

Effectiveness of Low cost Devices for Evaluation and Training of Eccentric Viewing



Education

KEYWORDS : Visually impairment, Low vision, Eccentric Viewing, Central Paper S cotoma, Visual skills, Reading Speed.

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ABSTRACT

Low vision is a bilateral impairment to vision that significantly impairs the functioning of the person and cannot be adequately corrected with medical, surgical, therapy, conventional eye wear or contact lenses. Low vision is not blindness, which is the absence of useful vision. When the macula dies as a result of macular degeneration, the tissue dies so a spot on the retina becomes totally insensitive to light. The fovea right in the middle of the macula is only 20/20 vision in a normal eye. Since the fovea and macula are dead in macular degeneration pupils, when the eye is focused directly on the object to be seen, the light entering the eye is being focused on the dead tissue. Consequently, nothing is seen. By looking to the right or left of the object, so that the light entering the eye is focused on the retinal tissue right beside the macula but not directly on it, allows the peripheral vision to come into play. Hence training in eccentric viewing can prove effective to be discrete focus of fixation which utilizes intact retina adjacent to the retinal pathology. Central field loss requires utilization of peripheral vision. This study was an attempt to measure the central vision loss and training to view eccentrically using low cost devices and techniques. The study results revealed that the low cost devices proved the efficacy for evaluation of Eccentric Viewing and training in the use of peripheral vision resulting in improved reading speed.

Introduction

Low vision is a bilateral impairment to vision that significantly impairs the functioning of the person and cannot be adequately corrected with medical, surgical, therapy, conventional eye wear or contact lenses. It is often a loss of sharpness or acuity but may present as a loss of field of vision, light sensitivity, distorted vision or loss of contrast. Low vision is not blindness, which is the absence of useful vision.

Vision loss and implications

There are literally hundreds of different diseases that can cause visual impairment. Instead of trying to discuss the management of each separate eye diseases, one can look at the system of classification that is based on the functional consequences of that disease. The first concept to know is that every disease can be placed in one or more of three categories based on similarity of functional symptoms.

They are

- Diseases involving the optical media
- Diseases involving the macula and central vision
- Diseases involving the peripheral retina and visual pathways.

The symptoms of each category are different. Therefore vision rehabilitation is said to be symptom based. The relative importance of each component varies with functional category.

Central vision loss

The loss of central vision hinders the ability to perform tasks that involve fine details such as reading, sewing and wood-working. Because it affects the central retina, the peripheral retina remains functional. Therefore the individuals having this loss rely on their peripheral vision in order to see.

Eccentric viewing

When the macula dies as a result of macular degeneration, the tissue dies so a spot on the retina becomes totally insensitive to light. The fovea right in the middle of the macula is only 20/20 vision in a normal eye. It is the only truly sharp vision in 180 degree of vision. Because this is true, and has been true from infancy, when one wanted to see something, the eyes were turned to look directly at whatever one wanted to see. By looking to the right or left of the object, so that the light entering the eye is focused on the retinal tissue right beside the macula but not di-

rectly on it, allows the peripheral vision to come into play.

Some people can see best if they move their eyes high right and some see best when they look high left. Some see best when they look straight left or right. Each person must determine for himself which way is best.

Need of the study

According to World Health Organization (2004), there are about 37 million blind and 124 million individuals with low vision comprising total of 161 visually impaired individual's worldwide.

More than 90% of the world's visually impaired live in developing countries. One fourth of the world blind is living in India. Rough estimates suggest that there could be 0.75-1 million children with low vision in India.

Central field loss requires utilization of peripheral vision. In developed countries, the central field loss is diagnosed with sophisticated equipment. But such equipment is not available in our country. Since the children with central vision loss form a sizable population, they should be provided with compensatory viewing strategies. After evaluation of central Scotoma, training is required to employ functioning retina adjacent to the Scotoma. Of all the techniques and aids the macular children with central Scotoma needs to master, none comes higher on the list than Eccentric Viewing; i.e., not looking at what one wants to see. Hence the investigators selected the topic "Effectiveness of Low Cost Devices for Evaluation and Training of Eccentric Viewing".

Objectives

- To measure the Central Scotoma using Low Cost Devices and Tests
- To study the effect of treatment in terms of Functional Visual skills of pupils having central vision loss.
- To study the effect of treatment in terms of Reading Speed of pupils having central vision loss.

Hypotheses

- There is no significant difference on the performance of Functional Visual skills of pupils before and after training.
- There is no significant difference on the Reading Speed of pupils before and after training.

Method**Settings**

The present study was conducted in the Inclusive Education for the Disabled in Coimbatore, Erode and Salem districts of Tamil Nadu. The schools were clustered in the main cities of these districts.

Sample

The sample chosen for the final study consisted of 30 pupils. The present study was experimental in nature. A stratified sampling was adopted to get homogeneous sample i.e. pupils having central vision loss. The sample by nature of its purpose consisted of 28 boys and two girls. The pupils were from Grade II - IX from different inclusive schools.

