



## Effect of Visual Sequencing Activities to improve Academic Performance in children with Learning Disability

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### ABSTRACT

**Background:** Learning disability is a neurological condition which affects the brain's ability to send, receive, and process information. A child with a learning disability may have difficulties in reading, writing, speaking, listening, understanding mathematical concepts, and with general comprehension.

**Objective:** To identify the effect of visual sequencing activities to improve academic performance in children with learning disability.

**Study Design:** The study is quantitative research with quasi-experimental design.

**Methods:** Thirty (30) subjects were selected based on the selection criteria. 15 subjects were in control group and 15 subjects in experimental group. The control group underwent conventional occupational Therapy. The experimental group underwent visual sequencing interventions. Intervention was done for 3 Days in a week, 4 months,. The pre-test and post-test was assessed by academic performance rating scale. The Mann Whitney U test and Wilcoxon test were used to analyse the data.

**Results:** Children analysed in experimental group were n=15 and control group were n=15. The results showed a statistically significant difference between the groups for Academic Performance Rating Scale with mean score of 36.8 in control group and with mean score of 59.2 in experimental group (P=0.0000, Z=-4.6455; CI value 23 to 68). Statistical analysis showed significant changes in experimental group after receiving visual sequencing activity training.

**Conclusions:** The results suggest that the visual sequencing activities can be used as an effective intervention to improve the academic performance in children with learning disability.

**Key Words:** Learning Disability, Academic Performance, Visual Sequencing Activities

**Trial Registration:** Not applicable

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### INTRODUCTION

Occupational therapists play an important role in our communities as they work to enable patients to engage in the meaningful activities of daily life. They step in when a person's ability to live independently is disrupted by illness/injury. With the goal of helping their patient lead more in dependent and active lives, occupational therapists will often specialize in working with a specific patient group, such as older adults, individuals with mental illness or children and youth.

The occupational therapist approaches the first goal, that of improving the child's functional performance, from a unique perspective in which performance is analysed into components of underlying ability and skill. The goal is also viewed from a holistic perspective that considers the supports and constraints of the environment. Occupational therapy begins by examining the child's ability to function in everyday activities. Through observation, testing, and interviewing, information is gathered to elucidate, or missing. The occupational therapist hypothesizes which performance components appear to interfere with the functional abilities of the child.

## **METHODOLOGY**

### **Ethical clearance:**

The study obtained approval from the institutional ethical committee of Saveetha College of Occupational Therapy Ethical clearance No: SCOT/ISRB/053/2021

### **Research design:**

Quasi- Experimental Research Design.

### **Sample:**

The present study was performed at Let's Speak Multispecialty Rehabilitation Center, Kolathur. Totally thirty (30) children with Learning Disability aged 5 to 13 years were recruited through convenient sampling technique. The sample size of this study was thirty (30) children and it has two groups each group consists of 15 children (15 children in the control group and another 15 children in the experimental group).

### **Screening criteria:**

This study used the following inclusion and exclusion criteria in the selection of participant:

#### ***Inclusion criteria:***

- Learning disability children were included.
- Children aged between 5 to 13 years were included.
- Both male and female were included.
- Children studying from 1<sup>st</sup> to 6<sup>th</sup> standard were included.
- Children with Academic Performance Rating Scale scoring < 40 (poor to fair) and 41 to 60 (moderate) were included.

#### ***Exclusion criteria:***

- Children with academic performance rating scale scoring 61 to 80 (Good) and >80 (Excellent) were excluded.
- Severe visual impairments, severe orthopaedic problems in upper limb, severe cognitive involvement, Aphasia and Apraxia were excluded.
- Children with neglect or inattention, musculoskeletal disorder and medical disorder affecting movement were excluded.

## **Instruments used:**

### ***Academic performance rating scale (APRS)***

The purpose of the APRS is a brief teacher questionnaire that provides reliable and valid information about the quality of a student's academic performance and behavioural conduct in educational situations. Separate principal components analyses resulted in the extraction of three components or subscales that were congruent across random subsamples. The Academic Success subscale accounted for over half of the variance which supports the construct validity of the APRS, as it was intended to assess teacher perceptions of the quality of students' academic skills.

