DEVELOPMENTAL COORDINATION DISORDER, GENERALIZED SELF-EFFICACY TOWARD PHYSICAL ACTIVITY, AND PARTICIPATION IN ORGANIZED AND FREE PLAY ACTIVITIES

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Objective To test a theoretical model linking developmental coordination disorder (DCD) to reduced physical activity (PA) through the mediating influence of generalized self-efficacy regarding PA.

Study design This was a cross-sectional investigation of students in grades 4 through 8 from 5 elementary schools in the Niagara region of Ontario, Canada (n = 590). Motor proficiency was evaluated using the short-form Bruininks-Oseretsky Test of Motor Proficiency. Generalized self-efficacy was assessed using the Children's Self-Perceptions of Adequacy in and Predilection for Physical Activity scale, and PA levels were evaluated using a 61-item Participation Questionnaire. Structural equation modeling was used to test the influence of generalized self-efficacy on the relationship between DCD and PA.

Results In this sample, 7.5% (n = 44) of the children met the requirements for probable DCD. The effect of DCD on PA was mediated by generalized self-efficacy. In this model, 28% of the variance in children's PA was predicted by generalized self-efficacy and DCD.

Conclusions Our results suggest that children with DCD are less likely to be physically active and that generalized self-efficacy can account for a considerable proportion of this relationship. The implications for appropriate interventions to increase PA among children with DCD are discussed. *(J Pediatr 2005;147:515-20)*

Developmental coordination disorder (DCD) has become the preferred diagnostic designation for otherwise healthy children with motor skill impairment that significantly interferes with academic performance and/or activities of daily living.[1] The prevalence of DCD is estimated to be between 5% and 9%,[1-3] and it often co-occurs with attention deficit and hyperactive disorders.[3,4] Children with DCD suffer both on the playground, where they are subject to ridicule, and in the classroom, where motor difficulties compromise their scholastic performance. Although a causal association has not yet been established, these difficulties may lead to lowered perceptions of personal competence.[5,6]

Children with DCD are much less likely than their peers to participate in vigorous, active play.[7-10] However, the potential pathways linking DCD to reduced physical activity (PA) in children with DCD are not well understood, and the psychosocial factors amenable to change that may connect DCD to PA remain unexplored. To develop effective PA interventions for young people with DCD, an understanding of the determinants of their activity levels is essential.[11]

Children with DCD may not participate in PA because they may not perceive themselves to be sufficiently adequate to meet minimum performance expectations. A predilection for sedentary pursuits and an avoidance of structured PA opportunities is likely

AGFI	Adjusted goodness-of-fit index	df	Degrees of freedom
BOTMP-SF	Short-form Bruininks-Oseretsky test of motor proficiency	GFI	Goodness-of-fit index
CFI	Comparative fit index	NFI	Normed fit index (GFI)
CSAPPA	Children's self-perceptions of adequacy in and predilection for physical activity	PA	Physical activity
DCD	Developmental coordination disorder	PQ	Participation questionnaire
		RMSEA	Root mean squared error of approximation
		SEM	Structural equation modeling

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Supported by the Canadian Institutes for Health Research (research grant 66959).

Submitted for publication Dec 4, 2004; last revision received Apr 20, 2005; accepted May 6, 2005.

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0022-3476/$ - see front matter

10.1016/j.jpeds.2005.05.013

a coping strategy to deal with the risk of failure and humiliation.[12] Perceived adequacy and predilection are components of generalized self-efficacy toward PA.[13] Although self-efficacy measures are often concerned with single-act criteria, all of these single acts reside within a single larger domain of what Bandura[14] defined as *generalized self-efficacy*. Self-efficacy toward specific acts forms the basis of generalized self-efficacy toward PA. This is a useful perspective, because the activities of children are widely varied and our interest is in those factors that influence overall participation. This study tested a theoretical model linking DCD to reduced PA through the mediating influence of generalized self-efficacy (ie, self-perceptions of adequacy in and predilection for PA, and enjoyment of physical education).

