied according to child behaviour. To do this, a further analysis was undertaken. A three-way repeated measures ANOVA was performed with child gender, child behaviour (externalizing or internalizing) and type of motor concern (fine motor or gross motor) as independent variables and the average of all motor ratings (for each case scenario (behaviour) and for both case scenarios (motor concern)) as the dependent

measure. For both degree of concern and importance of intervening, results of the three-way interaction between child gender, child behaviour and the type of motor concern were non-significant ($F(1,145) = 2.51$; $p = 0.115$ and $F(1,145) = 0.236$; $p = 0.628$ respectively). Results of these analyses suggest that child behaviour did not influence the interaction found between child gender and the type of motor concern.

In summary, with respect to the question: "Does child gender interact with the type of motor concern (fine motor or gross motor) to influence teachers' perceptions of children who present with motor concerns in the classroom?", results of these analyses suggest that child gender alone does not influence teachers' perceptions of particular motor concerns. Teachers were influenced by child gender only when it interacted with the type of motor concern, for degree of concern scores. The interaction between child gender and the type of motor concern was not influenced by child behaviour. In addition, teachers' perceptions were influenced by the type of motor concern.

Chapter 5

Discussion

This chapter begins with a discussion of the teacher participants and the potential generalizability of the study sample. The main research findings are then presented with a discussion of the literature that supports or refutes the findings of the present work. Implications for rehabilitation practice are outlined. The chapter concludes with a discussion of the strengths and limitations of the present research study and suggestions for future research in this area.

Teacher Participants

Teacher participants in this study were predominantly experienced, female teachers. A significant proportion of teachers had between 5 and 10 years of experience as well as additional qualifications in primary teaching and/or special education. It is important for the generalizability of the results to determine whether these teachers represent elementary school teachers in Ontario as a whole. It was not possible to obtain data from the school board regarding teacher years of experience or qualifications. With regard to the breakdown of elementary school teachers by gender, in the elementary school grades, especially in the primary division, there are typically many more female than male teachers (Steve Killip, Research Coordinator, Thames Valley District School Board, email communication, January 31, 2005). The sample population of teacher participants in this study is believed to be generally reflective of elementary school

teachers in Grades 1, 2, and 3 in rural and urban schools in Southwestern Ontario. As a result, findings from this study can likely be generalized to the larger population of elementary school teachers in Southwestern Ontario.

Research Questions

The primary research questions posed in this study examined the influence of child gender, child behaviour and the type of motor concern on teachers' perceptions of children who present with motor concerns in the classroom.

It was proposed in the current research study that teachers might have gender-biased expectations of children who present with motor concerns, in favour of boys. As a result, teachers would be significantly more concerned with boys than girls overall, as well as with respect to children's motor concerns, children's individual behavioural concerns and the likelihood that teachers would refer children to special education or rehabilitation services. These propositions were not supported by the results of this study. It was found that gender alone did not have a significant influence on teachers' perceptions with regard to any of these areas.

Little research has been published to date that specifically examines teachers' perceptions of children who present with motor concerns in the classroom and the role of child gender in forming those perceptions (Kirby et al., 2005). Findings from this study refute the idea that a teacher gender bias is present with regards to the identification of children with DCD, a speculation that has been made in the literature (Gillberg, 2003; Stephenson et al., 1991; Taylor, 1990). Results from this study further suggest that the

discrepancy found in gender prevalence ratios of teacher-identified samples and research-identified samples is not easily explained by gender alone.

One explanation for the lack of findings with respect to gender may be that teachers are now more aware of the influence of gender stereotypes in their perceptions. Teachers in this study were highly experienced teachers who have been teaching for many years. Much has been written in the educational literature to raise the level of consciousness of teachers regarding the role of gender in their perceptions (Garrahy, 2001; Helwig, Anderson, & Tindal, 2001; Li, 1999; Peterson et al., 1999; Tiedemann, 2000; Tiedemann, 2002; Wellhousen, 1996). It is possible that teachers are more sensitive to the role that gender plays in their perceptions and, as a result, they are striving to eliminate gender bias in their perceptions. Some would even go so far as to suggest that bias in teachers' perceptions has moved in the opposite direction. Articles written in the popular press recently would suggest such an explanation, proposing that teachers' biased expectations of achievement, combined with their expectations regarding behaviour, may now favour girls and disadvantage boys (Conlin, 2003).

