

Boys With Developmental Coordination Disorder: Loneliness and Team Sports Participation

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KEY WORDS

- extracurricular activities
- leisure
- occupations
- pediatrics
- social participation

OBJECTIVE. This study investigated the mediational role of team sports and other leisure occupations for boys ages 10 to 13 years in the relationship between physical coordination ability and perceptions of loneliness.

METHOD. Sixty boys with developmental coordination disorder (DCD) and 113 comparison boys without DCD completed a self-report measure of loneliness. Parents recorded information on leisure involvement over 7 days.

RESULTS. Boys with DCD recorded significantly higher loneliness and lower participation rates in all group physical activities, whether structured (e.g., team sports) or unstructured (e.g., informal outdoor play) than boys without DCD. An inverse relationship between physical coordination ability and loneliness was mediated by participation in team sports. No other leisure pursuits were found to be significant mediators. Childhood physical coordination difficulties were significantly associated with loneliness.

CONCLUSION. Participation in team sports acted as one potential mechanism mediating the inverse relationship between physical coordination ability and loneliness in boys. Occupational therapists can act as advocates to support boys with DCD who choose to participate in team sports. Further investigations are recommended to determine aspects of team sports environments that promote an optimal fit among child, activity, and environment.

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Occupational therapists involved in the management of children with developmental coordination disorder (DCD) are increasingly attentive to the impact of poor motor performance on social inclusion and physical activity participation (Chen & Cohn, 2003). Children with restricted participation in everyday life situations are at risk for experiencing social isolation, victimization, and rejection by peers. Loneliness can become chronic when social participation restrictions continue for a long period (Rubin & Coplan, 2004). Children with DCD have limited engagement in organized and recreational social–physical activities (Cairney et al., 2005). When participation in activities with friends increases, however, quality of life can improve even when motor impairment is not resolved (Mandich, Polatajko, & Rodger, 2003).

The primary purpose of this study was to examine the impact of leisure occupational performance patterns and contexts on perceptions of loneliness in boys with DCD. The defining feature of DCD is marked impairment in the development of motor coordination in the absence of neurological or sensory problems. Motor coordination is below the level expected for intelligence or chronological age, and the impairment interferes with activities of daily living (American Psychiatric Association, 1994). Estimates of incidence vary between 5% and 15%, and four times more boys than girls are referred for intervention, hence the focus on boys in the current study (Wilson, 2005).

Boys who play fewer sports outside school and are perceived by teachers to be less physically active than classmates are at higher risk for depressive symptoms (Tomson, Pangrazi, Friedman, & Hutchison, 2003). Two potential mechanisms have been proposed for understanding the association between occupation and adjustment: (a) child effects, by which better adjusted children become more involved in adaptive occupational performance contexts because of individual psychological characteristics, and (b) environmental effects, by which social environments, such as those found in structured activity settings with peers, facilitate the development of social ties and support adaptive functioning (McHale, Crouter, & Tucker, 2001).

Attention to the child–occupation–environment fit is integral to ensuring adaptive outcomes associated with participation in personally meaningful leisure occupations (Poulsen & Ziviani, 2004). The social context may be particularly important given that a key component of loneliness is lack of pleasurable engagement or connectedness with others (Goossens & Beyers, 2002). Another mechanism for understanding the relationship between physical activity and adjustment includes cultural perceptions of what it means to be a “real” boy in different milieus. Thus, the emphasis placed on sporting excellence in some school environments may lead to loneliness and depression in those singled out for disapprobation because of nonparticipation (Swain, 2004).

In many Western cultures, participation in team sports is endorsed for boys as a site of controlled masculinity, and success brings high social status (Burgess, Edwards, & Skinner, 2003). Moreover, the social context of the large-group physical activities that boys prefer may contribute to lower feelings of isolation and loneliness for those who are not active team sports participants (Pellegrini & Smith, 1998).

For boys, having DCD can be a barrier to full participation in social–physical activities such as team games (Smyth & Anderson, 2001). Nevertheless, participation in alternative pursuits with peers, such as choir, band, or youth groups, may provide comparable opportunities to develop these social networks.

Aims of the Study

One aim of this study was to describe the psychosocial self-perceptions of loneliness and the physical and social leisure participation patterns of boys ages 10 to 13 with and without DCD. A second aim was to identify leisure activity participation contexts that were associated with adaptive outcomes (such as less loneliness) for boys with different levels of physical coordination. Finally, we investigated occupational performance processes that may influence a proposed relationship between physical coordination and loneliness. Three aspects of leisure occupational performance were investigated as potential mediators: the social context, the physical context, and the level of structural organization of different leisure pursuits. This study was exploratory in nature and sought to ascertain whether there were activity–adjustment links.

