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Understanding teachers' perceptions of the motor difficulties of children with developmental coordination disorder (DCD)

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Background. Children with developmental coordination disorder (DCD) are often identified by classroom teachers and the identification process relies heavily on teachers' perceptions. The literature would suggest that teachers' perceptions may be influenced by a child's gender, behaviour and the type of motor problem they demonstrate. To date, the influence of these factors on teachers' perceptions of children with DCD has not been empirically tested.

Aim. This study investigated whether child gender, behaviour and type of motor problem influenced teachers' ratings of concern and importance of intervening for children with motor difficulties.

Sample. One hundred and forty-seven teachers of children from 6 to 9 years of age participated in this study.

Method. Hypothetical case scenarios were developed that experimentally manipulated the factors of child gender (male/female), behaviour (disruptive/non-disruptive) and type of motor problem (fine motor/gross motor). Teachers were given two case scenarios of the same gender (that varied by behaviour) and rated: (a) their degree of concern about children's motor problems and (b) how important they thought it was for the child to receive intervention for that problem.

Results. The effect of child gender on teachers' perceptions depends upon the type of motor problem. While child behaviour had a marginal influence on teachers' perceptions, interestingly, teachers appeared to recognize motor problems only in the absence of disruptive behaviour. The type of motor problem demonstrated also influenced teachers' perceptions.

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Conclusion. This study provides preliminary insight into factors that influence teachers' perceptions of children with DCD with clear implications for the classroom identification of children with DCD.

Five to six percent of school-aged children have movement difficulties, which are not due to specific neurological problems or cognitive impairment, and which limit their classroom potential and affect their long-term academic achievement (American Psychiatric Association (APA), 2000). Everyday functional tasks such as dressing, printing, cutting with scissors, copying from the board and ball skills are problematic for these children and cause daily frustration (Cermak, Gubbay, & Larkin, 2002; May-Benson, Ingolia, & Koomar, 2002; Missiuna, 2003). These difficulties are recognized as key features of a motor disorder known as Developmental Coordination Disorder (DCD); it is commonly accepted that males with this disorder outnumber females in a ratio of approximately 2:1 (APA, 2000).

Research performed in many countries around the world has confirmed that large numbers of children are affected by this chronic health condition (Iloeje, 1987; Kadesjo & Gillberg, 1999; Wright & Sugden, 1996). Despite the fact that DCD is a highly prevalent disorder in school-aged children, the condition has only recently received worldwide recognition (APA, 2000). Attention is increasingly being paid to this disorder because of the impact of children's primary motor limitations on everyday life. It has been clearly demonstrated that children with DCD are known to develop serious secondary sequelae that are not limited to the presenting motor difficulties. Several studies have shown that, over time, children with DCD are more likely to demonstrate behavioural and social/emotional difficulties including poor perceived social and physical competence, social isolation, academic and behaviour problems, poor self-esteem, low self-worth and higher rates of psychiatric problems (Cantell, Smyth, & Ahonen, 1994; Geuze & Borger, 1993; Losse *et al.*, 1991; Rasmussen & Gillberg, 2000; Rose, Larkin, & Berger, 1997; Rose & Larkin, 2002; Schoemaker & Kalverboer, 1994; Skinner & Piek, 2001; Smyth & Anderson, 2000). In addition, they are less likely to be physically fit or to participate voluntarily in motor activity (Cairney, Hay, Faught, Mandigo, & Flouris, 2005; Watkinson *et al.*, 2001).

The increased risk for children with DCD of secondary mental and physical health issues as well as academic failure has highlighted the need to identify children with DCD as early as possible (Missiuna, Rivard, & Bartlett, 2003). Children with movement problems identified at an early age may benefit from intervention that includes the education of teachers and parents about how to make tasks easier for them (Missiuna, Rivard, & Pollock, 2004).

