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CME Session

Presentation Abstract

Program#/Poster#:	4773
Abstract Title:	**Visual Simulation Of Binocular Depth Of Focus With A Corneal Small Aperture Inlay**
Presentation Start/End Time:	Wednesday, May 04, 2011, 5:15 PM - 5:30 PM
Session Number:	464
Session Title:	Exploring the Impact of Optical Blur on Vision /
Location:	Room 305
Reviewing Code:	103 adaptive optics: imaging and visual performance - VI
Author Block:	*Christina Schwarz, Juan Tabernero, Enrique J. Fernandez, Pablo Artal.* Laboratorio de Optica, Universidad de Murcia, Murcia, Spain.
Keywords:	434 binocular vision/stereopsis; 650 presbyopia; 623 aberrations
Abstract Body:	**Purpose:** To investigate binocular visual acuity, depth of focus and the mechanisms of binocular summation when one eye forms images through a pupil aperture of 4 mm in diameter and the other eye through a small pupil of 1.5 mm in diameter. **Methods:** We used a binocular adaptive optics visual simulator (Fernández, Prieto & Artal, Opt. Lett. 34, 2628, 2009) to measure both monocular and binocular visual acuity as a function of object vergence. The instrument allows for modifying the magnitude and phase of the eye's complex pupil function. Three subjects were tested under specially simulated visual conditions: right eyes had "small aperture" vision through a 1.5 mm-diameter pupil and left eyes had normal vision through a 4 mm-diameter pupil. The measurements were performed in photopic and mesopic conditions (placing a neutral density filter with optical density 1.5). **Results:** For the small aperture, we found an increase in binocular and monocular depth of focus compared to the case of 4 mm-diameter pupil. It ranged from 1 to 1.5 D depending on the threshold requirements and the visibility conditions. For photopic conditions, the J2 visual acuity level was reached at 1 D of defocus for the 4 mm pupil diameter case, while for the 1.5 mm-diameter pupil, the J2 level was reached at 2.5 D. Binocular summation, defined as the ratio of binocular and the best monocular visual acuity, occurred only for distance targets. For near vision, binocular visual acuity closely followed the values of monocular visual acuity for the eye with the smaller aperture. In this case no binocular summation was

observed in any of the subjects.
Conclusions: The small-aperture effect to increase depth of focus in the human eye was successfully implemented and reproduced in a binocular adaptive optics visual simulator. Although certain limitations exist, the small-aperture approach provided a simple but attractive solution to effectively increase depth of focus in the human eye.

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