ABSTRACT. Children with Developmental Coordination Disorder (DCD) experience difficulties in motor coordination. During the last decade there has been increasing interest in the psychosocial aspects of children with motor coordination difficulties. To date, the majority of studies have focused on the perceived competence and global self-worth of children with DCD. This study examined the self-concept in academic and nonacademic domains of 30 boys (aged 7 to 12 years) with DCD. Results indicated that boys with DCD had significantly poorer self-concept for physical abilities and peer relations when compared to normative mean values. Severity of motor difficulties was significantly related to self-concept for physical abilities and reading. Self-concept plays an integral role in the holistic management of children with DCD.

KEYWORDS. Developmental coordination disorder, self-concept, motor difficulties, children
Children with Developmental Coordination Disorder (DCD) experience significant difficulties in motor coordination, which frequently interferes with their academic achievement or the ability to successfully participate in daily activities (Diagnostic and Statistical Manual of Mental Disorders [DSM-IV]; American Psychiatric Association [APA], 1994). At home, children with DCD may lack the ability to be independent in self-care tasks such as dressing and managing cutlery (Dunford, Missiuna, Street, & Sibert, 2005). In physical activities, children with DCD may look awkward when walking and running, and are less proficient than their peers in ball skills, agility, and balance-based activities (Henderson & Sugden, 1992). In the classroom, children with DCD experience particular difficulties with pencil control, handwriting acquisition, organization, and legibility of written work (Dunford et al., 2005). This collection of difficulties has raised concern among educators, psychologists, and therapists about the secondary negative effects of DCD on the emotional and psychological well-being of children with the condition (Heath, Toste, & Missiuna, 2005).

During the last decade, there has been increasing interest in the psychosocial aspects of children with motor difficulties, which has included investigations examining the “self.” Various terms such as self-esteem, self-worth, and self-concept have been used to describe the self and are often used interchangeably and inconsistently (Butler & Gasson, 2005). Self-concept refers to an individual’s perception of him- or herself (Shavelson, Hubner, & Stanton, 1976). These perceptions are formed through one’s experiences and interpretation of the environment, which is influenced by reinforcements, the feedback of significant others, and one’s own attribution for behavior (Shavelson et al., 1976). Self-concept is defined as including both evaluative and descriptive aspects of the self (Shavelson et al., 1976). Self-concept plays a key role in the integration of personality, in motivating behavior and in achieving mental health (Burns, 1979; Shavelson et al., 1976).

To date, no studies have investigated the self-concept of children with motor difficulties. The majority of studies have examined the global self-worth and perceived competence of children with motor difficulties. Perceived competence is proposed to be predictive of global self-worth, the overall evaluation of one’s worth or value as a person (Harter, 1985). Evidence to date indicates that children with motor coordination difficulties, including those with DCD, perceive themselves to be less competent athletically and scholastically, and also have poorer perceptions about their physical appearance when compared to children without motor coordination difficulties (Mæland, 1992; Piek, Dworcan, Barrett, & Coleman, 2000;
Findings regarding the perceived social acceptance of children with motor difficulties have been equivocal. Some studies indicate that children with motor difficulties perceive themselves to be less socially accepted when compared to children without motor difficulties (Rose et al., 1997; Schoemaker & Kalverboer, 1994), whereas others have reported no significant differences (Mæland, 1992; Piek et al., 2000; Piek, Baynam, & Barrett, 2006; Skinner & Piek, 2001). Similarly, not all studies have found significantly lower self-worth in children with motor difficulties when compared to children without motor difficulties (Mæland, 1992; Piek et al., 2000).