Method

Participants

Sixty boys with DCD and 113 boys without DCD ages 10 to 13 years were group matched for school year level, chronological age, and socioeconomic status (see Table 1). Boys who participated in the study lived in the Brisbane metropolitan area of Queensland, Australia; were Australian

Table 1. Demographic Characteristics

Characteristic	Boys With DCD (<i>N</i> = 60)	Boys Without DCD (<i>N</i> = 113)	<i>F</i>
Mean age	11 years, 7 months (<i>SD</i> = 9.7 months)	11 years, 9 months (<i>SD</i> = 9.3 months)	0.47
Intelligence ^a	117 (<i>SD</i> = 18)	No intellectual impairment	
Total family size	4.45 (<i>SD</i> = 1.1)	4.54 (<i>SD</i> = 1.0)	0.31
Proportion of one-child families	0.05 (3.0%)	0.10 (6.0%)	1.18
Parents' occupational grouping ^b			1.02
Higher status	51 (85.0%)	89 (78.8%)	
Middle status	8 (13.3%)	22 (19.5%)	
Lower status	1 (1.7%)	2 (1.8%)	
School characteristics			32.39*
Independent—boys only	39 (65.0%)	110 (97.3%)	
Independent—coed	4 (6.6%)	0	
State funded—coed	17 (28.3%)	3 (2.6%)	

^aIntelligence was measured in the DCD group using the Slosson Intelligence Test–Revised (Slosson, Nicholson, & Hibpshman, 1990). For the non-DCD group, parent and teacher reports indicated no intellectual impairment.

^bParents' occupational grouping is based on the *Australian Standard Classification of Occupations* (Australian Bureau of Statistics, 1990), collapsed into three categories following Najman and Bampton (1991).

**p* < .001.

born, without Aboriginal or Torres Strait Islander heritage; and were from middle to higher socioeconomic backgrounds. Study participants were assigned to four groups based on Movement Assessment Battery for Children (MABC; Henderson & Sugden, 1992) scores (see Table 2).

Procedure

We obtained ethical clearance from all centers involved in the study. Sixty boys with DCD attending 15 state and 3 private co-educational schools and 2 private boys' schools (Table 1) were recruited. Methods of recruitment included practitioner referrals from therapy clinics, parent referrals from media releases and snowball recruitment, and a school screening program conducted at two private boys' schools. Boys were assigned to the DCD group if they scored below the 15th percentile on the MABC and had difficulties with daily living skills as assessed using parent questionnaires and clinical interviews. Inclusion criteria included no intellectual impairment; no diagnosed emotional, neurological, or motor disorder, and no intervention during the past 3 months that affected leisure participation patterns.

Boys in the comparison group were recruited through a school screening program at two boys' schools. Four non-consenting schools cited response burden and stigmatization concerns as reasons for refusal to participate. Concerns about stigmatization were addressed in the two participating schools by including all consenting students across eligible year levels. The response rates at these schools were 89% and 75%. Boys in the comparison group scored at or above the 15th percentile on the MABC, and other inclusion criteria were the same as for the target group. Intelligence was not measured in the comparison group, but boys identified as having academic or behavioral difficulties by either parents or teachers were excluded.

Parents of potential participants completed a retrospective 12-month child leisure survey that included questions about the child's physical, emotional, and cognitive characteristics and were interviewed about the child's performance on activities of daily living. All boys completed the MABC and the Loneliness and Social Dissatisfaction Questionnaire

(Asher & Wheeler, 1985). Estimates of cognitive ability were obtained for boys with DCD only, using the Slosson Intelligence Test-Revised (SIT-R3; Slosson, Nicholson, & Hibpshman, 1990). Assessments were carried out by registered occupational therapists employed by schools or occupational therapy centers. Parents filled out 7-day diaries after the child evaluations were completed. We conducted quality and accuracy checks by visually inspecting diary data and contacting parents about missing data. Eight diaries from the comparison group were rejected because of incompleteness or poor data quality.

The researchers used consensus-coded data to categorize pursuits on the basis of three criteria: physical/nonphysical, social/nonsocial, and structured/unstructured (examples of each type of activity are provided in Table 3). Coding resulted in eight activity categories, thus extending the four-category grouping on the basis of social and physical classification of activities used by Cantell, Smyth, and Ahonen (1994). Diary data were coded by the first author, and a random sample of 20% of the logs checked for inter-rater reliability showed a kappa of .90.

The Compendium of Physical Activities for adults was used to code energy expenditure using metabolic equivalents (METs; Ainsworth, 2002). Its utility with children has been documented (Trost et al., 2002). One MET is defined as the metabolic energy expenditure of sitting still. The cut-off point for determining physical activity in this study was set at greater than 2 METs to account for the higher resting energy expenditure rate of boys ages 8 to 13 years compared to adults (Harrell et al., 2005).

We divided the boys into four groups. The boys with DCD were designated as having moderate or severe DCD, and the control group boys were designated as having medium or high coordination (see Table 2).

Instruments

The MABC consists of three tests of manual dexterity, two tests of ball skills, and three tests of static and dynamic balance. Raw scores are summed and converted to percentiles. Adequate reliability (Henderson & Sugden, 1992) and acceptable concurrent validity (Crawford, Wilson, & Dewey, 2001) have been reported.

