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EFFECT OF VISUAL MOTOR SKILL RECONSTRUCTION PROGRAM ON VISUAL PERCEPTION AND READING SKILLS AMONG CHILDREN WITH LEARNING DISABILITY

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ABSTRACT

Background

Learning disabilities (LD) are neurodevelopmental disorders that impair age-appropriate academic skills, particularly in reading, writing, and visual processing. These challenges often hinder educational progress, with visual perception and reading errors significantly affecting learning. Vision and motor skills are vital for reading and writing, as they require coordinated activities dependent on visual perception and motor functions. Structured interventions, such as visual motor skill reconstruction programs, aim to enhance these abilities to improve cognitive functions. Despite the prevalence of LD, their specific challenges are often inadequately addressed. This study evaluated the impact of a visual motor skill reconstruction program on visual perception and reading skills in children with learning disabilities.

Objectives

This study aimed to assess visual perceptual skills using the Motor-Free Visual Perception Test-4 (MVPT-4), evaluate reading skills using the Manual for Reading-Writing Skills for Pre-primary School Children

(RWSPPSC-s), and determine the effectiveness of a visual motor skill reconstruction program in improving these skills among children with learning disabilities.

Study design

A quasi-experimental study design was employed, involving 30 children diagnosed with learning disabilities by pediatricians or psychologists. The sample consisted of 15 children in the experimental group and 15 in the control group.

Method

Participants were selected based on inclusion criteria. Visual perception was assessed using MVPT-4, and reading skills were evaluated using RWSPPSC-s. The experimental group received visual motor reconstruction training alongside conventional therapies, while the control group received only conventional therapy. The intervention spanned three months.

Result

Statistical analysis showed significant improvements in the experimental group compared to the control group. The "t" value for visual perception was 6.938 with a "p" value < 0.0001, and the "t" value for reading skills was 5.960 with a "p" value < 0.0001.

Conclusion

The visual motor skill reconstruction program effectively improved visual perception and reading skills in children with learning disabilities.

Keywords: Learning Disability, Visual Perception, Perceptual Motor Skills Reconstruction Program, Occupational Therapy

INTRODUCTION

A learning disability is a neurological condition that affects an individual's ability to acquire, process, store, and produce information. These difficulties can interfere with learning basic skills such as reading, writing, and math. Importantly, learning disabilities are unrelated to intelligence and are instead linked to how the brain processes information. Determining the prevalence of learning disabilities in India is challenging due to factors like limited awareness, a lack of standardized screening tools, and regional variations in definitions. Despite these challenges, learning disabilities are recognized as a significant concern, **[1]** affecting an estimated 10–15% of the population in varying degrees. Dyslexia, dysgraphia, and dyscalculia are among the most commonly identified conditions in the country **[2, 3]**. Children with learning disabilities often struggle with reading comprehension, a critical skill for academic success and self-esteem. Literacy challenges disproportionately affect these children,

highlighting the need for focused support **[3]**. Visual-motor skills, or the coordination of visual perception and motor actions, **[4]** are essential for tasks requiring the integration of visual information with physical movements. Weaknesses in visual-motor skills can impact performance in academics and daily activities, such as copying figures, recognizing shapes, or writing letters **[4]**. Difficulties with visual-motor integration may stem from problems in visual perception, motor skills, or the integration of both. Occupational therapists, educators, and healthcare professionals often collaborate to assess and address these challenges through targeted interventions **[5]**. Visual-motor skill reconstruction programs include balanced exercises focused on tone awareness, space awareness and perception, and sensory integration, aiming to enhance perceptual and motor systems **[6]**. Learning disabilities are often associated with alterations in visual perception, which can affect reading levels, comprehension, and accuracy. Children with visual perception deficits may struggle academically, particularly with identifying alphabets or numbers, copying shapes or letters, reading, and handwriting. Occupational therapy plays a vital role in improving these skills, especially for children with dysgraphia, through multisensory training programs **[8]**. This study aimed to evaluate the impact of a visual-motor skill reconstruction program on improving visual perception and reading skills in children with learning disabilities, addressing significant academic challenges and offering a promising approach to enhance their reading, handwriting, and overall development.