It is plausible that the self-concept of children with motor difficulties, particularly for physical domains, is related to the severity of motor difficulties. Of the few published studies that have reported on the relationship between motor difficulties and self-perceptions, no significant association was found between degree of difficulty, physical competence, social acceptance, or general self-worth (Mæland, 1992; Schoemaker & Kalverboer, 1994). However, the lack of significant association found in these studies may be partly due to the small sample size and consequently poor statistical power to detect a relationship. Results from a recent study involving a larger cohort of children with and without DCD indicated that age, gender, and gross motor ability were significant predictors of perceived athletic competence (Piek et al., 2006). For perceived scholastic ability, age, fine motor ability, and a diagnosis of DCD were found to be significant predictors (Piek et al., 2006).

Other conditions that frequently occur in children with DCD may also contribute to the development of a negative self-concept. Many children with DCD have poor academic performance, learning problems, and Attention Deficit Hyperactivity Disorder ([ADHD]; APA, 1994), (Dewey, Kaplan, Crawford, & Wilson, 2002; Rasmussen & Gillberg, 2000). Several studies have found that children with learning problems or ADHD have significantly poorer self-concept in academic, social, and/or behavioral domains when compared to control groups (Bear, Minke, & Manning, 2002; Dumas & Pelletier, 1999). It is possible that other conditions that occur with DCD contribute to poorer self-concept in these children compared to children with only DCD.

In summary, children with DCD perceive themselves to be less competent athletically and scholastically, and have poorer perceptions about their physical appearance than children without motor difficulties. Findings regarding other domains of self-perception such as social acceptance, as well as the relationship between motor difficulties and self-perceptions are...
less clear. To our knowledge, no studies have examined the self-concept of children with DCD. Therefore, the aims of the present study were to examine: (1) the self-concept of boys with DCD; (2) the relationship between motor difficulties and self-concept, and (3) the relationship between self-concept domains. Boys were the focus of this study because of the higher prevalence of DCD in boys than girls (Kadesjö & Gillberg, 1999).

**METHODS**

**Participants**

The study was approved by the following ethics committees: The Children’s Hospital at Westmead, The University of Sydney, The Department of Training and Catholic Education. Parents and boys were provided with an information sheet about the study and written informed consent was obtained from both. Parental consent was obtained to contact the child’s school.

Over an 18-month period, 41 boys aged between 7 and 12 years were referred by their hospital pediatrician to the Occupational Therapy Department, The Children’s Hospital at Westmead, Sydney, Australia, for an assessment of their motor coordination. The assessment was requested following parental concerns expressed to pediatricians of the boys’ motor coordination at home and/or at school. An occupational therapist (first author) assessed all boys to determine whether they satisfied the DSM-IV criteria (APA, 1994) for DCD. The DSM-IV criteria defines children with DCD as having motor coordination substantially below that expected, given the person’s age and intelligence, which affects their academic achievement and/or activities of daily living.

Boys who scored below the 15th percentile on the Movement Assessment Battery for Children (M-ABC) (Henderson & Sugden, 1992) were considered eligible to participate in the study. M-ABC scores between the 6th and 15th percentile suggests a degree of difficulty that is borderline, while scores below the 5th percentile are indicative of a definite motor problem (Henderson & Sugden, 1992). Children with scores below the 15th percentile were included, since those with borderline motor difficulties are at risk of social and emotional difficulties especially when presenting with a history of functional difficulties (Dewey et al., 2002; Dunford et al., 2005; Piek et al., 2000). In addition, there has been some variation in the cut-off point used to define motor coordination substantially below that expected,
which ranges from the 3rd to the 15th percentile on the M-ABC (Dunford, Street, O’Connell, Kelly, & Sibert, 2004).

