



THE PREVALENCE OF DEVELOPMENTAL COORDINATION DISORDER IN SCHOOL GOING CHILDREN OF WEST INDIA

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ABSTRACT

Development specifies maturation of functions. It is related to the maturation and myelination of the nervous system and indicates acquisition of a variety of skills for optimal functioning of the individual.¹ 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 this study is to find out the prevalence of DCD on BOT-2 in 5 to 15 years school going children. : It was a cross-sectional analytical study conducted in schools of Pimpri-Chinchwad area. This study included 516 students assessed by Using BOT-2nd edition. Prevalence of DCD was 1.16% (95%CI 0.43% to 2.51%). Where as female showed more prevalence of Developmental coordination disorder than Male

KEYWORDS: *Prevalence, Developmental coordination Disorder , School going childrens, motor proficiency.*



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INTRODUCTION

Growth is an essential feature of life of a child that distinguishes him or her from an adult. The process of growth starts from the time of conception and continues until the child grows into fully mature adult. The terms growth and development are often used together. These are not interchangeable, because they represent two different fact of dynamics of change, i.e; those of quantity and quality. Growth and development usually proceed concurrently, but may not always be interrelated¹. 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 condition². 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 1992³ and has been included in the diagnostic manuals of the American Psychiatric Association since 1989⁴. "Developmental coordination disorder (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 (eg, cerebral palsy) and are in excess of any learning difficulties is present⁵. 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.⁶ The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) provides four criteria to classify a child as having DCD⁴. The difficulties may be considered to be mild, moderate or severe. Even though this condition is observed by many school teachers, as well as physical and occupational therapists, it is not an easy diagnosis to make due to multi-faceted diagnostic criteria and terminology problems⁶. Outcome measurements used to assess gross motor development in infants and children up to age 5, including the Peabody Developmental Motor Scale⁷, second edition and the Alberta Infant Motor Scale⁸. When children age out of either the PDMS-2 or the AIMS, one standardized assessment option physical therapists have is the Bruininks-Oseretsky Test of Motor Proficiency, second edition⁹⁻¹¹. (BOT-2nd). The test-retest reliability and internal consistency of the total scale were excellent, with an Intraclass correlation Coefficient ICC of 0.99 (95% confidence interval) and alpha of 0.92. The BOT-2 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 diagnosticians⁹⁻¹³. 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% worldwide¹³⁻¹⁷. 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. Aim of the study is to find out Point score of all subtest motor component, Descriptive category of Composite & Total Motor Composite component by using BOT-2nd in school going children Among Genders & according age group

MATERIALS & METHODOLOGY

The Cross Sectional analytical study was conducted in Pimpri Chinchwad area of age group 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 healthy school going children. Exclusion criteria were neurological trauma like spinal fractures, any visual problem, or any congenital deficit. BOT-2nd kit used for assessment.

PROCEDURE

Institutional Ethical committee approval (reference No; DYPCPT/324/2016) was taken to conduct the study. 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. Subjects were selected on the basis of multistage sampling method. In the first stage, 3 English & 3 Marathi schools were selected randomly out of 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 was 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. BOT-2nd was used to assess children's motor proficiency. The BOT-2 (53 items, 8 subtests and 4 four motor-area composites; score range = 0-320 points) fine manual control (FMC), manual coordination (MC), body coordination (BC) and strength and agility (SA). Subjects were assessed for these tasks and these raw score were converted to a numerical point score. Descriptive analysis done by using manual, they are categorized in to WAA- Well above average, AA- Above Average, A - Average, BA- Below Average, WBA- Well Below Average. Data from all subjects was entered in to computer database & analyzed with SPSS statistical Package (version 14.0). Data analyzed by using percentage, mean & standard deviation from total number of sample.

