

Original Research Article

Age wise prevalence of developmental coordination disorder in school going children in west India


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Abstract

Background: Children with movement skill difficulties that have not been diagnosed with a general medical condition. This difficulty in motor skill competence, observed in children who are developing well intellectually, is termed 'developmental coordination disorder' (DCD). DCD is a highly prevalent disorder (5-6% of school-aged children) so it is likely that there is at least one child with DCD in most classrooms. The early diagnosis of DCD can be helpful to prevent the future secondary complications. Aim: So purpose of this study is to find out age wise prevalence DCD in school going children in West India.

Materials and methods: It was a cross-sectional analytical study conducted in PCMC area schools Multistage stratified sampling done to assessing 516 children's by Using The Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2). Statistical analysis used was Mean and Standard Deviation (SD) and Chi-square test was used to analysis.

Results: Age 8 and 9 year showed highest prevalence of DCD (3.16%). This difference in various age group was not statically significant as P=0.219 by chi-square test.

Conclusion: Age 8 and 9 year showed more prevalence of Developmental coordination disorder than other age.

Key words

DCD, Prevalence, Age group, BOT 2nd.

Introduction

Since the early 1900s, the scientific community has acknowledged a large group of children with movement skill difficulties who have not been diagnosed with a general medical condition [1]. This difficulty in motor skill competence, observed in children who are developing well intellectually, is termed 'developmental coordination disorder' (DCD). DCD is a recognized syndrome that was described by the World Health Organization in 1992 [2] and has been included in the diagnostic manuals of the American Psychiatric Association since 1989 [3].

“DCD is defined, using the Diagnostic And Statistical Manual Of Mental Disorders, Fourth Edition (DSM-IV), as a condition marked by a significant impairment in the development of motor coordination, which interferes with academic achievement and/or activities of daily living (ADL). These difficulties are not due to a general medical condition (e.g., cerebral palsy) and are in excess of any learning difficulties is present [4].

DCD is a highly prevalent disorder (5-6% of school-aged children) so it is likely that there is at least one child with DCD in most classrooms. One of the challenges of identifying children with DCD is the variety of ways in which it is revealed [5]. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) provides four criteria to classify a child as having DCD [3].

The difficulties may be considered to be mild, moderate or severe. Even though this condition is observed by many schoolteachers, as well as physical and occupational therapists, it is not an easy diagnosis to make due to multi-faceted diagnostic criteria and terminology problems [5]. Outcome measurements used to assess gross motor development in infants and children up to age 5, including the Peabody Developmental

Motor Scale [6] (PDMS-2), second edition and the Alberta Infant Motor Scale [7] (AIMS). When children age out of either the PDMS-2 or the AIMS, one standardized assessment option physical therapists have is BOT-2nd [8-10]. The test-retest reliability and internal consistency of the total scale were excellent, with an ICC of 0.99 (95% confidence interval) and alpha of 0.92. The BOT-2nd can be used to evaluate a wide variety of fine and gross motor skills for children, teenagers and young adults 4-21 years of age. This is a test that can also be used by Physiotherapist, psychologists, adaptive physical education teachers, special education teachers and educational diagnosticians [8-11]. The prevalence of DCD in India is found to be 1.37%. The prevalence of DCD in other countries is estimated to be (5-8%) USA, (1.8%) UK, (5.7%) Greek, (5-9%) Canada, (1.7%) Belgium, and 6% worldwide [12-16]. As per the literature there are no studies found on the prevalence of DCD using BOT-2 in 5-15 years of age group in Indian scenario. Considering the importance of timely diagnosis of DCD and the child's performance on the BOT-2 will allow the physical therapist to identify areas of strength and areas of need in regards to the child's gross motor functioning, and can therefore help to guide treatment. The early diagnosis of DCD can be helpful to prevent the future secondary complications. So, purpose of study was to find out age wise prevalence of developmental coordination disorder in school going children.

Materials and methods

The Cross Sectional analytical study was conducted in Pimpri Chinchwad area of age group of 5 to 15 years. Total samples 516 were studied. The Subjects were divided according to age groups. Age Group 1 includes 5.0-7.11, age group 2 includes 8.0-9.11, age group 3 includes 10.0-11.11, age group 4 includes 12.0-13.11 and age group 5 includes 14.0-15.11. Inclusion criteria were normal and healthy school going

children. Exclusion criteria were neurological trauma like spinal fractures, any visual problem, or any congenital deficit. BOT™-2nd kit was used for assessment.

