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Validation of diagnostic assessment tool for developmental coordination disorder

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***Abstract*---**Objective: To establish the validity of Developmental Coordination Disorder (DCD) assessment tool in Indian context Method: This study was a quantitative research design. Thirty samples were included through simple random sampling to examine concurrent validity and discriminant validity of diagnostic assessment tool for developmental coordination disorder Results: Data was analyzed using SPSS (version 30). There was a positive correlation between Diagnostic assessment tool for developmental coordination disorder and BOT-2. There was significant difference in typically developing and developmental coordination sample on diagnostic tool for developmental coordination disorder. Conclusion: Diagnostic tool for developmental coordination disorder has good concurrent validity and correctly discriminate typically developing sample performance from Developmental coordination sample. It depicts that discriminant validity was adequate. Further normative and validation studies can be done to strengthen psychometric properties,

***Keywords*---**diagnostic tool, DCD, concurrent validity, discriminant validity, typically developing, developmental coordination disorder.

Introduction

Long term impact of DCD includes psychiatric morbidity and other disorders like Affective anxiety disorder, borderline personality disorder, Withdrawal, depression and suicidal risk [1].Children with motor coordination defect experiences poor perception of self and considers themselves as poor and physically unfit to execute the simple activities of daily living task that other typically developing

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peer group children perform with ease. As a result of frequent failure in academics and sports they isolate themselves from others.

The issue of co-occurring conditions with developmental coordination disorder is one that provokes innumerous debates. Evidence from literature search indicates that there is an overlap of developmental coordination disorder with other neurodevelopment disorders. Kirby et al documents in Canadian population study that 23% of primary school children were identified with signs of DCD and 8% of children were diagnosed as attention deficit hyperactive disorder (ADHD) and 19% of children met the diagnostic criteria of dyslexia [2].

About 25% of primary school children were affected and found to have all three. 10% of children were identified with ADHD and DCD and they documented that there is an overlap between developmental coordination disorder and joint hyper mobility syndrome [3]. However on the past 15 years there is documented evidence that there is an overlap of DCD with reading, attention and motor defects [4].

There are provoking debates on analyzing the overlapping disorders like social, emotional and behavioral, anxiety problems with developmental coordination disorder. Various research questions were on debate, Are children with developmental coordination disorder were at risk of having adolescent anxiety? [5] However fine motor factors were not assessed which raise the debates on consistency of the tool and a review study by Lachambre C, questioned the distinction between gross and fine motor items and concluded that BOTMP has little value in delivering scores [6-7].

TOMI- Test of Motor Impairment which is the predecessor of the M-ABC which didn't differ from MABC and it is found to be useful in identifying children with motor defects. However for children with low birth weight and learning disabilities higher impairment score is found [8]. DCDQ- Developmental Coordination Disorder Questionnaire evaluates the parent's perception of their children's skills in daily life. However the scores of DCDQ correlated well with BOT in 68% of children [9].

Researchers in 2000 evaluated the children using two tools, where the results identified the lack of consistency between the two assessment methods. For the preschool children included, results in their motor score were in normal limit when evaluated with BOT but the children had impairment score when evaluated with MABC. However many children identified by the M-ABC had attention disorders as well. Mandich Poltajko, Macnab and Miller found that MABC identifies movement difficulties in Developmental coordination disorder more precisely than BOT-2 [10]. Monisha and Ganapathy sankar developed diagnostic tool for developmental coordination disorder in 2021. The purpose of the study was to examine concurrent validity and discriminant validity of diagnostic tool for developmental coordination disorder

Method

This study was a quantitative research design. Ethical clearance was obtained from Institutional ethical committee of SRM Medical college Hospital and Research center to conduct this research work. Ethical clearance number was 1755/IEC/2019.The purpose of the study was explained to head of the institution to carry out validation study in their institute. Informed consent form was obtained from parents/caretaker of samples. There is no gold standard diagnostic tool for developmental coordination disorder. But BOT-2 tool was used to identify movement difficulties in developmental coordination disorder. Hence BOT -2 tool was considered as standardized tool for developmental coordination disorder. Subtest of Diagnostic tool for developmental coordination disorder was correlated with subtest of BOT-2 test to establish concurrent validity of diagnostic assessment tool for developmental coordination disorder. BOT-2 and diagnostic assessment tool for developmental coordination disorder was administered to 30 samples. Further ,Diagnostic assessment tool for developmental coordination disorder was administered on 30 typically developed samples and matched developmental coordination disorder samples to establish discriminant validity. Simple random sampling method was used to select samples for this study from mainstream school and learning disability school. Developmental Coordination Disorder Questionnaire was used to identify DCD samples from learning disability school.