Parents and teachers completed questionnaires developed by the first author to provide information about any motor difficulties children were experiencing in the following domains: handwriting, fine motor skills, gross motor skills, academic performance (teacher only), and self-care (parent only). Items for each domain reflected commonly reported difficulties experienced by children with motor difficulties such as cutting skills, speed of handwriting, letter formation, tying shoelaces, and managing cutlery. The Parent Questionnaire consisted of 29 items and required parents to rate their satisfaction in their child’s performance for each domain using a five-point Likert scale (very dissatisfied to very satisfied). The Teacher Questionnaire consisted of 24 items, with teachers rating the performance of the child in each domain compared to other children in the same classroom using a five-point Likert scale (lowest 10%, next lowest 20%, middle 40%, next highest 20%, highest 10%). If the teacher rated the boy’s academic performance in the lowest 10% of the class in two or more academic subjects (reading, spelling, written expression, and mathematics), the boy was considered to have poor academic competence when compared to his classroom peers. No formal standardized testing of academic achievement or intelligence was administered; however, none of the boys were in classes or special schools for students with an intellectual disability. Prior to this study, the questionnaires were trialed with several parents and teachers, and subsequently wording was refined. However, the questionnaires were not validated. Ratings from these questionnaires, as well as clinical information obtained from the parent at the time of the assessment and performance on the M-ABC was used to diagnose DCD (in collaboration with the boy’s pediatrician) and to describe the academic competence of the boys.

Referral information from the boy’s pediatrician confirmed the absence of neurological conditions. Boys with a language disorder, pervasive developmental disorder, or who had contact with occupational therapy services in the last 12 months or attended a special school, were excluded. All boys had English as their first language.

Of the 41 boys referred, 7 boys scored above the 15th percentile on the M-ABC and were not eligible to participate. Therefore, 34 boys were eligible to participate. However, two boys declined to participate although parental consent had been given and two boys had inconsistent responses to items on the self-concept questionnaire and were excluded from further data analysis. Therefore, data was available for 30 boys, 14 (47%) of whom had an existing diagnosis of ADHD as diagnosed by the referring
pediatrician, with 7 (23%) currently taking stimulant medication. The mean age of boys’ was 9.5 years (SD = 1.4).

Assessment of SES was based on parental occupation (Daniel, 1983). When both parents were working, the more prestigious occupation was used. SES was classified as high, middle, or low (Daniel, 1983). Fifty-three percent (16/30) of boys were from low SES, 27% (8/30) boys were from middle SES, and 20% (6/30) were from high SES families. Eight (27%) boys were from families where the parent(s) was unemployed.

Responses from the parent questionnaire indicated that most parents (86%) were dissatisfied with the handwriting performance of their child. Also, almost half the parents were dissatisfied with the fine (47%) and gross (40%) motor skills of their child. Information from the teacher questionnaire was available for 22 boys, 6 (27%) of whom were identified as having poor academic competence. Approximately 60% of boys were rated by teachers as being in the lowest 10% for fine motor skills and/or handwriting. All boys had motor coordination difficulties that interfered with their academic achievement and/or daily activities.

**Measures**

*Movement Assessment Battery for Children (M-ABC; Henderson & Sugden, 1992).* The M-ABC was used to measure motor competence. The child was required to perform eight tasks measuring manual dexterity, ball skills, and balance. A Total Impairment Score is calculated by summing the scores for all tasks; a higher impairment score indicates poorer motor difficulties. The reliability and validity of the M-ABC are based on its predecessor, the Test of Motor Impairment (TOMI) (Stott, Moyes & Henderson, 1984). The minimum value of the test-retest reliability at any age for the TOMI is 0.75 and of the inter-rater reliability 0.70 (Henderson & Sugden, 1992). For the M-ABC, test-retest reliability is high over a 1-week period (0.92 to 0.98), with good concurrent validity with the Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978) (moderate Pearson correlation coefficients (r .60 to .90) (Croce, Horvat, & McCarthy, 2001) and high inter-rater reliability (0.95 to 1.00) (Smits-Engelsman, Fiers, Henderson, & Henderson, 2008). The M-ABC is an internationally recognized instrument for identifying children with motor difficulties (Barnett & Henderson, 1998, Croce et al., 2001). The same senior occupational therapist (first author) administered the M-ABC to all boys.