The SIT-R3 was used to determine whether the child met the exclusion criterion of intellectual impairment. If the child had been recently assessed on another recognized test of intelligence, we recorded the scores from that assessment and did not administer the SIT-R3. Reliability of the instrument is excellent (Slosson et al., 1990), and it has high concurrent validity for screening purposes against the fourth edition of the Stanford-Binet ($r = .92$; Kunen, Overstreet, & Salles, 1996).

Table 2. Group Definitions

Group	MABC Score	<i>n</i>
Boys With DCD		
Severe DCD	Below the 5th percentile	27
Moderate DCD	Equal to or above the 5th percentile but below the 15th percentile	33
Boys Without DCD		
Medium coordination	Equal to or above the 15th percentile but below the 50th percentile	41
High coordination	Equal to or above the 50th percentile	72

Note. MABC = Movement Assessment Battery for Children (Henderson & Sugden, 1992).

Table 3. Coding of Leisure Activity Pursuits

Activity Group	Examples	Activity Group Characteristics		
		Physical ^a	Social ^b	Structured ^c
Team sports	Soccer, cricket, basketball	Yes	Yes	Yes
Organized nonphysical groups	Choir, band, chess	No	Yes	Yes
Physically active group play	Chasing, street ball games	Yes	Yes	No
Sedentary group recreation	Electronic media use with friends	No	Yes	No
Individual and dyadic sports	Gymnastics, athletics, tennis	Yes	No	Yes
Individual sedentary lessons	Instrument lessons, tutoring	No	No	Yes
Solitary physically active play	Walking, trampolining, cycling	Yes	No	No
Solitary sedentary play	Electronic media use alone	No	No	No

^aPhysical activities were performed at greater than 2 metabolic equivalents (METs) for majority of half-hour block.

^bSocial activities involved more than 2 children.

^cStructured activities had adult-organized training or performance activities and regular schedules.

The Loneliness and Social Dissatisfaction Questionnaire (Asher & Wheeler, 1985) is a 24-item self-report questionnaire assessing the subjective experience of loneliness. We used Chipuer's (2001) modification of this 24-item self-report questionnaire to provide a context-free measure of loneliness. Sixteen core items measuring perceptions of loneliness and eight filler items are presented as statements to which children respond on a 5-point scale from *always true* to *not true at all*. A Total Loneliness score is computed; scores range from 16 to 80, and higher scores indicate greater loneliness. Three items can be extracted to provide a Pure Loneliness score. This questionnaire has been shown to have excellent psychometric properties, consistent factor structure across samples, high internal consistency, and good test-retest reliability (Goossens & Beyers, 2002). The use of a Total Loneliness score that was context free was adopted over the Pure Loneliness score, as suggested by Asher and Wheeler (1985).

Parents completed a 7-day leisure diary of their son's out-of-school activities over the past week, recording an activity description for each half-hour block. We modified this measure to include information about the physical location and social context of the activity as well as the roles of adults and children and their relationships to the target child. This measure has been reported to have acceptable levels of compliance and reliability (Larson & Verma, 1999).

A final measure was a retrospective 12-month leisure survey. Parents recalled their sons' participation in structured leisure activities over the past 12 months and the total number of sessions attended per week for each activity. Information about unstructured leisure participation patterns was not surveyed because of concerns about the accuracy of parents' recall of informal play, which may have been more variable and subjective. In contrast, we felt that structured time use recall was reliable because activity sessions usually have formal schedules. The retrospective 12-month leisure survey was adapted from a 1-year self-administered

physical activity recall questionnaire developed and validated for use with adolescents (Aaron et al., 1995).

Analyses

To investigate differences among the four groups of boys, we conducted analysis of variance (ANOVA) tests. The first analysis was to test differences in means for loneliness and leisure activity participation variables. Investigation of the distribution of Total Loneliness scores for all study participants revealed a positive skew, largely driven by boys in the non-DCD groups. Log transformations were unable to normalize the data. The test of ANOVA is robust, however, when sample sizes are large (Tabachnick & Fidell, 2002). ANOVA data were supported by Kruskal-Wallis test results. We conducted Tamhane's post hoc analyses to determine which of the means for the different-sized groups were different from each other.

To test for significant relationships among the outcome variable (loneliness), the mediating variable (leisure activity participation), and the predictor variable (physical coordination ability), we computed Spearman's correlations because of the nonnormal distribution of Total Loneliness scores. In the correlational analyses, we selected one representative variable for each activity category to reduce the data set. For structured activity participation, we selected a 12-month recall of the number of sessions per week. Unstructured activity data were derived from the 7-day diaries.

To test whether there was a different association between loneliness and leisure activity participation in each of the groups, an interaction term was included in the linear regression term of loneliness and leisure participation variables for physical coordination group membership. This result was not significant. Therefore, the combined data from all groups were used in subsequent analyses.

Our plan of analysis to investigate mediation effects followed the strategy developed by Baron and Kenny (1986). According to Baron and Kenny, a mediator variable

is an explanatory link or mechanism through which a predictor or independent variable influences an outcome or dependent variable. Significant relationships among predictor (physical coordination ability), mediator (leisure activity participation), and outcome (loneliness) variables are first demonstrated. If mediation effects are demonstrated, the significant predictor–outcome relationship will be diminished when effects of the mediator are controlled.

