



A COMPARISON OF THE VISUAL PERCEPTUAL SKILLS IN TYPICAL AND CEREBRAL PALSY CHILDREN

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ABSTRACT

Background and Aims: The purpose of this study is to evaluate the difference at occupational performance skills related to visual perception among typical developing children and cerebral palsy children by using measuring test of MVPT-R.

Methodology: Quantitative cross-sectional study, convenience sampling method. A total of 400 Cerebral palsy children (all types) and typical children each from different mainstream schools, rehab centers, pediatric occupational therapy departments, and special education centers located in Karachi. Test of visual perception that is Motor Free visual perceptual test- Revised MVPT-R.

Results: Result shows difference in perceptual ages (PA) between typical and cerebral palsy children. Perceptual age (PA) was greater than the chronological age (CA) in the typical group. Conversely, in the CP

group the perceptual age (PA) was lesser than the chronological age (CA).

Conclusion: Visual perception skills play a key role in a child's achievement at school and at home. Children require intact visual perception for the successful performance of their daily living as well as academic tasks like good eye-hand coordination, handwriting, reading, shape perception, play skills, and copying patterns, etc. This study is helpful to identify those children who have visual perception issues and sorting this problem will form the baseline for better evaluating and planning of useful visual perception activities for typical and cerebral palsy children.

Keywords: Cerebral palsy, Typical, Visual perception skills, Atypical, Visual Discrimination, Figure-ground

Introduction

Visual perception (VP) is the brain's ability to perceive, identify, interpret, and elaborate on stimuli generated by objects and occasions¹. It is responsible for receiving information (sensory functions) and cognition of particular mental processes in response to visual stimuli². The process of gathering and using sensory information is called sensory function. Which provides more substantial assistance in carrying out daily activities. Most phases of development of children depends on visual perception skills which plays an important role in child's cognitive development. It helps children in the recognition and identification of figures, objects, colors, and other assets. For the successful performance of most activities in early school age which involves constructing building blocks, solving puzzles, reading and writing requires visual perceptual skills for learning in different ways^{1,2}. When there is dysfunction in any of these skills in children it can affect on several gross and fine motor skills also in social participation of children³.

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The ability to determine differences or similarities in objects based on size, color and shape is called visual discrimination which enables a child to differentiate dominant features in different objects, for example, to discriminate position, shapes, forms, colors and letters are assessed through visual discrimination and have been shown to improve with age. Its dysfunction influence struggle to match clothing, socks, or cutlery, especially with the slight differences, to see the difference between similar objects, letters, and words^{4,20}. The capability to locate something in a busy background is known as figure ground relationship. At the age of three and six years .Figure-ground and visual-spatial relationships improve rapidly and appear to stabilize by approximately ten years. It is a skill to identify an object from its background and to orient one's body in space and to perceive the positions of objects about one. Their deficits lead to having difficulty to find information on a busy slate, lose his/her place when copying work from the board or sheet and poor handwriting and drawing abilities, miss the place on page while reading and to find personal items in chaos place^{5,17}. The potential to search incomplete figures when only fragments are presented is part of visual closure. These skills are mature at five years of age approximately. Loss of visual closure skill may create difficulty in academic performance like in reading with fluency because the child needs to focus and carefully understand each letter. Finally, regarding visual memory skills which is the ability to recall visual traits of a form or object these appear early in development. It helps to remember the dominant features of single object or to remember the sequence of several objects. Absence of this skill prompts recognition and remembrance of the numbers, letters, and words they see, copying the work as they have a problem to remember what they saw on board or book⁵. Children with Cerebral palsy (CP) have frequently been identified as a group with visual-perceptual deficits²³. Different studies showed that the amount of visual perceptual decline in persons with CP was related to the severity and kind of CP⁶. According to Abercrombie et al, and Foley approximately 80% of the fifteen children with cerebral palsy diplegic showed more visual perception dysfunction with physical impairments than hemiplegic. Further, he stated that athetoid children have been found to have fewer visual perceptual disorders than spastic children⁷. "Dr. U.Ganapathy Sankar (2015.6)" found that in typical children visual perception dysfunction can affect their vocational performance and daily living activities including basic functional and academic activities⁸. Many children are diagnosed with learning disabilities and neurological impairment presents with a problem in visual perception which leads to visual perception dysfunction. Most school -going children, experience a problem in their academics and ADLs which may give rise to visual perception dysfunction. These children require proper assessment for areas of difficulty^{17,23}. To overcome these difficulties Occupational therapist plays a key role by using different standardized tests and tools to assess and evaluate visual perception skills more efficiently, for this purpose they use different standardized tests and tools to measure visual perception skills. The Motor Free Visual Perception Test-Revised (MVPT-R) was one of the tests used in this study for this purpose²². This test is intended to describe differences in children on particular characteristics of visual perceptual skills that do not require motor responses since the child being tested is required to point to one of the four choices as a correct response. It consists of 40 multiple choice items based on five types of visual perceptual items and allow us to diagnose visual perceptual dysfunction appropriately and measure effectively any change in a client's vocational and functional performance in typical children and children with cerebral palsy. Since not any other research has been done in Pakistan for the comparison between cerebral palsy and typical children to assess visual perception skills, therefore this study intended to evaluate that significant number of typical school-going children and CP children who have visual perceptual deficits as these insufficiency interfere in their academics and social participation to complete their routine task , to overcome these difficulties into major problems, MVPT-R has been used as a valid and reliable tool for measuring visual perception skills in both typical and CP children.