*Self-Description Questionnaire I (SDQI; Marsh, 1992).* The SDQI is a 76-item self-report inventory that is suitable for primary-aged children and
measures self-concept in the following areas: Nonacademic (physical ability, physical appearance, peer relations, and parent relations), academic (reading, mathematics, general school), and general self that measures overall self-satisfaction. Composite scores—total academic, total nonacademic, and total self (the average of total academic and total nonacademic) are provided. Marsh (1992) recommends that scores for each domain of self-concept be used instead of composite scores as evidence supports specific and multiple domains of self-concept. Responses were also checked for consistency to correlated items and negativity bias as per the SDQI manual to ensure responses were valid. The normative data are based on responses by 3,562 Australian children.

The definition and model of self-concept proposed by Shavelson et al. (1976) served as the basis for the SDQI. The SDQI is the most validated self-concept instrument available (Byrne, 1996). Research has shown that factor analyzes have consistently identified each a priori factor; the internal consistency reliability coefficients range from 0.81 to 0.94 and there is strong support for the external and construct validity (Byrne, 1996; Hattie, 1992; Marsh, 1992; Marsh & MacDonald Holmes, 1990). The construct validity of the SDQI, based on the theoretical underpinning that self-concept is multidimensional is well established (see Marsh & Gauvernet, 1989; Marsh, Relich, & Smith, 1981). Scores on the SDQI have been found to correlate significantly with other measures of self-concept (Hymel, LeMare, Ditner, & Woody, 1999; Marsh & MacDonald Holmes, 1990). The external validity of the SDQI for Australian students is well established with similar response patterns being observed across public and private school children (Marsh et al., 1981).

Higher scores on the SDQI reflect positive self-concept. While there are no recommended cut-off scores that define low self-concept, scores below the 25th percentile are considered low (Marsh, 1992). For the purpose of this study, a relatively stringent cut-off mark was used and scores that were less than the 15th percentile were defined as “low” self-concept, which is consistent with previous research (Hay, Ashman, & van Kraayenoord, 1998).

Procedure

After the referral was received, the M-ABC was administered to the child, in the presence of the parent, in a room located in the Occupational Therapy Department. The first author, who administered the M-ABC to all children, has extensive experience in the administration of this instrument.
and has been a senior occupational therapist for over 15 years. Children then completed the SDQI in the same room with parents not present. In completing the SDQI, children were asked to respond to simple declarative sentences (e.g. “I’m good at mathematics”) by selecting one of five responses (False, Mostly False, Sometimes False/Sometimes True, Mostly True, True). All items of the SDQI were read out aloud by the first author to each child. The assessment took approximately 90 min to complete. Children with ADHD and taking stimulant medication were assessed while they were on medication.

**Data Analysis**

Data were analyzed using Statistical Package for Social Sciences for Windows (SPSS; Version 11). Scores for all measures were examined for univariate outliers, fit for normal distribution and test assumptions. The SDQI provides normative data separately for boys in grades 2 to 4 and grades 5 to 6. Normative means for both groups were combined to achieve a single mean value, as there were insufficient numbers to conduct the analysis based on grade groupings. SDQI raw scores for boys with DCD were compared to normative mean raw values using a one-sample t-test or sign test for scores that were not normally distributed. For scores with a non-normal distribution, the median and interquartile range is reported. An independent t-test or the Mann–Whitney \( U \) test was used to compare self-concept of children with DCD and ADHD to children with DCD. The relationship between self-concept domains and also with motor difficulties was examined using Pearson’s product moment, Spearman’s rho, and Kendall’s tau correlations. All tests were two-tailed and level of significance was set at 0.05. The Holm procedure was applied to control the family-wise error rate (Aickin & Gensler, 1996).

