

Assessment of In-Hand Manipulation in children with Developmental Coordination Disorders in Indian Context

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ABSTRACT

Objectives: To evaluate the In-Hand Manipulation skill in children with developmental coordination disorder in Indian context. **Method:** 8 children with Developmental Coordination Disorder were enrolled in the study. Convenient sampling procedure was used to select the children. After getting informed consent signed, these children have undergone baseline evaluation using BOTMP. Based on the poor scores on the BOTMP Children were classified as DCD, 5 children with were included into the study as they scored poorer on BOTMP and these children were assessed. TIHM-R was examined for all the participants to evaluate the in-hand manipulation skill in DCD children. **Results:** In-hand manipulation of children with DCD is poor when compared to their peer groups. **Conclusion:** The present study concluded that children with DCD not only vary from normally developing children in their Postural adaptation and motor skills but the in-hand manipulation skill is the most difficult task to achieve in this group of children

Key words: In-Hand Manipulation skill, Developmental Coordination Disorder, Children, Indian Context, TIHM-R

I.BACKGROUND

Hand of the human is the most vital instrument to perform all the activities of daily living and in executing the thoughts into action. Hand is considered as an effector organ. As hand functions when considered were innumerable. Hand is said to perform countless works through the primary action called prehension. It performs continuum of activity in fine motor component and all these activity needs in-hand manipulation (IHM). IHM is defined as the ability of hand to orient the objects by manipulating the same within the hand through translation, rotation and shift¹. By alternating the movements of fingers and palm all these 3 classified manipulations can occur in hand. In Translation, object is in motion by the coordinated movements of fingers and palm and for the translation to occur, the object will be linear movement. Shift of the object grasped with the hand can happen by alternating the movement between fingers and thumb pads. In rotation, an object is moved around one or more axes and the ability to hold one or more objects in the palm is denoted by "stabilization". All these activities like shift and rotation is divided into simple and complex². Researchers around the past have used two tests in identifying IHMS in children with DCD and this test measures the fine motor component. IHM is needed for children as well as adults to perform various recreational activities and also in work. Academic achievement of children with DCD depends on their IHM skill.

METHOD

The children with DCD were included in the study if they met the DSM IV criteria for DCD (APA, 1994). After signing the informed consent form and explaining the assessment procedures to the parents and guardians, baseline assessment of all the children's has been performed with MABC; it identifies more children with learning and attention problems. It contains behavioral checklist and teacher checklist that addresses environmental context. Prior to the commencement of detailed assessment of IHM in DCD, all children underwent neurological examination to exclude children with pervasive developmental disorder and the integrity of cranial nerves has been examined in detail and documented³. Further, the children were identified as DCD based on their poor scores on the Movement Assessment Battery for Children, 8 children with DCD scored below the 15th percentile score on the MABC and these children has been included to participate. Children with Upper limb deformity and any previous surgery in upper limbs have been excluded from the study. TIHM-R is used to assess the IHM in children

with DCD

TABLE 1- DEMOGRAPHIC DATA BETWEEN CHILDREN WITH DCD

S.NO	VARIABLE	CHILDREN WITH DCD- MEAN VALUE
1	AGE	7.8
2	BMI	30
3	PA SCHOOL	4
4	IQ SCORE	79
5	MABC PERCENTILE	6

PROCEDURE

All the included participants has been assessed with MABC, It is the gold standard assessment tool in identifying children with DCD. After recruiting Children from local schools in and around Chennai. Teachers and parents were asked to fill up a given questionnaire and that assess the child's preferred hand for activities of daily living. Handedness has been influenced by the cultural constraints, however even left-handed children are forced to use their right hand for certain eating, and while offering things to another person. For the fine motor activity, children use his/her right or left hand, by which the handedness can be evaluated⁴. Children were excluded from the study if they have history of sensory loss and having difficulty to understand test instructions. Assessment of IHM skills in done with the help of TIMH-R, it is a 47 item subtest and scored on a 4-point ordinal scale was formulated for scoring. The scale ranges from 0 to 3.

TABLE 2- TIMH-R PARAMETERS OBSERVED IN CHILDREN WITH DCD.