### **Data collection procedure:**

Totally thirty (30) subjects were selected according to theselection criteria. The subject's academic performance level is measured using academic performance rating scale from Let's Speak Multispecialty Rehabilitation Center. The samples are divided into two groups, 15 samples in the control group and 15 samples in the experimental group. After the baseline data was obtained the experimental group underwent visual sequencing activity sessions. The therapy consists of 3 sessions per week in alternative days each session last for 45 minutes, the intervention was conducted for 4 months. After the sessions academic performance rating scale is again administrated, to get the post-test values. The pre and post-test values are used to find out the result of the study. The results were computed using IBM SPSS Ver. 23.

### **Treatment protocol forexperimental group:**

SESSION: 1 On observation / pre-test was given.

SESSION: 2 Writing down alphabets and numbers in order.

SESSION: 3 Writing down the before and after numbers & fill in the missing letter in the words given.

SESSION: 4 Arranging similar shapes and colour in order (sequencing) The children were presented with similar shapes and colours and now the shapes were arranged randomly in an order.

SESSION: 5 Sequencing the order of the given-coloured shapes in a string. Along with sliding board games.

SESSION: 6 Repetition of word sequences the child was verbally presented with a series of words and asked to repeat them in order. Two series of two, three, four and five words were presented, analogous to the procedures in a Digit Span task.

SESSION: 7 What will happen next (The open ended scenes help build early communication skills) Picture cards. The child was presented with one card with one picture and the child is asked to talk about that picture and what might have happened after or before.

SESSION: 8 Mathematics - Addition, Subtraction, Multiplication.

SESSION: 9 Writing different languages - Tamil, Hindi, English. In this session, the children were asked to write second language which they are taught in their school or which they have studied somewhere. Only the alphabets of that particular language were written. This was done to check their skills in different languages.

SESSION: 10 Learning the opposites. Indoor games were given to the children i.e., Simon says.

SESSION: 11 What's next (A memory game that develop the habits, logical thinking and storytelling) There are eight sets of different stories. The child was required to sort and explain each card of a set then arrange in proper sequence and narrate the story in their words.

SESSION: 12 Kim's game. (Memory game) Put a selection of objects on a tray up to 10, talk to the child about each object one at a time. The objects chosen should be familiar to the child. Arrange those objects in a random order and tell the child to remember the order of the objects within 30 seconds. Then the objects are covered up with a cloth and shuffled. Now ask the child to arrange those objects in the same order which was kept before.

SESSION: 13 Story narration. In this session the child was asked to narrate a story from the story book which was familiar to the child. Encourage them to communicate their thoughts, feelings and ideas and to ask questions or discuss their thoughts.

SESSION: 14 Gross motor activities, memorize the colour names.

SESSION: 15 Identify the objects given in the chart paper(colour which colour game).

SESSION: 16 Writing down the words dictated. In this session, some familiar words were dictated to the children and were asked to write those words in their paper. Spellings and cursive of the children is checked.

SESSION: 17 Counting backwards. Digit span task the child was asked to repeat back sequences of verbally presented numbers. Two series of two, three, four, five, six and seven digits were used, with the two – digit series acting as practice.

SESSION: 18 Gross Motor sequencing activities Physical activities in which the children were asked to jump, run, or hop and arrange all the given objects in a sequence and order.

SESSION: 19 Writing down the numbers in increasing and decreasing order. The child was given with a set of 7 to 8 numbers randomly and asked to identify and arrange them and write them in increasing and decreasing order.

SESSION: 20 Memorizing the months of the year in forward and backwards order. (Hula hoop jumping game) In this last task the child was asked to recite and write the months of the year in forward and in backwards order. Then the order of the months and spellings of each word were noticed and corrected.

SESSION: 21 Reading and giving directions A fun way to help children learn to give directions is to have them write down how to make a sandwich. The child was asked to write down their instructions. Activities such as brushing your teeth, wrapping a gift, growing a plant etc., were given to the children.