**RESULTS**

Table 1 shows the median scores for subtests of the M-ABC and the classification of motor difficulties utilizing Total Impairment Scores. Almost two-thirds (67%) of the boys had a definite motor impairment and a high percentage of boys had manual dexterity skills below the 5th percentile.
TABLE 1. Median (IQ) Scores for the M-ABC and Classification of Motor Impairment

<table>
<thead>
<tr>
<th>M-ABC</th>
<th>Median (IQ)</th>
<th>Definite MI n (%)</th>
<th>Borderline MI n (%)</th>
<th>Normal MI n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total impairment score</td>
<td>19.00 (12.43)</td>
<td>20 (67)</td>
<td>10 (33)</td>
<td>—</td>
</tr>
<tr>
<td>Manual dexterity</td>
<td>9.00 (6.00)</td>
<td>22 (73)</td>
<td>4 (13)</td>
<td>4 (13)</td>
</tr>
<tr>
<td>Ball skills</td>
<td>2.75 (3.88)</td>
<td>8 (27)</td>
<td>10 (33)</td>
<td>12 (40)</td>
</tr>
<tr>
<td>Static and dynamic balance</td>
<td>7.50 (2.25)</td>
<td>15 (50)</td>
<td>9 (30)</td>
<td>6 (20)</td>
</tr>
</tbody>
</table>

M-ABC = Movement Assessment Battery for Children; MI = Motor Impairment
Definite MI = < 5th percentile; Borderline MI = 5–15th percentile; Normal MI = > 15th percentile.

Examination of Self-Concept of Boys with DCD

Boys with DCD had significantly lower mean scores for self-concept in physical abilities and peer relations when compared to normative mean values (Table 2). There were no other significant differences.

TABLE 2. Means (SD) Self-Concept Scores for Boys with DCD and Comparisons to Normative Data (Males Grades 2 to 6)

<table>
<thead>
<tr>
<th>SDQI Domain</th>
<th>Boys with DCD (n = 30)</th>
<th>SDQI Normative Data (n = 1,971)</th>
<th>t (29)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical abilities</td>
<td>30.07 (7.38)</td>
<td>34.31 (5.51)</td>
<td>−3.15</td>
<td>.004**</td>
</tr>
<tr>
<td>Physical appearance</td>
<td>27.07 (9.06)</td>
<td>28.36 (8.14)</td>
<td>−0.78</td>
<td>.44</td>
</tr>
<tr>
<td>Peer relations</td>
<td>25.70 (9.53)</td>
<td>31.52 (6.30)</td>
<td>−3.35</td>
<td>.002**</td>
</tr>
<tr>
<td>Parent relations</td>
<td>31.97 (6.89)</td>
<td>35.54 (5.01)</td>
<td>−2.84</td>
<td>.008</td>
</tr>
<tr>
<td>Reading</td>
<td>30.57 (8.10)</td>
<td>30.27 (7.88)</td>
<td>0.20</td>
<td>.84</td>
</tr>
<tr>
<td>Mathematics</td>
<td>35.50 (14.25)a</td>
<td>29.73 (8.84)</td>
<td>−2.01b</td>
<td>.045</td>
</tr>
<tr>
<td>General school</td>
<td>26.83 (8.69)</td>
<td>28.33 (7.25)</td>
<td>−1.00</td>
<td>.35</td>
</tr>
<tr>
<td>General self</td>
<td>30.20 (7.73)</td>
<td>32.99 (5.60)c</td>
<td>−1.98</td>
<td>.06</td>
</tr>
<tr>
<td>Total nonacademic</td>
<td>28.90 (6.70)</td>
<td>32.54 (4.73)</td>
<td>−2.98</td>
<td>.006</td>
</tr>
<tr>
<td>Total academic</td>
<td>29.63 (7.38)</td>
<td>29.43 (6.37)</td>
<td>0.15</td>
<td>.88</td>
</tr>
<tr>
<td>Total self</td>
<td>29.30 (5.87)</td>
<td>31.22 (4.68)</td>
<td>−1.79</td>
<td>.08</td>
</tr>
</tbody>
</table>

aMedian (IQ) reported
bZ value for sign test
cTotal SDQI normative sample (n = 1,118), which includes girls as SDQI has no published data for males in Grades 2–4.
*p < .05
**p < .01
Forty percent (12/30) of boys had a low self-concept for physical abilities and 43% (13/30) had a low self-concept for peer relations (Figure 1). Eighty-three percent (10/12) of the boys who had low self-concept for physical abilities and 76% (10/13) of the boys who had low self-concept for peer relations had M-ABC scores below the 5th percentile. ADHD was present in 43% (5/12) of the boys who had low self-concept in physical abilities and in 69% (9/13) of the boys with low self-concept in peer relations.

