ISSN: 2755-0281

Journal of Pediatrics Research Reviews & Reports

SCIENTIFIC Research and Community

Research Article

Open Access

Epidemiological Study on Developmental Coordination Disorder in School Going Children

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ABSTRACT

Introduction: Developmental coordination disorder (DCD) has garnered significant attention in recent years, with rapid advancements in our understanding of this condition. Despite this progress, DCD often goes undiagnosed, making it challenging for children, parents, and educators to access essential resources. The motor difficulties associated with DCD can lead to social exclusion, as peers may be reluctant to invite these children to participate in play activities. Consequently, children with DCD may withdraw from leisure pursuits, perceiving themselves as lacking the necessary skills to engage fully.

Objective: The primary objective of this study was to identify DCD in non-referred school-aged children. Early identification enables these individuals to access crucial resources, such as physiotherapy interventions, which can maximize their functional, academic, and psychosocial performance, and overall quality of life.

Materials and Methods: The study involved 200 non-referred school-going children aged 4-12 years from Bangalore, selected through random sampling. The Movement Assessment Battery for Children (M-ABC), consisting of 32 organized tasks across four sets covering manual dexterity, ball skills, and dynamic balance, was administered. Additionally, the Test of Gross Motor Development (TGMD), comprising 12 tasks that assess a child's ability to accomplish various motor skills, and the Child Behavior Checklist (CBCL), a 113-item inventory describing children's psychosocial behavior, were utilized to evaluate overall development.

Results: Multivariate analysis identified a significant prevalence of DCD among the study participants. The findings underscore the imperative nature of early identification using comprehensive assessment tools for the well-being and psychosocial adaptation of school-aged children.

Conclusions: These findings indicate that children with movement problems are at risk for difficulties in attention, learning, and psychosocial adjustment. Regardless of the kind or intensity, a child's assessment for movement issues should cover a broad variety of functions in addition to motor skills. This comprehensive approach will enable access to essential resources, such as physiotherapeutic interventions, crucial for their overall development.

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Received: July 11, 2024; **Accepted:** July 15, 2024; **Published:** July 25, 2024

Keywords: School, Developmental Coordination Disorder, Identification, Diagnosis

Introduction

The field of developmental coordination disorder (DCD) has seen a tremendous increase in understanding in recent years. Significant advancements have been achieved in our comprehension of DCD [1]. A disorder that often goes undiagnosed and makes it difficult for children, parents, and teachers to access resources [2]. Their motor difficulties make them, not get asked to play by peers. Hence, they might withdraw from leisure activities thinking they lack sufficient skills to enjoy participating.

Definition

The Diagnostic and Statistical Manual of Mental Disorders-4's American Psychiatric Association (APA 1994) [3]. Criteria for DCD state that the disorder is characterized by a marked impairment in motor coordination development that substantially interferes with daily living activities or academic achievement. These deficiencies must not be connected to a widespread developmental issue or a general medical condition. A child's motor skills should be delayed beyond their mental age if they show signs of mental retardation [4, 5].

Diagnostic Criteria for Developmental Coordination Disorder, Diagnostic and Statistical Manual of Mental Disorders-IV-TR; 2000; page 58). American Psychiatric Association (APA 1994)
Criterion Description A. Performance in daily activities that require motor coordination is substantially below that expected given the person's chronological age and measured intelligence. This may be manifested by marked delays in achieving motor milestones (eg, walking, crawling, sitting), ropping things, "clumsiness", poor performance in sports, or poor handwriting. B. The disturbance in criterion A significantly interferes with academic achievement or activities of daily living. C. The disturbance is not due to a general medical condition (e.g., cerebral palsy or muscular dystrophy) and does not meet the criteria for a Pervasive Developmental Disorder. D. If Mental Retardation is present, the motor difficulties are in excess of those usually associated with it.

