

To Find Correlation of Visual Perception with Handwriting in Mainstream School Children Aged 10-12 Years in Mumbai

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ABSTRACT

Visual perception is the process by which the brain organizes and extracts information. Handwriting is one of the basic tasks of the elementary grades in all school systems. It is believed that visual motor integration and visual perceptual skills are dependent on each other. There are numerous studies that suggest a correlation between visual motor integration and handwriting, but there is scarcity of evidence in the literature showing exclusive role of visual perception on handwriting. In this cross-sectional study, we aim to find the correlation of visual perception with handwriting. A total of 302 mainstream school going children (both male, female aged 10-12 years) were enrolled in the study using convenient sampling. Children were assessed using Motor Free Visual Perception Test-4 ed. (MVPT-4) and Evaluation Tool for Children's Handwriting. (ETCH). Following the completion of the assessment, Kruskal-Wallis's test was used to analyze and derive the results. The p value obtained through the comparisons of MVPT percentile scores with handwriting legibility (word, number, letter) were all significant. It was observed that with increase in MVPT percentile score the median score of ETCH also increases. Hence, the study concluded that there is a correlation of visual perception with handwriting legibility. This indicates that visual perception can be considered for assessment and intervention of handwriting.

Keywords: Visual perception, mainstream school children, handwriting

INTRODUCTION

The complex process by which the reception and cognition of visual stimuli occurs is called as visual perception. ^[1]

There are a lot of components included when we talk about visual perception which include eye hand coordination, figure ground perception, visual discrimination, form constancy, visual memory and visual sequential memory. An important component of visual perception is the ability to classify between different shapes such as position, size, pattern, forms, shapes and

colors. Occupational therapists use a variety of assessment tools to identify visual perceptual deficits such as VMI, TVPS and MVPT.

One of the complex skills in human beings is handwriting. Some children might be able to write legible alphabets by the age of 3, whereas others might not be able to do the same even after they reach Grade 1. It involves many abilities such as forming letters with appropriate letter size, consistency, spacing and proportions so that whatever is written is legible. ^[1] Many

investigations and studies lead to formation of various scales used for the assessment of handwriting. Developmental studies suggest that when children are learning to control their pencil for handwriting, they will be dependent on visual information to further look at their hand holding the pencil and what forms, shapes, letters or alphabets they are producing.

Occupational therapy intervention for handwriting difficulties mostly focuses on motor skills e.g. pencil grasp, pencil grip, eye hand coordination. The ability to copy a vertical line, circle, horizontal line, square or any other shapes or figures have been recognized by therapists worldwide as an indication of an individual's readiness to begin with handwriting.

MATERIALS & METHODS

A cross sectional study using convenient sampling was performed on 302 mainstream school children aged 10-12 years (both male and female). Children diagnosed with visual impairment, physical disability, developmental disorders were excluded from the study. The aim of the study and how it can be helpful for their students was explained to the school principal, teachers. Procedure of how the research will be conducted was demonstrated and the requirements were explained to all the staff members. The consent of the parents and assent of their children were taken respectively in the language best known to them. Assessment was scheduled during the school hours. The students were assessed in the classroom.

ASSESSMENT TOOLS USED

1)The Motor-Free Visual Perception Test (4th ed.) (MVPT-4) [2]

The Motor-Free Visual Perception Test (4th ed.) (MVPT-4) is a 45-item individually administered assessment of visual-perceptual skills commonly used in

everyday activities. The MPVT-4 provides a pure measure of visual perception, as opposed to assessments which require the individual to make motoric responses (e.g., tracing or copying) and which, therefore, measure the integration of visual and motor abilities rather than visual perception per se. Questions are presented in a multiple choice format. It requires 20 to 30 minutes to administer. The raw score (total points obtained out of 45) for the MVPT-4 is simply the number of correct responses. The raw score obtained is converted to the corresponding standard score, confidence interval, and percentile rank.

2)Evaluation Tool of Children's Handwriting (ETCH) [3]

The Evaluation Tool of Children's Handwriting (ETCH) is designed to evaluate manuscript and cursive handwriting skills of children. The ETCH-Manuscript is to be used with children in Grades 1 and 2. The ETCH-Cursive is to be administered to children in Grades 3 to 6. The primary focus of the ETCH is to assess a child's legibility and speed of handwriting in writing tasks that are similar to those required of students in the classroom. It contains 7 sub tasks to assess handwriting legibility. {In this study we have used the ETCH- Cursive model}

It takes 10-20 minutes to administer the scale. Scoring is done for word, letter and number legibility respectively.

STATISTICAL ANALYSIS

Data Analysis

The data was analysed using SPSS version 22. Kruskal-Wallis's test was used to derive the results. The value of P was set at 0.05 level of significance, and a 95% confidence interval (CI) values were determined.

RESULT

Figure 1: Distribution of age of the study participants.