It was further proposed in this study that child gender, in the presence of disruptive behaviour, would influence teachers' perceptions such that teachers would perceive boys as being more disruptive than girls, in a general sense. The arguments made with respect to child gender, in the presence of disruptive behaviour, were not substantiated by the present research. Teachers in this study perceived *both* boys and girls who were disruptive as being more concerning than boys and girls who were not disruptive, with behaviour playing a much more significant role in their perceptions than

gender. The role of behaviour alone in forming teachers' perceptions has been alluded to by several authors (Anderson, 1997; Gregory, 1977; Wehmeyer et al., 2001).

Regarding the combined role of child gender and child behaviour, it was predicted that teachers' perceptions of children's individual motor concerns would be greater when in the presence of disruptive behaviour. The same was predicted for teachers' perceptions of individual behavioural concerns. For teachers' perceptions of motor concerns, only the influence of behaviour was significant, and for importance of intervening ratings in particular. For teachers' perceptions of behavioural concerns, the influence of behaviour was highly significant for both degree of concern and importance of intervening. While behaviour was found to be a significant factor in influencing teachers' perceptions about both motor and behavioural concerns, results from this study pose some very interesting questions regarding teachers' responses to these different types of concerns. With regard to motor concerns, for both males and females, teachers tended to rate the motor difficulties found in the *internalizing* behavioural condition as more concerning than the motor items in the externalizing behavioural condition, the opposite of what was predicted. For degree of concern scores, this result was only a trend in the data because behaviour was non-significant. However, the trend found in degree of concern scores is consistent with that found for importance of intervening scores, where the influence of behaviour was significant. Given research suggesting that externalizing behaviours are strong influences on teachers' perceptions of children (especially boys) with developmental disabilities, many of which often co-occur with DCD, this is surprising (Anderson, 1997; Berry et al., 1985; Gregory, 1977; Shaywitz et al., 1990;

Vogel, 1990; Wehmeyer et al., 2001). For teachers' perceptions of behavioural concerns, results found in this study are in the direction predicted with regard to the type of behavioural condition. Teachers rated *externalizing* behaviours as significantly more concerning than internalizing behaviours.

So why did teachers rate motor concerns in the opposite direction to that predicted, even though they rated the behaviours according to what was predicted? The premise of the current research study was that externalizing behaviours, in combination with motor concerns, would tend to compound a teachers' perception of concern regarding children's motor difficulties. The results of this study did not support this prediction. It is possible that teachers only notice motor concerns in the "absence" of behavioural problems, or when behaviours are less disruptive. When behaviours were more problematic, as in the externalizing behaviour case scenarios, motor difficulties were rated as being of less concern. It appears as if concern for the motor problems was lessened, particularly in comparison with the degree of concern about the behaviours Since both types of behaviours, internalizing and externalizing, may be typical of children with DCD, this would suggest worrisome implications for the identification of children who demonstrate disruptive behaviours. Their behaviours may become the focus of concern, without investigation of the possible underlying causes, one of which could be motor in-coordination.

The findings of this study suggest that the argument in the literature that teachers are more likely to notice children based on behaviour is somewhat more complex than first thought. Teachers were significantly more concerned about externalizing behaviours

than internalizing behaviours and showed a trend to be more concerned about males demonstrating externalizing behaviours and females demonstrating internalizing behaviours. This finding confirms earlier contentions by several authors about the role of behaviour in teacher perception (Anderson, 1997; Francis, 2000; Grossman et al., 1994; Maccoby et al., 1978; Shaywitz et al., 1990; Vogel, 1990; Wehmeyer et al., 2001). Even though teachers notice, and are more concerned about disruptive behaviour, they do not necessarily notice children with motor concerns when this behaviour is present. In fact, quite the opposite may be true. Teachers may become more focused on behavioural issues, to the detriment of the motor problem.

It was also predicted that teachers would be more likely to refer children with externalizing behaviours than internalizing behaviours and that this trend would be greater for boys than for girls. Results of this analysis partially support this prediction. For both males and females, teachers were significantly more likely to refer children with motor problems when behaviour was of an externalizing nature than when behaviour was internalizing. They were not significantly more likely to refer boys than girls, but rather did appear to make decisions to refer children based on their accompanying behaviours. As has been previously stated, these findings further support the idea that teachers are not biased, in general, with regard to child gender.