SESSION: 22 Plot Sequence For a plot a sequence activity, the children were paired up, and gave each pair a different short story to read. Once the pairs have read their story, they should list five to 10 plot events from the story in order. After they list those events, they should mix them up, keeping a list of them in order for reference and give their mixed-up events to another pair to try and put them in order.

SESSION: 23 Storyboards In this session, when writing a short story, children were asked to begin with a storyboard of their story. They also can retell a story using a storyboard format. Children enjoy creating storyboards because it gives them opportunities to draw pictures and show some creativity while putting events in order.

SESSION: 24 Origami In this session, Origami, the Japanese art of paper folding, is great way to teach sequencing without relying on the traditional verbal and mathematical skills that dominate most classrooms. To create origami, students have to process directions and proceed according to a specific sequence.

## **RESULTS**

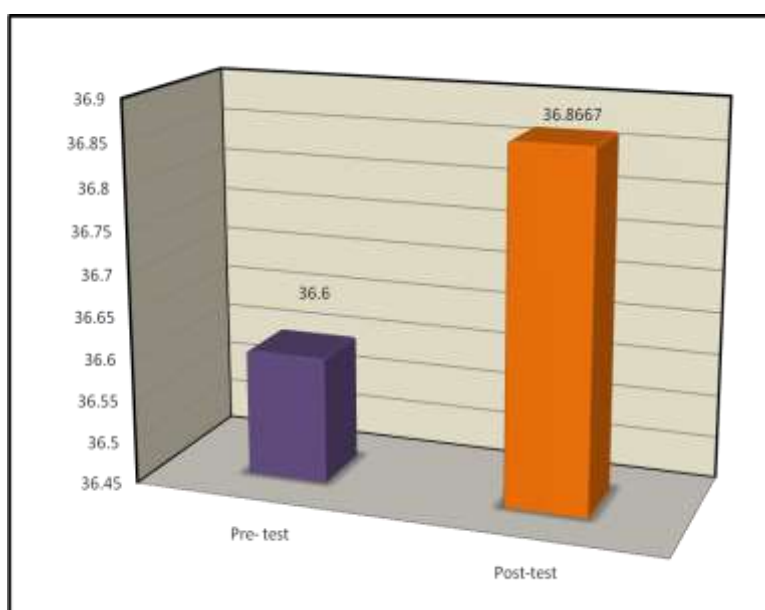
Since the samples belongs to small sample size (30), non-parametric method was used for analysis. Mann Whitney U test was used to test the statistical difference between pre- test and post- test scores in the control and experimental group. The Mann Whitney U test was performed to find statistical difference between control and experimental group. The hypothesis being tested identifies whether there exists statistically significant effect of the treatment being given. An alpha level of  $p= 0.05$  is considered to be statistically significant. IBM SPSS version 23.0 was used for statistical analysis.

**Table (i) : Statistical Analysis of Academic Performance Rating Scale between pre-test and post-test of control group**

Control Group	N	Mean	Std. Dev.	Z Value	P Value
Pre- Test	15	36.6	7.781	-1.265	0.206
Post- Test	15	36.867	8.069		

In **Table (i)** since the p value of 0.206 is greater than 0.05, null hypothesis is accepted. Hence, the results showed that there is no statistically significant difference in control group between pre-test and post-test scores. This maybe because they were undergoing conventional Occupational Therapy interventions.

#### **GRAPH – 4.1 Comparison of Pre and Post-test among Control group**

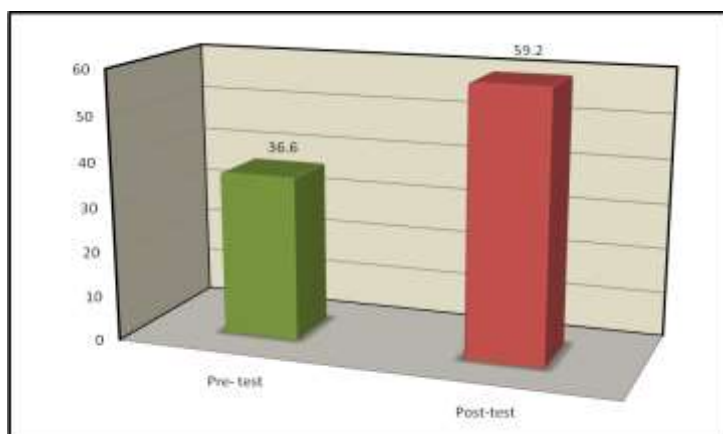


**Table (ii): Statistical Analysis of Academic Performance Rating Scale between pre-test and post-test of experimental group**