Many of the motor and behavioural difficulties of children with DCD can be observed in classroom activities and on the school playground (Cermak *et al.*, 2002; Missiuna, 2003). Classroom fine motor difficulties that are readily observable, for example, include problems with printing and/or handwriting (Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001). Difficulties with ball skills and poorly coordinated running, skipping, jumping and avoidance of outdoor playground equipment may also be observed (Cermak *et al.*, 2002; David, 2000). Children with movement difficulties that are 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. Withdrawal, avoidance and 'off-task' behaviours may be observed (Cermak *et al.*, 2002; Cermak & Larkin, 2002; Missiuna, 2003); alternatively, children may act out in class, disrupting the teacher and/or others (May-Benson *et al.*, 2002).

Identification of children with DCD by classroom teachers

Although the motor coordination difficulties of children with DCD are readily observable both in classroom and physical education settings, children with DCD are commonly under-recognized until academic failure begins to occur (Fox & Lent, 1996; Miller *et al.*, 2001). Classroom and special education teachers are often the initial source of referral in cases when they notice poor skill development interfering with classroom work and overall academic performance (Sugden & Wright, 1998). While teachers do identify some children with DCD, the literature suggests that teachers miss many children who may be experiencing motor limitations in their classrooms and that this may be related to a number of factors (Dunford, Street, O'Connell, Kelly, & Sibert, 2004; Green *et al.*, 2005; Junaid, Harris, Fulmer, & Carswell, 2000; Piek & Edwards, 1997). One solution to the problem, teacher checklists, has not worked well as they are often lengthy (Henderson & Sugden, 1992) and may have poor sensitivity (Junaid *et al.*, 2000). It is important to learn more about teachers' perceptions of what constitutes a motor problem.

Child gender and teacher perception

Much of the literature examining teachers' perceptions has focused on teachers' expectations of the academic performance of typically developing children and teachers' perceptions of students who are struggling academically, and/or who have behavioural or emotional difficulties (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990; Tiedemann, 2002; Vogel, 1990). Studies of children with developmental disabilities have shown that a greater number of males to females are identified by classroom teachers than in research-identified samples, suggesting that the child's gender may play a significant role in the identification process (Shaywitz *et al.*, 1990; Vogel, 1990). For example, several 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; Vogel, 1990; Wehmeyer & Schwartz, 2001). Teacher-identified samples of children with DCD report much higher numbers of males to females than is outlined by the APA (Geuze & Kalverboer, 1987; Geuze & van Dellen, 1990; Missiuna, 1994; Mon-Williams, Wann, & Pascal, 1999; Peters & Wright, 1999). In fact, researchers working in the DCD field have wondered whether a gender selection bias may also be occurring when teachers are asked to identify children with motor difficulties (Gillberg, 2003; Taylor, 1990). Alternatively, it may be that the discrepancy found between research- and teacher-identified samples may be due to the presence of co-occurring difficulties. These speculations have not been tested empirically.

Child behaviour and teacher perception

Another factor that may influence teachers' perceptions is classroom behaviour, particularly disruptive behaviour. Several researchers have stated that because boys are more active (regardless of whether or not they have a disability), they are more likely to disrupt traditional classroom environments and to be noticed by classroom teachers (Anderson, 1997; Vogel, 1990; Wehmeyer & Schwartz, 2001). The presence of behavioural disturbances may increase the likelihood that teachers will become concerned about children's development and make referrals to special education. Researchers have speculated that females with developmental concerns, who are quiet, withdrawn or depressed, may be 'missed' (Anderson, 1997; Berry *et al.*, 1985; Shaywitz *et al.*, 1990; Vogel, 1990; Wehmeyer & Schwartz, 2001). Teachers' perceptions of the

behaviour frequently observed in children with DCD may influence teachers' awareness of their motor difficulties.