RESULTS & OBSERVATION

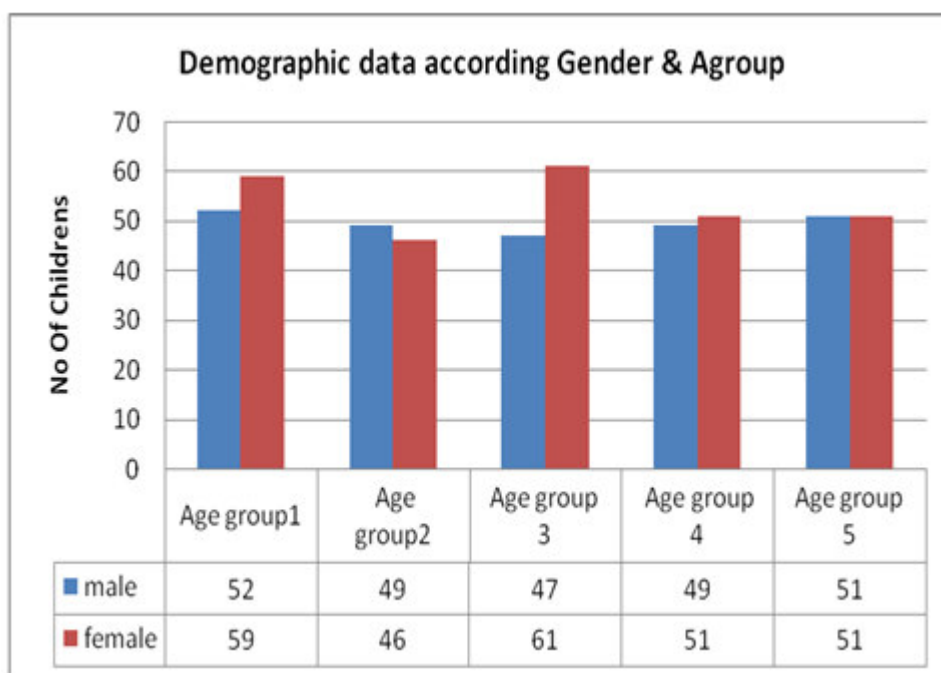


Figure 1
Demographic Data according Gender & Age Group

Table 1
Mean and standard deviation of subtest point score by Age group and Gender

Age Group.	Sex	N	FMP		FMI		MD		ULC		BLC		B		RSA		S	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	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	17.35	3.66	31.00	4.94	24.25	4.46	24.04	4.95
	M	59	25.44	5.95	24.76	7.24	19.19	6.08	19.68	9.09	32.81	7.37	30.59	5.99	24.44	4.76	24.15	4.95
	F	48	23.37	5.66	25.21	7.91	19.19	5.36	13.77	8.05	30.67	6.97	31.46	3.38	24.04	4.12	23.90	4.98
2 (Age8&9)	COM	95	30.56	6.40	30.61	6.72	25.08	4.56	27.47	8.32	19.60	6.62	33.43	2.57	29.94	4.39	24.61	4.75
	M	46	30.24	6.21	31.33	6.45	24.59	5.13	30.89	7.25	29.96	5.72	33.33	2.46	31.04	4.81	25.85	3.31
	F	49	30.86	6.63	29.94	6.97	25.55	3.94	24.27	8.04	27.57	7.12	33.53	2.69	28.90	3.71	23.45	5.57
3 (Age 10&11)	COM	108	32.08	5.82	33.06	5.04	29.16	4.51	32.23	6.04	20.95	3.20	33.20	4.17	33.99	4.93	26.52	4.92
	M	61	31.92	6.63	33.61	5.51	29.64	3.91	34.90	3.99	30.97	7.55	33.62	4.60	35.00	4.76	27.46	4.77
	F	47	32.30	4.62	32.36	4.32	28.53	5.16	28.77	6.50	25.72	11.59	32.66	3.52	32.68	4.89	25.30	4.90
4 (Age 12&13)	COM	100	35.33	5.79	34.10	5.71	32.62	4.50	34.02	4.25	22.04	3.28	33.43	2.21	34.67	4.49	27.38	5.54
	M	51	34.78	5.04	35.55	4.34	33.63	4.25	35.63	2.75	28.90	6.14	33.59	2.03	36.51	3.56	28.57	5.24
	F	49	35.90	6.48	32.59	6.57	31.57	4.56	32.35	4.88	28.41	6.53	33.27	2.39	32.76	4.59	26.14	5.63
5 (Age 14&15)	COM	101	36.36	5.45	35.24	4.88	33.78	4.05	35.39	3.82	21.88	3.05	34.20	2.32	34.81	4.55	28.44	3.73
	M	51	37.51	4.96	34.92	5.18	33.49	4.80	36.41	3.47	29.57	6.17	34.41	2.18	36.84	3.96	29.25	3.42
	F	51	35.22	5.71	35.55	4.59	34.08	3.15	34.37	3.92	27.98	8.73	33.98	2.45	32.78	4.22	27.63	3.88

