

Random changes of accommodative stimulus: an extension of the accommodative facility test

C Otero¹, M Aldaba², S Lopez,¹ F Díaz-Doutón,¹ J Pujol¹

¹Davalor Research Center (DRC), Universitat Politècnica de Catalunya, Terrassa, Spain

²Centre for Sensors, Instruments and Systems Development (CD6), Universitat Politècnica de Catalunya, Terrassa, Spain

Purpose:

To study the accommodative dynamics when the accommodative demand (AD) is randomly changed during the accommodative facility test.

Methods:

Nine young emmetropes and 9 young myopes (mean age \pm standard deviation (SD) of 22 ± 2) were measured monocularly 2 consecutive times with three different tests: 1) the near distance accommodative facility test (AD: 0.17 D/2.17 D); 2) the far distance accommodative facility test (AD: 0.50 D/4.50 D) and 3) the integrated randomized accommodative facility test (AD: 0.17 D/2.17 D/0.50 D/4.50 D). The accommodative response was measured with the PowerRef II, which was synchronized with an electro-optical Badal optometer that dynamically changed the accommodative stimulus. Each subject was instructed to clear the accommodative stimulus (black Maltese cross) and press a button once he/she cleared the stimulus. All of the subjects had normal accommodative amplitudes and accommodative facilities.

Results:

Each half cycle was fitted with an exponential function to compute the amplitude, time response and velocity. A mixed ANOVA with the following independent variables (each with 2 levels) was used: refraction (myopes, emmetropes), test (conventional, integrated) and direction (accommodation, disaccommodation) and demand (2 D, 4 D). There is a main effect of demand ($p < 0.01$) in all three variables. For amplitude, there is also a main effect of direction ($p < 0.01$) and for time response there is an interaction of direction*demand ($p < 0.01$) and test*demand ($p < 0.01$). There is not a systematic pattern between any of the measured variables and time.

Conclusions:

Despite there are significant differences in the accommodative dynamics between accommodation and disaccommodation and between 2 D and 4 D of accommodative demand, our results suggest that young subjects with good accommodative capabilities are not affected by the unpredictability of the accommodative stimulus during an accommodative facility task.

Keywords: accommodative facility; unpredicted stimulus; refractive error.

Acknowledgements:

Spanish Ministry of Economy and Competitiveness grant DPI2014-56850-R; European Union, Generalitat de Catalunya by Predoctoral grant FI-DGR (CO); Davalor Salud, S.L. (Spain)