What is interesting to note is that the significant findings with respect to likelihood of referral do not correspond with teachers' perceptions of motor concerns in the presence of disruptive behaviour, but do correspond with their perceptions of behavioural concerns in the presence of disruptive behaviour. It appears as if teachers

responded to this question by regarding the behavioural concerns only, as their ratings for both likelihood of referral and concern over behavioural difficulties were in the same direction (externalizing more than internalizing). They tended to report more concern about, and report it more important to intervene with, children who have motor problems and *internalizing* behaviours. However, when it comes to referral, children with externalizing behaviours are more likely to be referred. It should be noted that the order of presentation of the two behavioural conditions may have slightly affected the likelihood of referral scores, as outlined earlier in this chapter. Order was found to be a significant factor but only for the internalizing case scenario in the presentation order of internalizing followed by externalizing. Therefore, it is unlikely that order of presentation could have accounted entirely for the results seen. Overall, the findings with regard to likelihood of referral provide further support for the significant role of behaviour in teacher perception.

Finally, predictions were made in this study regarding the role of child gender and the type of motor concern. It was predicted that teachers would be more concerned about, and think it more important to intervene with, poor gross motor performance in boys and poor fine motor performance in girls, following gender stereotypes. This prediction was supported by the results of this study. Concerns over performance on gross motor items were significantly greater for *males* than females and concerns over performance on fine motor items were significantly greater for *females* than males. Although child gender alone was not found to be a significant factor in determining teachers' perceptions of either fine or gross motor concerns, there was an interaction

between child gender and the type of motor concern. Results of these analyses suggest that child gender does play a role, but only when child gender interacts with the type of motor concern. These research findings lend support to contentions made in the literature that teachers differentially observe and assess motor abilities in boys and girls depending on the type of motor task (Greendorfer, 1983; Thomas et al., 1985; Thomas et al., 1988; Toole et al., 1993). These results further suggest that this argument could be extended to explain teachers' perceptions of children's motor difficulties, an area that has not yet been investigated.

An additional result found in these analyses was that for *both* males and females, teachers rated problems with gross motor items as significantly more concerning than problems with fine motor items. With respect to the type of motor task, teachers may be more concerned about skills they are less comfortable assessing. Teachers may have less experience with, and knowledge of, developmentally appropriate gross motor skills compared with the fine motor skills that they readily and frequently observe in the classroom such as cutting, printing and drawing. Several researchers have pointed out that fine motor skill difficulties are a significant reason for referral (Barnhart et al., 2003; Miller et al., 2001). In the study by Miller et al. (2001), the percentage of children in two different treatment centres who had gross motor problems indicated as reasons for referral was half (centre 1) and one-quarter (centre 2) that of the number of children with fine motor problems cited. As has been previously suggested by the teachers in the studies conducted by Junaid et al. (2000) and Green and colleagues (2005), teachers may have fewer opportunities to observe the performance of children in areas requiring gross

motor skills. Overall, teachers may be more inclined to seek additional assistance regarding the assessment of, and provision of strategies for, gross motor skills than for fine motor skills, based on their level of knowledge of different types of skills and their opportunities to observe these skills.

Implications for Practice

Findings from this study have several implications for rehabilitation practice. Pediatric physical and occupational therapists involved in school settings are frequently asked to assess children with motor coordination difficulties and provide recommendations for their management. Effective physical and occupational therapy intervention involves not only direct intervention with children but also lies in effective education with teachers. The purposes of this type of education are two-fold: 1) to enhance teachers' understanding of children with motor coordination problems, and in so doing, assist teachers to identify children with DCD and 2) to provide teachers with classroom strategies for effective classroom management of children with DCD.

Results of the current research study have implications with respect to enhancing teachers' understanding about aspects of DCD that could assist with identification processes. Firstly, findings from this study indicate that therapists should educate teachers regarding the range of typical behaviours, both externalizing and internalizing, that can be associated with DCD and that are commonly seen in classroom situations. It is important to help teachers to understand how both types of behaviours, while differing in expression, could indicate underlying motor problems. The behaviours themselves

may be coping strategies for motor challenges and not isolated occurrences. Seeking to understand the root cause of both externalizing and internalizing classroom behaviours is critical.