Design of the study

The investigator followed the single group experimental study which does not involve control group. As an experimental study the study planned activities for five Visual Functional skills and a Reading Programme.

Before administering the Pre and Posttests, the investigator evaluated the pupils of their Central Vision Loss and its types. This evaluation constituted a higher portion of the time.

The component items and the activities for the functional visual skills were borrowed from the Manual 'Teaching Low Vision children' by Vijayan, P. and Naomi, V. The Functional Visual skills components included Visual Fixation, Visual Focusing, Visual Tracking, Visual Scanning and Form Constancy.

Activities Presented for Functional skills**1. Visual Fixation**

These activities included fixation of light / objects / person at the shorter and longer distance.

2. Visual Focusing

Visual focusing is converging eyes together to view. The activities included shifting gaze at short and longer distances, using both eyes to see an object / person and judging distance and depth perception.

3. Visual Tracking

Visual tracking is following the moving object. The visual skills assessed were tracking big and small object like rolling the ball. Activities were also provided for horizontal, vertical and circular tracking.

4. Visual Scanning

Visual scanning is searching for a particular. Scanning big and small objects, identifying details on objects and pictures were given to assess the skill.

5. Form Constancy

Form constancy is viewing the object at different angles while the object remains the same. Seeing object at different angles and positions, at longer and shorter distances were provided.

Reading programme**i) Selection of Content**

The investigators designed the text borrowing a passage and edited with the help of a linguistic. The text had hundred words. Each sentence had three lines, an average of ten words per sentence. The text was prepared in varying font size from 8 to 16 font sizes.

ii) Construction of the tool**Observation schedule**

The investigators developed the Observation Schedule which includes test items such as eye contact and head position of the

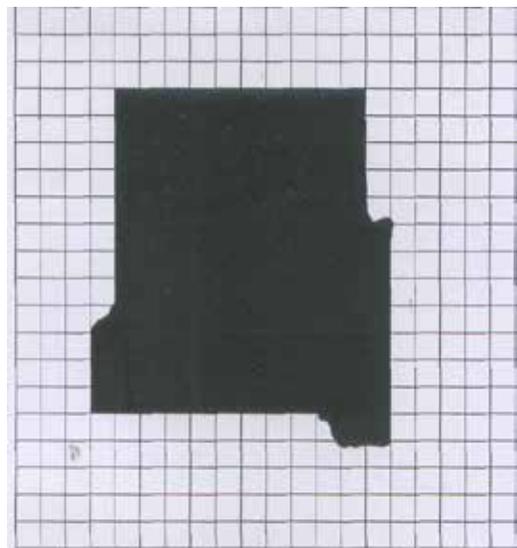
subjects during informal observation. There are three statements in that test and against each statement there was 3 point scale namely Routinely (R), Occasionally (O), and Never (N). The investigator administered the scale and response noted was recorded by 'Ö' mark.

Assessment Check list

The Assessment Scale developed for measuring the Central Scotoma included six test items namely, (i) Position of head during visual acuity testing, (ii) Identification of object - above, below, left or right of the object. (iii) Identification of word - above, below, left or right of the word. (iv) Identification of clock hours - above, below, circular. (v) Central field restriction (vi) Peripheral field restriction. Against each statement there was 3 point scale namely Routinely (R), Occasionally (O), and Never (N). The investigator administered the scale and response noted was recorded by 'Ö' mark.

Amsler Grid

This simple screening test named Amsler Grid developed by Marc Amsler (1945) is used to assess the center of the retina. The Amsler Grid consists of evenly spaced horizontal and vertical lines printed on black or white paper. A small dot is located in the center of the grid for fixation. While staring at the dot, the student looks for wavy lines and missing areas of the grid.



Central scotoma of the left eye of a student

Conduct of the study**The study has two aspects:**

- Effectiveness of Low Cost Devices for Evaluation of Central Scotoma.
- Effectiveness of Low Cost Devices and Techniques for Training.

This study was conducted into two phases. During the first phase of the study, the evaluation of Central Scotoma was analyzed on the basis of qualitative analysis. During the second phase of the study, Pretest and Posttest scores were individually analyzed.

Results**Result : I Evaluation of Eccentric Viewing through Observation**

The data in respect of Eccentric Viewing position were obtained with the help of Observation Schedule.

Table 2 : Eccentric viewing

| S.No | Observation | Percentage | | |
|------|---------------------------------------|------------|--------------|-------|
| | | Routinely | Occasionally | Never |
| 1 | Eye contact | - | 30 | 70 |
| 2 | Looking straight at the examiner face | - | 63 | 37 |
| 3 | Head movement tilting | 57 | 43 | - |

The table indicates that seventy percent of the selected samples do not have direct eye to eye contact. None of the pupils look straight at the investigator during informal observation. The head positions of the pupils (57%) are routinely tilting.**Result**

Result2: Evaluation of Eccentric Viewing through Assessment

The data in respect of Eccentric Viewing position were obtained with the help of Assessment Schedule.