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

Table2
Mean and standard deviation of Composite & Total Motor composite standard score by Age group and Gender

Age Group.	Sex	n	FMC		MC		BC		S&A		TMC	
			Mean	SD	Mean	SD	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	34.58	6.83	49.17	9.45
	M	59	27.25	7.92	28.27	7.15	32.81	7.37	35.24	5.71	51.88	9.68
	F	48	23.42	7.45	23.29	9.83	30.67	6.97	33.83	7.90	46.10	8.24
2 (Age 8&9)	COM	95	23.65	9.75	25.91	8.55	28.73	6.55	30.09	5.67	45.06	9.10
	M	46	25.46	9.28	28.96	8.88	29.96	5.72	31.83	5.47	48.39	8.87
	F	49	21.96	9.96	23.04	7.21	27.57	7.12	28.47	5.32	41.94	8.24
3 (Age 10&11)	COM	108	21.05	8.54	27.95	21.09	28.69	9.83	30.31	5.67	42.87	9.04
	M	61	22.97	9.28	29.41	8.65	30.97	7.55	31.49	6.05	46.54	9.42
	F	47	18.55	6.78	26.06	30.51	25.72	11.59	28.77	4.77	38.11	5.78
4 (Age 12&13)	COM	100	23.08	8.81	27.71	7.53	28.66	6.31	28.77	4.84	43.55	8.40
	M	51	23.92	8.24	30.63	7.22	28.90	6.14	30.22	4.22	45.69	7.33
	F	49	22.20	9.37	24.67	6.65	28.41	6.53	27.27	5.02	41.33	8.92
5 (Age 14&15)	COM	101	23.40	9.24	28.05	7.49	28.77	7.56	27.15	4.19	44.94	9.17
	M	51	24.16	9.07	29.84	8.08	29.57	6.17	27.25	4.68	45.45	7.47
	F	51	22.65	9.44	26.25	6.43	27.98	8.73	27.04	3.69	44.43	10.65

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

Table 3
Prevalence of Developmental coordination Disorder DCD (Motor Deficit)

Motor Deficit	Present	Absent	
N=516	%	1.16	98.64

Figure 2
Prevalence of Developmental coordination Disorder DCD (Motor Deficit)

