



## Evaluation of Multiple Interacting Factors Associated with Developmental Coordination Disorder (DCD)

Ganapathy Sankar U, Monisha R\*

SRM College of Occupational therapy, SRM Institute of Science and technology, SRM Nagar, Kattankulathur - 603203, Kanchipuram, Chennai, Tamil Nadu, India



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### ABSTRACT

Developmental coordination disorder is termed as a motor functioning disorder and it shows a major impact on motor learning and functioning. The aim of the current research is to have a critical analysis of the developmental coordination disorder using ICF model. However DCD is identified by functional limitations, there are associated factors which were left unattended. We discuss the participation restriction, body function and structural defects and other contextual factors associated with DCD. It has been highlighted that primary and secondary defects associated with developmental coordination disorder among children is due to the factors which depends on the cognitive and neurological structures. Personal and environmental factors associated play a major role in motor learning and acquisition. To design intervention for individual adult and children with developmental coordination disorder, there is need for consideration of the multiple interacting factors associated with developmental coordination disorder and understanding the primary and secondary factors that deteriorate the health of children with DCD needs attention. Psychological impairment is the factors which are identified at the front line. However while designing intervention sessions, there is a need to consider the psychosocial aspect of the individual with DCD.

### \*Corresponding Author

Name: Monisha R

Phone: 9940228679

Email: [dreamsfuture000@gmail.com](mailto:dreamsfuture000@gmail.com)

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### INTRODUCTION

Majority of the parents of children with developmental coordination disorder wish to have their child, who enjoys independent motor task execution. But as they mature, they will be given opportunity to learn and execute motor task. However, with-

out early assessment and intervention, these children once they mature, find difficulty to get proficiency in executing motor skills ([American Psychiatric Association, 1994](#)).

Developmental coordination disorder (DCD) is having a complex etiology and it is a motor disorder, which affects nearly 6-7% of primary school children's of age 5-10 years. It was termed as delay in acquisition and execution of motor skills. Inattention along with motor defect adds complexity to DCD ([Ferguson, 2014](#)).

Diagnosis is based on DSM-5 criteria of developmental coordination disorder. By comparing the age matched peer group, children with DCD have problems with planning and performing motor task. The impact of facing difficulty in executing motor task will have consequences in social, psychological and cognitive development. These secondary problems will persist into adult life ([Missiuna et al., 2008](#)).

When exploring the problems faced by children with DCD in detail, it has been highlighted that there defect in motor impairment will manifest in various ways in different environmental context. When cross cultural studies were evaluated, it has been proved that difference in performance and difference in assessment exist (Wilson *et al.*, 2009).

DCD is always heterogeneous and however various researchers tried classifying the children into various types. Based on the functional problems, researchers tried classifying children with DCD. When previous research evidence is examined, it has been proved that few children have problem with balance and other children experience difficulty in manual dexterity (Caravale *et al.*, 2014).

Thus, there are debates on classifying children into various subtypes of DCD. However, the classification will depend on the associated variables. When the developmental aspects of the child are examined, there are two ways, the development can be explored. Contextual and individual factors. Individual factors include body structure, function, level of cognition and other physical functions. Contextual factors include the environmental factors (Tseng *et al.*, 2010). The aim of this paper is to analyze the manifestations of DCD by considering various factors and components associated with it.

The component which was analyzed in the current study is,

1. Body structure,
2. Function,
3. Activities and participation,
4. Environmental factors
5. Personal factors.

## METHODOLOGY

Impairment in body structure will have a significant deviation from the general body function. When defect in the body structure was assessed in children with DCD, there are few hypotheses left out. Researchers have concluded that micro-structural damage exists at brain for children with DCD and that results in motor defect. Few researchers stated that intrinsic developmental defect exist in growing brain and that leads to motor coordination difficulty (Engel-Yeger *et al.*, 2010).

Many researchers have examined the neurological basis of DCD and left with a hypothesis that problem in motor behavior is due to defect on cerebellum, parietal cortex or basal ganglia. However minimal evidence is documented for the same. In 2011,

Chirico found that no difference in structure of heart for children with and without DCD. No structural difference was found (Saraiva *et al.*, 2013).

Children with DCD have problems in mental functioning and it affects the ability in performing various motor skills. They have reported to have anxiety problems and they are at risk of having inactive lifestyles and ends up with having a greater incidence of cardiovascular defects. Low motivation makes the children inactive and they perceive themselves inadequate and thus avoid participation with peer group in academics as well as play (Vaivre-Douret, 2014).

Various emotional defects reported among children with DCD include stress, anxiety, depression, low self esteem. These emotional problems persist into adulthood and are considered as secondary consequences of DCD. When evaluating the body functions, the functional capacity of the cardio respiratory system is impaired in children with DCD. PFT Values denotes a generalized decrease in FVC and FEV1 values among children with DCD as compared to their age matched peer group children (Bronfenbrenner and Morris, 2006).

When the function of bones, joints and muscles were evaluated, their exist a greater prevalence of joint hyper-mobility and these children with DCD have poor joint position sense. Muscle strength, power and endurance are generally reduced among children with DCD. Environmental factors include technologies and products of natural environment, social relationship, attitudes, systems and policies. A personal factor includes internal factors related to gender, age, copying strategy, educational status and social background (Rosenbaum and Stewart, 2004).

## DISCUSSION

DCD presents with multifaceted secondary consequences. Impaired functioning experienced by a child with DCD is directly related to impairment in body function. Poor motor skill experienced by children with DCD is related to contextual factors. Identifying the relationship between multiple factors was attempted. From the review of literature (Figure 1).

It has been highlighted in the current study that rather than impairment in body structure and function, activity limitation and participation restriction requires an immediate attention among multidisciplinary team members. As the children with DCD consider themselves as less adequate and will not participate in any physical activity with peer group,

Impairment in Body structure



Impairment in body function



Activity limitation



Participation restriction

**Figure 1: Sequence of multiple Factors & Results**

tend to isolate themselves in schools as well as in home. Parents were not aware of the consequences, if their child stays at home without participating in play at green lands. Few mothers restrict their children with DCD from participating in green land play. Thus the children lacks exposure of vitamin D and many researchers have highlighted that these children have low level of vitamin D status and have fragile bones and muscles (Martin *et al*, 2006).

The current review established that impairment in motor skill acquisition will affects all domains of life. When domains of mobility, recreations tasks were considered, the ability to perform the tasks was directly related to movement and sensory functions of the child. For a child with DCD, the ability to perform functional tasks was impaired and it affects the mental functions in tasks like time management, executing the motor skill in a specified time period and mathematical skills. There is a reciprocal relationship exists for activity restriction and impairment in body functioning.

It is a cycle, were movement, sensory, motor and cognitive functions are the primary impairments that develop further as secondary consequences. Secondary impairments affect the body's structure and function. Cardio-respiratory impairments reported in children with DCD are secondary consequences to poor motor control.

## CONCLUSIONS

Activity and experiences are well known factors that affect the connectivity and this have important implications for rehabilitation of children with DCD. Preventive and interventions can be targeted for these children by analyzing these multiple interacting factors.

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## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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