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Original Research Article

Comparison of contrast sensitivity in Myopes and Hyperopes

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Abstract

To compare contrast sensitivity in myopes and hyperopes and the evaluation of diffrences in contrast sensitivity in different degrees of myopic and hyperopic correction. A comperitive cross sectional study was conducted on 31 patients having different degrees of myopia and hyperopia to assess its effects on contrast sensitivty. Visual acuties for distance and near was measured by using distance snellen chart at 6m and near vision chart at 33cm. Contrast sensitivity was measured by using Pelli Robson contrast sensitivity chart. Results showed us that contrast sensitivity effect ratio was more in hyperopes as compared to myopes . Moreover myopes with mild to moderate degree showed normal contrast sensitivity while contrast sensitivity was reduced on severe myopes. Hyperopes showed decreased contrast sensitivity then myopes. Binocular contrast sensitivity was better than monocular contrast sensitivity. It was concluded that hyperopes showed more reduction in contrast sensitivity as compared to myopes. Mild to moderate degree of myopes and hyperopes showed better contrast sensitivity without any optical correction. Severe degree of such refractive errors showed decreased contrast sensitivity. Binocular contrast sensitivity was much better than monocular contrast sensitivity.

Keywords: Contrast sensitivity, Myopes, Hyperopes, Visual acuties.

INTRODUCTION

Contrast sensitivity

Contrast sensitivity is the capacity to detect, distinguish or recognize items that differ moderately in relative luminance, difference in contrast sensitivity is due to variations in retinal ganglion cells sensitivity (Fiorentini and Maffei, 1976). Contrast awareness is a fundamental component of visual efficiency and is capable of performing tasks such as driving, reading, navigation. For the calculation of refractive surgery results, contrast sensitivity is used (Collins and Carney, 1990). One of the main techniques presently used to assess visual function is the measurement of contrast sensitivity. The eye can interpret an object by comparing the light level variations between the goal and the background (Liou and Chiu, 2001) Contrast sensitivity is one of the most important requirements for healthy vision and can be influenced by many variables unlike visual acuity (Aung et al., 2001). The growing use of multifocal contact lenses and intraocular lenses (IOLs) has developed a fresh group of patients whose visual quality is impacted regardless of visual acuity (Kawabata and Adachi-Usumi, 1997). Visual acuity measurement in these patients is not an appropriate evaluation of visual function, increasing the need for contrast sensitivity and glare testing. In order to discuss pathological levels, however, we first need to determine levels of contrast sensitivity in ordinary people and comprehend the circumstances of daily living and environment that affect these concentrations.

Contrast sensitivity measurement provides vision quality (Jurklies et al., 2002). On the Pelli-Robson graph it can be verified. It can also be evaluated by a Mars contrast sensitivity graph that is kept by side and used 41 to 5 cm away (Hood et al., 2002). The range is between 0.04 and 1.92 log units. In triplet of equal comparison, letters are not structured which reduces by 0.04 log unit (Montes-Mico and Charman, 2002). Test Chart 2000 is a graph of contrast awareness consisting of letters on a computer monitor (Nikonov et al., 2000). It is conducted at a Pelli-Robson chart-like range of 1 meter (Fain et al., 2001). The patient must carry + 0.75DS add. The Pelli – Robson chart is performed at a distance of 1 m and the patient is required to wear+ 0.75 DS lenses. The letters that are used are of steady size (Short, 1966). The graph consists of sixteen triplets with eight rows. It's done binocularly. The incidence of anisometropia is about 2% with distinct age groups. Approximately 1.5 percent of babies are more or equal to 1.5 diopters with anisometropia (Patel and Jones, 1968). Cycloplegic retinoscopy indicates that more than 1D anisometropia is present in newborn babies around 14 percent. The binocular vision is worsened as the degree of anisometropia rises and it also finds out which eye is amblyopic eye (Legge and Kersten, 1983). The threshold for the development of amblyopia is about 1D of anisometropia. Spherical hyperopic anisometropia higher than 1D or spherical myopic anisometropia higher than 2D effects higher rise in amblyopia incidence and decrease in binocularity (Ahumada and Scharff, 2003). Cylindrical hypermetropic anisometropia and cylindrical myopic anisometropia with effects higher than 1.5D higher rise in amblyopia incidence and decrease in binocularity.

Myopia is a sort of refractive error that focuses in front of the retine on light from a remote object. It is possible to correct myopia by optically prescribing concave lenses. When divergent light from the lens is fixed, it focuses on the retina. Close to objects can be seen obviously in myopia while remote objects are difficult to see. LASIK and other methods for laser eye surgery are efficient long-term nearsightedness treatments.

Optical aberrations and light scattering can lead to degradation of image quality on the retina, leading in subjective visual performance deterioration. Clinically helpful for examining the subtle changes in subjective visual performance, contrast sensitivity testing has been shown. This test, however, cannot determine whether the modifications were due to optical aberrations or light dispersion (Zemon et al., 1988). Accordingly, the roles of optical aberrations and light scatter in the contrast sensitivity function in a clinical environment should be evaluated separately. However, as far as we can ascertain, in an ophthalmologically ordinary population, no comprehensive study on the clinical variables behind the contrast sensitivity feature has yet emerged. In addition, there has been no quantitative clarification of the relationship between the contrast sensitivity function and intraocular scattering in such subjects.

