

## Does the Best Aberration Correction for the Eye Depend on Neural Factors?

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Webster et al. (2002) found that the neural visual system adapts to prismatic distortions, contrast or blur. Our previous study showed that the neural visual system adapts to its own particular pattern of optical defects. In that experiment we used the Rochester Adaptive Optics Ophthalmoscope to replace the wave aberration from a subject, either in its original orientation or rotated version. Subjects viewing the world through their own wave aberration reported that it was much sharper than when the wave aberration was rotated. Despite the fact that the rotation only changes the orientation of the aberrations and not the objective amount of retinal blur, the subjective blur changed dramatically.

The purpose of this experiment was to gain further insight on the plasticity of the neural visual system. In this experiment we use the Rochester Adaptive Optics Ophthalmoscope to replace the wave aberration from a subject by scaling the wave aberration from  $-1$  to  $+1$ , and quantifying the blur of each scaling wave aberration with defocus. Results measured from 3 subjects show that image quality from the positive scaling wave aberration is sharper than that from the negative scaling wave aberration. The results also show that the best image quality does not correspond to full correction. All subjects prefer to have some (average scaling from 3 subjects is 0.12) of their own wave aberration remaining in their eye for the best correction. This supports clinical wisdom that patients will often reject astigmatic corrections that improve objective image quality, but cause too large a departure from their normal experience of the world. This effect has far-reaching implications for vision correction, since it means that subjects who receive an aberration-free view of the world through customized correction may require time to adjust to the benefit. Alternatively, vision correction might best be accomplished through a multiple step process that ultimately converges on the desired correction.



*Denise Gutierrez is currently a sophomore at Hartnell Community College in Salinas, CA. She is pursuing a major in Biology and will be transferring to a four year university by fall of 2005. She is the oldest child and first generation born in the U.S. from a family with a Mexican heritage. The day she transfers to a four year institution will be a significant achievement for herself and a proud day for her family. Denise enjoys reading, traveling outside of Monterey County, dancing, joining community groups, and playing soccer whenever possible.*