Type of motor problem and teacher perception

There has been limited investigation of teachers' perceptions of the motor abilities of typically or poorly-coordinated children (Granleese, Turner, & Trew, 1989; Hay & Donnelly, 1996). Much of the research investigating motor skills relates to whether gender differences in motor skill ability exist or whether notions about motor abilities are gender-stereotyped (Nelson, Thomas, Nelson, & Abraham, 1986; Thomas & French, 1985; Toole & Kretzschmar, 1993). Some research in this area suggests the presence of small gender differences prior to puberty (Nelson *et al.*, 1986, 1991; Thomas & French, 1985). Several researchers propose that because females and males are treated differently even as infants, it is difficult to sort out gender differences from differential socialization and that early stereotypical messages regarding motor activities may simply be reinforced by teachers in the classroom and on the school playground (Thomas & French, 1985; Thomas & Thomas, 1988). Teachers may have different perceptions of the motor abilities of boys and girls and have stereotypical expectations of their performance level on different types of motor tasks, based on their gender.

Teachers' perceptions of children with DCD

To our knowledge, there is no published literature regarding the role that child gender, child behaviour or type of motor problem may play in influencing teachers' perceptions of children's movement problems. However, there is some speculation that these factors might influence teachers' perceptions. As previously outlined, children with DCD may exhibit many behavioural and emotional/social difficulties, which can be observed readily in the classroom setting. Behaving in a disruptive (or even non-disruptive) way may be a strategy used to cope with motor difficulties, or may be related to co-occurring learning and attention problems, which have been shown to be highly associated with DCD (Dewey, Kaplan, Crawford, & Wilson, 2002; Kadesjo & Gillberg, 1998; Kaplan, Wilson, Dewey, & Crawford, 1998).

The purpose of this study is to determine whether teachers' perceptions about the motor difficulties of children with DCD are influenced by child gender, child behaviour and the type of motor problem. Specifically, this study will address the following questions: Do teachers report more concern about males than females with similar movement difficulties? Do teachers report more concern about motor difficulties when disruptive behaviours are also present? Do teachers report more concern about gross motor difficulties than fine motor difficulties if the child is male, and more concern about fine motor difficulties than gross motor difficulties if the child is female? It is anticipated that knowledge gained from this study may inform efforts to facilitate the effective identification of *all* children with DCD, both males and females.

Method

Participants

Elementary school teachers who were teaching children aged from 6 to 9 years, as well as teachers with special education responsibilities were invited to participate

($N = 752$). Teachers of younger or older children and special education teachers who had never previously taught children from 6 to 9 years of age were excluded.

Design

This study used an experimental, randomized, factorial design that allowed for manipulation of the independent variables of child gender (male/female), child behaviour (disruptive/non-disruptive) and type of motor problem (fine motor/gross motor).

Procedure

The study was approved by both the McMaster University Research Ethics Board at McMaster University and by a school board in Ontario. Informed written consent was obtained from all teacher participants.

Elementary school principals distributed packages containing scenarios to teachers within their schools. All participants were provided with two hypothetical case scenarios describing children with DCD. Teachers were asked to read both the scenarios and then provide ratings of their perceptions about the difficulties outlined in each of the scenarios. All packages were completed anonymously and returned through the school board courier system.

Instruments

Case scenarios

A total of eight case scenarios describing hypothetical children demonstrating both motor and behavioural difficulties were devised. These scenarios were based on widely accepted clinical and research descriptions of children with DCD. Four case scenarios described a male child and four described a female child. Each scenario contained sixteen items, characteristic of children with DCD, which could be of potential concern. Within each scenario, there were four behavioural difficulties, eight fine motor problems and four gross motor problems.

In order not to make the purpose of the study obvious, teachers were given two scenarios of the same gender with slightly different motor items and different behavioural items (see Figures 1 and 2 for examples of scenario groupings given to teachers). Each teacher received scenarios describing a single gender so that the study's investigation of gender influences would not be obvious to any individual teacher. The motor items found in each of the two scenarios given to a teacher were slightly different but were designed to be as equivalent as possible so that it would not appear that the scenarios differed by behavioural concerns alone, indicating the study's second purpose. For example, both scenarios contained a fine motor tabletop item but the actual items themselves were slightly different. Gross motor items were treated in a similar fashion. The entire group of motor items was counterbalanced with the group of behavioural items such that different combinations of motor and behavioural items were used, in order to avoid any effects due to possible motor item differences. The two scenarios in a package did, however, contain different behavioural items. One scenario contained non-disruptive behaviours (manageable within the classroom environment). The other scenario contained disruptive behaviours (requiring management outside the classroom). Unlike the motor items, the behavioural difficulties were intended to be

Scenario # 1:

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.