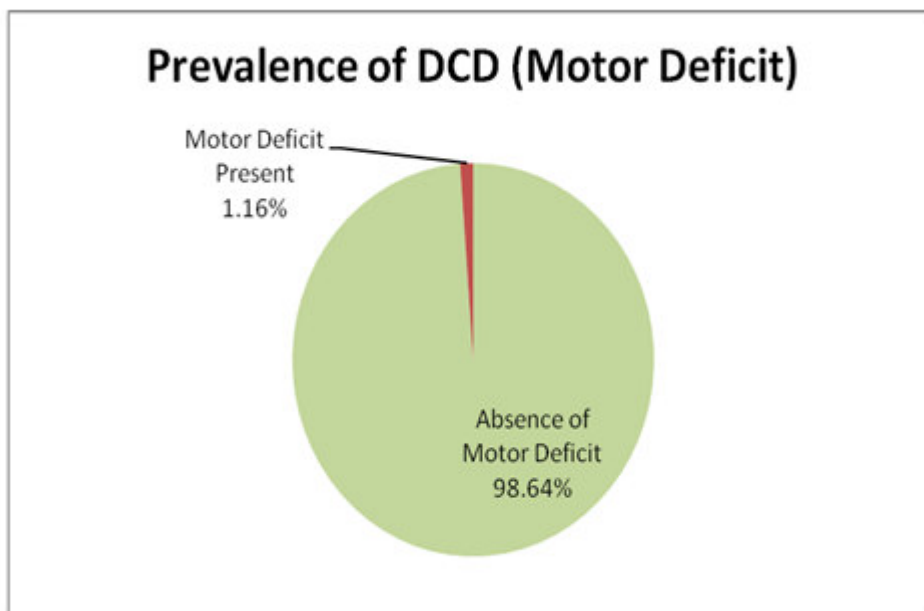


Figure 3
Descriptive category of Children on motor Proficiency According Gender

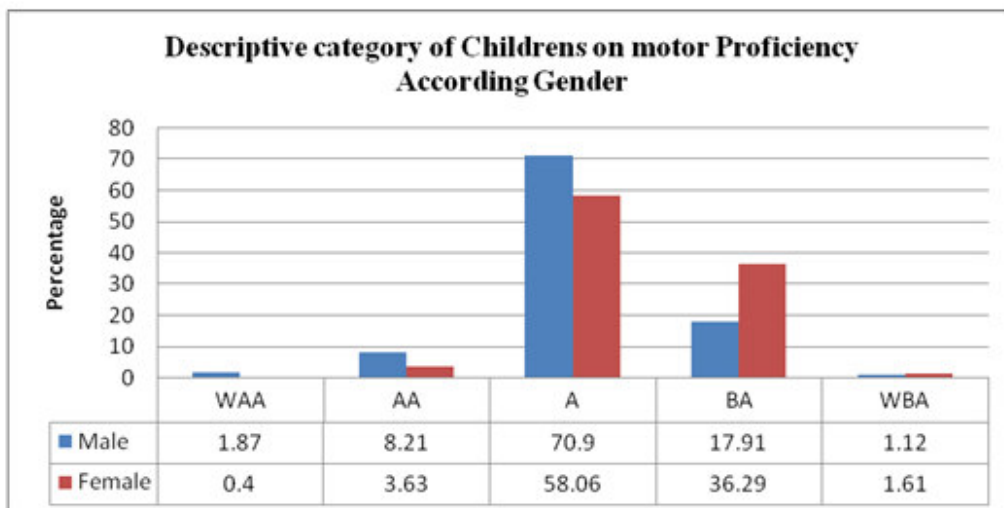


Figure 4
Prevalence of DCD among Male And Female

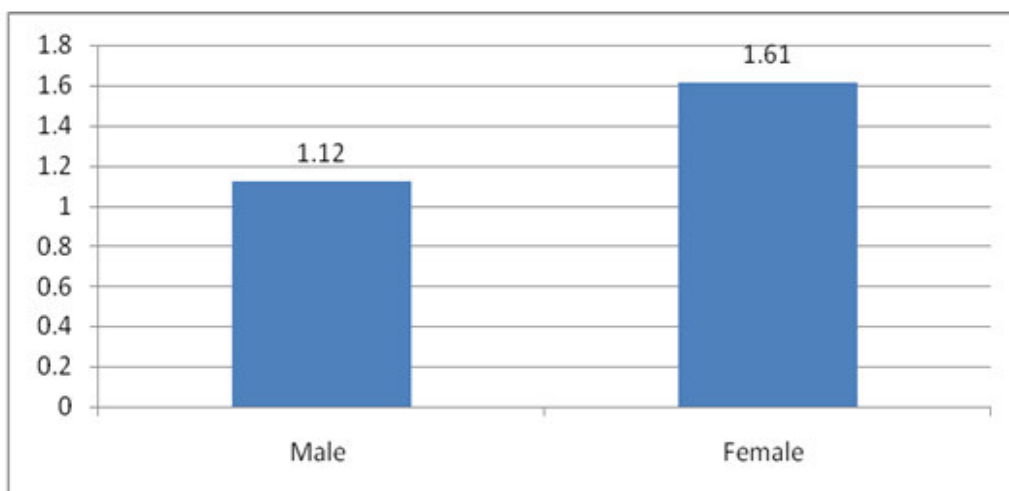


Figure 5
Descriptive category of Children on motor Proficiency According Age Group