We performed two steps to test for mediation effects. In Step 1, loneliness was regressed on physical coordination ability. In Step 2, loneliness was regressed on both the physical coordination ability and the leisure activity participation variables. To determine whether the significance of the drop in *B* coefficients from Step 1 to Step 2 on an approximate *Z* curve was significant, we computed Sobel's (1988) test using the MedGraph program (Jose, 2005).

Results

Descriptive Statistics

Means and standard deviations for loneliness, physical coordination, and leisure activity participation variables are reported in Table 4. Statistical significance was set at .01 for all statistical tests to reduce the likelihood of Type I errors. There was a significant group effect for Total Loneliness. Tamhane's post hoc analyses revealed that boys with DCD experienced greater loneliness than boys without DCD, irrespective of allocation to severe or moderate DCD group. There were no significant differences between the two non-DCD groups or between the two DCD groups for all variables.

Participation in all social–physical activities was less for boys with DCD compared with boys without DCD. This difference was significant regardless of whether the

Table 4. Means and Standard Deviations for Loneliness, Physical Coordination, and Leisure Activity Participation Variables

Type of Activity	Boys With DCD		Boys Without DCD		<i>F</i> 3.169	Effect Size η_p^2
	Severe (<i>n</i> = 27)	Moderate (<i>n</i> = 33)	Medium (<i>n</i> = 41)	High (<i>n</i> = 72)		
Total Loneliness score	38.33 ^a (12.18)	35.03 ^a (11.27)	22.46 ^b (4.73)	21.30 ^b (5.03)	45.61**	0.45
Team sports, 7-day data	3.19 ^a (5.31)	3.03 ^a (4.41)	6.59 ^b (5.66)	10.46 ^b (7.92)	13.74**	0.20
12-month data (sessions per week)	1.04 ^a (1.89)	1.91 ^a (1.61)	4.22 ^b (2.72)	4.36 ^b (2.36)	20.67**	0.27
12-month data (no. of activities)	0.52 ^a (0.98)	1.06 ^a (0.86)	1.93 ^b (1.13)	2.25 ^b (1.49)	16.44**	0.27
Structured social–nonphysical activities, 7-day data	3.67 ^a (5.41)	3.12 ^a (5.17)	2.97 ^b (4.48)	1.61 ^b (3.20)	1.97	0.04
12-month data (sessions per week)	1.00 ^a (1.96)	0.94 ^a (1.39)	0.61 ^b (0.10)	0.19 ^b (0.49)	5.07	0.08
12-month data (no. of activities)	0.67 ^a (0.78)	0.61 ^a (0.66)	0.46 ^b (0.78)	0.17 ^b (0.41)	6.31	0.10
Unstructured social–physical activities, 7-day data	12.08 ^a (9.02)	12.70 ^a (10.40)	22.71 ^b (11.28)	21.99 ^b (9.18)	12.44**	0.18
Unstructured social–nonphysical activities, 7-day data	54.00 (24.57)	50.91 (22.07)	50.37 (18.97)	51.76 (18.43)	0.18	0.00
Structured nonsocial–physical activities, 7-day data	3.31 (4.62)	2.33 (4.65)	4.44 (6.42)	3.14 (4.96)	1.01	0.02
12-month data (sessions per week)	1.15 (1.61)	1.85 (3.63)	2.66 (2.67)	1.86 (2.31)	1.90	0.03
12-month data (no. of activities)	0.93 (1.17)	0.91 (0.91)	1.12 (1.08)	1.18 (1.27)	0.61	0.01
Structured nonsocial–nonphysical activities, 7-day data	0.35 (0.80)	0.55 (1.00)	0.33 (0.74)	0.32 (0.89)	0.51	0.68
12-month data (sessions per week)	0.52 (0.76)	0.67 (0.89)	0.71 (0.90)	0.50 (0.92)	0.63	0.01
12-month data (no. of activities)	0.48 (0.64)	0.55 (0.56)	0.56 (0.74)	0.33 (0.56)	1.57	0.03
Unstructured nonsocial–physical activities, 7-day data	4.42 (5.15)	4.03 (5.63)	3.26 (3.52)	3.57 (4.83)	0.36	0.01
Unstructured nonsocial–nonphysical activities, 7-day data	53.00 (27.62)	53.21 (26.79)	45.03 (18.44)	43.47 (14.89)	2.47	0.04

Note. DCD = developmental coordination disorder. Physical activity was performed at > 2 metabolic equivalents (METs), and nonphysical activity was performed at ≤ 2 METs. Total Loneliness score = mean total raw scores (Asher & Wheeler, 1985). 7-day data indicate total time in half-hour blocks over 7 days (severe DCD *n* = 26, moderate DCD *n* = 33, non-DCD medium coordination *n* = 38, non-DCD high coordination *n* = 68). Structured 12-month data include number of activity sessions per week and total activities per week over 12 months (severe DCD *n* = 27, moderate DCD *n* = 33, non-DCD medium coordination *n* = 41, non-DCD high coordination *n* = 72). Effect sizes η_p^2 = partial eta squared.