Methodology

A quantitative cross-sectional study was conducted to compare the visual perceptual skills in cerebral palsy and typical children. The MVPT-R was standardized on 440 children, and performance scores were collected. The sample was divided among 199 girls and 221 boys ranging from 4-11 years of age⁹. Data of 220 cerebral palsy children and typical children, each from different mainstream schools, rehab centers, pediatric occupational therapy departments, and special education centers were collected using the convenience sampling method. The validity of participants were established by using a cognitive abilities practice test., age should be between 4-11 years. Both genders male and female were included^{21,22}. On the other hand, children who are diagnosed other than CP, MR or any other hearing, visual impairment, unable to follow verbal commands given in MVPT-R and children with intellectual deficits were excluded.

Procedure

The research was conducted in different Rehabilitation centers, Pediatric occupational therapy departments, Special education schools and, mainstream schools. Before the application of visual perception test, a simple cognitive abilities practice test was applied on children to test his/her cognitive skills and general verbal instruction following¹³. If he/she succeeded in the cognitive test, then a visual perception test was applied otherwise not. The test was administered in a silent, distraction-free environment with good lighting. In the start, examples were explained to the children about the test items¹⁴. A clear instruction was given to the child and a little assistance was given to CP child if they face any problem in answering the question¹⁵. All assessments were carried out by an occupational therapist at a time and performance of individual child was scored on a standardized scoring sheet. The MVPT-R consists of 40-item, each having four alternatives and the subject responded with the correct answer after that examiner responds with YES or NO for right or wrong alternative respectively¹⁶. No clues or confirmation were given to the subject for the correct answer. The test took 5-10 minutes to administer on normal children and 15-20 minutes on CP children and then compiled for a total raw score.

Questionnaires

Mvpt-R: Motor Free visual perceptual test- Revised was developed by Ronald .R. Colaussoand Donald D hammily. The test comprises of total 40 questions divided into multiple choice questions in a horizontal manner designed to evaluate visual perceptual as a whole, it measures figure-ground perception, spatial relationship, visual memory and visual discrimination¹². The test was applied by an occupational therapist to measure visual perception. It will take 5-10 minutes max to administer on normal children and around 15-20 minutes on CP children followed by compilation of total raw scores on the scoring sheet.

Scoring:

- 0-inaccurate response
- 1-Accurate response

Result

A total of 440 children participated in this study which included 220 typical and 220 cerebral palsy children (231 girls and 209boys; age range between 4-11 years), presented in figure 1. Independent t-test was used for the comparison of overall performance on MVPT-R, and to find the significant differences in perceptual age (PA) of typical and cerebral palsy children. The result revealed a significant difference in perceptual ages (PA) between typical and cerebral palsy children. (MVPT-R: $t=16.89$, $p<0.005$).The chronological age (CA) and perceptual age (PA) of typical and cerebral palsy children are presented in figure 2,which indicated that the perceptual age (PA) was greater

than the chronological age (CA) in the typical group. Conversely, in the CP group the perceptual age (PA) was lesser than the chronological age (CA).

