Evaluation of gait in children with and without Developmental Coordination Disorders in Indian Context

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ABSTRACT
Objectives: To compare the gait pattern in children with and without developmental coordination disorder. Method: Five children with typically developing children and Developmental Coordination Disorder participated in the study. Convenience sampling procedure was used to select the participants. the children were classified as DCD based on their poor scores on the Movement Assessment Battery for Children, 5 children with DCD scored below the 15th percentile score on the MABC and these children has been invited to participate. Clinical test of Sensory interaction on balance was examined for all the participants to evaluate the postural sway in DCD children.Results: Gait pattern of children with DCD showed they have higher cadence when compared to their peer groups. They have difficulty in body configuration resulted in DCD children's to appear more bent than in their typically developing children.Conclusion: The present study conlcuded that children with DCD not only vary from normally developing children in their overall level of stride length and cadence but that the level of variability across the two limbs is significant.
Key words:Gait,Developmental Coordination Disorder,Children,Context

I.BACKGROUND

Walking from place to place without tripping or falling over is an essential skill needed in everyday life. Some children have difficulty in achieving this task and they find walking as a difficult and complex task in life. Amongst these are children with Developmental Coordination Disorder (DCD). DCD children's have difficulties with fine and gross motor skill without marked neurological disorder and they don't have any intellectual impairment. Common Skills those DCD children's finds complexity in achieving are tying up shoelaces, playing with their peer group, driving a bicycle and the most problematic skill cited as for this Children are handwriting. Majority of research work has highlighted that these children without proper evaluation they have the persistent difficulty in motor skills in adolescence and early adulthood.

Teachers and parents who are the first population to rule out the clinical features observed in children with DCD. They were commonly referred by the teachers as clumsy, awkward in walking. Therapist working with these children have identified different gait pattern as compared to typically developing children. When gait pattern is evaluated in detail, they found to have difficulty in walking, when certain new object has been interfered in their walking space in a familiar environment. They reported to have frequent sway, stumbling and hitting to objects in the pathway. Difficulty in activity of daily living is complex for these children.

In the present study the walking pattern of 5 children with developmental coordination disorder (DCD) was investigated and compared to that of 5 typically developing children in the same age group. All children have been asked to walk at their own pace. Normally developing children has covered the 10 meter hallway at the shorter duration of time and they have normal step length, stride length and cadence. But children with DCD walked with shorter steps and at a higher cadence than the typically developing children.

II.METHOD

The children with DCD were recruited if they met the DSM IV criteria for DCD (APA, 1994). Before being referred to as DCD, all children underwent neurological examination to explore neuromuscular or neurological dysfunctions. A prior examination of balance, peripheral reflex and integrity of cranial nerve has been done. Further, the children were classified as DCD based on their poor scores on the Movement Assessment Battery for Children, 5 children with DCD scored below the 15th percentile score on the MABC and these children has been invited to participate. Clinical test of Sensory interaction on balance was examined for all the participants to evaluate the postural sway in DCD children

TABLE 1- DEMOGRAPHIC DATA BETWEEN CHILDREN WITH AND WITHOUT DCD

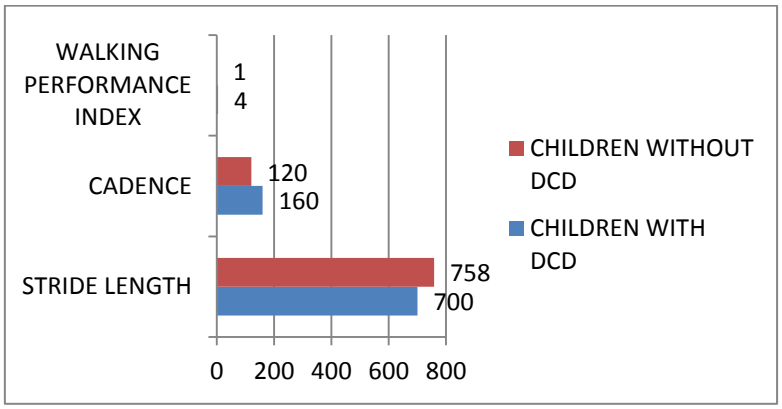
S.NO	VARIABLE	CHILDREN WITH DCD- MEAN VALUE	CHILDREN WITHOUT DCD- MEAN VALUE
1	AGE	6.5	6.5
2	BMI	20	25
3	PA SCHOOL	3	5
4	IQ SCORE	75	80
5	MABC PERCENTILE	7	59.1