S.NO	VARIABLES	SCORING CHILD A	B	C	D	E
1.	Shift (with stabilization)	1	0	1	0	1
2.	Shift(without stabilization)	0	0	0	1	0
3.	Simple rotation (with stabilization)	0	1	1	1	1
4.	Simple rotation (without stabilization)	0	0	0	0	0
5.	Complex rotation (with stabilization)	0	1	1	1	1
6.	Complex rotation (without stabilization)	1	1	1	1	0
7.	Finger to palm translation (with stabilization)	1	1	1	1	1
8.	Palm to finger translation (without stabilization)	0	0	0	0	0
9.	Palm to finger translation (with stabilization)	1	0	0	1	0
10.	Complex rotation (without stabilization)	1	0	1	0	1
11.	Complex rotation (with stabilization)	0	0	0	0	0
12.	Finger to palm translation (without stabilization)	1	0	0	0	1
13.	Finger to palm translation (with stabilization)	1	1	1	1	0
14.	Palm to finger translation (without stabilization)	0	0	0	1	2
15.	Palm to finger translation (with stabilization)	1	1	1	1	1
16.	Complex rotation (without stabilization)	1	1	1	1	1
17.	Complex rotation (with stabilization)	1	1	2	2	1
18.	Simple rotation (without stabilization)	0	0	0	0	0
19.	Complex rotation (without stabilization)	1	1	1	1	0
20.	Finger to palm translation (without stabilization)	0	0	0	0	1

	stabilization)					
21.	Finger to palm translation (with stabilization)	2	1	1	1	0
22.	Palm to finger translation (without stabilization)	0	1	2	1	0
23.	Palm to finger translation (with stabilization)	0	1	1	1	0
24.	Finger to palm translation (with stabilization)	0	1	1	1	2
25.	Palm to finger translation (without stabilization)	1	0	0	0	0
26.	Palm to finger translation (with stabilization)	1	1	1	1	1
27.	Finger to palm translation (without stabilization)	2	2	1	1	0
28.	Finger to palm translation (with stabilization)	0	1	0	0	0
29.	Simple rotation (without stabilization)	1	2	0	0	0
30.	Finger to palm translation (with stabilization)	1	1	1	1	1
31.	Palm to finger translation (with stabilization)	0	0	0	0	0
32.	Simple rotation (without stabilization)	1	1	1	1	0
33.	Simple rotation (with stabilization)	0	0	0	0	0
34.	Complex rotation (without stabilization)	1	1	1	1	1
35.	DO	0	0	0	0	0
36.	Complex rotation (with stabilization)	1	1	1	1	2
37.	DO	1	2	1	2	1
38.	Shift (with stabilization)	1	1	1	1	1
39.	Simple rotation (with stabilization)	0	0	0	0	0
40.	Shift (without stabilization)	1	1	1	1	1
41.	DO	2	1	1	1	1
42.	Simple rotation (without stabilization)	0	1	2	3	1
43.	DO	0	0	0	0	0
44.	DO	0	0	0	0	0
45.	Simple rotation (with stabilization)	1	2	1	1	1
46.	Complex rotation (without stabilization)	1	1	1	1	1
47.	Simple rotation (without stabilization)	1	0	0	0	0

DISCUSSION

Few research has been done in handwriting difficulties faced by children with DCD as all the children with DCD have paid assessment for their motor component and this creates a lag in research of the fine motor and gross motor component to rule out the difficulties in writing a short paragraph. Much debate has been on research in DCD children, shows that in-hand manipulation and handwriting skill will be affected in all these children of same age group. Aim of this current study was on the assessment of handwriting skill. In this study it was proved that DCD children performed significantly more poorly on the TIMH-R test on determining the in-hand manipulation skills. It has been clearly examined that differences parameters of TIMH-R was poorer among children with DCD⁵. However, in the current study we examine the extent to which these the assessment measures were able to record the In-hand manipulation skill. No significant correlations study was done to compare the relationship of In-hand manipulation and handwriting kills. Indeed the International Guidelines for DCD provide a list of useful tools for assessing handwriting difficulties in children with DCD, all of which require the completion of a handwriting task rather than visual perceptual measures (Blank et al., 2012). From the table 2, it has been evident

that these children find it hard to shift objects within the hand to perform activity of daily living and they had poorer scores in academic examination because of poor handwriting skill. The research in this study indicates that not only the tests of visual motor integration and visual perception do not appear to be related to poor handwriting performance in children with DCD⁶. However further research needs to be carried out in children by comparing the in-hand manipulation skill and academic achievement.

CONCLUSION

The study concluded that children with DCD can learn simple sequential movements but it would be interesting to examine form in-hand manipulation skill. There is a lag in the development of standardized assessment tool for the evaluation of in-hand manipulation skill, as none of the assessment tool has evaluated the hand size. The findings of this study suggest that there are other factors which may explain In-Hand manipulation skill is difficulties in children with DCD and further investigation is needed.

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