METHODOLOGY

The objectives of this study are to assess the visual-motor skills of children with learning disabilities, evaluate their reading skills using the Manual for Reading-Writing Skills for Pre-primary School Children (RWSPPSC-s), and determine the effect of a visual-motor reconstruction program on their visual perception and reading skills. Ethical approval obtained from IRB of Jkk munirajah medical research foundation Ref. no. IEB/OT/ 71/2023. It is a Quasi-experimental study conducted with a convenient sample of 30 children diagnosed as learning disabled. Children were selected according to the selection criteria, in which they were divided into experimental and control groups. Children with Learning Disability diagnosed by pediatricians or psychologists, both male and female children, age groups between 7- 12 years were included. Learning-disabled children with a comorbid condition such as seizure disorder are excluded. Visual perception skills are assessed by the Motor

Free Visual Perception Test **[9, 10]** and reading skills are assessed by the Manual for Reading-Writing Skills for Pre-Primary School Children- RWSPPSC-s **[11]**. The experimental group received Visual motor reconstruction training along with conventional therapies and the control group received only conventional therapy. The Independent variable of this study is the visual motor skill reconstruction program, Dependent variables are visual perception and reading skills of learning-disabled children. Intervention was given for 3 months consisting of sixteen sessions, weekly 3 times, 45 minutes for each session. After the intervention post post-test was done for both the control and experimental group by using MVPT-4 and Manual for Reading-Writing Skills For Pre-Primary School Children-RWSPPSC-s. The data was analyzed and statistically treated with the "t" Test. Visual motor reconstruction program activities include a pip cleaner in the form of a human, a human puzzle, drawing body parts, **[12]** a Felt board with right and left-hand shapes, running left-hand commands on the right leg and vice versa, **[13]** Mirror & blackboard, diagram and reading arrows directions, Following directions, child's bending and balancing on the geometric shapes, **[14]** Shape, letter and number dominoes, design and color play, Sand, clay, and painting with fingers, Eye rotation, penlight, maze, hidden images, Visual memory exercises, thread and bead, Sharp-eyed game, **[14]** Depth perception board, paper pencil exercises.

RESULTS

Table 1 and Graph 1, show the comparison of pre-test values of the control group and experimental group, mean values are 9.53 and 9.27 respectively, and the t-value is 0.606 and p-value is 0.549, which shows it is not statistically significant.

Table 2 and Graph 2, show the comparison of post-test values of the control group and experimental group using MVPT-4. The mean values of the post-test control group and post-test experimental group are 9.6 and 13.73 respectively, and the t-value is 6.938 and the p-value is less than < 0.0001. Therefore, there is a significant difference in the post-test values of visual perception.

Table 3 and Graph 3, show the comparison of the pre-test and post-test of the control group using MVPT-4. The mean values of the control group are 9.53 and 9.60 and t value is 0.32 and the p-value is 0.751, which is not statistically significant.

Table 4 and Graph 4, show the comparison of the pre and post-test of the experimental group using MVPT-4. The mean values of the experimental group's pre and post-test are

9.27 and 13.73 respectively and the value is 10.019 and the value is less than 0.0001. Therefore, there is a significant difference between pre-test and post-test values of visual perception.

Table 5 and Graph 5, show the comparison of the control group and experimental group pre-test mean values by using RWSPPSC - S. Mean values for the control group and experimental group are 13.9 and 14.7 respectively, and the t value is 0.917 and 'p' value is 0.367, which shows it is not statistically significant.