Materials used

Developmental coordination disorder questionnaire (DCDQ)

Developmental coordination questionnaire was used mainly to screen the samples with the disorder in motor coordination. Wilson et al developed DCDQ and the questionnaire comprises of 15 items and total maximum score is 60. The questionnaire is valid and reliable to use for the evaluation of motor coordination difficulty and The DCDQ is intended to use for children with 5 - 15 year age group. For a total of 287 parents of children with typical development this DCDQ was administered. Logistic regression modeling was used to generate separate cut-off scores for three age groups (overall sensitivity = 85%; overall specificity = 71%).

BOT-2

BOT-2 measures fine and gross motor proficiency, with subtests that focus on stability, mobility, strength, coordination, and object manipulation. The test is tailored to school-aged children and young adults among the ages of 4-21 years, who have varying motor control abilities ranging from normal to mild or moderate. BOT-2 has good reliability and validity.

Results

Table No. 1. Comparison of diagnostic assessment tool for developmental coordination disorder with BOT 2

	Static balance –BOT 2	Dynamic Balance – BOT 2	Gross motor coordination– BOT 2	Fine motor coordination– BOT 2	Visual motor coordination– BOT 2
Muscle power	0.899	-	-	-	-
Movement	-	0.977	-	-	-
Inhand manipulation	-	-	0.816	-	-
Gross motor skill	-	-	-	0.844	-
Eye hand coordination	-	-	-	-	0.823

$p \leq 0.01$ level

Pearson correlation coefficient was used to correlate subtest of diagnostic assessment tool of developmental coordination disorder and subtest of BOT-2. The results showed that there was positive correlation between subtest of diagnostic assessment tool of DCD and BOT-2 at 0.01 level.

Table No.2. Comparison of typically developing and Developmental coordination disorder on diagnostic assessment tool for Developmental coordination disorder

Subtest	Groups	Mean	Standard Deviation	't'	Level of significance
Muscle power	Typically developing	10.2111	.70000	35.121	0.000
	DCD	2.6600	1.21223		
Movement	Typically developing	21.0000	2.13222	45.231	0.000
	DCD	2.4500	1.65477		
Inhand manipulation	Typically developing	21.2200	1.23111	65.215	0.000
	DCD	1.0200	1.10111		
Gross motor skill	Typically developing	11.2000	.74521	90.100	0.000
	DCD	.2400	.53212		
Eye hand coordination	Typically developing	3.2100	.52121	40.224	0.000
	DCD	.2100	.23411		

$p \leq 0.000$ level

Independent 't' test was used to compare the typically developing and developmental coordination disorder sample. The results showed that there was significant difference between typically developing and developmental coordination disorder sample on diagnostic tool for developmental coordination disorder at 0,000 level.

Discussion

Executing the activities of daily living skills demands no strenuous effort but for children with developmental coordination disorder executing the simple task of buttoning the shirt and tying the shoe lace as well as handling a spoon demands repeated learning to master the skill. The experience of repeated failure in executing the task that demands motor coordination makes the children stressful. Increasing interests over the children with DCD necessitates understanding of the cause, diagnostic methods, child's academic performance, and long term impacts[11]. Over the past, innumerous terminology was directed towards the identification of children with DCD. The characteristics displayed by the children were awkward in movements, poor at games, poor handwriting and difficulty in concentration. These characteristics were focused as a common ground for understanding the children with DCD in the past [12]. American Psychiatric Association and World Health Organization have framed inclusion and exclusion criteria for children to be diagnosed as DCD. In 2013, the criteria for diagnosing children with DCD were more refined by the publication of DSM-5.The complexity in organizing, sequencing and coordinating the task that demands motor coordination skills needs early identification and intervention [13].

Developmental coordination disorder has got a resurgence of attention in recent years, understanding its etiology gained substantial interest among researchers. The literature search documented with wide variation in terminology used to interpret the children with developmental coordination disorder [14]. These variation in terminology used resulted in studying the underlying cause for developmental coordination disorder difficult. Developing an appropriate treatment approach for the child's motor coordination defect is also difficult.

Monisha and ganapathy sankar developed diagnostic tool for developmental coordination disorder in 2021. Correlation of subtest of BOT-2 and Diagnostic tool for developmental coordination disorder showed that there was a positive correlation between developed diagnostic tool for developmental coordination disorder and BOT-2.It depicts that concurrent validity of diagnostic tool for developmental coordination disorder was good. The new diagnostic tool for developmental coordination disorder is required less time for administration compare to BOT-2. Further , there was a significant difference in subtest score between diagnostic tool for developmental coordination disorder and BOT-2.it depicts that new developed diagnostic tool correctly discriminate typically developing sample with developmental coordination disorder sample. Literature identified that DCD samples exhibits problems in muscle power, movement, in hand manipulation, gross motor skills and eye hand coordination [15]. This may influence study results.

Conclusion

Diagnostic tool for Developmental Coordination Disorder has good concurrent validity and correctly discriminate typically developing and developmental coordination disorder sample performance on DCD assessment. Further normative and validity studies can be done to strengthen validity of diagnostic

tool for developmental coordination disorder. It can be replicated in other diagnostic group and other geographical region.

Author Contribution
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