^aSignificant difference (*p* < .01) from ^b in Tamhane's post hoc tests.

p* < .01. *p* < .001.

social activity was structured or unstructured. ANOVAs showed that the mean level of team sports participation was significantly less for boys with DCD compared with boys without DCD on all three measures of team sports participation. Time spent in unstructured social–physical play also was significantly lower in boys with DCD compared with boys without DCD. The DCD group spent significantly more time in structured social–nonphysical activities than the highly coordinated non-DCD group.

When correlations for the combined group data were analyzed, strong positive correlations between DCD and loneliness were found (see Table 5). Positive correlations between DCD and participation in nonphysical activities such as choir (structured and social) and between loneliness and participation in these sedentary activities were weaker but significant at the $p < .001$ level. Moderate negative correlations were found between DCD and team sports participation, a structured social–physical activity context that was negatively associated with loneliness. Weak negative relationships between loneliness and time spent in unstructured group physical activities and between DCD and time in these social–physical play contexts also were found.

Correlations were found between different activity contexts. For example, time spent alone in sedentary activities such as television viewing was negatively related to time spent in these types of pursuits with other children present. Time spent in structured social–physical activities such as team sports was negatively associated with structured time use in social activities of a more sedentary nature. Time spent outdoors with friends in physically active informal games and activities also was negatively correlated with time spent in unstructured sedentary group activities.

Mediation Analyses

The interaction effect for the relationship between leisure participation and loneliness was not significant, providing

support for mediation analyses using the combined group data. Leisure activity participation variables were first regressed on physical coordination. Two leisure activity participation variables were significantly associated with physical coordination: number of sessions of team sports played per week over the past 12 months ($B = .03, p = .01$) and number of sessions of structured social–nonphysical activities attended per week over the past 12 months ($B = -.02, p = .01$).

Loneliness was regressed on physical coordination alone in Step 1 ($B = -.17, p = .02$). In Step 2, the two leisure activity participation contexts that were significantly associated with loneliness were regressed on physical coordination. First, loneliness was regressed on physical coordination and team sports participation ($B = -.14, p = .02$). As revealed in Table 6, the B , or unstandardized beta coefficient, which represents the strength of the relationship between physical coordination and loneliness, diminished from a significant $-.17$ when entered by itself to a smaller, but still significant $-.14$ when team sports participation was controlled. This represents a significant reduction, as evaluated by Baron and Kenny (1986), that estimates the degree of change in the regression coefficient after a mediator variable is controlled.

Second, loneliness was regressed on physical coordination and social nonphysical activities, but the result was not significant ($B = .04, p = .59$). The number of sessions of team sports per week over the past year was found to be the only significant predictor of loneliness. The relationship between physical coordination and loneliness was significantly smaller when team sports participation was included in the equations than when it was omitted, but it was still greater than 0, suggesting partial mediation. Figure 1 depicts the significant partial mediation of the relationship between physical coordination and Total Loneliness by team sports participation ($z = 2.49, p < .01$).

Table 5. Spearman's Correlations for Total Loneliness, Developmental Coordination Disorder (DCD), and Leisure Activity Participation

	1	2	3	4	5	6	7	8	9	10
1. Total Loneliness	—									
2. DCD ^a	.69**	—								
3. Team sports ^b	-.40**	-.53**	—							
4. Structured social–nonphysical activity ^b	.30**	.29**	-.22*	—						
5. Unstructured social–physical activity ^c	-.26**	-.48**	.26**	-.02	—					
6. Unstructured social–nonphysical activity ^c	.05	.01	-.03	-.10	-.01	—				
7. Structured nonsocial–physical activity ^b	-.14	-.16	.11	-.04	.05	-.10	—			
8. Structured nonsocial–nonphysical activity ^b	.13	.07	-.09	.15	-.08	-.18	.08	—		
9. Unstructured nonsocial–physical activity ^c	.07	.04	-.08	.03	.01	-.19	.08	.08	—	
10. Unstructured nonsocial–nonphysical activity ^c	.09	.18	-.06	.00	-.37**	-.68**	-.06	.18	.09	—

^aCoded 0 = non-DCD, 1 = DCD.

^b $N = 173$ for the 12-month leisure activity survey (number of sessions per week).

^c $N = 165$ for 7-day diary variables (half-hour blocks per week).

* $p < .01$. ** $p < .001$.

Table 6. Mediation of the Relationship Between Physical Coordination and Total Loneliness by Team Sports Participation (N = 173)

Steps	R ² change	B	95% Confidence Intervals	Sobel's Test Z score
Step 1. Physical coordination	0.31**	-0.17**	-0.20 to -0.13	
Step 2.	0.34**			-2.49*
Physical coordination		-.14**	-0.18 to -0.10	
Team sports participation		-.76**	-1.31 to -0.22	

Note. Step 1 = Outcome variables (Total Loneliness raw scores) regressed on predictor variable (Movement Assessment Battery for Children [MABC; Henderson & Sugden, 1992] percentile scores). Step 2 = Outcome variable (Total Loneliness raw scores) and mediator variable (team sports participation sessions per week) regressed on predictor variable (MABC percentile scores). Sobel's (1988) test of mediation reflects the degree to which the *B* for physical coordination changed from Step 1 to Step 2 on an approximate Z curve. **p* < .01. ***p* < .001.