Experimental Group	N	Mean	Std. Dev.	Z Value	P Value
Pre- Test	15	36.6	7.781	-3.41	0.001*
Post- Test	15	59.2	5.073		

\*Significant at 5% alpha level

In the Experimental group, since the p value of 0.001 is less than 0.05, alternate hypothesis is accepted. Hence, the results showed that there is statistically highly significant difference in Experimental Group between pre-test and post-test mean scores because of using visual sequencing activities along with occupational therapy intervention resulted in highly significant improvement in Academic Performance.

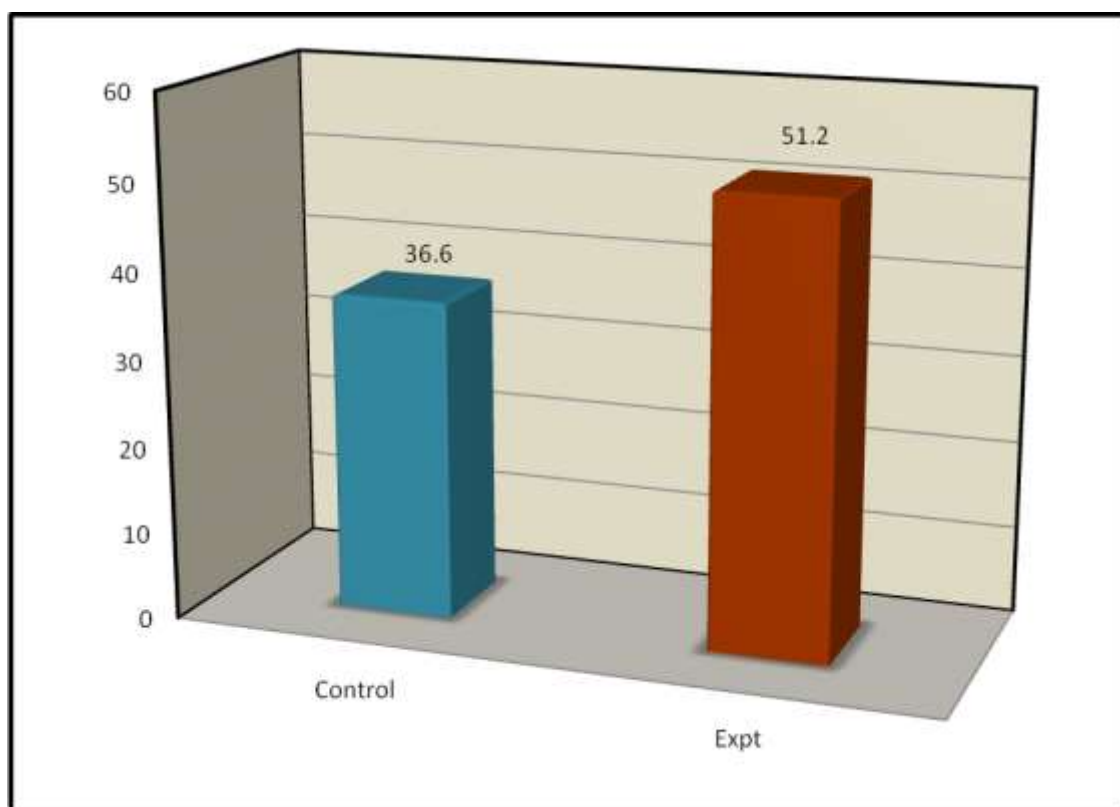
**GRAPH – 4.2 Comparison of Pre and Post-test among Experimental group****Table (iii): Statistical Analysis of Academic Performance Rating Scale between control and experimental group in post- test**

	Group	N (30)	Mean	Std. Dev.	Z Value	P Value
Post- test APRS	Control	15	36.867	8.070	-4.65	0.000*
	Experimental	15	59.2	5.073		

\*Significant at 5% alpha level

Since the p value of 0.0000 is lesser than 0.05, alternate hypothesis is accepted. Hence, the results showed that there is statistically high significant difference in posttest mean scores between Experimental and Control Group. Comparatively Experimental Group is higher than the Control Group because visual sequencing activities were given in the Experimental Group.