It also seems important, based on the results of this study, to educate teachers regarding the co-occurrence of other developmental disorders with DCD. Many of the behaviours demonstrated in the classroom co-occur with movement problems, indicating that assistance should be sought to address both behavioural and motor concerns.

With respect to the findings of gender bias in teachers' perceptions of types of motor tasks, it will be important to educate teachers regarding the fact that all children with DCD can demonstrate either gross motor or fine motor difficulties. In order to determine if a child's difficulties are sufficient to warrant additional help, it is critical that a child's skill level is compared with their typically developing peers, rather than with a pre-conceived belief about the importance or value of the skill to different genders. There is evidence indicating that children with DCD often perform at a level substantially below what is expected for their age (Hill, 1998; Hill et al., 1998). If there is a discrepancy between a child's abilities and that of their peers, regardless of their gender, further investigations of their motor skills is warranted.

Strengths and Limitations of the Present Research

This study was an exploratory study designed to answer questions regarding the identification of children with motor concerns. Participants in this study represented teachers from rural and urban schools in a large school board and were, based on their

demographic characteristics, generally reflective of elementary school teachers in Southwestern Ontario.

The study design, which involved experimentally-manipulated scenarios, was both a strength and a limitation of this research. The design was a randomized, factorial, repeated measures design that attempted to control rigorously for extraneous confounding factors. Where confounding factors were present, analyses were conducted to investigate the potential effects of these factors on the study results. However, the case scenarios were created and therefore not based on clinical case scenarios. Attempts were made to ensure the scenarios represented different, but typical, presentations of children with DCD. It is possible that the behaviours differentiating the scenarios were not distinct enough to meet the study's intended design.

The major limitation in using case scenarios as part of the research design relates to the fact that what teachers say they would do on paper may have no bearing on what they would actually do. This study design did not attempt to relate teachers' responses to the questionnaires with their actual behaviours. The methodological rigor used in this study design ensured good internal validity, but cannot ensure external validity. As a result, the generalizability of the results is somewhat limited. Conclusions based on this design and the results of this study cannot be generalized to predict what teachers would actually do in the same circumstances.

A related difficulty stems from the fact that there was no true "control" case scenario presenting a child with behavioural problems but no motor concerns (or motor concerns with no behavioural problems). While the internalizing case scenario was

planned to act as a "control" case scenario, it is clear that many teachers viewed both internalizing and externalizing behaviours as problematic, but for different reasons, suggesting that this may not have been the best "control".

A final limitation with this study design is that teachers were told that children had motor difficulties and behavioural difficulties. It is not known from this study whether teachers would actually notice these motor concerns at all and whether or not this would affect their responses. Given that teachers reported that they would pay attention to motor concerns only in the *absence* of disruptive behaviours, it is quite possible that this did not limit the study; but, instead, teachers' perceptions of motor concerns, particularly in the presence of co-occurring behaviours, may have been underestimated.

Future Research Directions

The research presented here has begun to explore the area of teacher perception and children with motor coordination difficulties. Work to either substantiate or refute the current findings with a larger, more diverse sample of teachers would be a logical next step. In addition, results of this study point to the need, in particular, to further examine the role of child behaviour and its influence on teachers' perceptions and children with DCD. The current research study, while examining the role of child gender and its relationship with child behaviour, was not designed to fully address the role of child behaviour as an independent factor. Teachers were asked globally about their perceptions of the children described in these scenarios. Their global perception was

especially evident with respect to their perception of likelihood of referral. Teachers appeared to base their ratings of likelihood of referral on their concern of behavioural problems. Had the question been specifically designed to enquire how likely they would be to refer children, based on their motor concerns, and how likely, based on their behavioural concerns, other trends may have been detected. The current study design could be modified to investigate the influence of behaviour more directly.

Other methodologies could be used to investigate the same factors. Prospective clinical studies correlating teacher identification of children with DCD in the classroom with investigation of the reasons for referral and mutual identification by health care professionals would be one possible way to accomplish this.

