

Original article**ASSESSMENT OF STEREOPSIS AMONG STUDENTS WITH MYOPIC REFRACTIVE ERRORS**

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Abstract

Background: Stereopsis is the essential component of binocular vision. Stereoscopic vision is impaired in myopia, which should be corrected at the earliest.

Objective: To find the extent of improvement in stereoscopic vision by correcting myopia

Material & Methods: A prospective observational study included 50 students of both sexes aged 19-23 years with myopic refractory errors. Stereopsis was evaluated using TNO test at a distance of 30 cm using red green glasses. A baseline stereopsis was evaluated before myopic refractory errors were corrected and after correction of these errors.

Results: There was a significant improvement in stereopsis after myopic refractory error correction.

Conclusion: Early correction of myopic refractory errors is necessary for good stereopsis vision and to reduce longterm complications as a result of stereopsis vision.

JK-Practitioner 2021;26(1):44-46

Introduction

Visual acuity refers to the ability to discriminate between two points. The first few months are essential in a human's visual development. Using both the eyes to see the same object simultaneously is known as binocular vision.

An essential component of binocular vision is stereopsis, the perception of depth produced by the reception in brain of visual stimuli from both eyes using binocular vision. It is the visual appreciation of three dimensions, that is, the ability to obtain the impression of depth by the superimposition of two images of the same object seen from two slightly different angles. Stereopsis develops by fourth month of life and reaches the adult level at six years of age and then deteriorates after the age of forty. In situations of monocular deprivation, it can affect binocular vision up to two years.

The simultaneous occurrence of pattern visual input is necessary for binocular vision development. Both eyes see different images and our brain fuses the images together to form a single image. During fusion, similarities between two images are matched together to aid in making image. However, if the differences between images are too many, then double vision can occur. After fusion is completed, depth perception is perceived. Our eyes use this fascinating function in our daily life. It allows us to judge distances and to see where objects are in relation to us and to each other. Only when both eyes work together we are able to do simple acts like driving cars, climbing up and down the stairs, etc.

Hence, performance of motor skill tasks are directly related to stereo acuity. Impaired stereoscopic vision is one of the important causes of anisometropic amblyopia. Myopia or nearsightedness, where the parallel rays of light focus in front of retina, is one of the major causes of

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Indexed

Scopus, INDMED, EBSCO &
Google Scholar among others

Cite this article as:

Subramani NNV, Bhaskaran B ,
Ikram SS , Veeramani VPA
Divya.N. Assessment Of Stereopsis
Among Students With Myopic
Refractive Errors.
JK Pract 2021;26(1):44-46

Full length article available for
download at jkpractitioner.com
two months after publication

Key Words:

Myopia, Vision

diminished loss of vision in early childhood. Stereoscopic vision reduction in the presence of myopia is very common as the conditions for yielding good stereoscopic vision is not fulfilled.

MATERIALS AND METHODS

The study was duly approved by Institutional Ethics Committee.

Study Design and Duration

This was a prospective observational study conducted between months of January and March 2020 under Department of Ophthalmology, Saveetha Medical College, Chennai among Saveetha University students.

Inclusion Criteria

150 students of both sexes, aged 19-23 with myopic refractory errors were included in this study.

Exclusion Criteria

Students with no myopic refractive errors or minimal myopic refractive errors and with history of refractive surgery were excluded from this study.

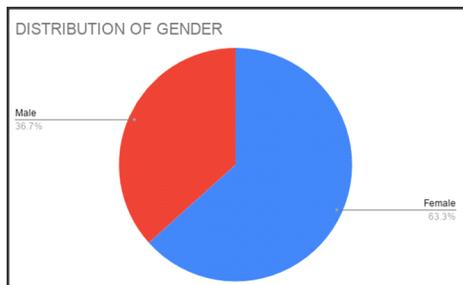
Method

Oral consent was obtained after explaining the purpose and procedure of study. The baseline visual acuity for distance was checked using Snellen chart at 6 meters for each student before and after myopic refractory errors were corrected. Stereopsis was then evaluated using TNO test at distance of 30cm using red green glasses. A baseline stereopsis was evaluated before myopic refractory errors were corrected and then stereopsis was assessed after the myopic refractory errors were corrected.

DATA AND ANALYSIS

Table 1: Distribution of Gender

Sex	Frequency	Percentage
Female	95	63.30%
Male	55	36.70%
Total	150	100%



Out of the 150 students included in the study, 63.3% of the respondents are females and 36.7% are males.

Data analysis was done using Chi Square Test as test of significance and P value of <0.05 was considered as statistically significant.

RESULTS

Table 1 shows the gender distribution of the study.

Table 2 displays the assessment of stereopsis before the myopic refractory errors are corrected. There is no statistical significance between the power of refractory error and the stereopsis.

Table 3 presents the assessment of stereopsis after the myopic refractory errors are corrected. There is no statistical significance between the power of refractory error and stereopsis.

Table 4 displays that there is a significant improvement in stereopsis after myopic refractory errors are corrected.

Stereopsis before Correction of Myopic Refractory Errors

Refractive Power	≤120 Arch Degrees	240 Arch Degrees	480 Arch Degrees	Total	P value
-3 to -5	55	44	35	134	
-5 to -7	4	6	4	14	0.725643
-7 to -9	1	0	1	2	
				150	

The p value is 0.725643.

The result is not statistically significant at $P < 0.05$.

Stereopsis After Correction of Myopic Refractory Errors

Refractive Power	≤120 Arch Degrees	240 Arch Degrees	480 Arch Degrees	Total	P value
-3 to -5	133	1	0	134	
-5 to -7	14	0	0	14	0.998276
-7 to -9	2	0	0	2	
				150	

The p value is 0.998276.

The result is not statistically significant at $P < 0.05$.

Stereopsis with TNO Test

Stereopsis with TNO Test	No. of Students before Correction	No. of Students after Correction	P Value
120 Arch Degrees	60	149	
240 Arch Degrees	50	1	0.00001
480 Arch Degrees	40	0	

The p value is 0.00001.

The result is statistically significant at $P < 0.05$.

DISCUSSION

Stereopsis is the perception of depth produced by reception in brain of visual stimuli from both eyes in combination using binocular vision.¹ With

binocular vision, humans are able to see the same object as one image and that creates perception of depth. We use this function in our daily life as when we are driving cars, pouring cup of coffee, threading, sewing, knitting needles, climbing up and down stairs, reaching out to touch or hold something, suturing and performing surgery.²

In this study, the assessment of stereopsis was done in students with myopic refractive errors. It was found that P value of 0.00001, which is statistically significant, suggests that there was significant improvement after myopic refractive errors were corrected in students. In myopic patients, shadows that occur from greater disparity of the retina leads to decrease in the depth level of binocular vision which ultimately affects stereopsis. After myopic refractive errors are corrected, the light entering the eye focuses on the retina, leading to perfect vision, which ultimately leads to favorable binocular vision and improved stereopsis.

CONCLUSION

Based on these data, students with myopic refractive errors are associated with reduced stereopsis before correction. After the correction of myopic refractive errors, there was significant improvement in stereopsis. TNO Test is an effective test that can be used to evaluate in young age as early as preschool children to correct the myopic refractive errors early and to reduce long term complications.

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