

TITLE:

Effect of experimental conditions in the accommodation response in myopia

AUTHORS:

Carles Otero¹, MSc; Mikel Aldaba², PhD; Fuensanta A. Vera-Diaz³, PhD; Jaume Pujol¹, PhD

INSTITUTIONAL AFFILIATIONS:

¹Davalor Research Center, Universitat Politècnica de Catalunya, Terrassa, Spain

²Center for Sensors, Instruments and Systems Development, Universitat Politècnica de Catalunya, Terrassa, Spain

³New England College of Optometry, 424 Beacon Street, Boston, MA 02115, United States

STRUCTURED ABSTRACT

Purpose: To analyze the effect of stimuli characteristics: method, depth and field of view (FOV) on the accommodation response (AR) for emmetropes (EMM), late-onset myopes (LOM) and early-onset myopes (EOM).

Methods: Monocular AR were measured under 60 different viewing conditions, the result of permuting the following factors: (1) stimulation procedure (free space, FS, or Badal lens viewing, BLV), (2) stimulus depth (flat or volumetric), (3) FOV (2.5°, 4°, 8°, 10°, 30°) and (4) amount of accommodation stimulation (AS: 0.17 D, 2.50 D, 5.00 D). The refractive error groups comprised n=9 EMM (those with a subjective spherical equivalent between 0.00 and +0.75 D), n=8 LOM those who became myopic after or at 15 years old) and n=9 EOM (before 15 years old).

Results: Mixed ANOVA for the AS of 2.50 D showed a significant interaction between stimulus depth and FOV ($F=2.73$, $p=0.03$) and among stimulation methods, FOV and refractive groups ($F=2.42$, $p=0.02$). For the AS of 5.00 D, there was a significant effect of stimulation methods, stimulus depth and refractive groups ($F=4.08$, $p=0.03$). When controlling for the within factors interactions: LOM showed larger lags than EMM and EOM, and the most accurate AR was obtained for a FOV between 8° and 10°, which did not significantly differed for different stimulation methods or stimulus depth.

Conclusions: AR were most accurate when the FOV was between 8° and 10°, which suggests that there may be an optimum peripheral retinal image size for accommodation stimulation. Previously reported differences in AR when using lens-based methods compared to FS viewing may be explained by the effect of other factors such as the FOV or the depth of the stimulus.

Keywords: Accommodation, field of view, periphery, Badal, depth.

ACKNOWLEDGEMENTS

This research was supported by the Spanish Ministry of Economy and Competitiveness under the grant DPI2014-56850-R, the European Union and by Davalor Salud, S.L. Carles Otero thanks the Generalitat de Catalunya for his awarded PhD studentship. None of the institutions had a role in the realization of this manuscript.