Mean self-concept scores for boys with DCD and boys with DCD and ADHD are presented in Table 3. Boys with DCD and ADHD had significantly poorer self-concept for general school and total academic when compared to boys with DCD.

**Relationships Between Motor Difficulties and Self-Concept**

Poor motor abilities were significantly associated with low self-concept for physical abilities and reading (Table 4). Physical abilities self-concept was significantly negatively correlated with ball skills and balance subtests of the M-ABC ($r_s = -0.46$, $p = .001$ and $r_s = -0.55$, $p = .002$ respectively). There was no significant association between physical abilities self-concept and manual dexterity scores ($r_s = 0.02$, $p = .90$).
TABLE 3. Means (SD) Self-Concept Scores for Boys with DCD and Boys with DCD and ADHD

<table>
<thead>
<tr>
<th>SDQI Domain</th>
<th>Boys with DCD (n = 16)</th>
<th>Boys with DCD &amp; ADHD (n = 14)</th>
<th>t (28)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical abilities</td>
<td>27.88 (8.16)</td>
<td>32.57 (5.65)</td>
<td>1.81</td>
<td>.08</td>
</tr>
<tr>
<td>Physical appearance</td>
<td>28.00 (8.49)</td>
<td>26.00 (9.89)</td>
<td>−0.60</td>
<td>.56</td>
</tr>
<tr>
<td>Peer relations</td>
<td>29.00 (11.75)</td>
<td>18.50 (23.00)</td>
<td>−1.29</td>
<td>.21</td>
</tr>
<tr>
<td>Parent relations</td>
<td>32.75 (6.45)</td>
<td>31.07 (7.49)</td>
<td>−0.66</td>
<td>.52</td>
</tr>
<tr>
<td>Reading</td>
<td>33.75 (6.35)</td>
<td>26.92 (8.56)</td>
<td>−2.50</td>
<td>.02</td>
</tr>
<tr>
<td>Mathematics</td>
<td>36.00 (7.75)</td>
<td>32.50 (19.50)</td>
<td>−1.83</td>
<td>.07</td>
</tr>
<tr>
<td>General school</td>
<td>31.50 (6.39)</td>
<td>21.20 (7.99)</td>
<td>−3.81</td>
<td>.001</td>
</tr>
<tr>
<td>General self</td>
<td>32.06 (7.31)</td>
<td>28.07 (7.89)</td>
<td>−1.44</td>
<td>.16</td>
</tr>
<tr>
<td>Total nonacademic</td>
<td>31.00 (8.75)</td>
<td>25.00 (13.50)</td>
<td>−0.23</td>
<td>.82</td>
</tr>
<tr>
<td>Total academic</td>
<td>33.19 (5.72)</td>
<td>25.57 (7.10)</td>
<td>−3.25</td>
<td>.003</td>
</tr>
<tr>
<td>Total self</td>
<td>31.31 (5.55)</td>
<td>27.00 (5.53)</td>
<td>−2.13</td>
<td>.04</td>
</tr>
</tbody>
</table>

*aMedian (IQ) reported

*bz value for sign test

*p < .05

**p < .01

self-concept correlated with manual dexterity ($r_s = 0.39, p = .04$) but not ball skills ($r_s = 0.10, p = .61$) or balance ($r_s = 0.19, p = .31$). There was no significant relationship between M-ABC scores and other self-concept domains (Table 4).