Discussion

Boys with DCD in this study reported more loneliness than boys without DCD. These clear differences between boys with and without DCD are of concern because of potential adverse outcomes, including depression, unhealthy attributional styles, and low self-worth associated with loneliness (Qualter & Munn, 2002). In addition, boys with DCD participated in fewer structured social-physical activities, such as team sports, than did boys without DCD. They also spent more time in structured nonphysical activities with large groups of peers, such as choir, than boys in the well-coordinated group, and this finding was associated with higher levels of loneliness.

Participation in structured extracurricular activities has been associated with less depression in middle childhood, particularly for boys who are active sports participants

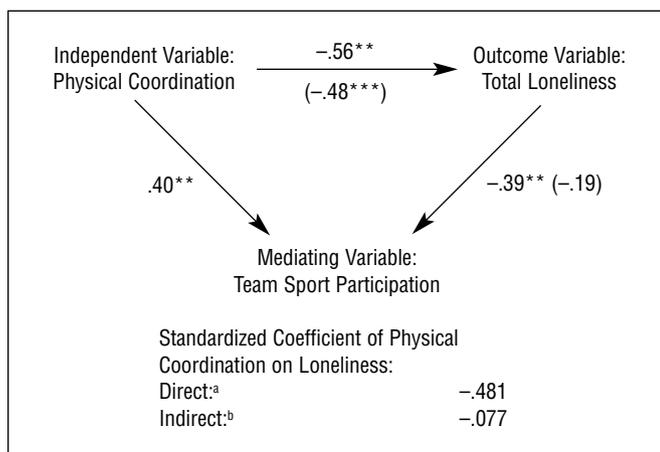


Figure 1. Partial mediation by team sport participation on relationship between physical coordination and loneliness.

^aDirect correlation effect includes the mediating variable in the regression.

^bIndirect correlation effect is the amount of the original correlation between the independent variable and outcome variable that now goes through the mediator to the outcome variable.

p* < .01. *p* < .001

(McHale et al., 2001). Team sports participation was found to be associated with low loneliness for boys in this study. Positive processes operating in these structured activities may include the presence of nonparental adult mentors; affiliation benefits; and emotional investment in activities to promote academic achievement, self-efficacy, and behavioral competencies.

In this study, all leisure activities were examined for their potential role as mediators of the relationship between physical coordination and loneliness. Activities were classified on the basis of structure, social context, and extent of physical activity. Team sports incorporate all three elements: They are highly structured, include large groups of children, and involve moderate to vigorous energy expenditure.

Team sports participation was the only activity context that significantly mediated the relationship between loneliness and physical coordination ability. Although we explored other social activity contexts involving structured and unstructured time spent with peers in group settings for their potential as mediators, team sports alone influenced loneliness for boys with different levels of physical coordination. Thus, team sports participation is one mechanism through which physical coordination influences feelings of loneliness reported by boys in the preadolescent to early adolescent years.

To understand why team sports participation acted as a mediating influence on perceptions of loneliness in boys, it is necessary to consider elements of the team milieu that might militate for or against loneliness. Links between activities and adjustment have been explained by the social context rather than the content of the activities (McHale et al., 2001). Team sports offer opportunities for affiliation, supportive networks, turn taking, and leadership possibilities. These benefits of participation vary with the motivational climate and goal orientation of the group, and they are implicitly linked with structural elements of the activity context, including how the adult leader organizes training sessions, the level of competition or grading of the team, and the rules of engagement.

Detailed information on aspects of the social and structural characteristics of team sports was not recorded in the current study. It could be that participation per se, regardless of level of proficiency, provides a buffer against loneliness. Poor physical performance in competitive or performance-oriented motivational climates is a discrediting attribute, however, and it is possible that participation alone would not ameliorate loneliness in these environments. Poor performance may, in fact, lead to anxiety, negative affect, reduced enjoyment, and lack of personal satisfaction, emotions that have been reported for children with DCD (Fitzpatrick & Watkinson, 2003; Segal, Mandich, Polatajko, & Valiant

Cook, 2002). Other elements of the child–occupation–environment fit also may be important to consider.

Social stigmatization by peers who are securely located in the sporting realm may contribute to feelings of loneliness for boys with DCD (Segal et al., 2002). Stigmatization may be endorsed in cultures where stereotypic views of masculinity are promoted in power sports such as rugby (Swain, 2004). Highly visible peer groups, such as the sports “jocks” who participate in popular team sports, also may discredit participation in alternative social extracurricular activities such as choir, chess club, or art groups. Several boys in the study perceived art and choir to have low social status, although some artistic activities, such as cartooning, were exceptions because they were socially valued.