Summary and Conclusions

DCD is a chronic health condition with significant secondary consequences that is relatively unrecognized. Teachers are in a unique position to assist with the identification process. Educational literature has contributed to our understanding of who teachers notice in their classrooms and has suggested that identification of motor abilities or difficulties may be complicated by social factors including gender stereotypes. Timely and effective identification of children with DCD relies on a better understanding of teachers' perceptions of children with motor difficulties, especially with regard to the influence of child gender, child behaviour and the type of motor concern.

Using hypothetical case scenarios, it was found that child *gender*, by itself, does not influence teachers' perceptions of children's overall concerns, children's motor

concerns, children's individual behavioural concerns, teachers' perceptions of the degree to which a child is disruptive, or teachers' likelihood of referral of children for additional services. It was found that child *behaviour* is a much more significant factor in determining teacher perceptions, especially with regard to teachers' perceptions of the extent to which a child is disruptive, children's behavioural concerns and teachers' perceptions of how likely they would be to refer children to special education or rehabilitation services. Results of this study refute the notion that teachers notice motor concerns more when behavioural concerns are present. In fact, it may be that teachers only notice motor concerns in the absence of behavioural concerns. In addition, this study suggests that teachers' perceptions are influenced by the particular type of motor concern, and by child gender, but only when gender interacts with the type of motor concern.

The findings of this research study have implications for health care professionals with respect to the education of teachers concerning recognition of children with DCD. Education of teachers regarding the characteristics of children with DCD is important, including the presence of particular behaviours. It is equally critical for physical and occupational therapists to help teachers understand the importance of identifying all children with movement difficulties relative to their peers, regardless of their gender and regardless of the type of motor concern demonstrated. By understanding more about children with DCD, and how they present in the classroom, teachers can assist in a timely and effective identification process, which is paramount to the successful management of children with coordination difficulties.

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Appendix 1: Case Scenarios – Set 1

Male Case Scenario, Externalizing Behaviour, Version 1 of Motor Problem

Ben is a seven-year-old boy in your classroom. He is observed to frequently get out of his chair and disturb his classmates. Lately he has been assuming the role of "class clown" to avoid doing his classroom work altogether. In gym class he has been noted to do this as well. In and out of the classroom, Ben has been noted to act aggressively towards others and is often seen bumping and pushing his classmates, including when in line. When printing, he holds his pencil awkwardly and presses so hard on the page that he often rips it. His work is very slow and effortful such that often he cannot complete his work on time. His printing is illegible because his letters are not aligned at the left margin and he demonstrates poor letter formation. He has difficulty cutting accurately with scissors and his "free-hand" artwork lacks detail, making it difficult to interpret his drawings. In gym class, Ben is unable to catch a ball when thrown to him. He requires physical guidance to learn new motor skills. His movements are awkward and clumsy, and he frequently trips and stumbles, especially on the playground. Ben is often the last to get ready for gym class, as he is unable to tie his shoelaces independently.

Male Case Scenario, Internalizing Behaviour, Version 2 of Motor Problem

Matt is a seven-year-old boy in your classroom. During seatwork activities, he is often "fidgety" and inattentive and he frequently complains of being tired. During free play in class, Matt tends to avoid art activities. When it comes to participating in gym class, Matt frequently complains of a stomach-ache. He demonstrates jerky, laboured hand movements with printing activities and must frequently sharpen his pencil because he breaks the lead so often. At times, he takes so long with his work that he spends much of his recess in the classroom. He has trouble copying math activities from the board and his work is sloppy. With art activities, Matt has difficulty pasting. His creative drawings are immature compared to his peers. Matt requires individualized instruction to learn new motor skills in gym class. He is unable to throw a ball at targets even short distances away. With physical activities, Matt's body appears to be quite tense, and he frequently bumps into objects in his path. Matt is always late for recess, as he needs assistance to manage buttons and zippers on his outdoor clothing.