Hypermetropia is a form of refractive error that focuses on light from remote objects beyond the retina. If you are farsighted, your cornea will not correctly refract light, so the focal point will fall behind the retina. This makes objects close-up seem blurry. Using convex lens, hypermetropia is fixed. This happens when the eyeball is too short, preventing incoming light from directly concentrating on the retina. S a condition of vision in which remote objects are obviously visible, but near objects is not properly focused. It can also be triggered by a cornea or lens abnormal shape. Surgery such as LASIK is accessible to adults with mild to moderate farsightedness rates.

Causes of farsightedness

One cause of farsightedness is a flat cornea. If your eyeball is shorter than ordinary, you can also be farsighted. This leads light to concentrate instead of on it beyond your retina. One cause of farsightedness is a flat cornea. If your eyeball is shorter than ordinary, you can also be farsighted.

DISCUSSION

The results of this study indicate that myopia, the nature of contrast, and the level of background luminance affect contrast thresholds (Kolb and Marshak, 2003). In particular, although refractive errors have been corrected, myopic subjects show reduced contrast sensitivity relative to emmetropes, although the difference decreases with a higher background luminance level. Another psychophysical investigation also revealed a reduction in contrast thresholds as a consequence of an rise in the background luminance level, 8 and the phenomenon was addressed in studies on the molecular and cellular processes for adapting the retina. We also find that in both photopic and mesopic circumstances, emmetropes show reduced contrast thresholds for adverse than for favorable comparison, the reverse pattern being shown by myopes. The presence of such functional asymmetry in the human visual system is also confirmed by other psychophysical (Short, 1966; Patel and Jones, 1968; Legge and Kersten, 1983; Ahumada and Scharff, 2003) and electrophysiological studies (Zemon et al., 1988) on emmetropes. This phenomenon can be clarified by a morphological asymmetry in the (Kolb and Marshak, 2003; Dacey and Petersen, 1992) ON and OFF pathways or by distinct comparison gain processes in these two visual system channels.

Table 1. Contrast Sensitivity with spectacles in right eye.

		CSRE						Total
		0.15	1.05	1.2	1.3	1.5	1.65	
Type	Myopic	0	3	2	0	7	6	18
	Hyperopic	2	0	2	3	6	0	13
	Total	2	3	4	3	13	6	31

Table 2. Contrast sensitivity with spectacles in left eye.

		CSLE					Total
		1.2	1.4	1.5	1.7	1.8	
Type	Myopic	2	3	7	3	3	18
	Hyperopic	0	0	4	9	0	13
	Total	2	3	11	12	3	31

Table 3. Contrast sensitivity with binocular correction.

		CSBN			Total
		1.5	1.7	1.95	
Type	Myopic	7	8	3	18
	Hyperopoic	2	11	0	13
	Total	9	19	3	31

In addition, for the first time, our research offers proof that the sensitivity to contrast is negatively linked to the degree of myopia (Dacey and Petersen, 1992). We find that with a greater spherical equivalent refractive error, contrast thresholds are systematically increased and the rate of rise is greater for adverse than for favorable contrast. One might argue that this phenomenon is the result of myopia reducing the retinal image's optical quality. The optical defocus and astigmatism are two factors that lead to deteriorated retinal image quality. For this reason, only myopic topics without astigmatism and with excellent visual acuity corrected (20/20 or better) have been examined in our inquiry. The empirical evidence is contradictory with regard to other optical imperfections, the so-called high-order aberrations (Porter et al., 2001). Some researchers say that myopic eyes don't have much more aberrations than emmetropic eyes (Jindra and Zemon, 1989). Other studies, however, indicate that myopia has greater aberrations than emmetropes. However, there is little correlation between the amplitude and type of aberration and the quantity of spherical equal refractive error. High-order aberrations increase with a greater degree of myopia, according to a third group of researchers (Wood and Owens, 2005). The final consequence is not compatible with our findings that the rate of rise in comparison thresholds with a greater degree of myopia ranges from negative to beneficial contrast.

However, this argument is based on the assumption that aberration-induced retinal image distortions do not introduce asymmetries related to the sign of stimulus contrast (Wood and Owens, 2005). Therefore, it is possible that the observed increase in contrast thresholds with a higher degree of myopia is caused by aberrations of the myopic eye, and/or aberrations added by corrective lenses. Alternatively, the causes could also be functional and/or morphological changes in the myopic eye retina, particularly since there is proof of such modifications. In conclusion, this research demonstrates that despite excellent visual acuity corrections, myopes show a decreased sensitivity to contrast with emmetropes. For the first time, the current research showed that contrast sensitivity is negatively associated with the degree of myopia. With a higher spherical equivalent refractive error, the contrast thresholds increase systematically, and the rate of increase is higher for negative than for positive contrasts. These results warrant further investigation of the myopic visual system's functional characteristics. (Table 1, 2 and 3)

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