Although high loneliness and low participation in team sports are reported by many boys with DCD, a small number remain active participants in games such as soccer, even when faced with limited success and higher levels of physical injury than their peers (Cantell et al., 1994; Cantell, Smyth, & Ahonen, 2003). Ongoing engagement for boys described as “determined” athletes may be facilitated by an optimal child–occupation–environment fit. Support from parents, coaches, and others may be particularly important for these children. Although some boys reported a more encouraging peer environment, others described active rejection, a situation that is more strongly associated with loneliness than is being overlooked or neglected (Asher & Wheeler, 1985).

Clinical Implications

The findings of this study have implications for occupational therapy practice. Should occupational therapists endorse team sports participation for boys with DCD? If so, how and in what context is team sports participation likely to be beneficial? Experienced practitioners working with boys with DCD have voiced concerns about the negative impact of highly competitive team sports and non-supportive physical activity environments for individuals with poor physical coordination (see, e.g., Missiuna, Rivard, & Bartlett, 2003). Thus, practitioners with a conservative approach to intervention have steered children with DCD toward noncompetitive activities in which skills can be acquired sequentially and success is measured through individual achievements rather than collective performance (see, e.g., Poulsen & Ziviani, 2004).

In this study, we found that for the small number of boys with DCD who participated in team sports, loneliness was lower and social satisfaction higher, irrespective of the child’s level of physical coordination ability. Therefore, it appears that team sports participation offers psychosocial

benefits for participants and should not be discounted as a potential leisure pursuit for boys with DCD. However, parents and practitioners need to be able to identify team sports characteristics and environments that are likely to be supportive of a child’s mental health. Research and judicious use of clinical reasoning are necessary in determining the best fit among child, team, sport, and environment for each boy with DCD.

We recommend that occupational therapists who work with children with DCD obtain information from the child, his or her parents, and nonparental adult leaders involved in community team sports to identify the characteristics of the child, activity, and environment that support an optimal fit. Child characteristics affecting team sports participation are age, physical abilities, cognitive abilities, and affective and motivational factors. For example, younger children with DCD are more likely to participate in team sports than older children with DCD (Christiansen, 2000). Perhaps this fact is related to an increased emphasis on mastery of skills and acquisition of game rules knowledge in entry-level team sports, providing a developmental focus, compared with team sports for early adolescent children, in which competitive goals are more likely to be emphasized.

Decisions about the best fit for each child should be made on the basis of knowledge of the child characteristics required for different team sports and information about activity- and environment-specific factors, including costs, availability, coaching accreditation programs, parent and extended family support, level of competition, and intensity and focus of training. Most important, practitioners need to evaluate the motivational climate of the proposed team sports environments to determine whether the coaching program is directed toward a mastery-oriented climate that promotes personal improvement, learning, and self-referenced skill acquisition rather than an ego-involving or competitive motivational climate, where social comparison or normative referencing of ability is the focus. Mastery-oriented motivational climates are associated with increased enjoyment and life satisfaction (Spray, 2000). Therefore, asking a boy if he is having fun and if the team practice sessions are going well may allow the practitioner to assess the enjoyment and satisfaction factors. Team sports environments are multidimensional, however, and the way tasks are structured, how success and failure are appraised, the grouping of children by ability, and so on also are important considerations.

The achievement goal framework is one approach with potential to inform clinical decisions about team sports participation (e.g., Nicholls, 1989; Ntoumanis & Biddle, 1999). Occupational therapists should consider adopting a

role advocating mastery-oriented motivational team climates. Such a role involves promoting a shift from a competitive team sports orientation to cooperative learning and peer interaction and from public to private recognition of accomplishments or progress (Henert, 2001). Encouraging communities and schools to adopt models such as the “sports for peace” approach, which emphasizes affiliation and learning processes (Ennis et al., 1999) or the TARGET (Tasks, Authority, Recognition, Grouping, Evaluation, and Time) applied coaching program, which is based on the principles of achievement goal theory (Epstein, 1989), has the potential to increase participants’ enjoyment of, persistence in, and involvement in team sports. Students’ perceptions of a team sport’s motivational climate can be readily measured with a shortened version of the Perceived Motivational Climate in Sport Questionnaire–2 (Newton, Duda, & Yin, 2000; Newton, Watson, Kim, & Beacham, 2006).

School-based occupational therapists can make a compelling argument for increased funding and resource allocation to enable them to incorporate advocacy and community liaison roles into their treatment schedules for boys with DCD. Occupational therapists are important service providers for this group of children, who are poorly understood and whose physical coordination difficulties and secondary psychosocial problems are underrecognized and either disregarded or trivialized by many community members (Missiuna, Moll, King, Law, & King, 2006). Although intervention is a major focus of occupational therapy practice with this population, there also is a need to act in a preventive health role capacity aimed at early recognition and understanding of the physical and psychosocial characteristics and activity participation implications of this condition. General resource flyers to disseminate best practice information for coaches are currently available as Web-based resources (e.g., Missiuna, 2003). However, context-specific written and verbal information also is necessary and can be used as an adjunct to intervention when networking and forming collaborative partnerships with key stakeholders. Occupational therapists should use print and Web-based publications to inform children, families, teachers, and community organizations.

