The application of the red-green test in optometric examination

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In optometric practice, one of the most commonly used tests for determining spherical correction power is the red–green test. The aim of this study was to evaluate its effectiveness under monocular conditions and to demonstrate that it is not always the optimal choice, particularly for young patients. Seventeen binocularly seeing patients aged 20–25 years were examined. The effect of gradual overcorrection of up to 1.00 diopter, applied monocularly, on red–green test results was analyzed. The results showed that accommodation has the greatest influence on test outcomes, highlighting limitations of the test and the importance of accurate initial correction.

Keywords: red–green test, bichromatic test, accommodation, overcorrection

INTRODUCTION

The European Academy of Optometry and Optics establishes standards and regulations in the field of optometry and optics. In accordance with these guidelines, specialists use various methods and tests, including the bichromatic (red-green) test, to accurately determine vision correction. The aim of this study is to assess the effectiveness of this tool and demonstrate that it is not always the best solution. This paper emphasizes the necessity of a cautious and critical approach to the use of the red-green test, particularly in the case of young patients.

	VALUE OF THE LENS ADDED IN FRONT OF THE CORRECTED EYE [D]			
	overcorrection			
	-0,25	-0,50	-0,75	-1,00
BACKGROUND COLOR WITH MORE CONTRASTED/SHARPER SYMBOLS	green	green	green	green
	return from overcorrection			
	-0,75	-0,50	-0,25	0,00
	green	green	green	equally

Figure 1. Expected scheme of the conducted study.

METHODS

The study included 17 healthy participants (13 women and 4 men) with binocular vision, aged 20–25 years (22.53 ± 1.28), and was conducted in two stages. Initially, accommodation parameters (near point of accommodation, amplitude, near point of convergence, and accommodative facility) were compared with established norms based on monocular and binocular assessments. Spherical equivalents were determined to ensure a visual acuity of 1.0 on the Snellen scale and equal contrast perception on red and green backgrounds during the bichromatic test. In the second stage,

conducted in a dark room, the effects of gradual overcorrection (for the right eye) up to -1.00D and its subsequent reduction on test outcomes and visual acuity were analyzed. The ideal model (Figure1.) assumed an increase in green-background contrast with the addition of minus lenses and equal contrast on both backgrounds upon returning to the spherical equivalent.

RESULTS

In the measurements (Figure 2.), an increase in green-background contrast was observed up to an overcorrection of −1.00 D, at which full agreement with the model was achieved. During the return from overcorrection, green-background contrast decreased, whereas after reaching the spherical equivalent, most participants demonstrated increased contrast perception on the red background. Only 3 out of 17 participants obtained results consistent with the assumptions. A subgroup of patients was identified whose bichromatic test results (Figure 3.) deviated from the model. Over 70% of participants showed normal values for the near point of accommodation, accommodative amplitude, and near point of convergence. However, 66.67% of the group exhibited reduced accommodative facility. Overcorrection of the examined eye resulted in visual acuity remaining nearly unchanged after returning to the spherical equivalent.

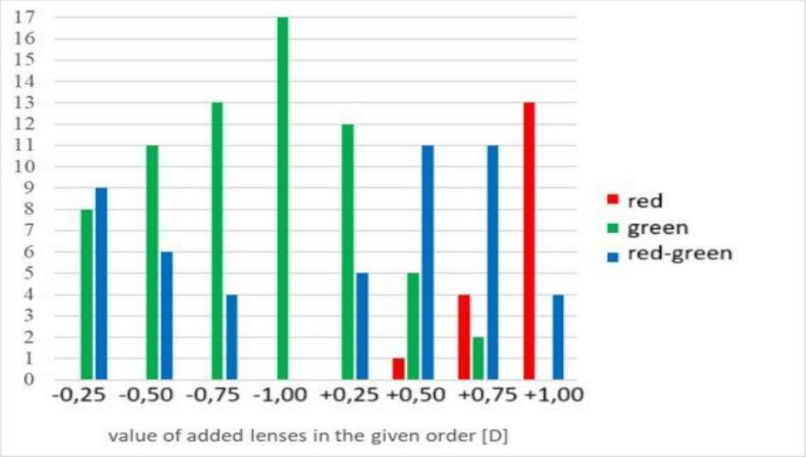

Figure 2. Q uantitative distribution of visual perception results regarding contrast of symbols in the red-green test examined monocularly (OD).

	PATIENTS WITH A NEGATIVE RED-GREEN TEST RESULT (OD)	
	The normality of the accommodative parameter relative to the norms	
	NORMAL	ABNORMAL
NPA OD	73,33%	26,67%
AA OD	73,33%	26,67%
AAF OD	33,33%	66,67%

Figure 3. The accommodative parameters in individuals with a negative result from the red-green test performed monocularly.

CONCLUSIONS

The findings led to three main conclusions. First, accommodation facility has the greatest impact on bichromatic test results. Additionally, the ocular accommodation system reacts rapidly to inappropriate correction, particularly when minus lenses are used. Therefore, proper relaxation and stabilization of the intraocular lens accommodative response are critical before performing procedures based on the bichromatic test. Finally, excessive accommodative strain, ciliary muscle tension, and overall system stress can result in reduced visual acuity and discomfort. This study highlights the limitations of the red-green test, particularly in younger patients, and underscores the importance of carefully selecting initial corrections to avoid excessive accommodative strain and prevent long-term accommodative dysfunctions.

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