Scenario # 2:

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.

Figure 1. Example of a set of case scenarios given to teacher 'A'.

different from one another. A pilot sample of five classroom teachers and five school-based therapists demonstrated that these behaviours had been appropriately classified. Scenarios within the packages given to teachers were arranged in random order. In addition, packages of case scenarios were randomly distributed amongst teachers.

Rating scales

Teachers were asked to read the two case scenarios and, for each, complete two rating scales regarding each of the difficulties outlined in the scenarios (see Figure 3). Using 10-point Likert rating scales, teachers rated: (a) the *degree of concern* that they had about each difficulty and (b) the *importance of intervening* with respect to each difficulty listed in the case scenario. For degree of concern, a rating of 1 indicated that a teacher was 'not at all concerned' and a rating of 10 indicated 'extremely concerned'. For the scale asking teachers to rate the importance of intervening, a rating of 1 indicated 'not at all important' and a rating of 10 indicated that it was 'extremely important' to intervene.

Scenario # 1:

Ben 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, Ben tends to avoid art activities. When it comes to participating in gym class, Ben 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, 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.

Scenario # 2:

Matt 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, Matt 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, 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.

Figure 2. Example of a set of case scenarios given to teacher 'B'.

Results

Out of the 752 survey packages distributed, 152 packages were returned and complete, representing a response rate of 20.2%. Five survey packages did not meet inclusion criteria and were, therefore, excluded from the analyses. Eligible survey packages ($N = 147$) represented responses from teachers in 75 of 148 schools (51% of all elementary schools in the school board) with an average of two teachers participating per school (range from 1 to 7). Out of the 147 packages, 73 (49.7%) contained male gender case scenarios and 74 (50.3%) contained female gender case scenarios. The demographics of the teacher participants in this study are outlined in Table 1. They were predominantly female teachers, many of whom were experienced and had additional qualifications. A large percentage of teachers (81%) had experience teaching physical education. Class sizes were average for an Ontario school board, with 69% having class sizes greater than 20 children.

Teachers provided ratings regarding their perceived degree of concern and perceived importance of intervening for *each* of the difficulties outlined in the case

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
During seatwork, often "fidgety", inattentive	1	2	3	4	5	6	7	8	9	10
Frequently complains of being tired	1	2	3	4	5	6	7	8	9	10
During free play, avoids art activities	1	2	3	4	5	6	7	8	9	10
Complains of a stomach ache in gym class	1	2	3	4	5	6	7	8	9	10
Demonstrates jerky, laboured hand movements	1	2	3	4	5	6	7	8	9	10
Frequently sharpens pencil; breaks lead often	1	2	3	4	5	6	7	8	9	10
Takes a long time with work; spends recess in class	1	2	3	4	5	6	7	8	9	10
Has trouble copying math from board; work is sloppy	1	2	3	4	5	6	7	8	9	10
With art activities, has difficulty pasting	1	2	3	4	5	6	7	8	9	10
Creative drawings are immature compared to peers	1	2	3	4	5	6	7	8	9	10
Needs individual instruction with new motor skills	1	2	3	4	5	6	7	8	9	10
Unable to throw a ball to a short distance target	1	2	3	4	5	6	7	8	9	10
With physical activities, body appears quite tense	1	2	3	4	5	6	7	8	9	10
Frequently bumps into objects in her path	1	2	3	4	5	6	7	8	9	10
Always late for recess	1	2	3	4	5	6	7	8	9	10
Needs assistancewith buttons, zippers	1	2	3	4	5	6	7	8	9	10

(NB: For ratings of importance of intervening, the table was identical except the instructions were "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*."