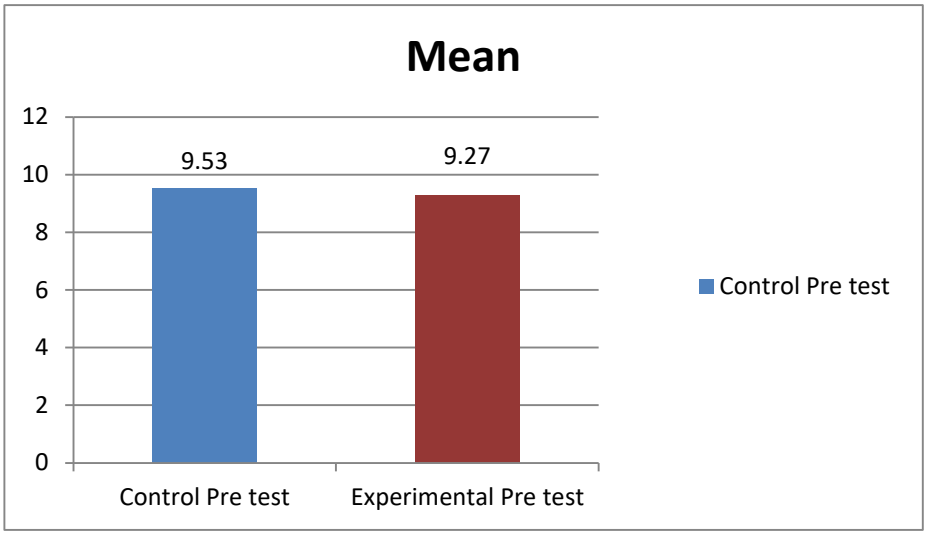
Table 6 and Graph 6, show the comparison of post-test values of the control group and experimental group using RWSPPSC - S. Mean values of the post-test control group and post-test experimental group are 14.2 and 20.2 respectively, and the t value is 5.960 and the p-value is less than <0.0001. Therefore, there is a significant difference between the pre-test and post-test of experimental groups.

Table 7 and Graph 7, show the comparison of the pre-test and post-test of the control group using RWSPPSC - S. Mean values of the control group are13.9and 14.2 and the t value is 1.468 and the p-value is 0.164, which shows it is not statistically significant.

Table 8 and Graph 8, show the comparison of the pre and post-test of the experimental group using RWSPPSC – S. The mean values of the pre and post-test of the control group are14.7 and 20.2 respectively and the t value is 10.741 and the value is less than 0.0001, which shows the result is statistically significant.

Table 1: Comparison of visual perception scores between pre-test values of the control and experimental group using MVPT-4

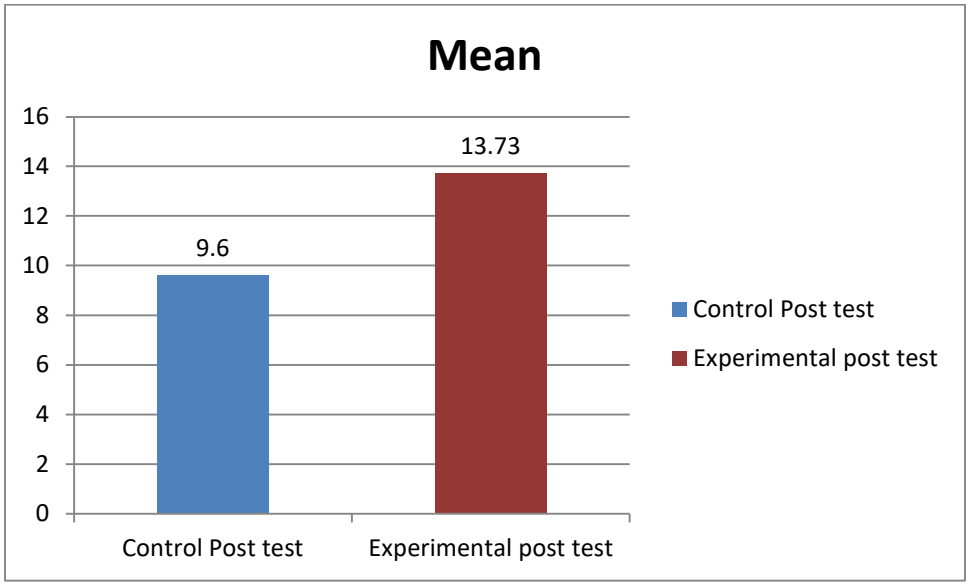
Group	Test	Mean	S.D value	't'value	'p'value
Control Group	Pre-test	9.53	1.23	0.606	0.549
Experimental Group	Pre-test	9.27	1.16		



