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**Long Term Memory Difficulties and DCD Diagnosed
Children, Is There Any Relation?**

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Abstract

Developmental Coordination Disorder (DCD) is defined as a developmental disorder characterized by difficulties in motor skill performance with a prevalence of 5% in children. These difficulties affect function of daily activities as well as academic achievements, such as writing skills. Although the disorder is expressed by difficulty in acquiring new motor skills, there are those who hypothesize that DCD can be associated with the long term procedural memory system and is not limited to the motor system. The procedural memory was also found impaired among developmental disorders which come in high co-morbidity with DCD such as specific language impairment and attention deficit hyperactivity disorder.

The term "motor skill learning" denotes a series of processes that bring about relative and absolute changes in the ability to move skillfully. These changes are initiated through motor learning processes that involve cognitive aspects. In order to achieve efficient motor control, the child must first learn the skill and then practice it multiple times until the execution of the motion becomes fast, fluid, and does not require attention. The formation of long term memories of motor and cognitive skills acquired via the procedural memory system.

The current study evaluates the formation of long term procedural memory learning during the motor skill acquisition process, using a grapho-motor task known as "Invented letter task". The study investigated differences in the learning process in 16 children with DCD and 16 children with typical development (TD) at four stages: before and after practice (the first session) and in two additional sessions; twenty-four hours and one week after the initial training. Previous research found correlation between DCD and executive functions. As executive function deficits are highly common in DCD, another aim of this study was to check the child's ability to transfer the acquired knowledge from the present task to a similar task with different performance conditions. In addition to evaluating the child's learning process after a week, three transfer tasks were tested.

Throughout the duration of the research, results indicate that children with DCD when compared with the control group were consistently slower at performing the tasks. Procedural learning abilities in both groups improved in performance speed at the fast

learning stage as well as the later stages when memory consolidation was required a day later and a week later. These findings suggest that children with DCD and TD matched peers, use a similar mechanism when learning the task. However, results of the three transfer tasks demonstrate difficulties experienced by the children with DCD in adjusting to the changes in performance conditions of the task. This difference could not be explained by a different cognitive ability between the two groups. The groups demonstrated similar cognitive and executive function abilities and similar associations were found between the motor learning abilities of the task and the three transfer tasks.

These findings call for a renewed investigation of the hypothesis explaining motor difficulty in DCD in relation to the characteristics of procedural learning. Implications of this study suggest a dedicated protocol for supported learning for the children with DCD. In this protocol, additional repetitions would be required and additional support would be offered for tasks requiring skills transfer to a similar task in different conditions. This would enhance performance ability in skill learning to the level of that in TD children.