Appendix 2: Case Scenarios – Set 2

Male Case Scenario, Externalizing Behaviour, Version 2 of Motor Problem

Ben is a seven-year-old boy in your classroom. He is observed to frequently get out of his chair and disturb his classmates. Lately he has been assuming the role of "class clown" to avoid doing his classroom work altogether. In gym class he has been noted to do this as well. In and out of the classroom, Ben has been noted to act aggressively towards others and is often seen bumping and pushing his classmates, including when in line. He demonstrates jerky, laboured hand movements with printing activities and must frequently sharpen his pencil because he breaks the lead so often. At times, he takes so long with his work that he spends much of his recess in the classroom. He has trouble copying math activities from the board and his work is sloppy. With art activities, Ben has difficulty pasting. His creative drawings are immature compared to his peers. Ben requires individualized instruction to learn new motor skills in gym class. He is unable to throw a ball at targets even short distances away. With physical activities, Ben's body appears to be quite tense, and he frequently bumps into objects in his path. Ben is always late for recess, as he needs assistance to manage buttons and zippers on his outdoor clothing.

Male Case Scenario, Internalizing Behaviour, Version 1 of Motor Problem

Matt is a seven-year-old boy in your classroom. During seatwork activities, he is often "fidgety" and inattentive and he frequently complains of being tired. During free play in class, Matt tends to avoid art activities. When it comes to participating in gym class, Matt frequently complains of a stomach-ache. When printing, he holds his pencil awkwardly and presses so hard on the page that he often rips it. His work is very slow and effortful such that often he cannot complete his work on time. His printing is illegible because his letters are not aligned at the left margin and he demonstrates poor letter formation. He has difficulty cutting accurately with scissors and his "free-hand" artwork lacks detail, making it difficult to interpret his drawings. In gym class, Matt is unable to catch a ball when thrown to him. He requires physical guidance to learn new motor skills. His movements are awkward and clumsy, and he frequently trips and stumbles, especially on the playground. Matt is often the last to get ready for gym class, as he is unable to tie his shoelaces independently.

Appendix 3: Case Scenarios – Set 3

Female Case Scenario, Externalizing Behaviour, Version 1 of Motor Problem

Sarah is a seven-year-old girl in your classroom. She is observed to frequently get out of her chair and disturb her classmates. Lately she has been assuming the role of "class clown" to avoid doing her classroom work altogether. In gym class she has been noted to do this as well. In and out of the classroom, Sarah has been noted to act aggressively towards others and is often seen bumping and pushing her classmates, including when in line. When printing, she holds her pencil awkwardly and presses so hard on the page that she often rips it. Her work is very slow and effortful such that often she cannot complete her work on time. Her printing is illegible because her letters are not aligned at the left margin and she demonstrates poor letter formation. She has difficulty cutting accurately with scissors and her "free-hand" artwork lacks detail, making it difficult to interpret her drawings. In gym class, Sarah is unable to catch a ball when thrown to her. She requires physical guidance to learn new motor skills. Her movements are awkward and clumsy, and she frequently trips and stumbles, especially on the playground. Sarah is often the last to get ready for gym class, as she is unable to tie her shoelaces independently.

Female Case Scenario, Internalizing Behaviour, Version 2 of Motor Problem

Katie is a seven-year-old girl in your classroom. During seatwork activities, she is often "fidgety" and inattentive and she frequently complains of being tired. During free play in class, Katie tends to avoid art activities. When it comes to participating in gym class, Katie frequently complains of a stomach-ache. She demonstrates jerky, laboured hand movements with printing activities and must frequently sharpen her pencil because she breaks the lead so often. At times, she takes so long with her work that she spends much of her recess in the classroom. She has trouble copying math activities from the board and her work is sloppy. With art activities, Katie has difficulty pasting. Her creative drawings are immature compared to her peers. Katie requires individualized instruction to learn new motor skills in gym class. She is unable to throw a ball at targets even short distances away. With physical activities, Katie's body appears to be quite tense, and she frequently bumps into objects in her path. Katie is always late for recess, as she needs assistance to manage buttons and zippers on her outdoor clothing.

Appendix 4: Case Scenarios – Set 4

Female Case Scenario, Externalizing Behaviour, Version 2 of Motor Problem

Sarah is a seven-year-old girl in your classroom. She is observed to frequently get out of her chair and disturb her classmates. Lately she has been assuming the role of "class clown" to avoid doing her classroom work altogether. In gym class she has been noted to do this as well. In and out of the classroom, Sarah has been noted to act aggressively towards others and is often seen bumping and pushing her classmates, including when in line. She demonstrates jerky, laboured hand movements with printing activities and must frequently sharpen her pencil because she breaks the lead so often. At times, she takes so long with her work that she spends much of her recess in the classroom. She has trouble copying math activities from the board and her work is sloppy. With art activities, Sarah has difficulty pasting. Her creative drawings are immature compared to her peers. Sarah requires individualized instruction to learn new motor skills in gym class. She is unable to throw a ball at targets even short distances away. With physical activities, Sarah's body appears to be quite tense, and she frequently bumps into objects in her path. Sarah is always late for recess, as she needs assistance to manage buttons and zippers on her outdoor clothing.