Graph 1: Comparison of visual perception scores between pre-test values of the control and experimental group using scores of MVPT-4

Table 2: Comparison visual perception scores between the control group and experimental group in post-testusing scores of MVPT-4

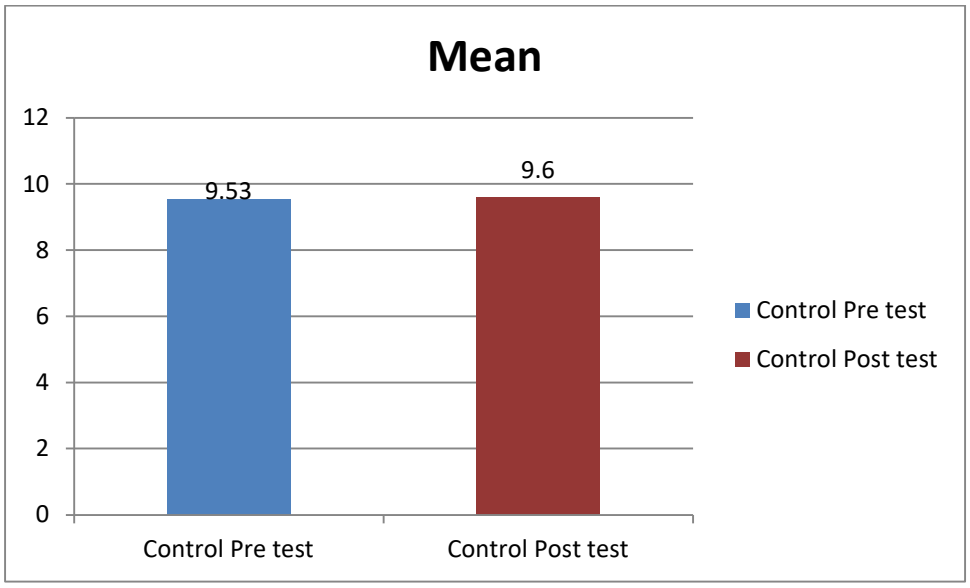
Group	Test	Mean	S.D value	't'value	'p'value
Control Group	Post-test	9.6	0.91	6.938	<0.0001
Experimental Group	Post-test	13.73	2.12		



Graph 2: Comparison of visual perception scores between the control group and experimental group in post-test using scores of MVPT-4

Table 3: Comparison of visual perception scores between pre-test and post-test values of the control group using scores of MVPT-4