Figure 3. Example of a rating scale given to teachers.

scenarios, including both motor and behavioural difficulties. This was to ensure that participants would be unaware that the ratings of interest in this study were in fact only their rating of the motor items, under differing behavioural conditions. Therefore, to address the research questions posed in this study, only teachers' ratings of the motor difficulties were used in the analyses. A three-way repeated measures ANOVA was performed on *average* ratings of concern or importance of intervening regarding *motor*

Table 1. Demographic characteristics of teacher participants ($N = 147$)

Demographic characteristic	Total (*N*)	Total %
Gender: Male–female	7–139	4.8–94.6
Years teaching: Ten or more years–less than ten years	75–68	51.0–46.3
Years teaching in primary division: Ten or more years–less than ten years	63–81	42.9–55.1
Teaching responsibilities: Classroom–classroom and/or other	133–11	90.5–7.4
Highest degree level: Baccalaureate–other	126–17	85.7–12.2
Additional qualifications: None–primary +/or special education qualifications	64–80	43.5–54.5
Teach or have taught and physical education: Yes–no	129–15	87.8–10.2
Number of children responsible for: Less than 20 children–greater than 20 children	39–102	26.5–69.4
Average number of referrals per year: Up to five referrals–greater than five referrals	142–2	96.6–1.4

NB: Percentages reported above do not always add up to a total of 100% due to missing data.

problems. Child gender (male/female) and child behaviour (disruptive/non-disruptive) were between-subjects factors and type of motor problem (fine motor/gross motor) was a within-subjects factor. Separate analyses were performed for degree of concern and importance of intervening ratings. Results of these analyses are found in Table 2.

For degree of concern, there was a main effect of type of motor problem ($F(1, 145) = 24.01$; $p = .000$) and a significant two-way interaction between child gender and type of motor problem ($F(1, 145) = 5.31$; $p = .023$) (Figure 4). For importance of intervening, there was a main effect of type of motor problem ($F(1, 145) = 8.12$; $p = .005$) (Figure 5) and a marginal main effect of behaviour ($F(1, 145) = 3.79$; $p = .054$) (Figure 6).

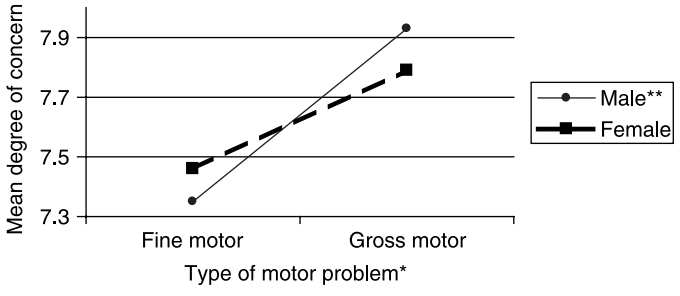
The significant interaction found between child gender and type of motor problem for degree of concern (Figure 4) indicates that the effect of child gender on teachers' perceptions of concern depended on the type of motor problem. Teachers reported more concern about the gross motor performance of boys than about their fine motor performance and reported more concern about the fine motor performance of girls than about their gross motor performance, along gender stereotypes. This trend was also seen for importance of intervening ratings, although it was non-significant.

Results of this study also showed that the type of motor problem being demonstrated influenced teachers' perceptions. Teachers reported more overall concern about, and

Table 2. ANOVA results for ratings of degree of concern and importance of intervening

Factor(s)	Degree of concern $F(1, 145)$	Importance of intervening $F(1, 145)$
Gender: Male/female	0.006	0.014
Behaviour: Disruptive/non-disruptive	0.862	3.79 +
Motor: Fine motor/gross motor	24.01***	8.12**
Gender × behaviour	0.055	0.024
Gender × motor	5.31*	0.51
Behaviour × motor	0.005	1.02
Gender × behaviour × motor	2.21	0.507

Note. *$p < .05$; **$p < .01$; ***$p < .001$; + $p < .06$.



* Significant main effect of type of motor problem

** Significant interaction between child gender and type of motor problem

Figure 4. Mean degree of concern rating (Gender by type of motor problem).