Figure 1:

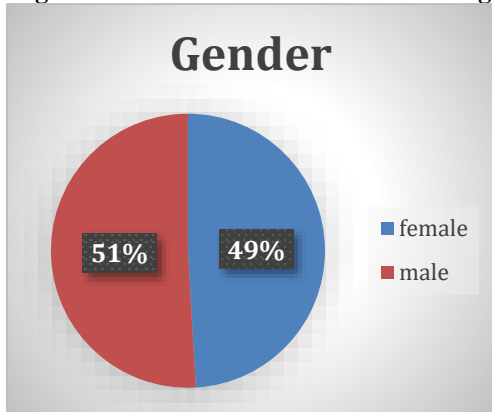
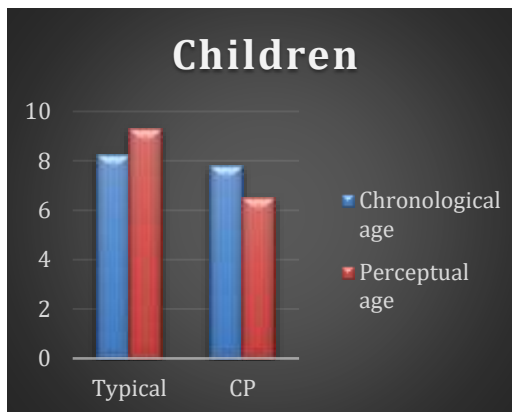


Figure 2:



Graph 1: Age group showing 4 subgroups of age i.e. 1 (4-6yrs), 2 (6-8yrs), 3 (8-10yrs), 4 (10-11) which indicates that children within age group 4-6yrs and 10-11 yrs. are in more numbers than other age groups.

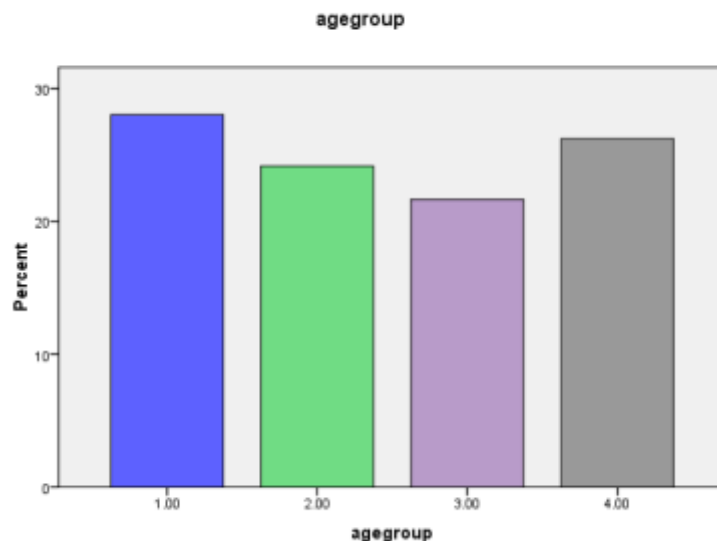


Table 1 presents the perceptual age (PA) differences between the typical and the CP group across independent sample t-test. The result shows ($p < 0.005$) that there is a statistically significant difference between two groups at 0.005 level.

GROUPS	MEAN	SD	LOS
Typical Children	9.2978	1.61	
CP Children	6.4757	1.87	0.000

Table 1. Means between typical and cerebral palsy children

Table 2 shows that there is more score of mean for Visual discrimination and visual memory and least score of mean for figure ground perception and spatial relationship in all CP age groups.