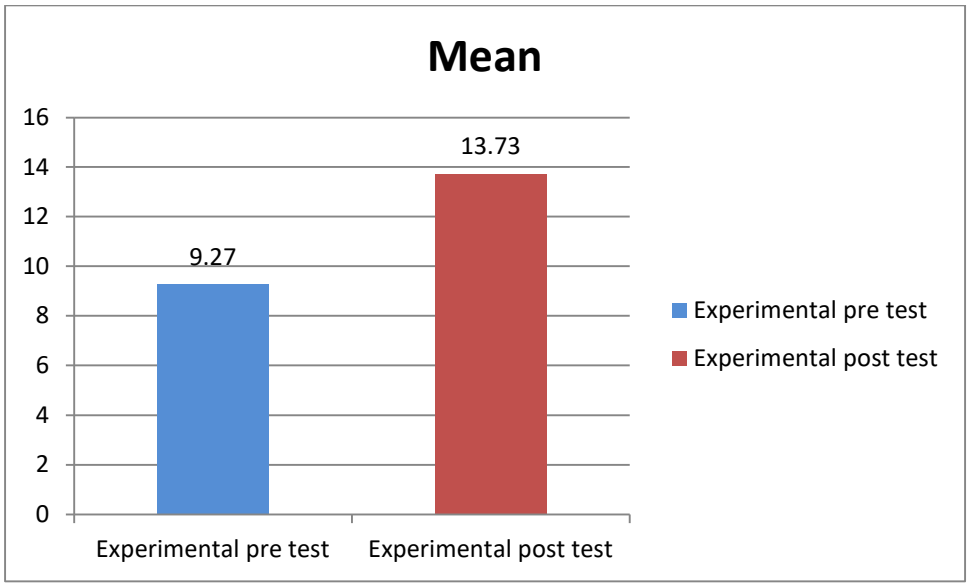
Group	Test	Mean	S.D value	't'value	'p'value
Control group	Pre-test	9.53	1.25	0.32	0.751
	Post-test	9.60	0.91		



Graph 3: Comparison of visual perception scores between pre-test and post-test values of the control group using scores of MVPT-4

Table 4: Comparison of visual perception scores between pre-test and post-test values of the Experimental group using scores of MVPT-4

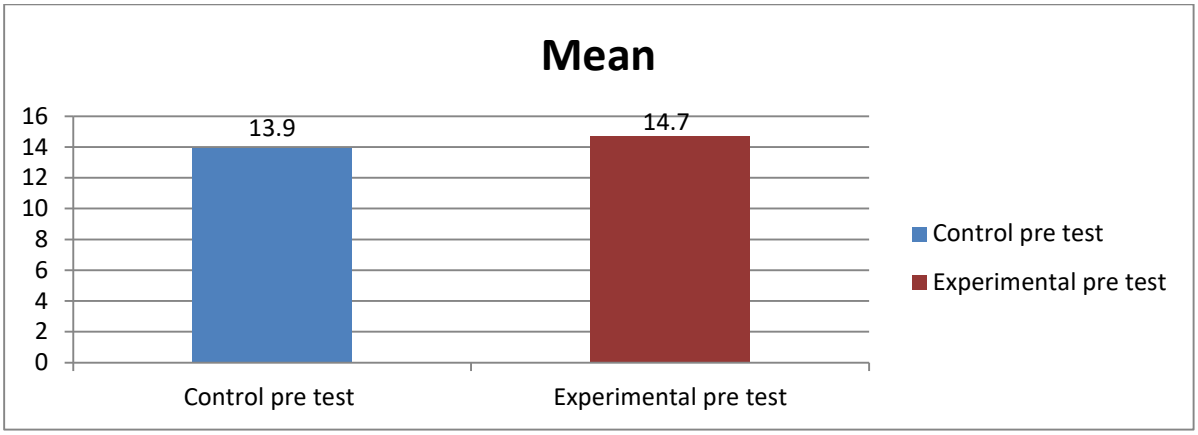
Group	Test	Mean	S.D value	't'value	'p' value
Experimental group	Pre-test	9.27	1.16		
	Post-test	13.73	2.12	10.019	<0.0001



Graph 4: Comparison of visual perception scores between pre-test and post-test values of the Experimental group using scores of MVPT-4

Table 5: Comparison of reading skills between the control group and experimental group in the pre-test