Relationships Between Self-Concept Domains

Positive self-concept for Physical Abilities was significantly associated with positive self-concept for physical appearance, peer relations, parent relations and general self (Table 5). The magnitude of correlation coefficients was moderate. Age did not significantly correlate with physical abilities self-concept ($r = −0.15, p = .43$).

**DISCUSSION**

The results indicate that boys with DCD have significantly lower self-concept for physical abilities and peer relations when compared to a normative sample. These findings are relatively consistent with previous findings of perceived competence for athletic and social domains in children with
TABLE 4. Correlations Between Movement ABC Total Motor Impairment Scores and Self-Concept Scores for Boys with DCD

<table>
<thead>
<tr>
<th>SDQI Domain</th>
<th>$r_s$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical abilities</td>
<td>−0.45</td>
<td>.01*</td>
</tr>
<tr>
<td>Physical appearance</td>
<td>−0.02</td>
<td>.93</td>
</tr>
<tr>
<td>Peer relations</td>
<td>−0.11</td>
<td>.57</td>
</tr>
<tr>
<td>Parental relations</td>
<td>0.16</td>
<td>.41</td>
</tr>
<tr>
<td>Reading</td>
<td>0.38</td>
<td>.04*</td>
</tr>
<tr>
<td>Mathematics*</td>
<td>0.09</td>
<td>.53</td>
</tr>
<tr>
<td>General school</td>
<td>0.35</td>
<td>.06</td>
</tr>
<tr>
<td>General self</td>
<td>0.14</td>
<td>.48</td>
</tr>
</tbody>
</table>

*p < .05
*Kendall’s tau.

DCD (Mæland, 1992; Rose et al., 1997; Schoemaker & Kalverboer, 1994). Greater severity of motor difficulties was significantly associated with poorer self-concept for physical abilities. Children’s perceptions appear to be accurate when it comes to describing their motor performance, since

TABLE 5. Correlation Between Self-Concept for Physical Abilities and Other Domains of Self-Concept for Boys with DCD

<table>
<thead>
<tr>
<th>Self-concept domain</th>
<th>$r$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical appearance</td>
<td>0.64</td>
<td>&lt;.0001**</td>
</tr>
<tr>
<td>Peer relations</td>
<td>0.46</td>
<td>.01*</td>
</tr>
<tr>
<td>Parent relations</td>
<td>0.38</td>
<td>.04*</td>
</tr>
<tr>
<td>General school</td>
<td>0.18</td>
<td>.33</td>
</tr>
<tr>
<td>General self</td>
<td>0.58</td>
<td>.001**</td>
</tr>
<tr>
<td>Total nonacademic</td>
<td>0.75</td>
<td>&lt;.0001**</td>
</tr>
<tr>
<td>Total academic</td>
<td>0.10</td>
<td>.30</td>
</tr>
<tr>
<td>Total self</td>
<td>0.58</td>
<td>.0001**</td>
</tr>
</tbody>
</table>

**$p < .01$
*$p < .05$
motor skills are measurable and can be observed by both the participant and others (Dunford et al., 2005).

The significant relationship between severity of motor difficulties and self-concept for physical abilities was of a slightly higher magnitude than previously reported (Mæland, 1992; Schoemaker & Kalverboer, 1994). While previous studies have not reported a significant relationship, this is partly attributable to different measures used, smaller sample size, or both. Our results indicated that boys who were more competent in ball and balance skills had higher self-concept for physical abilities. Manual dexterity was not associated with self-concept for physical abilities. This result may be related to the fact that the SDQI items for physical abilities assess self-concept for gross motor activities and not fine motor abilities such as manual dexterity. Poor manual dexterity was associated with positive self-concept for reading. It is not clear as to why there was a significant relationship between Reading self-concept and manual dexterity. It is possible that this is a spurious result and a confounding variable could account for this relationship.