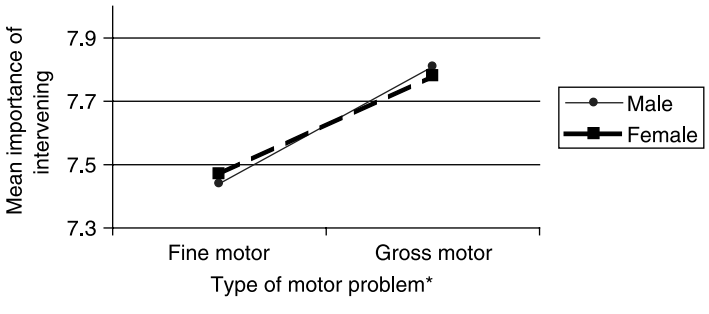
thought it more important to intervene with, children who had gross motor problems than fine motor problems (Figures 4 and 5).

The influence of behaviour on teachers' perceptions was found to be marginal for the importance of intervening rating only (Figure 6). Teachers tended to report that it was more important to intervene with the motor difficulties described in the *non-disruptive* behavioural condition than with the motor difficulties in the *disruptive* behavioural condition. The results were non-significant for degree of concern, but the pattern demonstrated was consistent.

Discussion

The proposition that teachers might report more concern about males than females with similar movement problems was not supported by the results of this study as child gender alone was not found to have a significant influence on teachers' perceptions of children's motor problems. Findings from the current study refute the idea that boys' difficulties are noticed more easily by teachers (Gillberg, 2003; Taylor, 1990) and further suggest that the discrepancy found between the gender prevalence ratios of teacher- and research-identified samples is not easily explained by gender alone.

The fact that an overt gender bias was not found may be explained by an increased awareness, on the part of teachers, of the influence of gender stereotypes. Much has been written recently in the educational literature to raise the level of consciousness of



* Significant main effect of type of motor problem

Figure 5. Mean importance of intervening rating (Gender by type of motor problem).

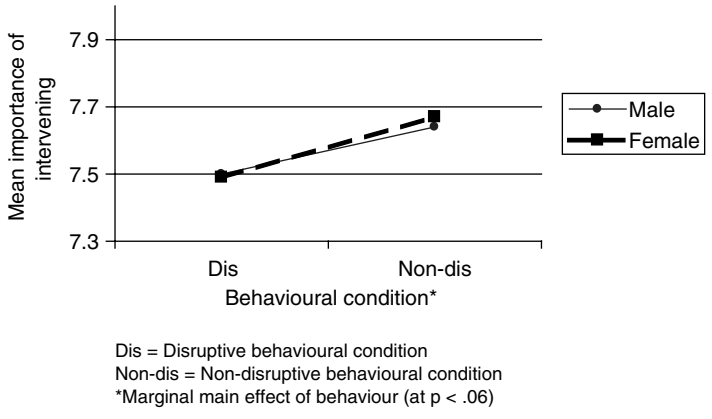


Figure 6. Mean importance of intervening rating (Gender by behavioural condition).

teachers regarding the role that child gender may play in their perceptions (Garrahy, 2001; Helwig, Anderson, & Tindal, 2001; Peterson & Bainbridge, 1999; Tiedemann, 2002). However, while a global gender bias was not demonstrated in this study, results with respect to the type of motor problem suggest that the influence of child gender on teachers' perceptions may continue to be demonstrated in more subtle ways.

Previous literature suggested that disruptive behaviours are strong influences on teachers' perceptions of children (especially boys) with developmental disabilities (Anderson, 1997; Vogel, 1990; Wehmeyer & Schwartz, 2001). Surprisingly, this prediction was not substantiated for children with movement difficulties. In fact, teachers in this study appeared to report concern about motor difficulties only when *non-disruptive* behaviours were present. It was anticipated that disruptive behaviours might compound a teachers' perception of concern about children's motor difficulties. The findings of this study suggest, instead, that teachers do not necessarily notice children with motor problems when disruptive classroom behaviour is present. Teachers may become more focused on behavioural issues, to the detriment of the motor problem. Since both types of behaviours, disruptive and non-disruptive, are typical of children with DCD, this suggests 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. There are equally concerning implications for children who demonstrate quiet, withdrawn behaviours. Their motor difficulties may be noticed, while accompanying psychosocial issues may be over-looked and, subsequently, not addressed.