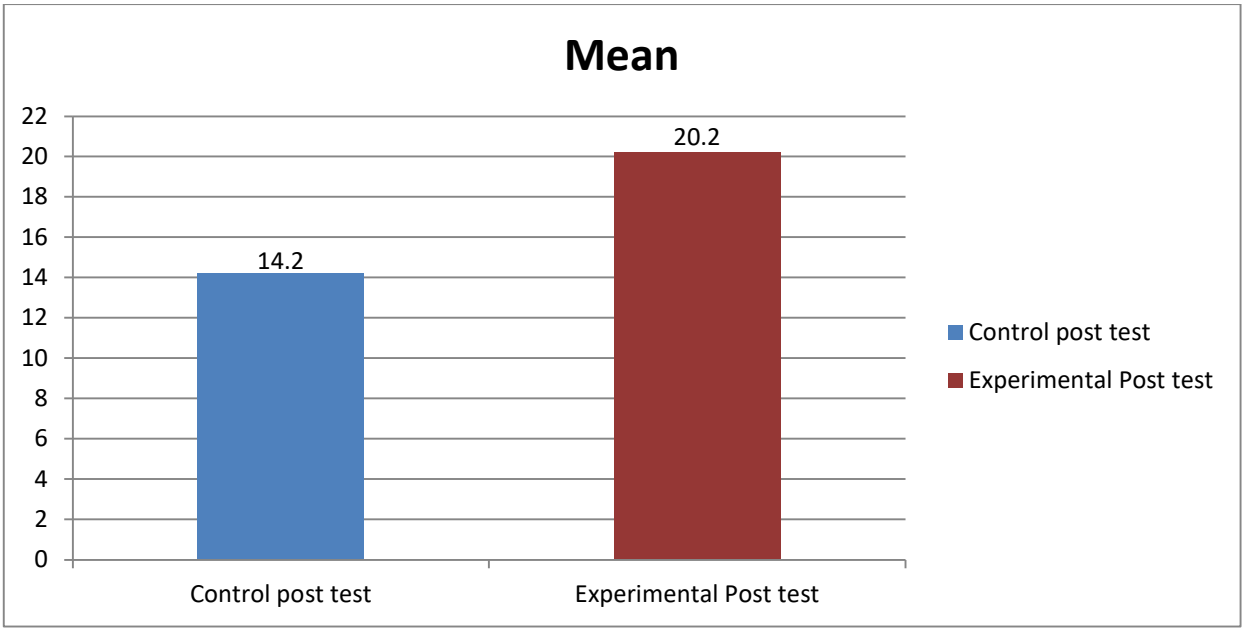
Group	Test	Mean	S.D value	't'value	'p'value
Control Group	Pre-test	13.9	2.05		
Experimental Group	Pre-test	14.7	2.32	0.917	0.367



Graph 5: Comparison of reading skills between control and experimental group in pre-test.

Table 6: Comparison of reading skills between control and experimental group in post-test.

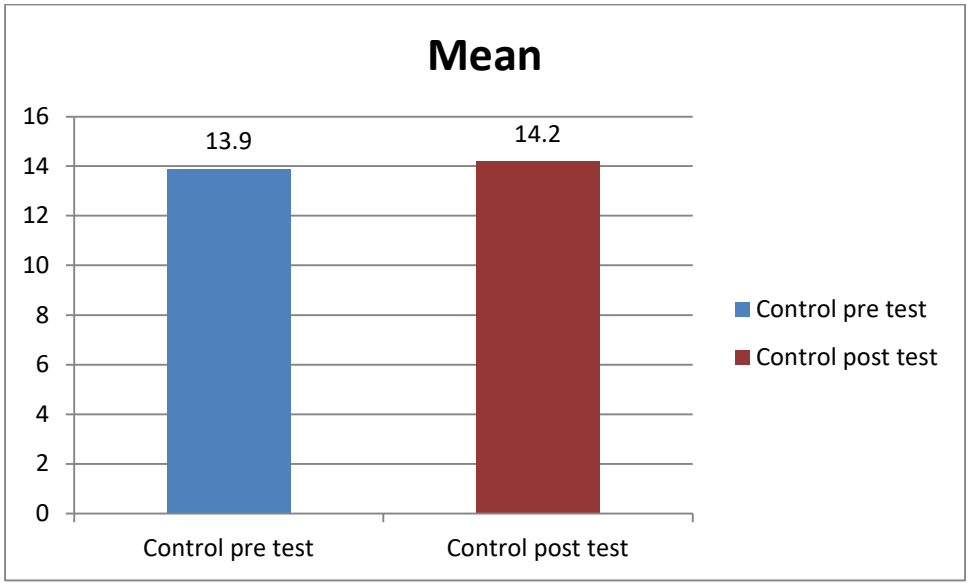
Group	Test	Mean	S.D value	't' value	'p' value
Control Group	Post-test	14.2	2.04		
Experimental Group	Post-test	20.2	3.32	5.960	<0.0001