The addictive qualities of social media, games, and digital technology can exacerbate behavioral disorders and other health problems in kids and teenagers. Recent studies have indicated that excessive screen time may negatively impact cognitive development in children. Furthermore, research suggests a potential link between high digital media use and an increased risk of Developmental Coordination Disorder (DCD) in young populations [6, 7]. The types of motor skills that children with DCD struggle with vary. Writing and drawing, dressing (including buttoning and tying shoe laces), and locomotion (walking, climbing or descending stairs, hopping, running, and jumping) are frequently mentioned as difficult to master skills [4]. These skills can have a significant impact on behavior, learning and academic achievement, self-esteem and other emotional traits, personal appearance, or organizational issues [1, 8].

Need for Study:

Not every kid with DCD receives assistance from qualified educators or healthcare providers. Studies show that, according to popular belief, children with learning impairments, speech and language issues, attention deficit hyperactivity disorders, or perceptuo-motor disorders are far more likely to experience motor difficulties. Determining DCD may therefore be an essential initial step in detecting the aforementioned comorbid disorders [2, 5, 9].

Objective

The current study aims to investigate the prevalence of developmental cognitive disorder (DCD) in school-age children who are not referred. This gives these students access to important resources, such as physiotherapy intervention, to improve their quality of life and functional, academic, and psychosocial performances.

Methods

Subjects

The study's sample consisted of two hundred north Bangalore-resident children between the ages of four and twelve, chosen at random using a sampling technique. The study group was made up of 66 girls and 134 boys, with a mean age difference of 8.24 years for girls and 7.89 years for boys. The participants were chosen from S. Cadambi Vidya Kendra, Basveswernagar, Bangalore.

Table 1: Numerical and Descriptive Data of Participants

GROUP	N(BOYS/GIRLS)	M Age (in yrs)	SD Age (in yrs)	Minimum age	Maximum age
BOYS	134	7.89	2.097	4	11
GIRLS	66	8.24	2.433	4	12
TOTAL	200	16.13	4.53	8	23

Materials

The Movement Assessment Battery for Children (M-ABC)

The M-ABC provides insight into a child's motor functioning in daily activities by evaluating speed, accuracy, and distance across various motor skills. It consists of four age-specific battery sets with a total of 32 structured tasks spanning three key domains: manual dexterity, ball skills, and dynamic balance [10-14, 15]. Specifically, manual dexterity is assessed through three tasks, ball skills through two tasks, and static/dynamic balance through three tasks.

The scoring is normed for age, enabling comparisons of motor competence across a broad age range. Lower total impairment scores indicate superior movement proficiency. Extensive research has demonstrated the M-ABC possesses moderate to good psychometric properties in terms of validity and reliability as a measure of motor performance [12-14, 15].

Consistent with the standardized guidelines outlined in the M-ABC manual, this study utilized the 15th percentile as the cut-off criterion to differentiate children with developmental coordination disorder from those exhibiting age-appropriate motor abilities. Adhering to established cut-offs from the validated test enhances diagnostic accuracy.

Figure 1: Threading Beads

Figure 2: Flower Trail

The Test of Gross Motor Development

The Test of Gross Motor Development (TGMD) The TGMD was administered because it assesses how children coordinate their trunk and limbs during fundamental movement task performance, rather than solely focusing on time spent or errors made [4, 8]. It measures 12 skills typically acquired by children in preschool and early elementary grades.

Figure 3: Locomotor Skill

Figure 4: Object Control Skill

The test includes two subtests: a) Locomotor subtest (Figure 3) consisting of running, galloping, hopping, leaping, horizontal jumping, and sliding. b) Object control subtest (Figure 4) with six propelling and receiving skills: striking, bouncing, catching, kicking, throwing, and rolling.

The TGMD provides three to four performance criteria for each skill. The test administrator demonstrates the skill, and the child is asked to perform it, receiving two test trials. One point is awarded for each performance criterion met, with higher scores indicating better quality of movement patterns. The TGMD has a high degree of reliability and low-test error [2, 16].

The Child Behavior Checklist 4-18yrs

The Child Behavior Checklist 4-18 years (CBCL) The CBCL is a parent questionnaire used to assess behavioral or emotional problems in children aged 4-18 years over the past 6 months [17]. It consists of 113 items that measure eight problem syndromes, three of which are conceptually meaningful: internalizing, learning, and externalizing behaviors [18].