Female Case Scenario, Internalizing Behaviour, Version 1 of Motor Problem

Katie is a seven-year-old girl in your classroom. During seatwork activities, she is often "fidgety" and inattentive and she frequently complains of being tired. During free play in class, Katie tends to avoid art activities. When it comes to participating in gym class, Katie frequently complains of a stomach-ache. When printing, she holds her pencil awkwardly and presses so hard on the page that she often rips it. Her work is very slow and effortful such that often she cannot complete her work on time. Her printing is illegible because her letters are not aligned at the left margin and she demonstrates poor letter formation. She has difficulty cutting accurately with scissors and her "free-hand" artwork lacks detail, making it difficult to interpret her drawings. In gym class, Katie is unable to catch a ball when thrown to her. She requires physical guidance to learn new motor skills. Her movements are awkward and clumsy, and she frequently trips and stumbles, especially on the playground. Katie is often the last to get ready for gym class, as she is unable to tie her shoelaces independently.

Appendix 5: Example of a Rating Scale (Set 1 – MEV1)

1. Rate how CONCERNED you would be regarding each of the items in the following table, with 1 being not at all concerned, and 10 being extremely concerned.

	Degree of CONCERN									
	Not at all concerned									Extremely concerned
Frequently gets out of chair, disturbs classmates	1	2	3	4	5	6	7	8	9	10
Assumes the role of "class clown" to avoid work	1	2	3	4	5	6	7	8	9	10
Acts aggressively towards others in/out of classroom	1	2	3	4	5	6	7	8	9	10
Bumps and pushes classmates, including when in line	1	2	3	4	5	6	7	8	9	10
When printing, holds pencil awkwardly	1	2	3	4	5	6	7	8	9	10
Presses so hard on the page that he rips it	1	2	3	4	5	6	7	8	9	10
Work is slow, effortful, can't complete on time	1	2	3	4	5	6	7	8	9	10
Printing is illegible, letters poorly formed/aligned	1	2	3	4	5	6	7	8	9	10
Difficulty cutting accurately with scissors	1	2	3	4	5	6	7	8	9	10
Artwork lacks detail, difficult to interpret	1	2	3	4	5	6	7	8	9	10
Unable to catch a ball thrown to him	1	2	3	4	5	6	7	8	9	10
Requires physical guidance to learn new motor skills	1	2	3	4	5	6	7	8	9	10
Movements awkward/clumsy	1	2	3	4	5	6	7	8	9	10
Frequently trips, stumbles especially on playground	1	2	3	4	5	6	7	8	9	10
Last to get ready for gym	1	2	3	4	5	6	7	8	9	10
Unable to tie shoelaces independently	1	2	3	4	5	6	7	8	9	10

Please turn the page and complete questions 2 and 3.

2. Rate the same items, but this time indicate how important you think it is to INTERVENE, with 1 being not at all important and 10 being extremely important.

	Importance of INTERVENING									
	Not at all important									Extremely important
Frequently gets out of chair, disturbs classmates	1	2	3	4	5	6	7	8	9	10
Assumes the role of "class clown" to avoid work	1	2	3	4	5	6	7	8	9	10
Acts aggressively towards others in/out of classroom	1	2	3	4	5	6	7	8	9	10
Bumps and pushes classmates, including when in line	1	2	3	4	5	6	7	8	9	10
When printing, holds pencil awkwardly	1	2	3	4	5	6	7	8	9	10
Presses so hard on the page that he rips it	1	2	3	4	5	6	7	8	9	10
Work is slow, effortful; can't complete on time	1	2	3	4	5	6	7	8	9	10
Printing is illegible, letters poorly formed/aligned	1	2	3	4	5	6	7	8	9	10
Difficulty cutting accurately with scissors	1	2	3	4	5	6	7	8	9	10
Artwork lacks detail, difficult to interpret	1	2	3	4	5	6	7	8	9	10
Unable to catch a ball thrown to him	1	2	3	4	5	6	7	8	9	10
Requires physical guidance to learn new motor skills	1	2	3	4	5	6	7	8	9	10
Movements awkward/clumsy	1	2	3	4	5	6	7	8	9	10
Frequently trips, stumbles especially on playground	1	2	3	4	5	6	7	8	9	10
Last to get ready for gym	1	2	3	4	5	6	7	8	9	10
Unable to tie shoelaces independently	1	2	3	4	5	6	7	8	9	10