Graph 6: Comparison of reading skills between control group and experimental group in post test

Table 7: Comparison of reading skills between the pre-test and post-test of the control group.

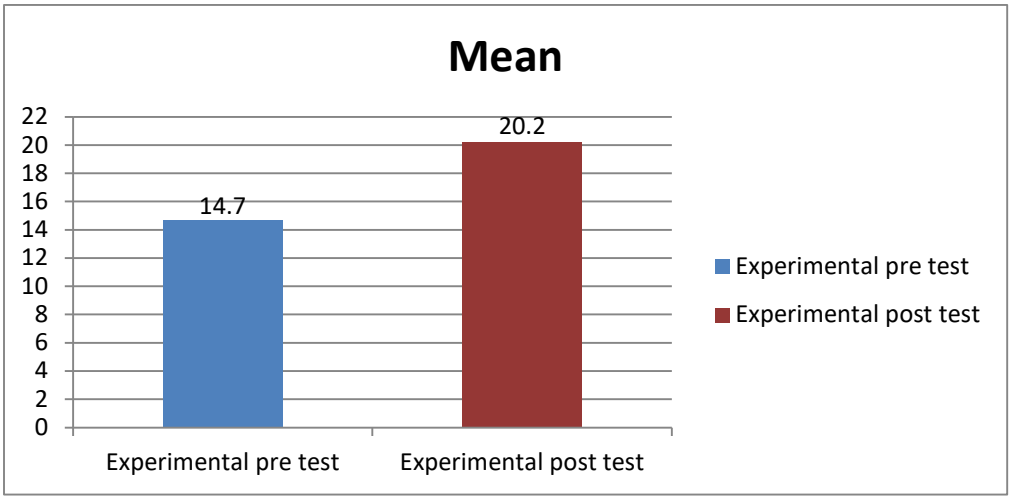
Group	Test	Mean	S.D value	't'value	'p'value
Control group	Pre-test	13.9	2.05	1.468	0.164
	Post-test	14.2	2.04		



Graph 7: Comparison of reading skills between the pre-test and post-test of the control group

Table 8: Comparison of reading skills between pre-test and post-test of experimental group.

Group	Test	Mean	S.D value	't' value	'p' value
Experimental group	Pre test	14.7	2.32	10.741	<0.0001
	Post test	20.2	3.32		



Graph 8: Comparison of reading skills between pre and post-test of experimental group

DISCUSSION

This study was done to find the effect of a visual motor skill reconstruction program on visual perception and reading among children with learning disabilities. Totally 30 subjects were selected for the study of which 15 were in the control group and 15 were in the experimental group. This study was conducted at Srisarvavidhya Multispecialty Therapy Center, Erode. Informed consent was taken from the child's parent for the study and the data are used to measure the outcome of the intervention.

Table 1 and Graph 1, show the comparison of visual perception scores between the control group and experimental group in pre-test by using MVPT-4. The mean values for the control group and experimental group are 9.53 and 9.27 respectively "t" value is 0.606 and the "p" value is 0.549, which shows it is not statistically significant it indicates that there is no significant difference between the control and experimental group, moreover, it shows the unanimity between the groups.