Finally, it was anticipated from previous literature that teachers would be influenced by gender stereotypes and report more concern about gross motor problems in boys and more concern about fine motor problems in girls. Child gender was found to play a role in this study when it interacted with the type of motor problem. 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 (Thomas & French, 1985; Thomas & Thomas, 1988; Toole & Kretzschmar, 1993).

In this study, teachers reported more concern and a stronger desire to seek intervention for gross motor problems than for fine motor problems, however, the reasons for this are not clear. Teachers readily and frequently observe fine motor skills in the classroom and several researchers have pointed out that fine motor skill difficulties are a significant reason for referral (Miller *et al.*, 2001). Teachers may have relatively

fewer opportunities to observe the performance of children in areas requiring gross motor skills (Green *et al.*, 2005; Junaid *et al.*, 2000). They may also perceive gross motor difficulties to be more serious in nature, perhaps indicating an underlying medical aetiology, so assign more concern and a greater importance to intervening.

Implications for practice

Results of the current research study have several implications for practice. With increased awareness of the typical behaviours (both disruptive and non-disruptive) that may be demonstrated by children with motor problems, teachers can increase the effectiveness of the identification process. It is important for teachers, when they observe behavioural difficulties in children, to also observe for possible movement difficulties. Recognition of the behaviours that children use as coping strategies for motor challenges or that indicate possible co-occurring developmental concerns, will assist teachers in making appropriate referrals to other professionals. When both motor and behavioural difficulties are present, communication of teachers' concerns about both issues will ensure that a child's needs are recognized.

The classroom setting provides a unique opportunity for teachers to observe children with motor difficulties in relation to their peers. There is evidence indicating that children with DCD often perform at a level substantially below what is expected for their age (Hill, 1998; Hill, Bishop, & Nimmo-Smith, 1998). When a discrepancy between a child's motor abilities and that of their peers is observed, regardless of the child's gender, further investigations of their motor skills is warranted. Teachers can be instrumental in making these referrals.

Strengths and limitations of the present research

The design employed in this study involved experimentally manipulated scenarios in order to control for extraneous confounding factors and, in doing so, maintain a high level of internal validity. However, these findings are limited with respect to external validity. The design did not attempt to relate teachers' responses to the questionnaires with their actual behaviours. What teachers report they would do on paper may not correlate with what they would actually do. A related difficulty is that there was no true 'control' case scenario presenting a child with motor problems but not behavioural problems (or behavioural problems without motor problems). However, the literature suggests that cases of 'pure' DCD are not the norm and, in this way, this study accurately reflected the typical presentation of a child with DCD. It is also important to note that teachers in this study were told that children had motor and behavioural difficulties. It is not known whether teachers would actually notice these motor problems and whether or not this would affect their responses. Finally, it was not possible in this study to examine the potential influence of the gender of the *respondents* on the results found, as the sample comprised female teachers predominantly. In a school setting where there are more equal numbers of female and male teachers, different findings may result.

Conclusions

DCD is a chronic health condition affecting large numbers of school-aged children that can lead to significant secondary consequences. Despite its prevalence, the disorder is relatively unrecognized. 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 problem.

Results of this study suggest that child *gender*, by itself, does not influence teachers' perceptions of children's motor coordination difficulties. Gender is not irrelevant, however. The significant gender effect on teachers' perceptions seen in this study was found to depend on the particular *type of motor problem*. Child *behaviour* was not found to significantly influence teachers' perceptions. Results of this study refute the notion that teachers notice motor problems more when behavioural difficulties are present. In fact, findings from this study would suggest that teachers seemed to only notice motor problems in the absence of any behavioural difficulties.

Teachers have a critical role to play in the identification and management of children with motor coordination difficulties. Through classroom observations and communication of concerns regarding both motor and behavioural problems, teachers can ensure that the needs of children with DCD are recognized and addressed.

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