Conversations among researchers, practitioners, and policymakers need to be strengthened to develop best practice in team sports environments. Key research findings associated with implementation of a mastery-oriented team sports motivational climate for children ages 11 to 13 years provide a starting point for discussions focused on practical initiatives for change and suggest avenues for future research aimed at boys with DCD. For example, increased satisfaction, greater effort-focused beliefs, and a desire for challenging tasks have been reported following

implementation of a 2-week climate manipulation program, the TARGET mastery-oriented coaching program (Treasure, 2001).

Occupational therapists can support the implementation of the proposed rating classification system for American Youth Sport Programs that would enable parents to make informed decisions about team sports participation (Wiersma, 2005). This rating scheme classifies youth sports according to criteria such as level of competition, cost, skill, participation opportunities, and time commitments. For example, Level 1 is characterized by a focus on skill acquisition across all playing positions, low cost and time commitment, no tryouts or team cuts, and no formal competitions or scoring.

Collaboration with community partners, families, and children requires a shared motivational vision and adoption of child-centered practices to ensure optimal participation outcomes. Such efforts involve working with the boys who have DCD, teams, parents, and coaches in collaborative partnerships. Occupational therapists can provide information to parents, teachers, and other key individuals based on research about how to create an optimal child–activity–environment fit for children with DCD as a preventive health initiative as well as an intervention strategy. Occupational therapists need to think outside existing structures to pursue opportunities to advocate for inclusive participation in social–physical settings for boys with DCD.

Limitations and Future Directions

Because this study was cross-sectional, experimental manipulation of the mediator variable, team sports participation, was not possible. A plausible connection among physical coordination, loneliness, and team sports participation was demonstrated, however, and the significant mediating effect of team sports participation on loneliness for boys with DCD survived multiple empirical tests. Direction of effect cannot be resolved using a mediational model. Longitudinal investigation would contribute to an understanding of directional effects.

The difficulties inherent in measuring a subjective experience such as loneliness are mitigated by evidence that the scores of children who report loneliness may be considered accurate (Terrell-Deutsch, 1999). Future researchers might consider collecting information on the developmental course of loneliness in children with DCD. Prolonged loneliness has been shown to lead to internalizing problems such as depression; however, developing alternative areas of competencies in valued pursuits may influence participation and mental health outcomes at different ages (Goossens & Beyers, 2002).

More detailed activity participation information might be obtained by using a retrospective 24-hr cued interview recall method with both child and parents that includes probing about the social and structural characteristics of leisure environments. Comparison of gender, age, and socioeconomic differences in participation in structured physical and nonphysical activities would broaden the applicability of findings.

The findings of the study must be treated with caution given the nonrepresentative sample; the proportion of boys in each group who came from an all-boys or a coeducational school differed, and a high proportion of boys came from higher socioeconomic backgrounds. These factors are important to consider in examining social variables such as loneliness. Also, the mean intelligence score of the DCD group was 117, which is in the top range of the high average category. Future research with a more representative population is recommended.

A final limitation of the study relates to the investigation of mediation effects using combined data from the two groups. When we analyzed the residuals for the loneliness scores, we found that they were positively skewed; thus, the standard errors were influenced by nonnormally distributed data for the comparison group. This skew can be attributed to missing information from one quadrant of the distribution for loneliness scores of the non-DCD group. The DCD groups' scores for loneliness were normally distributed, but there were a few boys in the comparison group who reported high loneliness. Although the DCD group included many boys referred by therapy clinics because of identified problems with motor coordination and functional impairment, the comparison group was recruited through a school screening program. The response rate was high at the schools, but the families who refused participation may have done so because of social, behavioral, or other reasons, which may have influenced the distribution of loneliness scores. Although the skewed data for Total Loneliness for the comparison group represent an inherent problem in the sampling procedure, the regression analyses are robust to slight skewness (Tabachnick & Fidell, 2002). There was evidence of slight bimodality, which could artificially inflate the correlations; therefore, the results must be regarded as exploratory and could be improved with a full range of loneliness scores. These issues could be addressed in future research.

Conclusion

Occupational therapy professionals should consider the implications of motor coordination difficulties in 10- to 13-year-old boys. This study identified increased feelings of

loneliness in boys with DCD compared with boys without DCD. We found that the amount of time these boys spent engaged in team sports mediated the negative relationship between loneliness and level of physical coordination ability.

Therapeutic occupational performance interventions should include ensuring access and ongoing support for boys with physical coordination difficulties who choose to participate in team sports activities. Low participation in team sports for boys with DCD, whether through overt or covert exclusion, may reduce opportunities to develop affiliation with a peer group and thereby increase feelings of loneliness. Health practitioners are increasingly concerned that boys with poor motor performance, high levels of loneliness, and reduced physical activity participation may experience detrimental secondary sequelae. ▲

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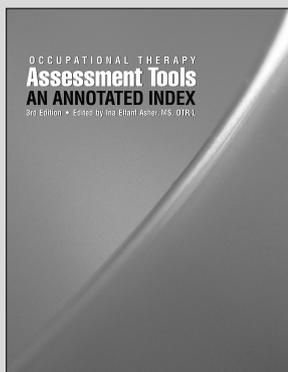
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