

Collins, MJ and Buehren, T and Iskander, DR (2006) Retinal image quality, reading and myopia. *Vision Research* 46(1-2):pp. 196-215.

Abstract

Analysis was undertaken of the retinal image characteristics of the best-spectacle corrected eyes of progressing myopes ($n = 20$, mean age = 22 years; mean spherical equivalent = -3.84 D) and a control group of emmetropes ($n = 20$, mean age = 23 years; mean spherical equivalent = 0.00 D) before and after a 2 h reading task. Retinal image quality was calculated based upon wavefront measurements taken with a Hartmann–Shack sensor with fixation on both a far (5.5 m) and near (individual reading distance) target. The visual Strehl ratio based on the optical transfer function (VSOTF) was significantly worse for the myopes prior to reading for both the far ($p = 0.01$) and near ($p = 0.03$) conditions. The myopic group showed significant reductions in various aspects of retinal image quality compared with the emmetropes, involving components of the modulation transfer function, phase transfer function and point spread function, often along the vertical meridian of the eye. The depth of focus of the myopes (0.54 D) was larger ($p = 0.02$) than the emmetropes (0.42 D) and the distribution of refractive power (away from optimal spherocylinder) was greater in the myopic eyes (variance of distributions $p < 0.05$). We found evidence that the lead and lag of accommodation are influenced by the higher order aberrations of the eye (e.g. significant correlations between lead/lag and the peak of the visual Strehl ratio based on the MTF). This could indicate that the higher accommodation lags seen in myopes are providing optimized retinal image characteristics. The interaction between low and high order aberrations of the eye play a significant role in reducing the retinal image quality of myopic eyes compared with emmetropes.

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