

Título: CRYSTALLINE LENS RESPONSE TO DIFFERENT OPTICAL SIGNALS

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Resumen: It is well known that the eye is capable of changing its power, in order to focus on objects that are placed on different distances. The change in focus of the human eye is established as accommodation and it is vital for the visual performance of the human eye, as accommodation has an essential contribution to it. Retinal image quality also influences the visual performance of the human eye, as well as the resolution of the images formed on the retina. The retinal image quality is described in terms of ocular aberrations.

The aim of this Thesis was to investigate the crystalline lens response to different optical signals. In order to achieve the aim of the study, the most widely accepted and powerful technologies of wavefront sensing, Optical Coherence Tomography and Adaptive Optics were used to objectively appraise the accommodation mechanism of the human eye under different conditions.

In particular, initially it was assessed the accommodation response after short reading periods with two different handheld electronic devices, as well as the potential differences in accommodation response at various stimulus vergences, using a wavefront aberrometer. The acquired accommodation responses were not affected by the electronic devices employed, due mainly to the young age and the level of the amplitude of accommodation of the subjects that were enrolled.

Then, a two-scaled study was conducted between different age groups to evaluate the changes that occur at the main structures that take part in the process of accommodation in the anterior segment of the eye (i.e. lens

curvature and ciliary muscle area) using OCT. It was identified that there are significant variations in the anterior segment structures, which occur with the accommodation process. Whereas, with aging, the eye undergoes some significant anatomical changes that have an impact on the quality of vision and thus, of life.

Finally, using the AO system, it was investigated how the monochromatic higher-order aberrations (HOAs) influence on the accommodation response of the eye. More specifically, the accommodation response of the subjects' eye was measured under different conditions; with the natural aberrations being present and with the odd and even HOAs aberrations being corrected. The odd and even HOAs were not helping the visual system to choose the right direction of accommodation, as with their partial correction the accommodation performance remained unaffected, in comparison to the condition of the total aberrations presence.

This Thesis has provided with extra useful information about the accommodation mechanism and aging process of the eye that can be useful to improve the quality of vision and further of life of individuals with different age.