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Does low contrast sensitivity lead to visual functional difficulties in cerebral palsy?

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Abstract

Aim: To study whether the low contrast visual acuity leads to visual functional difficulties in children with cerebral palsy.

Methodology: Thirty children with cerebral palsy, who had the cognitive ability to detect lea symbols in visual acuity charts were chosen from a vision rehabilitation centre, Chennai. Their high and low contrast visual acuity measurement was done with Lea's 3 metre translucent distant visual acuity charts with 100% and 2.5% contrast levels against ETDRS light box. These children were clinically examined by ophthalmologists for ocular abnormalities if any. They were also assessed on Jill Keefe's scale on Functional Vision Assessment. The results were recorded.

Results: 28% of children with cerebral palsy fell in the visual impairment range from mild to severe at 100% contrast. 77% had visual impairment at 2.5% contrast level. The ophthalmic conditions diagnosed were strabismus 63%, Refractive error 43%, Optic Atrophy 10%, Retinal Disorders 10% and Nystagmus 10%. Functional vision assessment in low contrast sensitivity revealed the difficulty in visual communication, mobility, finding inner details and daily living skills.

Conclusion: Though the visual acuity is normal at high contrast, a few children performed very low at low contrast level which certainly led to the functional difficulties like identification of face, reading contours in face during visual communication, depth perception for near and far activities, mobility, reading and writing and also performing other academic tasks. Environmental adaptations and training in special skills are the key rehabilitation measures for inclusion of these kids into the society.

Keywords: Visual function, cerebral palsy, sensitivity lead, rehabilitation centre

1. Introduction

Contrast sensitivity (ICF b2103) measures the ability to see differences in the amount of light reflected from adjacent surfaces. This ability allows us to notice edges and shadows that define objects and also shows us their depth and placement in space. In the assessment of visual functioning it is one of the most important measurements because visual information for communication and perceiving environment is mostly at low and intermediate contrasts. Although it is well established that visual information at low contrast levels has great impact on the functioning, low contrast tests are rarely used in clinical examinations where quick screening and disease identification are the major goals. For those involved in intervention, understanding a child's contrast sensitivity helps identify and plan for potential problems in communication, orientation and mobility, and near work. (Hyverinen L, 2013)

Both contrast sensitivity and visual acuity loss contribute independently to deficits in performance on everyday tasks. Defining disability as deficits in performance relative to a population, it is possible to identify visual acuity and contrast loss where most are disabled. However, the cut off points depend on the task, suggesting that defining disability using a single threshold for visual acuity or contrast sensitivity loss is arbitrary (Sheila K. West, 2002) [2].

The ability of the person with low vision to achieve successful orientation and mobility depends on residual vision, age of onset of visual impairment, posture and balance, intelligence, body image, auditory –tactile abilities, and personality. This study assesses the role of residual vision and looks in particular at visual fields, spatial contrast sensitivity, and visual acuity. Correlation coefficients indicate that, for low vision patients, spatial contrast sensitivity and visual fields each have more influence on orientation – mobility than does visual acuity (Marron, 1982) [1]. This study focused on the functional difficulties of children with cerebral palsy whose contrast sensitivity was tested for high and low contrast levels.

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2. Methodology: Fifty children with cerebral palsy were chosen from Spastic Rehabilitation Centre and they were tested for their cognitive ability of identifying symbols in Lea visual acuity charts. Only thirty subjects were qualified and tested for visual acuity at various contrast levels. Visual Acuity at 100%, 5% and 2.5% contrast levels were measured with Dr. Lea’s 3 meters distant acuity Translucent symbol charts with ESV 1500 ETDRS Standardized illuminated cabinet. The smallest size of the symbols recognised by the children was documented. The children were asked to identify the first or last symbol on each line. When the child hesitated or found difficult with the current line, one line was receded and the child was asked to read the entire line. The threshold line is recognition of 4 out of 5 symbols in the line. Informed consent was obtained from all subjects who were interested in participating the study. These children were clinically examined by ophthalmologists for ocular abnormalities if any. They were also assessed on Jill Keefe’s scale on Functional Vision

