

Myopes visual acuity with positive and negative contrast stimuli

G. Ikaunieks, E. Caure, E. Kassaliete, Z. Meskovska

Department of Optometry and Vision Science, University of Latvia

Gatis.ikaunieks@lu.lv



LATVIJAS
UNIVERSITĀTE
UNIVERSITY OF LATVIA



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Introduction

Some researchers showed that for corrected myopes visual acuity is better with positive Weber contrast (white symbols on black background) than with negative contrast (black symbols on white background) optotypes. One explanation of such phenomena is that myopes have neurological changes in ON and OFF pathways [1]. Kurtev *et al.* studies confirmed this hypothesis [2]. However also optical factors (retinal straylight) could influence reduction of visual acuity with negative contrast stimuli [3]. One source of retinal straylight for myopes could be optical correction - spectacle or soft contact lenses. Our previous results (Fig.1.) showed that spectacle lenses increase retinal straylight [4]. Some authors found out that contact lenses don't influence retinal straylight [5].

Our hypothesis is that difference between positive and negative contrast stimuli is greater with spectacle than with soft contact lenses. With this research we wanted to verify this hypothesis.

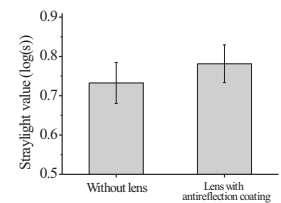


Fig.1. Retinal straylight is smaller in measurements without spectacle lenses than with them.

Method

Monocular visual acuity with positive (Weber contrast = 35.7), negative (-0.97) and low contrast stimuli (-0.11) were measured.

Computer program Freiburg Visual Acuity and Contrast Test were used for acuity measurements [6]. Distance was 4.5m.

8 emmetropes, 10 with spectacle and 13 with soft contact lenses corrected myopes participated in measurements.

Weber contrast

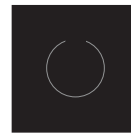
$$C_W = \frac{L_O - L_B}{L_B}$$

L_O - Luminance of the object

L_B - Luminance of the background

Michelson contrast

$$C_M = \frac{L_{max} - L_{min}}{L_{max} + L_{min}}$$



Positive contrast
 $C_W=35.7$
 $C_M=0.95$



Negative contrast
 $C_W=-0.97$
 $C_M=0.95$



Low contrast
 $C_W=-0.11$
 $C_M=0.06$

Results

As was expected, the worst visual acuity was found with the low contrast optotypes. For myopes these values were lower than for emmetropes, but for myopes visual acuity obtained with high contrast stimuli also were lower, so we can't conclude that myopes have worse contrast sensitivity than emmetropes

For emmetropes visual acuity with positive and negative contrast was not significantly different, while for corrected myopes visual acuity values were statistically significant better (paired t-test) with positive than with negative contrast stimuli.

For myopes results measured with different vision correction - spectacle or contact lenses - were not statistically different.

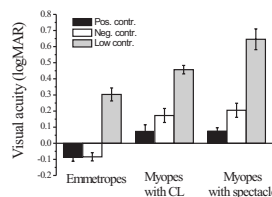


Fig.2. Average visual acuity values for emmetropes and corrected myopes measured with different contrast stimuli. Standard errors are showed for each data series.

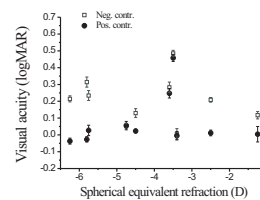


Fig.3. Positive and negative contrast visual acuity values for each myope corrected with spectacle lenses.

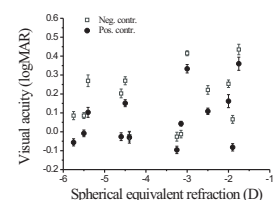


Fig.4. Positive and negative contrast visual acuity values for each myope corrected with soft contact lenses.

Conclusions

Difference between myopes visual acuity values measured with positive and negative contrast stimuli is the same with spectacle and contact lenses correction. We can conclude that these two types of optical correction create similar amount of retinal straylight.

However there is still question is retinal straylight related with decreasing of visual acuity for myopes when negative contrast optotypes are used.

References

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