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Behavior of the accommodation response during the subjective refraction

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Abstract

Purpose : Subjective refraction is considered the gold standard when assessing refraction. In this method the control of accommodation plays a key role. The purpose of this work was to study the relationship between the subjective refraction and the accommodative response. In particular, we analyzed the residual relative accommodation for the subjective refraction and the relationship between the transition between relaxed and activated accommodation and the subjective refraction.

Methods : The accommodative response of the right eye of 27 young healthy subjects between 18 and 30 years old was obtained with the subjective refraction. The setup used was a system based on a Hartmann-Shack aberrometer coupled to a phoropter that provides an estimation of the accommodative state every 100ms. First, the subjective refraction of each participant was obtained. Then a sweep of spherical lenses (ΔS) from +1.5D to -1.5D, in 0.25D steps, was presented in front of the corrected eye with the subjective refraction while monitoring the accommodation. The residual relative accommodation for the subjective refraction was obtained as the value for ΔS=0 D minus the minimum measured value of accommodation.
The transition between relaxed and activated accommodation within the measured response was obtained as follows: first, two linear fitting were obtained for each spherical power ΔS, one considering the curve between -1.5D and ΔS, and another between ΔS and +1.5D; then, the spherical lens ΔS producing the linear fittings with the best cumulative coefficient of determination was selected as the transition point between relaxed and activated accommodation.

Results : Results showed that the mean relative accommodation ± SD with the subjective refraction was 0.19±0.12D. Bland-Altman analysis was done to determine the agreement between the value of the traditional subjective and the value obtained by finding the transition point of accommodation. The mean ± SD of the differences between methods and 95% limits of agreement were 0.019 ±0.42D (1.01D, -0.64D).

Conclusions : Considering the values of relative accommodation with the subjective refraction a tendency to have a residual activated accommodation can be observed. Moreover, the transition between relaxed and activated accommodation may be a significant information and could be a useful tool to detect accommodative anomalies during subjective refraction.

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