3. Rate how likely you would be to refer Ben to another professional for additional assessment and/or intervention, with 1 being not very likely and 10 being extremely likely.

Not very likely — Extremely likely

1	2	3	4	5	6	7	8	9	10

Why or why not?

_____

_____

Appendix 6: Teacher Demographic Questionnaire

Teacher Demographic Questionnaire

Please complete the following questionnaire:

1. School: _____
2. Grade level taught: _____
3. Gender: ☐ Male ☐ Female
4. Number of years teaching:

   ☐ 0-5 years ☐ 5-10 years ☐ 10 or more years

5. Number of years teaching within the primary division:

   ☐ 0-5 years ☐ 5-10 years ☐ 10 or more years

6. Teaching responsibilities (please include all those that apply):

   ☐ classroom teacher ☐ literacy teacher ☐ learning resource teacher

7. Highest educational degree level obtained:

   ☐ Bachelors ☐ Masters ☐ Doctoral

8. Additional qualifications (please specify, i.e. Special Education1, Reading Specialist):_____
9. Do you now teach, or have you previously taught, physical education?☐Yes ☐No
10. Number of children you are primarily responsible for: _____
11. On average, in an academic year, approximately how many children <u>with motor difficulties</u> do you refer to another health professional for assessment and/or intervention?

    ☐ 0-5 ☐ 5 -10 ☐ more than 10

Appendix 7: Letter of Information and Informed Consent Form

McMaster University

School of Rehabilitation Science
Institute for Applied Health Sciences
McMaster University
1400 Main St. W.
Hamilton, Ontario L8S 1C7

Letter of Information and Informed Consent

Title of Research Study: *Teachers' Observations of Children's Motor Coordination Difficulties in the Classroom*

Student Investigator:

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Supervisor:

Dr. Cheryl Missiuna, PhD, OTReg(Ont)
Assistant Professor
School of Rehabilitation Science

Dear Participant,

You are being invited to participate in a research study that looks at what teachers notice about children's motor coordination in the classroom. In this study, we hope to develop a better understanding of what teachers notice about children with motor difficulties.

If you take part in this study, you will be asked to complete 2 two-page questionnaires that describe a hypothetical case scenario about children with motor difficulties. You will also be asked to complete a one-page teacher profile questionnaire that asks questions about your background in teaching. Completion of the questionnaires will take no more than 20 minutes. Your responses will remain anonymous.

There are no known risks to your participation in this study. You may not benefit personally from this study; however, your participation will help develop educational materials for other primary teachers to assist them in the identification and referral of children with motor difficulties for special education services.

Participation in this study is voluntary and you will not be compensated. You may refuse to participate or withdraw from the study at any time with no effect on your relationship with the Thames Valley District School Board.

Data collected will be kept in the strictest of confidence and stored in a locked filing cabinet at McMaster

University. Only the principal investigator and supervisory committee will have access to the data. Aggregate (group) data will be used only. No individual data will be used in any publications or presentations about the findings of the research study.

If you have any questions about this study please contact the graduate student, Lisa Rivard at 519-632-8927 or by email at rivardlm@mcmaster.ca or her supervisor, Dr. Cheryl Missiuna at McMaster University, 905-525-9140, ext. 27842. If you have any questions regarding your rights as a research participant you may contact the Hamilton Health Sciences Patient Relations Specialist at 905-521-2100, ext. 75240.

You will be invited to attend a discussion of the findings, once the study is complete.

I have read and understood the Letter of Information and I agree to participate. I will receive a signed copy of this form.

_____ _____

Participant's Name (please print) Date

_____

Participant's Signature

_____ _____

Witness Date

10/15/2004