Table 2 : Evaluation of Eccentric Viewing

| S.No | Items Assessed | Percentage | | |
|------|--|------------|--------------|-------|
| | | Routinely | Occasionally | Never |
| 1 | Tilting position of the head during visual acuity test | 57 | 43 | - |
| 2 | Identification of object above, below, left or right of the object | 53 | 47 | - |
| 3 | Identification of word above, below, left or right of the word | 43 | 57 | - |
| 4 | Identification of clock hours above, below, circular | 53 | 47 | - |
| 5 | Central field restriction (Confrontation Test) | 90 | 10 | - |

The table presents the visual behavior of the sample during assessment. Fifty three percent of the pupils routinely look at the object, above, below, left and right and not at centre of the object. Above 50% of the pupils routinely identified the clock hours in above, below and circular manner.

During Confrontation Test for Visual field assessment 90% of them showed field restriction at their centre of their vision.

Result : 3 Evaluation Central Scotoma with Amsler Grid

Table 3 : Evaluation Central Scotoma with Amsler Grid

| S.No | Test Item | Percentage | | |
|------|---|------------|--------------|-------|
| | | Routinely | Occasionally | Never |
| 1 | Cannot see the black dot | 53 | 33 | 14 |
| 2 | Seeing a black or dark spot | 27 | 66 | 7 |
| 3 | The lines in the grid look wavy, blurred, or curved instead of straight | 27 | 73 | - |

The table reveals the results of the Amsler grid test. Fifty three percent of the pupils could not see the central dot in the grid and 25% of them expressed that they see blank dark spot. The blank spot may be below, above and side of the grid. Similarly 27% of them expressed that the lines of the grid look wavy, blurred or curved instead of straight. The subject was asked to draw lines from where they can see in the grid without moving head and eyes.

Result : 4 Effectiveness of Eccentric Viewing Training on Functional Visual Skills

Table 4 : Mean, SD, df, and Correlated t-value of Visual Performance

| Testing | Mean | SD | df | t - value |
|----------|-------|------|----|-----------|
| Pretest | 11.07 | 2.64 | 29 | 16.55** |
| Posttest | 14.13 | 2.30 | 29 | |

**** Significant at 0.01 level**

The co-related t - value is 16.55 which is significant at 0.01 level. It means that there was a significant impact of training on the performance. In the light of this, the null hypothesis stated as there is **“no significant difference in the performance of pupils on Visual Functional Skills is rejected”**. It may therefore be said that the training in the use of Eccentric Viewing helped pupils in improving the performance on Visual Functional skills.

Result : 5 Comparison of Mean Scores of Visual Functional Skills

Table 5 : Analysis of Pretest Posttest Scores of Visual Functional Skills

| S.No | Visual Functional Skills | Mean | | SD | t value |
|------|--------------------------|------|------|------|---------|
| | | Pre | Post | | |
| 1. | Visual Fixation | 3.00 | 3.73 | 0.69 | 5.81** |
| 2. | Visual Focus | 1.80 | 2.77 | 0.61 | 8.61** |
| 3. | Visual Tracking | 2.27 | 2.80 | 0.51 | 5.76** |
| 4. | Visual Scanning | 3.53 | 4.07 | 0.57 | 5.11** |
| 5. | Form Constancy | 0.47 | 0.77 | 0.54 | 3.07** |

**** Significant at 0.01 level**

From this table it is evident that there is a significant difference between pretest and posttest scores of Visual Functional skills. The pre and post mean scores of Form Constancy component are lower than other skills. Form Constancy component are lower than other skills. Form constancy assessment requires different viewing position. The pupils with Central Vision Loss due to their eccentricities show poor performance in this skill.

Result : 6 Effectiveness of Eccentric Viewing Training on Reading Speed

Table 6 : Mean, SD, df, and Correlated t - value of Reading Speed

| Testing | Mean | SD | df | t - value |
|----------|-------|------|----|-----------|
| Pretest | 21.47 | 13.4 | 29 | 2.76** |
| Posttest | 25.07 | 13.6 | 29 | |

****Significant at 0.01 level**

The co-related t - value is 2.76 which are significant at 0.01 levels It means that there was a significant impact of training on the Reading performance. In the light of this, the null hypothesis stated as there is **“no significant difference in the Reading Speed of pupils before and after training is rejected”**. It may therefore be said that the training in the use of Eccentric Viewing helped in improving the Reading Speed of pupils with Central Vision Loss.

FINDINGS

- The low cost devices proved the efficacy for evaluation of Eccentric Viewing
- The study revealed that with the Amsler Grid test Central Scotoma can be identified with the trained teacher
- The study revealed that there was a significant impact of training on the performance of Visual Fixation, Visual Focusing, Visual Tracking, Visual Scanning and Form Constancy.
- It was noted that the Eccentric View training helped in improving Reading Speed of pupils with Central Vision Loss. The pre mean score is 21.47 whereas the post mean score is 25.07

CONCLUSION

A Central Field Loss or Central Scotoma can significantly affect visual functioning. Once aware of the Scotoma, the students can be taught to position the Scotoma eye movements. This control can be achieved in a guided practice manner with a variety of targets. And this study stands as a testimony to it.

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