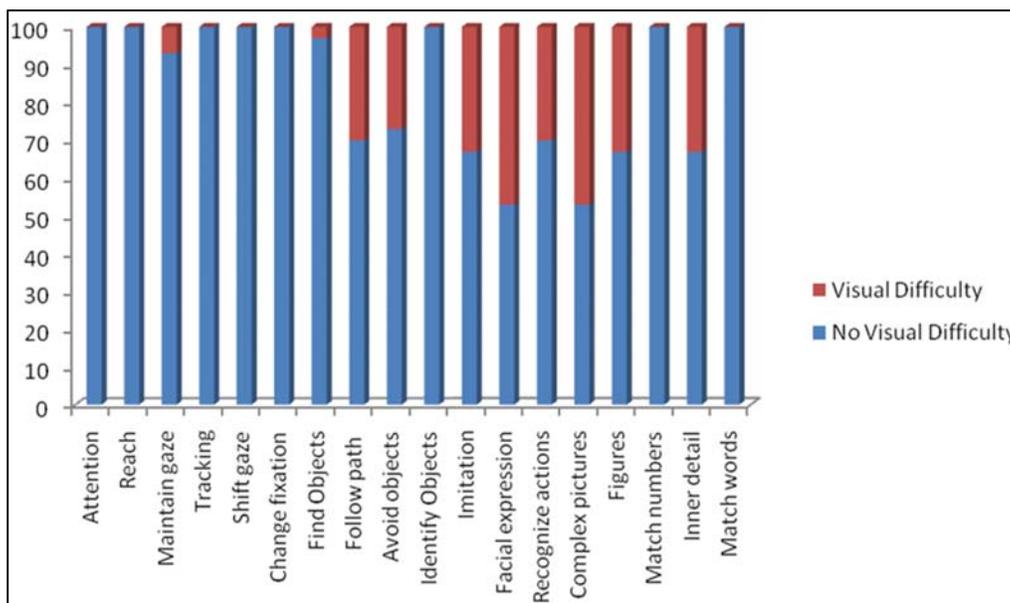
Assessment. This scale revealed functional difficulties in the areas of finding objects, following path, avoiding & identifying objects, imitation, facial expressions, recognising actions& complex pictures, perceiving figures, numbers, inner details and words. These actions are closely related with our everyday chores. The results were recorded. This study followed the tenets of the Declaration of Helsinki and it is approved by Frontline Eye Hospital’s ethical committee.

3. Results

30 children with cerebral palsy were tested for functional difficulties as well as high & low contrast sensitivity. Every child with Cerebral Palsy was assessed for functional vision on Jill Keefe’s scale to identify whether they can perform on the visual acuity charts to measure the low contrast acuity. The following areas were assessed and listed in the following tables.

Table 1

Sl. No.	Visual Function	Details	Visual functional Difficulty			
			Presence of Difficulty		Absence of Difficulty	
			Frequency	Percentage	Frequency	Percentage
1.	Awareness & Attention	Attention	0	0	30	100
		Reach	0	0	30	100
2.	Tracking	Maintain gaze	2	7	28	93
		Tracking	0	0	30	100
3.	Scanning	Shift gaze	0	0	30	100
		Change fixation	0	0	30	100
4.	Discrimination of objects	Find Objects	1	3	29	97
		Follow path	9	30	21	70
		Avoid objects	8	27	22	73
		Identify Objects	0	0	30	100
5.	Discrimination of details	Imitation	10	33	20	67
		Facial expression	14	47	16	53
6.	Discrimination of details in pictures	Recognize actions	9	30	21	70
		Complex pictures	14	47	16	53
7.	Identification & Perception	Figures	10	33	20	67
		Match numbers	0	0	30	100
		Inner detail	10	33	20	67
		Match words	0	0	30	100



The children are experiencing visual functional difficulties in Following path, Avoiding objects, Imitation, Facial expression, Recognizing actions, Complex pictures, Figures, Inner detail and Finding Objects.

4. Discussion: The areas affected are mainly mobility, visual communication and sustained near vision tasks. Maintaining gaze is a problem for Cerebral Palsy children with Nystagmus. Problem in following path, avoiding & finding objects lead to problems in mobility. Imitation, Facial expression, Recognizing actions lead to problems in visual communication. Complex pictures, Figures, Inner detail lead to problems in sustained near vision tasks like reading, writing etc.

The primary purpose of administration the Jill Keefe functional assessment scale is to find out whether the child has required oculo motor and visual perceptual skills so that he/she can respond to visual acuity charts at different contrast levels. Children with Nystagmus found it difficult to maintain gaze as it is the nature of the condition and with squint were encouraged to see with eccentric viewing to elicit the better visual response.

28% of children with cerebral palsy fell in the visual impairment range from mild to severe at 100% contrast (73% mild, 23% moderate, 3% severe. 77% had visual impairment at 2.5% contrast level). 77% had visual impairment at 2.5% contrast level (37% mild, 13% moderate, 27% severe). The ophthalmic conditions diagnosed were strabismus 63%, Refractive error 43%, Optic Atrophy 10%, Retinal Disorders 10% and Nystagmus 10%. Functional vision assessment in low contrast sensitivity revealed the difficulty in visual communication, mobility, finding inner details and daily living skills.

5. Conclusion

It is very important to assess visual acuity at high and low contrast levels to understand the contrast sensitivity function of the individual. It is observed that even the child's visual acuity is better, there is a drop in the contrast sensitivity. This will certainly affect the child's functional aspects. When we checked the functional difficulties with Jill Keefe's scale, it mainly reflected that if the children have low contrast sensitivity, they will definitely have difficulties in the areas of mobility, communication, near vision tasks and daily living chores. It is very important to adapt the environment and materials with good contrast to improve the visual functioning among these children.

6. Reference

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