Procedure

The synopsis of the study was submitted to institutional ethical committee, after the clearance 516 subjects were selected who fulfilling the inclusion criteria. After explaining the purpose of the study to the subject/parent, they were informed that they can withdraw any time during the course of the study without giving reason for doing so. The parents/teacher was assured that their child's participation and non-participation would not affect their child's education. Subjects were selected on the basis of multistage sampling method. In the first stage, 3 English and 3 Marathi schools were selected randomly out of the total schools in Area. In 2nd stage, from each standard, any one division was selected randomly. In 3rd stage, from every division, boys and girls of same age were selected by random sampling method. A written informed consent was obtained from the subjects/parents one day prior to the assessment. Proper precautions were taken so that there was no harm to the child. Total children were divided into 5 age groups according to their chronological age. These age groups were divided for sampling convenience and for obtaining proper results. The age group 1 included age group ranging from 5.0-7.11 years, age group 2 included 8.0-9.11, age group 3 included 10.0-11.11, age group 4 included 12.0-13.11 and age group 5 included 14.0-15.11.

BOT-2nd was used to assess children's motor proficiency. BOT-2 is an individually-administered test that uses engaging, goal-directed activities to measure a wide array of motor skills in individuals aged 4 through 21 (Bruininks and Bruininks, 2005). The BOT-2 assesses motor proficiency in four motor-area composites; fine manual control (FMC), manual coordination (MC), body coordination (BC) and strength and agility (SA). BOT-2 has 8 subtests with 53 items and each motor-area composite has

two subtests. The total motor composite score can be calculated by adding four composite scores together (53 items, 8 subtests and 4 four motor-area composites; score range = 0–320 points) (Bruininks and Bruininks, 2005). Subjects were assessed for these tasks and these raw score were converted to a numerical point score. Descriptive analysis done by using manual, point score converted in to five descriptive category that of WAA-Well above average, AA- Above Average, A – Average, BA- Below Average, WBA- Well Below Average.

Results

Demographic Data according Gender and Age Group was as per **Graph – 1**. Mean and standard deviation of subtest point score by Age group was as per **Table – 1**. Mean and standard deviation of Composite and Total Motor composite standard score by Age group and Gender was as per **Table – 2**. Descriptive category of Children on Total motor Proficiency According Age Group was as per **Graph – 2**. Prevalence of DCD among Age Groups was as per **Graph – 3**.

Discussion

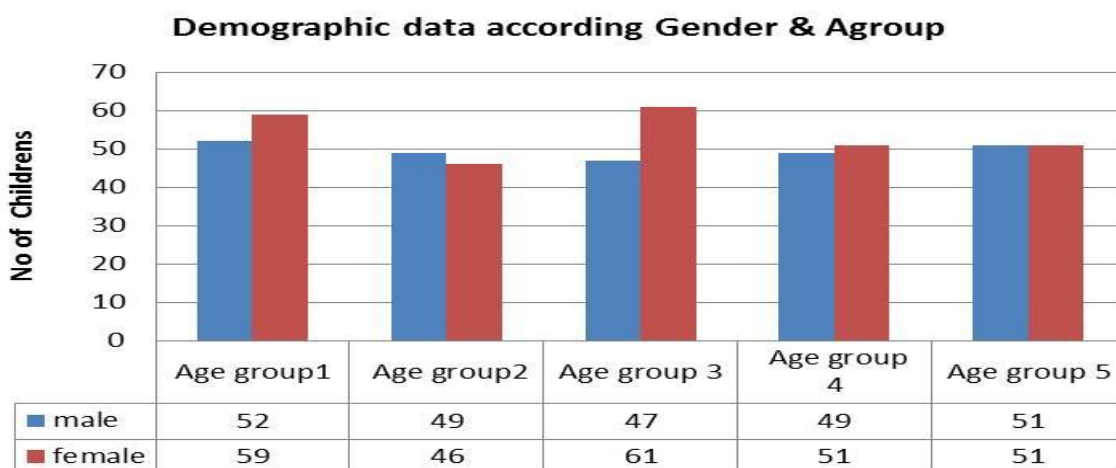
The present study was carried out with the aim To find out Point score of all eight subtest, Descriptive category of four subtest Composite and Total Motor Composite component on BOT-2 in school going children of age group between 5 to 15 years according age groups.