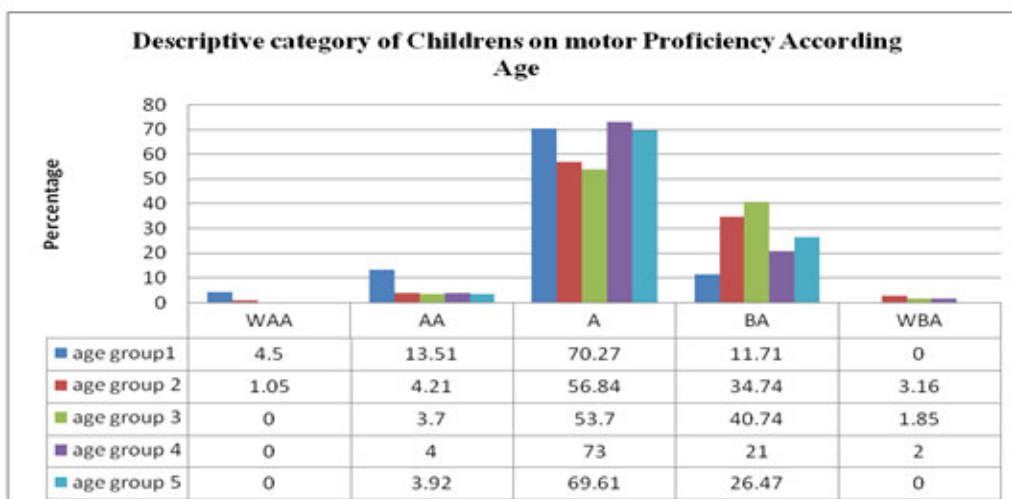
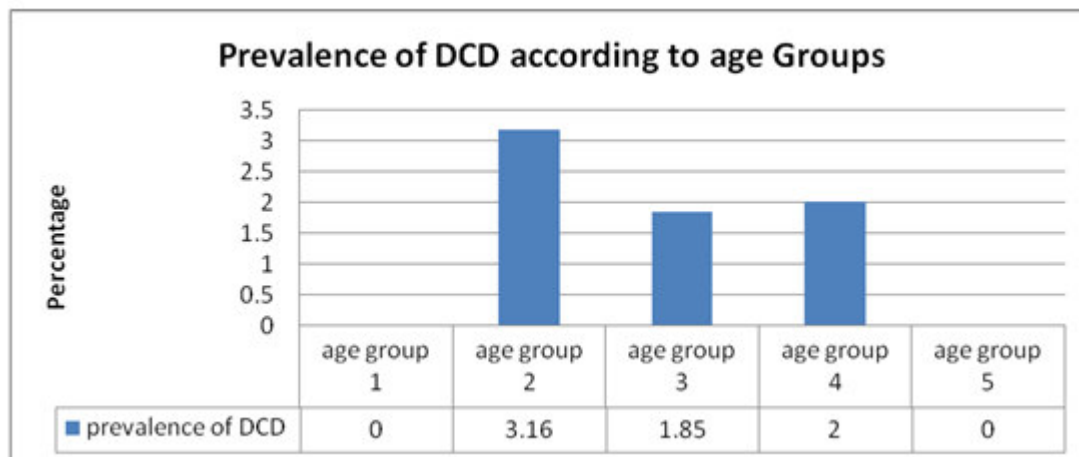