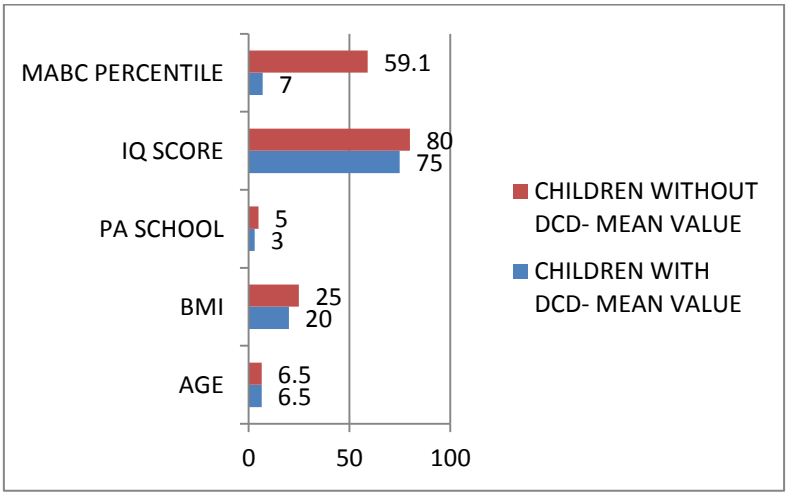
III.PROCEDURE

After testing the children with the MABC. A practice walk has been given for them before an hour of testing , researcher have highlighted that habituation occurs during the first minute of locomotion and all these children needs a practice walk to produce a stable walking pattern. Initially children's were asked to walk at their own pace along the 10 m hallway and after becoming familiar with the movement in hallway , they were given instruction to walk in between the two lines of tape fixed in a hallway. Physical activity questionnaire was completed by all the children with the assistance of at least one of their parents. This questionnaire determines the degree and nature of the physical activity of the child. All parents gave their written informed consent prior to participation and the children assented to the testing. Children with DCD have increased trunk flexibility during gait cycle. They have difficult in maintaining the COM within the BOS during walking. Children will make adaptations to their gait pattern to compensate for problems with balance control. On observation it is evident that during toe-off phase of ground clearance DCD children have less pronounced plantar flexion of the ankle. Developmental Coordination Disorder (DCD) shows greater variability of foot placement measures and movement of the centre of mass within the BOS, because of the motor coordination difficulty while walking in a new environment on the initial trial. Initially after a trial walk to make the hall way and the environment habitual for the children, they were given instructions to walk up and down a flat 10-m-long pathway for 1 min, it is observed that they have a disproportionate movement of feet and trunk.Gait pattern of children with DCD were prominent with wider steps, walking time to cover the 10 m hallway is double the timing as compared to children without DCD, they have higher amount of time spent in double stance and in stride time. These children have higher acceleration compared to their peers. These children have higher incidence of fall because of difficulty in controlling the COM and they lack the ability in coordinating the trunk and limb movements.

TABLE 2- MEAN VALUE OF GAIT PARAMETERS OBSERVED IN CHILDREN WITH AND WITHOUT DCD.

S.NO	VARIABLES	CHILDREN WITH DCD	CHILDREN WITHOUT DCD
1	STRIDE LENGTH	700	758
2	CADENCE	160	120
3	WALKING PERFORMANCE INDEX	4.00	1.00





IV.DISCUSSION

In summary, gait pattern of children with DCD showed they have higher cadence when compared to their peer groups. They have difficulty in body configuration resulted in DCD children's to appear more bent than in their typically developing children. These differences on observing child with DCD is due to the problems at the neuromuscular or postural control level and by observing all these children with DCD it is proved that gait pattern of children with DCD is adaptive, it is also shown that each child will not have the same adaptations and each one will have variation in gait pattern. Individual child with DCD will have their own kind of adjustment to keep trunk and limb to perform the coordinated movements during walking .The present results indicate that even a fairly easy locomotors task can challenge children with DCD. Whereas they seem to have found strategies to cope with their movement difficulties in a structured, uncluttered environment, it might be clear that these strategies could fail in daily living environment and in performing physical or sport activities. It is also evident through observation, that greater variability in the movement would occur in more distal limb segments. Difference encountered in gait pattern between children with DCD and normal developing child is seen in stance phase. This deference might be due to variability in the movement of distal limb segment. Children with DCD may exhibit greater variation in ankle control during stance phase as compared to normal developing peers, the reason behind this difference is still in debate and further research is needed to test this hypothesis.

V.CONCLUSION

This result of this evaluation suggests that children with DCD not only vary from normally developing children in their overall level of stride length and cadence but that the level of variability across the two limbs is significant. This study has proved that children with DCD have difficulty in producing consistent movement patterns for the right and left legs in stride to stride phase. Further research is needed in evaluating the gait pattern with increase in sample size and making the children to get habituation with treadmill.

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