Table 2 and Graph 2, show the comparison of visual perception scores of learning-disabled children in the post-test between the control group and experimental group using MVPT-4. The mean value of the post-test control group and post-test experimental group are 9.6 and 13.73 respectively "t" value is 6.938 and the "p" value is less than < 0.0001, were very statistically significant and supported by Sakineh Soltani Kouhbanani, *et al*, 2021 - cognitive flexibility, abstract verbal skills, reaction inhibition, and working memory are taken into account of the perceptual-motor skills rebuilding program on Executive Function in children with ADHD. The perceptual-motor skills repair program

was administered to the test group throughout 16 sessions. To check for changes over time, the Delis-Kaplan executive function system (D-KEFS) was administered at three measurement sites (M1-3). This study concluded that training with a perceptual-motor skills reconstruction program improved the trained variables (i.e., cognitive flexibility, abstract verbal skills, response inhibition, and working memory) and clinical symptoms of the children with ADHD. The results showed that the experimental group performed significantly better than the waiting control group at posttest (M2) and follow-up (M3) for cognitive flexibility **[7]**.

Table 3 and Graph 3, show the comparison of visual perception scores between the pre and post-test of the control group using MVPT-4. The meanvalues of the control group are 9.53 and 9.60 and "t" value is 0.32 and the "p" value is 0.751, which is not statistically significant. It indicates that the control group doesn't show any significant improvement in visual perception skills, since they have not received a visual motor reconstruction program.

Table 4 and Graph 4, show the comparison of visual perception scores between the pre and post-test of the experimental group using MVPT-4. The mean value of the experimental group's pre and post-test are 9.27 and 13.73 respectively and the "t" value is 10.019 and the "p" value is less than 0.0001, which results in extremely statistically significant. These significant changes were observed due to their participation in the visual motor reconstruction program for 3 months.

Table 5 and Graph 5, show the comparison of reading skills scores between the control group and the experimental group in the pre-test using RWSPPSC - S. Mean value for the control group and experimental group are 13.9 and 14.7 respectively "t"value is 0.917 and the "p" value is 0.367, which shows it is not statistically significant.

Table 6 and Graph 6, show the comparison of reading skills scores in the post-test between the control group and experimental group using RWSPPSC - S. The Mean value of the post-test control group and post-test experimental group are 14.2 and 20.2 respectively "t" value is 5.960 and "p" value is less than < 0.0001, were very statistically significant. These significant changes were observed due to their participation in the visual motor reconstruction program for 3 months. These findings are also supported by T. Jegadeesan *et al* who suggested that multisensory training activities are found to be effective in improving writings kills among dysgraphic children.

Table 7 and Graph 7, shows the comparison reading skills scores between pre-test and post-test of the control group using RWSPPSC - S. Mean values of the control group are 13.9 and 14.2 and the t-value is 1.468 and the p-value is 0.164, which is not statistically significant.

Table 8 and Graph 8, show the comparison of reading skills scores between the pre and post-test of the experimental group using RWSPPSC – S. The mean value of the pre and post-test of the control group are14.7 and 20.2 respectively and the t value is 10.741 and the p-value is less than 0.0001, which results in an extremely statistically significant. These findings are supported by T. Jegadeesan *et al* in their study also visual motor skills training using visual and haptic perception training is effective in improving the writing skills of learning-disabled children with these findings, the researcher accepts the alternate hypothesis and rejects the null hypothesis.

CONCLUSION

The study concludes that the Visual Motor Skill Reconstruction Program is an effective method for improving visual perception and reading skills in children with learning disabilities. This program significantly reduces visual perception problems, enhances reading abilities, and increases active participation, thereby helping children achieve greater independence in reading and improved academic performance. However, the study has certain limitations, including being conducted on a confined age group with a limited sample size and without gender-based comparisons. Future studies are recommended to include larger sample sizes, extended age groups, and follow-up assessments to further validate the findings and expand the applicability of the program.

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