On average, boys with DCD had poor self-concept for peer relations, indicating that they perceived themselves to have few friends, to be unpopular, and that they do not make friends easily. Previous studies report poor social acceptance of children with motor difficulties (Rose et al., 1997; Schoemaker & Kalverboer, 1994; Skinner & Piek, 2001). Collectively, these findings suggest that children with motor difficulties are at increased risk of peer rejection and social isolation. Support from peers is a strong predictor of self-worth, particularly during adolescence and adulthood (Harter, 1999). As motor coordination difficulties continue into adulthood (Rasmussen & Gillberg, 2000), this suggests that the impact of these problems on self-concept and psychosocial functioning may potentially be long-lasting.

Boys with DCD did not have significantly lower self-concept for physical appearance when compared to the normative mean value. Other studies have also found that children with DCD did not experience low self-concept for physical appearance despite the possibility of their physical appearance being “different” because of uncoordinated and awkward movements (Rose et al., 1997; Skinner & Piek, 2001). However, it should be noted that SDQI items for this domain focus on looks and facial appearance.

Boys with DCD and ADHD had significantly poorer self-concept for general school and total academic than boys with DCD. Previous studies have found that the self-concept of children with ADHD for academic domains is significantly poorer when compared to boys without ADHD (Dumas & Pelletier, 1999; Eisenberg & Schneider, 2007; Kaneko...
ADHD is associated with poorer school performance—children with ADHD have significantly poorer academic achievement, as well as significantly higher rates of school absenteeism, grade retention, and school dropouts compared to children without ADHD (Barkley, 1998; Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2007). In addition, children with ADHD demonstrate poor executive functioning and have difficulty learning, due to deficits in the acquisition of information and a disorganized approach to encoding (Denckla, 1996; Mahone et al., 2002). Poor school performance, as well as these cognitive impairments may contribute to the negative self-perceptions of children with ADHD and may account for the poorer self-concept of boys with DCD and ADHD.

A limitation of our study is that responses were compared to normative mean values rather than an age-matched control group of boys without motor difficulties. In addition, almost half of the cohort had ADHD, which is consistent with previous studies (Gillberg, 2003) and a few boys had poor academic competence as measured by the teacher questionnaire. It is possible that comorbid conditions may have confounded the results. Studies that have examined the self-worth of children with DCD have not reported on the frequency of ADHD or academic competence, and have not specified whether children with comorbid conditions were excluded. Other limitations of our study are that no formal IQ testing was conducted, which would have provided a profile of the boys’ intellectual functioning, and that the psychometric properties of the parent and teacher questionnaires had not been established. Future studies could compare the self-concept of boys with DCD, boys with DCD and ADHD, and normal-achieving male peers. A stricter cut-off point, that is, boys with definite motor impairment (M-ABC total impairment score < 5th percentile) could also be employed. Self-concept of girls with DCD is also worthy of investigation as gender differences have been found in specific domains of self-concept, especially that of physical appearance (Marsh, Smith, & Barnes, 1985). The impact DCD has on the self-concept of adolescents also requires further research as during adolescence there can be a period of changing self-awareness and self-criticism (Thompson, 1999).

In summary, the results of this study suggest that boys with DCD are at an increased risk for developing negative self-concept about their physical abilities and peer relationships. Boys with DCD and ADHD appear to be more likely to report poorer self-concept for academic domains. The findings highlight the importance of examining specific domains of self-concept. From a clinical perspective, domain-specific self-evaluations could be incorporated into therapy sessions. Tools such as the Perceived Efficiency and Goal Setting System (PEGS; Missiuna, Pollock, & Law, 2004)
can assist in identifying young children’s perceptions of their abilities required for completing daily living tasks, and priority areas for intervention. This enables the therapist to gain insight into how the child views his or her own performance within the context of actual task performance. For example, a child rates his or her own performance in scissor use before and at the conclusion of a therapy session using such techniques as a 10-point “response wheel” (Hymel et al., 1999). The 10-point rating scale is sensitive to change and allows greater response variability. An understanding of how children with DCD perceive their abilities and performance is an essential component of goal setting for therapy intervention and monitoring of intervention efficacy.

REFERENCES