Figure 6
Prevalence of DCD among Age Groups



DISCUSSION

The present study was carried out with the aim 1) To find out point score & Descriptive category of all subtest motor component by using BOT-2nded. 2) To find out the prevalence of Developmental coordination disorder by using BOT-2nded in 5 to 15 yr of school going children, and 3) To find out prevalence of developmental coordination disorder according age group and gender. 1stgraph showed Five hundred & sixteen children (Mean age =10.67 years, SD = 3.03) participated in this study among that 248 & 268 were male & female respectively. Table 2 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 control¹⁸. 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 & 5 having higher age, they had significantly performed better in comparison to Age group 1,2&3 boys & 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&3 will have less motor quality than that of Age group 4 & 5 because of structural and functional differences with the higher age groups¹⁹ 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 children²⁰. Moreover, the motor performance is related to body stature, body weight, growth spurt, body composition, cardiovascular fitness and muscle strength²² hence as age increases point score of motor proficiency also get increases. Standard score, Descriptive category of all composite component & total motor composite did not showed any linear pattern of motor development with age growth because Brenda N. Wilson concluded Standard Score & 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 a accurate measure of change.¹⁸ In this study, we found Prevalence of DCD by Using BOT-2nded. was 1.16% (95% CI 0.43% to 2.51%) from 516 children as they fall under Well below average descriptive category i.e motor deficit. This result showed the similar findings of the study done by Girish, Srilatha et al who showed prevalence of DCD in children between ages of 6-15 years attending mainstream schools in a school district in southern India using criteria of Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition (DSM-5) was 0.8% in Southern India²². Another study conducted by Sankar U et.al. found out the prevalence rate of Developmental Coordination Disorder (DCD) at Kattankulathur among 5 - 10 years of age group by using The Developmental Coordination Disorder Questionnaire (DCDQ) was 1.37%¹⁵. Another study conducted by Georgia D. Tsiotra et.al. investigated whether lifestyle differences between Canadian and Greek children are mirrored in DCD screening results. As compared with their Canadian peers (8%), Greek children exceeded expected DCD prevalence rates (19%) for pediatric populations^{16,23}. Greek children demonstrated greater prevalence rates as they were relatively inactive compared with their peers from other countries²⁴⁻²⁵. Limited physical activity may result in a decline in selected fitness-related parameters and deterioration in motor skills acquisition²⁷. Present study also showed that females are having more prevalence of DCD than males, however this difference is not statically significant as P=0.915 by Fisher's Exact test. These performance differences in males and females can be due to the nutritional status, as the dietary intake of boys is more than that of girls. (satabdighosh et al 2013)²⁷. Nutritional status appear to be significant predictor for both fine and gross motor development²⁷. Similar observations have been reported by other research workers in children of different countries (Bobbio et al., 2007; Chowdhury, Wrotniak, & Ghosh, 2010; Pollitt et al., 1994;)²⁸⁻³⁰. Nutritional status

may alter the learning process by influencing brain development and physical growth and accordingly modify the movement proficiency of the children by adjusting the strength, power, coordination and perception²⁶. Our study result are in accordance with Girish, SrilathaRaja et.al as in their study prevalence of DCD with girls (1.1%) affected more than boys (0.5%) at confidence interval of 95%. Girls were twice affected than boys²². Some researchers stated that girls with low socioeconomic status were less competent in locomotors skills compared with their high socioeconomic status peers (Hardy et al., 2012; Mészáros et al., 2008)³¹. However difference among gender in present study was not statistically significant. It is difficult to make exact comparisons between countries because the estimated prevalence is highly influenced by the means of assessment and the type of sample recruited. Developmental coordination disorder in various age group did not show statically significant difference as $P=0.219$. However Age 8 & 9 yr showed highest prevalence of DCD (3.16%) followed by Age 12 & 13yr (2%). The Indian children underperformed 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) variations³². In Bilateral Coordination component no children were found in well Above Average category (WAA) because scale score was not given for this category even though they scored maximum in Bilateral coordination point score. So need to establish normative data for Indian population is suggested. Limitation of the present study was socioeconomic status, Cardiorespiratory Fitness & 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.

CONCLUSION

Prevalence of DCD by Using BOT-2nd ed. was 1.16% (95% CI 0.43% to 2.51%), where as female showed more prevalence of Developmental coordination disorder than Male.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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