Age ranges	Visual discrimination	Figure ground	Visual memory	Spatial relationship
	(VD)	perception (FG)	(VM)	(SR)
	MEAN	MEAN	MEAN	MEAN
4-6	4.8800	3.1200	5.2600	3.3200
6-8	5.0299	3.0000	4.7910	3.2836
8-10	5.2373	3.5932	5.0000	3.4746
10-11	5.0930	3.6279	5.5814	3.9767

Table 2. The performance of CP samples on 5 subskills of visual perception in MVPT-R

Table 3 indicates that overall mean of CP group in spatial relationship and visual discrimination is more (i.e. 5.1136 & 5.0591) and least in figure ground perception and visual memory (i.e. 3.3182 & 3.4864)

Age range	Visual discrimination	Figure ground	Visual memory	Spatial relationship
	(VD)	perception (FG)	(VM)	(SR)
	MEAN	MEAN	MEAN	MEAN
4-11	5.0591	3.3182	3.4864	5.1136

Table 3. The overall performance of CP group on 5 sub skills of visual perception in MVPT-R

Discussion

Deficits in Visual perception skills affect the cognitive functioning, academics, and functionality of a child that he or she might face problems in performing basic ADLS as well as in, play activities involving building blocks, solving puzzles, reading and writing. Children have difficulty and trouble in seeing the difference between similar letters or shapes and have a hard time memorizing what they've seen. In most of the school-going children, visual perceptual problems eventually lead to visual-perceptual dysfunction that can cause negative impact on a child's capabilities. Occupational therapy medical practitioner focus on functional independence in performing ADL, improving play skills and involving in leisure activities. They use standardized test to identify major areas of problems to evaluate these deficits and dissimilarities in performance between typical children and children with cerebral palsy. In this study visual perception test, MVPT-R is used as a valid and reliable tool for the assessment of children. By using the standardized MVPT-R test, numerous studies have been conducted to evaluate the visual perceptual abilities of both typical and cerebral palsy-affected children. Early research suggested that the type of CP and the severity of the motor impairment were related to the degree of perceptual impairment in children with CP. Using the MVPT-R, Christine Menken, Sharon A. Cennak, and Anne Fisher conducted a comparison study to assess visual perceptual abilities in typical and cerebral palsied children. Their findings confirm that on a motor-free test of visual perception, children with CP scored significantly lower than typical children. Similar to that, we evaluated each child with CP individually for visual perceptual dysfunction in sub-components of their visual perception skills. In university of Toronto Denise Reid, Susan Drake conducted a comparative study of visual perceptual skills in normal children and children with diplegic cerebral palsy. Their result of the investigation indicated that disabled children performance on MVPT has considerably lesser than that of normal children. In contrast to the present study, we have included all types of CP and have compared the difference between sub-skills of visual perception which shows that the overall mean of CP group in the visual-spatial relationship is more and least in visual figure-ground¹⁹. In India Dr.U. Ganapathy Sankar collected a normative data of 331 typically developing children from normal schools situated in different parts of Chennai and find out the performance difference in gender and determined the correlation between age and raw score. The result illustrated no significant difference between gender on MVPT performance and Pearson correlation exhibits

positive correlation. In our study, we have focused on typical children along with CP children and have done a comparison of both groups to assess visual perceptual skills along with sub-skills. This study was anticipated to evaluate and to compare visual perceptual skills in typical and children with cerebral palsy using MVPT-R as an assessment tool. However, due to incomplete demographic information and a language barrier, some children were excluded from the study because it was difficult to assess their visual perceptual abilities. As a clinical intervention for functional and occupational improved performance as well as the restoration in daily activities, a visual perceptual programme should be executed in combination with survey in future studies.

Conclusion

Visual perception skills play a key role in a child's achievement at school and at home. Children require intact visual perception for the successful performance of their daily living as well as academic tasks like good eye-hand coordination, handwriting, reading, shape perception, play skills, and copying patterns, etc. Occupational therapist offers new strategies and alternative methods for visual perceptual dysfunction, this study is helpful to identify those children who have visual perception issues using a standardized assessment tool i.e. MVPT-R(Motor Free Visual Perception test -Revised) which can be beneficial to form the baseline for better evaluating and planning of useful visual perception activities for those children.

AUTHORS' CONTRIBUTION:

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Zubia Saleem

Acquisition, Analysis or Interpretation of Data: Bushra Ejaz

Manuscript Writing & Approval: Farzana Ashfaq

All authors acknowledge their accountability for all facets of the research, ensuring that any concerns regarding the accuracy or integrity of the work are duly investigated and resolved.

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