Procedures

Prior to commencing the study, the examiner visited the schools to obtain verbal consent from the management and parents. These preliminary visits allowed the examiner to become a familiar face to the children. This procedure helped alleviate any tension or fear the children might have felt towards an unexpected individual, enabling them to feel more at ease during the assessments.

The motor assessments took place in the school playgrounds and specially prepared rooms within the school premises. Each student was evaluated individually to ensure an optimal testing environment. The tasks were administered in the precise order outlined in the respective test manuals to maintain the standardized characteristics and validity of the assessments.

Regarding the Child Behavior Checklist (CBCL), parents were provided with the 113-item questionnaire to gather information on any behavioral problems their child may have exhibited during the preceding 6 months. This allowed for a comprehensive evaluation of not only motor skills but also potential behavioral or emotional issues that could impact the child's overall development and functioning.

By following structured protocols, ensuring child comfort, and incorporating parent reports, the study aimed to create an effective and well-rounded assessment approach to identify developmental coordination disorder accurately and understand the broader context of each child's abilities and challenges [19, 20].

Results

The DCD was identified in this study using a multivariate analysis. We also described behavioral symptoms and motor performance in a non-referred group and identified children who scored at or below the < 5th percentile on the M-ABC. These kids were diagnosed with DCD for the sake of this study. We distinguished between children with DCD and those who perform within age norms using the M-ABC's 15th percentile cut-off score, in compliance with the MABC instructions.

Figure 5 shows the distribution of the entire sample (n = 200) in accordance with the Norms provided by the MABC Manual [8] and the children's performance. Out of the entire sample, 16 children (8%) showed performance that fell inside the lowest 5% of the range, indicating a clear-cut coordination impairment. Additionally, because 44 kids (or 22%) had motor skills that fell between the continuum's 6th and 15th percentiles, they were classified as "at risk."

Table 2:

Total No of students	Percentile	No of students distributed as per MABC norms	Percentage of students
200	<5%	16	8%
	6-15%	44	22%
	16-35%	46	23%
	36-55%	32	16%
	56-70%	36	18%
	>90%	26	13%
Total		200	100%

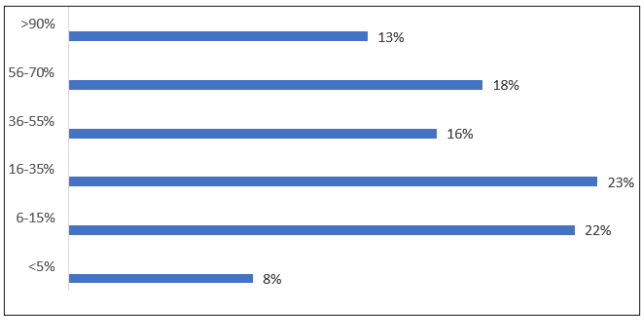

Figure 5: Total Sample Distribution According to the MABC Norms (<5% Denotes Severe Coordination Disorders, <15% denotes "at risk", >15% no Movement Difficulties.)

The results of the gross motor performance test indicated that children with poor MABC scores also demonstrated reduced gross motor skill performance in the locomotor skill and object control skills TGMD subtests (figure 6&7).

Table 3: Locomotor Skills

Percentage of population distributed as per locomotor skills performance		
Performance	No of students	Percentage
Poor	6	3%
Fair	12	6%
Good	182	91%
Total	200	100%

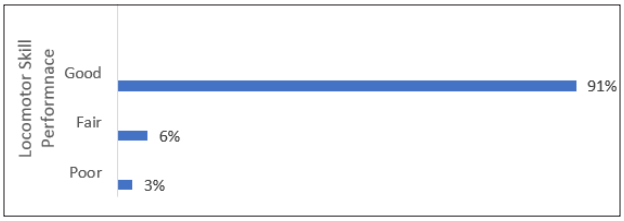

Figure 6: Total Sample Distribution as per Performance in TGMD (Locomotor Skills)