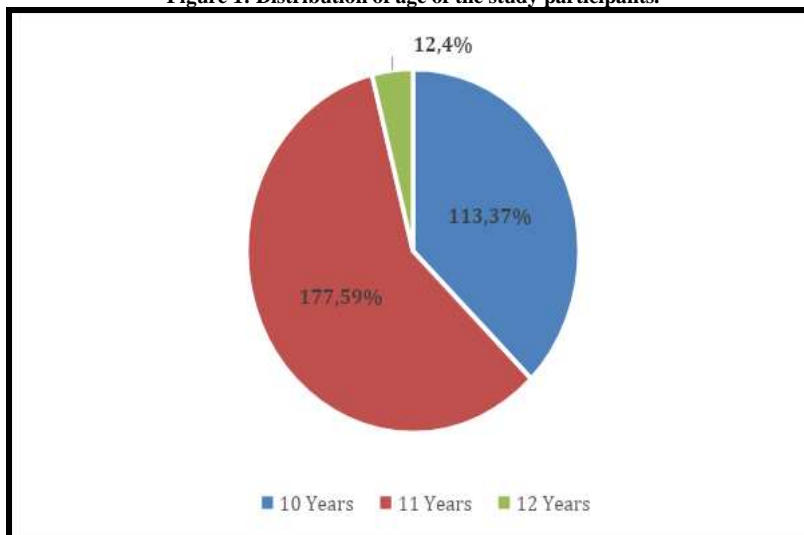


Table 1: Comparison of MVPT percentile scores with word legibility as per ETCH.

MVPT Percentile Score	N	Word legibility %					Kruskal Wallis Value	df	P Value*
		Minimum	Percentiles 25	Median	Percentiles 75	Maximum			
0-20	66	6.4	48.3	76.935	88.115	100	17.066	4	0.002
20-40	104	0	61.725	83.8	96.15	100			
40-60	68	0	67.7375	89.65	96.5375	100			
60-80	53	0	77.31	88	96.29	100			
80-100	10	56	69.5	94.775	100	100			

P Value<0.05= Significant

Table 2: Comparison of MVPT percentile scores with letter legibility as per ETCH.

MVPT Percentile Score	N	Letter legibility %					Kruskal Wallis Value	df	P Value
		Minimum	Percentiles 25	Median	Percentiles 75	Maximum			
0-20	66.00	0.00	48.90	66.63	79.94	100.00	18.339	4	0.001
20-40	104.00	0.00	58.69	73.56	87.70	100.00			
40-60	68.00	0.00	62.60	83.43	90.90	100.00			
60-80	53.00	0.00	62.90	82.24	90.87	100.00			
80-100	10.00	47.40	67.15	82.02	90.67	100.00			

P Value<0.05= Significant

Table 3: Comparison of MVPT percentile scores with number legibility as per ETCH.

MVPT Percentile Score	N	Number legibility %					Kruskal Wallis Value	df	P Value
		Minimum	Percentiles 25	Median	Percentiles 75	Maximum			
0-20	66.00	2	64	80	96	100.00	13.717	4	0.008
20-40	104.00	0	64	86	96	100.00			
40-60	68.00	0	80	88	100	100.00			
60-80	53.00	0	78	96	100	100.00			
80-100	10.00	36	70	92	100	100.00			

P Value<0.05= Significant

DISCUSSION

Visual Perceptual skills is one of the most important skills required for handwriting. It starts developing by the fourth month and continues to develop up to the age of 10.

The primary objective of our study was to find out if there is any correlation between visual perception and handwriting.

In accordance to our results as shown in Table 1,2 and 3 it is observed that with increase in MVPT percentile scores the median score of ETCH also increases.

Our findings were as follows:

The p value obtained was,

- The p-value obtained through the comparison of MVPT percentile scores

with word legibility as per ETCH was - 0.002

- The p-value obtained through the comparison of MVPT percentile scores with number legibility as per ETCH was - 0.008
- The p-value obtained through the comparison of MVPT percentile scores with letter legibility as per ETCH was 0.001

p value < 0.05

All the comparisons were significant.

The results obtained shows that there is a correlation between visual perception and handwriting legibility. It can be said that visual perception has an impact on handwriting legibility. Thereby visual perception can be taken as a precursor to assess a child's handwriting.

A similar study by Supawadee C. Lee (2021) demonstrated the predictors of handwriting skills in children of grade 1-3.

[4] This study aimed to find the correlation between sub components of visual perception (eye hand coordination, position in space, copying, figure ground discrimination, spatial relations, visual closure, visual motor speed and form constancy) with handwriting ability. 65 children from grades 1-3 were evaluated using the Evaluation Tool Of Children's Handwriting (ETCH) and the Developmental Test of Visual Perception-2 (DTVP-2). The results revealed that there was a significant relationship between the sub components of visual perception and word legibility.

Another study by Mellisa prunty, Anna L Barnett, Kate Wilmut, Mandy Plumb (2016) [7] mentions the effects of visual perceptual and handwriting skills in children with developmental coordination disorder. The objective of the study was to demonstrate that deficits in visual perception is an underlying cause of handwriting difficulties in children with DCD. 28 children aged 8 to 14 years who met the DSM-5 criteria of DCD were compared with 28 mainstream school (TD) children. The assessment was done using VMI, TVPS and various

handwriting measures. The result obtained showed no significant correlation between the components.

This study varies from our study on the basis of the inclusion-exclusion criteria. This study has taken into consideration children with DCD which differed from our criteria.

Further researchers may consider attention level, language development, compliance, behaviors and motivation to moderate inclusion-exclusion criteria for conducting similar study to understand the role of visual perception in handwriting skills.

LIMITATION

Limitation of the study are as follows:

Children of only one school were assessed, hence limiting the population diversity. Multiple schools in various regions of Mumbai could be taken for varied diversity.

CONCLUSION

The conclusion of our study is that in children with higher scores of visual perceptions, the handwriting legibility (letter, word and number) scores were also found to be higher. Hence, concluded that there is a correlation between visual perceptual skills and handwriting.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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