Effectiveness of Visual Memory Training For Primary School Children with Developmental Coordination Disorder (DCD)

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ABSTRACT

Developmental coordination disorder is a term that refers to a Motor coordination disorder manifested by significant unexpected, specific and persistent difficulties in the acquisition and use of practical motor skills, which is most needed for academic performance among primary school children with DCD. This current research aims to determine the effectiveness of visual memory training in children with DCD- Developmental coordination disorder. Ten children with DCD (N=10) were recruited from the year 2016 June to December 2016 through convenient sampling. DCDQ was used to include the children in the study. Children were enrolled in a visual memory training programme of 24 sessions, one hour per session continued for three a week for eight weeks. Visual memory training revealed statistical significance on reading, visual memory and reading comprehension skills (t= -4.346; p<0.05; t= -3.356, p<0.05 and t= -5.265, p<0.05 respectively) and also suggested a statistically significant difference and the association between reading skills, visual memory skills and comprehension skills (F=20.234, p= 0.000). The study concluded that visual memory training had a significant effect on visual memory skills which have an impact on academic performance.

INTRODUCTION

Developmental coordination disorder is a term that refers to a Motor coordination disorder manifested by significant unexpected, specific and persistent difficulties in the acquisition and use of practical motor skills, which is most needed for academic performance among primary school children with DCD. Difficulties exist in reading (dyslexia), writing (dysgraphia) or mathematics (dyscalculia) abilities despite conventional instruction, intact senses, High intelligence, proper motivation and adequate social, cultural opportunity (American Psychiatric Association, 1994).

DCD Children initially were termed as a clumsy child. Teachers used to refer these children as awkward. DCD is a real problem for the child’s academic integrity; few parents never discovered and understood the lifelong difficulties the child is about to experience in areas as reading, math, written expression and in comprehension (Sankar and Monisha, 2018)

DCD will be considered as a diverse group of disorders in which children who had the highest intelligence have problems processing information or generating output. Their etiologies are multifactorial and reflect genetic influences and dysfunction of brain systems (Sankar and Monisha, 2019). Physiotherapist and occupational therapist were on finding out the therapeutic interventions to deal with...
the child’s motor coordination difficulty. There is a need to find out and develop awareness on DCD through educational programs, methods of diagnosis, and policies that stand to improve services to people with DCD and ultimately their academic performance (U, 2020b).

A child with DCD has shows cluster of symptoms which do not disappear as they grow older these includes discrepancy factors, academic learning difficulties, perceptual disorders, meta-cognitive deficits, memory problems, phonological deficits, motor disorders, attention problems, and social, emotional problems Shankar and Monisha (2019).

Pediatric occupational therapists diagnose and treat DCD children with visual perceptual difficulties. Difficulties in this skill area like play and recreational activities and in completing school-related work and accomplish age-related developmental tasks can persist and if left without much attention can affect the child physical and psychological well being. Visual memory is an essential visual cognitive function, and it plays an essential role in a student’s day to day life. For reading and writing skill, a child with DCD must possess an excellent visual perceptual skill for academic integrity. Visual attention and visual discrimination are the other two crucial visual cognitive functions (U, 2020a).

The relation between the visual memory and academic performance different perspective exists; different researches prove the positive correlation between academic execution and visual memory, Visual perception plays a significant role in school learning, particularly in reading. Most of the reading programs developed for students with or at risk for reading disabilities focus almost exclusively on building decoding skills; Researches on the nature of reading suggests that reading comprehension consists of a dynamic interaction among three elements Various studies conducted on primary school children with DCD reveal that there is a critical problem learning to read and write (U, 2020c).

Students with DCD regularly encounter poor comprehension because of their inability to peruse deliberately and to screen their comprehension while perusing suddenly. Reading comprehension is a vital component for the transition of an individual from schooling to adult responsibilities. The reason for the difficulty in reading comprehension is stated as not due to the deficiency of cognitive skills but due to inefficiency to process information effectively. Peer-Assisted Learning Strategies, which is a compere coaching program that involves collaborator reading plan, paraphrase summing-up and other such tasks to facilitate applying strategies have shown great betterment of reading comprehension (Bernardi et al., 2018; Fong et al., 2016).

**METHODODOLOGY**

After obtaining ethical clearance from SRM College of occupational therapy, SRMIST in 2018. The study is bought into a design. It is a quasi-experimental intervention study. Ten children with DCD (N=10) between the age group of 5 to 10 years participated in the study from Kids therapy centre and special school through Non-probability sampling. The children were allotted to the visual memory training program for two months. DCDQ is used to screen children with DCD, and if any child is found to be present with a pervasive developmental disorder and intellectual difficulty has been excluded from the study. Reading comprehension components of NIMHANS SLD INDEX and Visual Memory Component of NIMHANS SLD INDEX is used as an outcome measures (Wilson et al., 2013)

The purpose of the study was explained to the parents and authorities. A written consent form was obtained from the parent as required. Ten children (N = 10) diagnosed with DCD were randomly chosen for visual memory training. Table 2 depicts the demographic distribution of participants. The data collection lasted for eight weeks, and after the intervention, the primary investigator administered the post-test data using NIMHANS SLD INDEX to assess the reading, reading comprehension and visual memory.

Ten participants received Visual memory training which consists of 24 sessions thrice a week, 1 hour each session for eight weeks (Table 1). Activities for visual memory training for experimental group children were planned out depending on children’s ability and performance.