Table 4: Object Control Skills

Percentage of population distributed as per Object control skill performance.		
Performance	No of students	Percentage
Poor	4	2%
Fair	24	12%
Good	172	86%
Total	200	100%

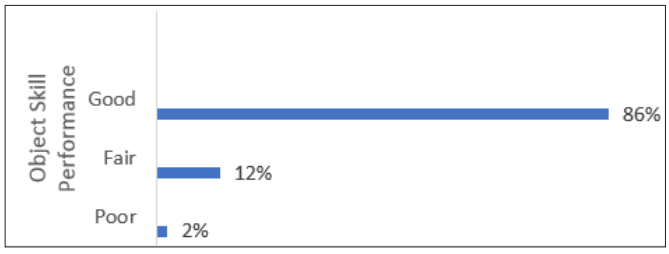

Figure 7: Total Sample Distribution as per Performance in TGMD (Object Control Skills)

While CBCL results did not correlate with M-ABC gain, they did indicate that children classified as having a definite coordination disorder are more likely to experience behavioral or emotional issues, learning difficulties, and internalizing issues. In this aspect, more research is necessary.

Discussion

The current study set out to investigate the prevalence of developmental coordination disorders (DCD) in early childhood school-age children. Based on the findings from this investigation, 8% (less than the fifth percentile) of 200 samples had DCD. In addition to these obvious movement issues, there was a significantly higher prevalence of children with moderate motor issues (referred to as "at risk" by the MABC manual). Of the 200 youngsters in the sample, 22% had moderate coordination impairments, with 5–15% of them falling below the 15th percentile. Suspected sample performance during M-ABC demonstrated lower TGMD scores as well. The Child Behavior Checklist (CBCL) revealed that individuals who performed poorly had greater externalizing issues and learning challenges. Future research must establish the statistical association between MABC and CBCL, as it has not been done yet.

The results from the Child Behavior Checklist (CBCL) revealed that subjects with poor motor performance were more likely to exhibit externalizing problems and learning difficulties. However, a statistical correlation between the M-ABC and CBCL scores was not established in this study, which should be explored in future research.

According to data from related studies, developmental coordination issues not only continue but also have the potential to negatively impact other facets of daily life, including behavior learning and academic success, self-esteem and other emotional traits, engagement in physical activities, and physical fitness [2, 5]. Since early and targeted intervention has been shown to have beneficial effects, there is consensus regarding the critical necessity for early and correct identification of developmental coordination deficits [2, 4, 5, 8, 9].

The discussion highlights the importance of early identification and intervention for children with DCD or moderate motor difficulties. By recognizing these challenges during early childhood, appropriate support and resources can be provided to mitigate the potential negative impacts on various aspects of development, including behavior, learning, self-esteem, physical activity participation, and overall well-being.

Conclusion

The conclusion that can be made in light of the current findings and in spite of the study's relatively small sample size is that, in comparison to previous research, the prevalence of DCD among early childhood students attending school is somewhat higher [2].

All children who have movement disorders run the risk of developing attention, learning, and psychosocial adjustment problems, according to the findings. On the Movement Assessment Battery for Children (M-ABC), females performed better in manual dexterity activities but less well in ball skills and balance tasks, despite the fact that there were no gender differences in total performance. To find statistical correlations in this field, more research is necessary.

Regardless of the extent or severity of movement issues, children should have a thorough evaluation that looks at many different

areas in addition to motor skills. These kids will benefit greatly from an all-encompassing approach by having access to vital resources like physiotherapeutic therapies, which are critical to their general development and wellbeing.

These results suggest that all kids with movement issues run the risk of experiencing issues with learning, attention, and psychosocial adjustment. Although there was no gender difference in the performance, the girls did well on the manual dexterity tasks of the MABC but did less well on the ball skills and balancing abilities. In order to establish a statistical association, more study is required. Regardless of the extent or severity of the issues, children with movement disorders should have their assessments look at a variety of functions in addition to motor performance. They will be able to use essential resources like physiotherapeutic therapies as a result.

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