**GRAPH – 4.3 Comparison of Pre-test among Control and Experimental group**





## DISCUSSIONS

The objective of the study was to identify the effect of visual sequencing activities to improve academic performance in children with learning disability. The **table (ii)** indicated that, in the Experimental group, since the p value of 0.001 is less than 0.05, alternate hypothesis is accepted. Hence, the results showed that there is statistically highly significant difference in Experimental Group between pre-test and post-test mean scores because of using visual sequencing activities along with occupational therapy intervention resulted in highly significant improvement in Academic Performance and the **alternate hypothesis was accepted**. In **table no. (ii)** results showed that comparison of Academic Performance Rating Scale between pre-test and post-test mean scores among the experimental group which were 36.6 and 59.2 and 'Z' value is -3.41; 'p' value is 0.001. This indicates a statistically highly significant difference, as compared to control group because of using visual sequencing activities along with occupational therapy interventions. **Alternative hypothesis was accepted**. This correlates the study that working memory loads in structured learning activities in the classroom; Frauke De Weerd et al 2013.

Another hypothesis was that effect of visual sequencing activities to improve academic performance in children with learning disability than the conventional therapy. **Table no. (ii)** shows that since the p value of 0.0000 is lesser than 0.05, alternate hypothesis is accepted. Hence, the results showed that there is statistically high significant difference in post-test mean scores between Experimental and Control Group. Comparatively Experimental Group is higher than the Control Group because visual sequencing activities were given in the Experimental group, hence the **alternate hypothesis was accepted**. In **table no. (ii)**, the results shows the comparison of academic performance rating scale between post-test scores among control and experimental group which showed mean value of control group is 36.8 and the mean value of experimental group is 59.2 were statistically significant at the level of  $p = 0.0000$ . This means that visual sequencing activities along with occupational therapy interventions results in a higher level of Academic Performance in children with Learning Disability than conventional occupational therapy. Similar results are supported by a review done by Anne Fischbach et al 2015, who implemented working memory with Learning Disability in reading versus spelling, and also supported by John Everatt et al 2000, who implemented a series of measures for dyslexic in English monolinguals and Sylheti/ English bilinguals. The results shows that the differential effects on treatment groups with visual sequencing activities and that treatment group showing greatest improvement on all dependent variables over an extended period of time.

## CONCLUSION

The study was done to examine the effect of visual sequencing activities to improve academic performance in children with Learning Disability. The study was conducted for 6 months with an intervention period of 3 months. Thirty (30) samples were selected for this study, 15 samples were the control group, and 15 samples were the experimental group. Pre-test and Post-test were conducted in both groups. Pre and post-test were done for both groups using the Academic Performance Rating Scale. The experimental group underwent visual

sequencing activities along with occupational therapy interventions whereas the control received only conventional occupational therapy. The results show that there was a significant improvement in the experimental group than the control group after receiving visual sequencing activities. Thus, this study proves the effectiveness of visual sequencing activities to improve academic performance for children with learning disabilities. The results of the present study indicate that visual sequencing activities can be a useful skill for children who are dealing with poor academic performance. Other studies also show that this kind of technique is effective on treating learning disability.

### **LIMITATIONS**

There were a number of study limitations which have been described. The sample was small and convenient sampling technique was used, hence generalization of effectiveness of virtual reality training program was poor. The study also did not focus on gender based differences that might have had its own impact on the result.

### **RECOMMENDATION**

This study recommended continuous follow-up of participants to identify the effects of therapy on a long-term process. Further, implicating the study on larger probability sample for generalization of the results. The intervention can be given for different paediatric conditions. Studies focusing on the impact of gender or age on the academic performance of children with learning disability.

### **ACKNOWLEDGEMENT**

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