**Statistical Methods**

The data were analyzed using the statistical package for social science (SPSS 22.0 Version). Descriptive statistics were used to examine data distribution and to summaries the data. Paired “t” test was used to find out the mean difference between groups. An alpha level of p=.05 is considered to be statistically significant. A parametric test, ANOVA was used to analyze whether there is a statistically significant difference between the components of SLD index (reading, reading comprehension and visual memory)

**DISCUSSION**

Visual memory revealed the levels of learning by the practice among all participants. Therapist direc-
Table 1: Description of Intervention protocol

| Visual Memory                          | Description                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Identifying missing object             | The therapist will display objects which are familiar to the child, ask him to observe all of it for a few seconds. Later therapist asks the child to close the eyes and remove one or two items from it and ask the child to find the removed objects. It will repeat with different objects, numbers or alphabets. |
| Repeating patterns or reconstructing a pattern from memory | Show or display pattern and ask the child to imitate or reconstruct the pattern.                                                               |
| Stories from picture and sequencing the story | Display the flashcards with different sequences of a story display randomly and ask him to arrange in order later ask the child to explain it. |
| Finding the right match                | Provide a few pair of cards, that make sense after pairing it and ask the child to match it and why it was done that.                           |
| Enumerating seen objects or flashcards | Provide him a few minutes to observe any actions or flashcards then later ask him to explain what actions happened or what’s there is a flashcard. |
| Constructing puzzles                  | Simple to tricky puzzles can use based on the child capacity to join and form its clear image.                                               |
| Ordering from memory                   | Therapist arranges a few objects, shapes or cards in order then ask the child to pick one by one and place it on the table placed far away.   |
| Complex visual memory games            | Different games that were having rules, regulations and clear structure.                                                                        |

Table 2: Distribution of demographic variables

| Variables                  | Participants N = 10 | Total % |
|----------------------------|---------------------|---------|
| Sex                        |                     |         |
| Male                       | 5                   | 100%    |
| female                     | 5                   | 0%      |
| Age                        |                     |         |
| 5-6                        | 5                   | 40%     |
| 7-8                        | 5                   | 50%     |
| 9-10                       | 0                   | 10%     |
| Medium                     |                     |         |
| English                    | 0                   | 0%      |
| Tamil                      | 10                  | 100%    |
| Syllabus                   |                     |         |
| State board                | 2                   | 20%     |
| CBSE                       | 8                   | 80%     |

Table 3: Identifying baseline data of visual memory, reading and reading comprehension skills among children with DCD.

| Variable                  | N   | MEAN | SD   |
|---------------------------|-----|------|------|
| Reading                   | 10  | 3.50 | 1.531|
| Reading comprehension     | 10  | 0.40 | 0.324|
| Visual memory             | 10  | 5.00 | 0.996|
Table 4: Comparison of pre-test and post-test data of visual memory among children with DCD

| Variable       | Mean | N  | Std. Deviation | Std. Error | "t"-test | "p"-Value |
|----------------|------|----|----------------|------------|---------|----------|
| Visual Memory  | Pre-test | 5.00 | 10 | 0.996 | 0.321 | -3.153 | 0.001* |
|                | Posttest | 10.00 | 10 | 2.345 | 0.987 |

Level of significance p ≤ 0.05

Table 5: Comparison of pre-test and post-test data of reading comprehension among children with DCD

| Variable      | Mean | N  | Std. Deviation | Std. Error | "t"-Test | "p"-Value |
|---------------|------|----|----------------|------------|---------|----------|
| Reading       | Pre-test | 0.40 | 10 | .324 | .067 | -5.034 | 0.000* |
| Comprehension | Post test | 1.50 | 10 | .888 | .260 |

Level of significance p ≤ 0.05

*significant

Table 6: Comparison of pre-test and post-test data of reading among children with DCD

| Variable     | Mean | N  | Std. Deviation | Std. Error | "t"-Test | "p"-Value |
|--------------|------|----|----------------|------------|---------|----------|
| Spelling     | Pre-test | 3.50 | 10 | 1.531 | .486 | -3.765 | 0.0001* |
|              | Posttest | 7.60 | 10 | 1.567 | .645 |

Level of significance p ≤ 0.05

Concentration and guidance are of importance in achieving this process using various forms of activity engagement to facilitate the teaching-learning process. The result obtained on the comprehension aspect of illustration was statistically significant. Although, the significant level was limited compared with the other two variables (i.e., Visual memory & reading ability) with (p<0.05) (Tables 3, 4, 5 and 6). The reading comprehension outcome variability one of such was a study conducted by Karen, L., 2015 proves that Reading Comprehension can be influenced among Secondary Students with Disabilities owing to the following factors (working memory, vocabulary, prior knowledge, word recognition, reading strategies, and motivation-to-read). The main finding factors were suggestive of cognitive and affective factors that influence the reading comprehension of the disabled population. Knowing this serves as guided factors before baseline selection of this study procedure (Sman et al., 2013).

Visual memory training had a significant effect on the academic performance of children with a learning disability. This was supported by the results that were obtained from the comparison of pre-test and post-test scores. The visual memory training program specifically targeted the reading comprehension skills of children with a learning disability, which results in an excellent academic performance. The visual memory training can be implemented in different levels of educational institutions to improve the academic performance of the students. The training program can be targeted on a specific population of students who have not performed well in their previous exams. The visual memory training program can be graded based on the age of the student and the academic requirement of a student or institution (Hyde and Wilson, 2011).

CONCLUSIONS

The study investigated the effectiveness of visual memory training on children with DCD. The children with DCD have deficits in areas of visual memory which is a crucial requirement for reading comprehension. Visual memory training was effective to improve the reading comprehension of children with a learning disability, which may also improve their academic performances.

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Conflict of interest

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

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