METHODS

The study involved a cross-sectional investigation of students in grades 4 through 8 from 5 elementary schools in the Niagara region of Ontario, Canada. Although schools and students were not randomly selected, particular attention was given to the selection of schools to ensure that the participants represented the socioeconomic, ethnic, and urban/rural mix of the general Canadian population. Eighteen children with preexisting physical limitations were excluded from the study, and 8 children with previously known learning disorders were allowed to take part in the study but were excluded from all analyses. From a total of 929 students, 590 (322 males and 268 females; 63.62%) provided informed consent and participated in the study. After a listwise deletion of cases with missing values, the total sample size was finalized at 564.

Variables and Analysis

Developmental Coordination Disorder (DCD). Motor proficiency was evaluated using the short-form Bruininks-Oseretsky Test of Motor Proficiency (BOTMP-SF). This widely accepted test examines the full scope of motor proficiency (eg, static and dynamic balance, reaction time, bilateral coordination) using selected items from the full scale and takes only 30 minutes to complete, as opposed to 2 hours for the full version. The short form has been validated against the full scale with intercorrelations between .90 and .91 for children in the 8- to 14-year age range.[16] Although it does not provide an in-depth analysis of each aspect of motor proficiency, it does provide an excellent assessment of general motor functioning.[17,18] The BOTMP-SF was individually administered by a trained investigator to each consenting child in the school's gymnasium behind a curtained barrier to ensure confidentiality. Furthermore, the BOTMP-SF examiner was blinded to the Children's Self-Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) (see below) scale results. A BOTMP-SF standard score (age-adjusted) below 38, which is at or below the 10th percentile rank on the BOTMP-SF, was required to classify a diagnosis for probable DCD. For all analyses, a binary variable (DCD = 1, no DCD = 0) was used. We use the term "probable DCD" because the BOTMP-SF is a field test administered by trained researchers, not a diagnostic protocol administered by a licensed health care professional (eg, pediatrician or occupational therapist).

Generalized Self-Efficacy Toward Physical Activity. The Children's Self Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) scale is a 20-item scale designed to measure children's self-perceptions of their adequacy in performing, and their desire to participate in, physical activities.[13] Hay[13,20] designed the CSAPPA scale for children age 9 to 16 years, and it has demonstrated a high test–retest reliability (r = .84 to .90), as well as strong predictive and construct validity.[13,19,21] The CSAPPA scale has 3 imbedded factors: adequacy (confidence in), predilection (preference for), and enjoyment of physical education class. In this study, each of these 3 subscales was used to assess different dimensions of generalized self-efficacy toward PA. In terms of construct validity, the CSAPPA is significantly correlated with aerobic fitness (Leger shuttle run test), PA (energy expenditure and self-reported participation in physical activities), body weight (percentage body fat and body mass index), and motor proficiency.[13,22,23]

Participation in Organized and Free Play Activities. The Participation Questionnaire (PQ) is a 61-item questionnaire that asks children to report their actual participation levels in the areas of free-time play, seasonal recreational pursuits, school sports, community sports teams and clubs, and sport and dance lessons over the past year. The PQ measures activity units, defined as an active pursuit that is regularly selected in free play/recreational situations and/or enrolment in an organized sport team, club, or lesson. Subtotals are available for unorganized activity (free play) and organized activity (sports teams, lessons). The PQ provides an estimation of a child's frequency and nature of PA, but does not address overall intensity or duration. The PQ has been demonstrated to have strong construct validity with expected significant gender differences and urban/rural differences present.[21] Consistency of the PQ among elementary school children has been established with a test–retest reliability of .81.[13]

Analysis

First, we conducted an exploratory factor analysis to examine generalized self-efficacy and PA as underlying latent constructs of the CSAPPA and PA. In the second part of the analysis, we used descriptive and bivariate statistics (1-way analysis of variance) to examine whether children with DCD score lower on measures of both perceived self-efficacy and play. In the final section, we used a structural equation modeling (SEM) technique to construct the latent variables and test the proposed model from DCD to self-efficacy to PA.

All SEM analyses were performed using AMOS 5.0.[24] Maximum likelihood estimates were used for all analyses. Model fit was assessed using the following goodness-of-fit statistics: χ^2 goodness-of-fit test (χ^2_{GoF}), normed fit index (NFI), comparative fit index (CFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and root mean squared error of approximation (RMSEA).[25] For the NFI, CFI, GFI, and AGFI, values range from 0 to 1, with higher