

# Perceiving Edges and Curves - A Real Challenge for Annapoorani: A Case Study

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**Abstract:** ***Purpose:** To illustrate the importance of vision assessment at low contrast level and recommend the environmental adaptations for a child with low vision and cerebral palsy. **Method:** It is a case presentation from Frontline Eye Hospital, India. An eleven year old female child, diagnosed with spastic cerebral palsy, hypoglycaemia and seizure disorder was referred to Vision Rehabilitation Department. Her ophthalmic report revealed optic atrophy. Her visual acuity was assessed at 100%, 5% and 2.5% contrast levels with Lea's translucent distant vision symbol charts. **Results:** The results revealed her visual acuity was 20/125 at 100% contrast, 20/800 at 5% contrast and 20/1600 at 2.5% contrast. **Conclusion:** As visual information at low contrast level is essential for visual communication, mobility, daily living and near vision tasks, it is important to assess vision at high and low contrast levels. This paper also recommended the adaptations for the improved visual performance and also highlighted the change with the child after the adaptations.*

**Keywords:** Vision, Assessment, Visual Acuity, Contrast Sensitivity, Environmental Adaptations

## 1. Introduction

“Contrast sensitivity defines the threshold between the visible and invisible, which has obvious significance for basic and clinical vision science”.<sup>1</sup> It is an important measure of visual function, especially in situations of low light, fog or glare, when the contrast between objects and their background often is reduced.<sup>2</sup> The visual information at low and intermediate contrasts is very essential for visual communication, environmental clues and the curved surfaces like faces are perceived flat if the contrast sensitivity is poor.<sup>3</sup>

- a. **Aim:** This paper focuses on the importance of assessing visual acuity at low contrast level and recommending environmental adaptations to enhance the visual performance through a case study.
- b. **Background:** Annapoorani, 11 years old female child is studying 4<sup>th</sup> grade in Ellen Sharma Nursery & Primary School, Chennai, TN, India. The School has inclusion programme for children with special needs. Annapoorani was diagnosed with spastic cerebral palsy & delayed milestones and her birth history revealed hypoglycaemia & neonatal seizures. Extensive physiotherapy for five long years helped the child walk independently. Speech & Language therapy facilitated basic speech expressions while Neurological evaluation prescribed medication for seizure disorder till today. Her ophthalmic diagnosis revealed optic atrophy with normal ocular movements and she was referred to Frontline Eye Hospital, Chennai, India for Vision Rehabilitation Services at age of seven. Functional Vision Assessment revealed poor contrast sensitivity.

## 2. Methodology

- a. **Assessment:** Assessment with Lea's Distance and Near Vision charts revealed her visual acuity as 20/125 for single symbol and 20/200 for crowded symbols. She scored 5M in near vision crowded symbols test. These tests were performed binocularly at 100 % contrast at different intervals considering the child's visual fatigue and emotional status. Her reading speed is 80 words per minute. She had difficulty in copying from the blackboard, maintaining the

average writing speed and also staying on the line while writing.

### b. **Inclusion**

Annapoorani was referred to the above mentioned school explaining her visual abilities and limitations with the required adaptations for distance, seating, lighting and contrast needed in the literacy materials. The school provided her admission and also made arrangement for an educational assistant who helped her in academic classroom activities. Though her grades/marks are at par with the other children in the classroom, her pace of learning was slow. The school teachers were oriented about her visual status and recommended 5M size for near vision by a Vision Rehabilitation Professional with a request to provide her literacy materials in large print.

## 3. Results

Though it was assumed that she might have issues with contrast sensitivity and a few modifications at school were suggested, the intensity of contrast loss was not assessed initially. She was tested for her contrast sensitivity at 5% and 2.5% in Dr. Lea's translucent symbol charts against ETDRS illuminated cabinet. The results were really shocking. Annapoorani's visual acuity is 20/800 at 5% contrast and 20/1600 at 2.5% contrast.

***Challenges faced by the child:*** Annapoorani can identify symbols at 200 feet, but not faces and other details. She manages climbing up the stairs but hesitates to climb down. She observes and appreciates bright or glittering ornaments worn by others yet shows no reaction to non verbal cues at the same distance. She guides her mother in taking the routes to her school on the bike but confuses during rainy and winter days. She moves around in illuminated environment even if unfamiliar but hesitates with familiar dim lit areas. She expresses withdrawal symptoms when she is left by herself in the crowd.

## 4. Discussion

Visual acuity matures fully between age 5 to mid teenage years while contrast sensitivity matures between 8 to 19

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years.<sup>4</sup> According to this study Annapoorani's visual acuity and contrast sensitivity may develop further and she needs periodical vision evaluation. "If your visual acuity is 20/20 at 90% contrast, and you have normal contrast sensitivity, you will find that you can barely read the 20/40 line (you see "half as well") when the contrast drops to 2.5%. At hospitals, the most common measures of contrast sensitivity recorded are either the threshold sensitivity value or the 10% contrast. However to anticipate the impact of issues in contrast sensitivity on functioning, it is important to record the value at 2.5% contrast level".<sup>3</sup> In this case, the child's contrast sensitivity was assessed first time at the age of seven in our vision rehabilitation centre. Visual Acuity and Low Contrast Acuity performance was significantly poorer in children with Down syndrome and Cerebral Palsy groups than in control groups, and high-contrast Visual Acuity did not reliably predict low-contrast performance. Therefore both high- and low-contrast acuity assessments are valuable to fully describe an individual's visual function especially in Down syndrome and Cerebral Palsy cases where the patients are unable to articulate visual difficulties.<sup>5</sup>

## 5. Recommendations

The vision centre explained these results to her parents and made them understand the importance of improving contrast in every area the child's functioning. Following tips were given for the better performance of her activities from morning to night.

- To illuminate the flooring through a contrast demarcating the floor and the wall.
- To minimize visual clutter in all areas.
- To highlight the contrast in objects used together.
- To have a light above the mirror while using it.
- To allot a room for her with good natural and artificial illumination with translucent curtains.
- To place her objects of use near the window or well illuminated area and divide the shelves with broad bands of colours for visual discrimination.
- To demarcate the areas of functioning with good contrast.
- To differentiate the edges and corners of furniture and interiors.
- To use felt tip pens, high contrast pencils, bold line notebooks and typoscopes for eliciting better visual response.
- To have JAWS and MAGic software as default start up option in her computer/laptop to assist her to locate subject files easily. The wall paper of the desktop should be as per visual preference and size of the cursor should be increased.
- To mark the corners of monitor with her favourite cartoon character stickers and different stickers for vowels and numbers in the keyboard for easy location.
- To make her movements within the house without any obstacles and contrast friendly.

## 6. Conclusion

The parents followed the recommendations and discussed these aspects in the school. The educators gradually understood her limitations and way of functioning. Within three months, she gained confidence with a marked

difference in her attitude as well as school performance. She started participating in the school events and improved her social interactions but prefers events that are less crowded. She is faster with her grooming skills and there is greater independence at school and home. The results reinforce the importance of contrast sensitivity assessment and intervention for every child with visual or multi-sensory impairments to improve their quality of vision through rehabilitation services.

## 7. Declaration of Interest

The authors report no declarations of interest

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