Graph - 1 showed Five hundred and sixteen children (Mean age =10.67 years, SD = 3.03) participated in this study among that 248 and 268 were male and female respectively. Table 1a and 1b showed linear pattern subtest point score of Motor proficiency according to age group. The use of subtest point score will result in more precise measurement of function, because gain or deterioration will be related to specific area of motor control [17]. Barnekow-Bergkvist, et al. (1998) found that performance in physical tests; height, weight and physical activity at the age of 13 contributed best of explain adult physical

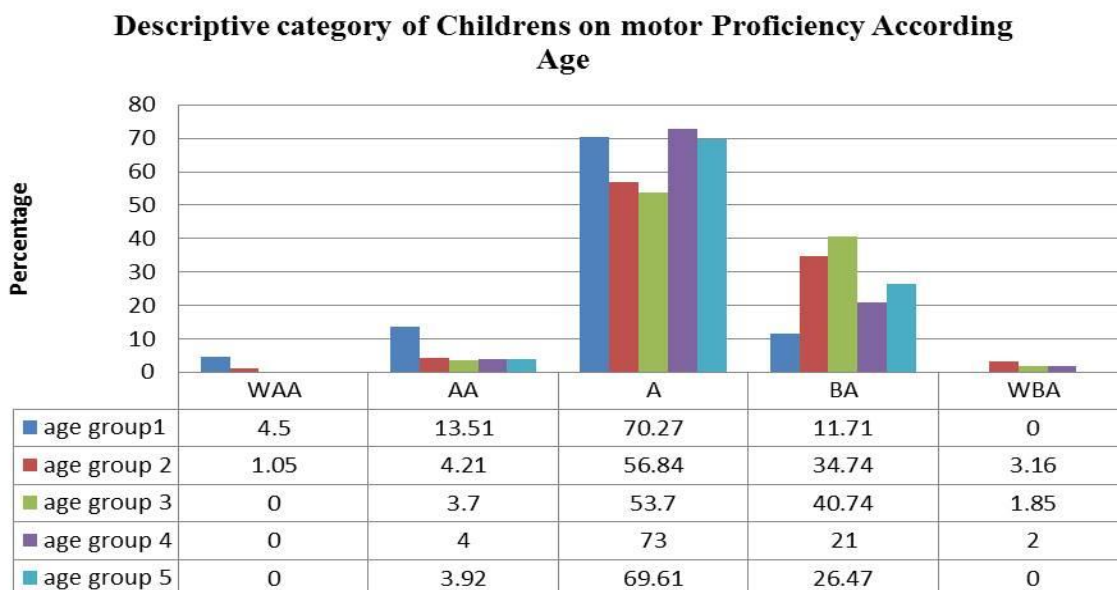
performance and physical activity. Therefore, it may be concluded that so far when all the subtest point score was concerned age factor was responsible for the higher mean value. Age group 4 and 5 having higher age, they had significantly performed better in comparison to Age group 1, 2 and 3 boys and girls. Motor performance is related to lean body mass, general musculature, aerobic capacity and certain psychological state of mind (willingness to accept pain) and development of all of which are influenced by advancement of age. Therefore, it is obvious that Age group 1, 2 and 3 will have less motor quality

than that of Age group 4 and 5 because of structural and functional differences with the higher age groups [18]. Magalhaes, et al. (1989), in their study on the development of bilateral coordination on certain jumping tasks observed improvement in the performance with age in their sample of 5 to 9 years of typical children [19]. Moreover, the motor performance is related to body stature, body weight, growth spurt, body composition, cardiovascular fitness and muscle strength [20] hence as age increases point score of motor proficiency also get increases.

Graph - 1: Demographic Data according Gender and Age Group.



Graph - 2: Descriptive category of Children on Total motor Proficiency According Age Group.



Graph - 3: Prevalence of DCD among Age Groups.

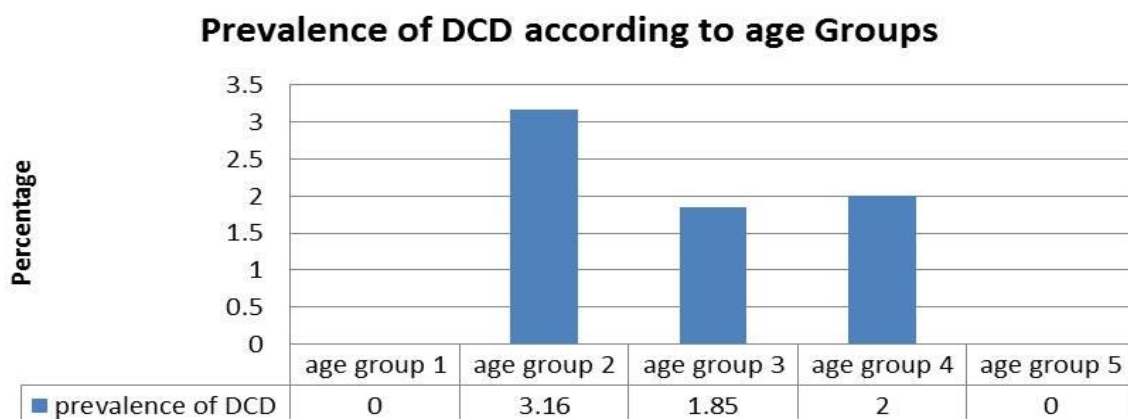


Table – 1: Mean and standard deviation of subtest point score by Age group.

Table - 1(a)

Age Group	Sex	N	FMP		FMI		MD		ULC	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 (Age 5,6&7)	COM	111	24.47	5.89	24.97	7.53	19.19	5.73	16.91	9.08
2 (Age 8&9)	COM	95	30.56	6.40	30.61	6.72	25.08	4.56	27.47	8.32
3 (Age 10&11)	COM	108	32.08	5.82	33.06	5.04	29.16	4.51	32.23	6.04
4 (Age 12&13)	COM	100	35.33	5.79	34.10	5.71	32.62	4.50	34.02	4.25
5 (Age 14&15)	COM	101	36.36	5.45	35.24	4.88	33.78	4.05	35.39	3.82

Table - 1(b)

Age Group	Sex	N	BLC		B		RSA		S	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 (Age 5,6&7)	COM	111	17.35	3.66	31.00	4.94	24.25	4.46	24.04	4.95
2 (Age 8&9)	COM	95	19.60	6.62	33.43	2.57	29.94	4.39	24.61	4.75
3 (Age 10&11)	COM	108	20.95	3.20	33.20	4.17	33.99	4.93	26.52	4.92
4 (Age 12&13)	COM	100	22.04	3.28	33.43	2.21	34.67	4.49	27.38	5.54
5 (Age 14&15)	COM	101	21.88	3.05	34.20	2.32	34.81	4.55	28.44	3.73

Abbreviation: COM: Combine (Male & female), N= Total number of sample, SD: Standard Deviation, FMP: Fine Motor Precision, FMI: Fine Motor Integration, MD: Manual Dexterity, ULD: Upper Limb Coordination, BLC: Bilateral Coordination, B: Balance, RSA: Running Speed And Agility

Table - 2a and **Table - 2b** showed Standard score, Descriptive category of all composite component and TMC did not showed any linear pattern of motor development with age growth because Brenda N. Wilson concluded Standard Score and Descriptive category that have undergone statistically transformation will be less exact in their ability to detect real changes that occurred. Because these standard score are

age adjusted, progress will not be reflected in the score unless the progress is faster than typical maturation (which is not likely to occur with children who have motor problem). Therapist should consider using the subtest point score as accurate measure of change [17].

Graph - 2 showed Maximum Children were found in Average category of motor proficiency

followed by Below average category in all age groups. Age group 1 showed better performance than other group as maximum children from this group (88.28%) fall between average to well above average category. Graph 3 showed Developmental coordination disorder in various age group showed did not show statically significant difference as $P=0.219$. However age 8 and 9 years showed highest prevalence of DCD (3.16%) followed by Age 12 and 13 year (2%). The Indian children under-performed in the bilateral coordination subtest across all age group 7, 8 and 9 as compared to the USA normative

sample. This observed developmental variation in the bilateral coordination patterns between Indian children and USA normative sample which may be attributed to the cultural and environmental (school) variations [20].

Limitation of the present study was socioeconomic status, Cardiorespiratory Fitness and Body Mass Index were not considered while finding out the prevalence of DCD. Further studies can be conducted to investigate Motor proficiency of school going children who were underweight at time of birth and preterm.

Table - 2: Mean and standard deviation of Composite & Total Motor composite standard score by Age group and Gender.

Table - 2(a)

Age Group	Sex	n	FMC		MC		BC	
			Mean	SD	Mean	SD	Mean	SD
1 (Age 5,6&7)	COM	111	25.46	7.90	25.94	8.83	31.81	7.23
2 (Age 8&9)	COM	95	23.65	9.75	25.91	8.55	28.73	6.55
3 (Age 10&11)	COM	108	21.05	8.54	27.95	21.09	28.69	9.83
4 (Age 12&13)	COM	100	23.08	8.81	27.71	7.53	28.66	6.31
5 (Age 14&15)	COM	101	23.40	9.24	28.05	7.49	28.77	7.56

Table - 2(b)

Age Group	Sex	n	S&A		TMC	
			Mean	SD	Mean	SD
1 (Age 5,6&7)	COM	111	34.58	6.83	49.17	9.45
2 (Age 8&9)	COM	95	30.09	5.62	45.06	9.10
3 (Age 10&11)	COM	108	30.31	5.67	42.87	9.04
4 (Age 12&13)	COM	100	28.77	4.84	43.55	8.40
5 (Age 14&15)	COM	101	27.15	4.19	44.94	9.17

Abbreviation: FMC: Fine Manual Control, MC: Manual Coordination, BC: Body Coordination, S and A: Strength and Agility and TMC: Total Motor Composite.

Conclusion

Age 8 and 9 years showed highest prevalence of Developmental coordination disorder followed by Age 12 and 13 years. This difference in various age group is not statically significant.

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