Interactions of ocular aberrations in Chinese adults with emmetropia and myopia

Purpose
To investigate the contribution of corneal and internal optics to the overall ocular aberrations in Chinese adult computer users with emmetropia and myopia.

Methods
Emmetropic or myopic Chinese adults (18-40yrs, n=64) with spherical-equivalent refractive error (SE= +0.38D to −8.50D) and cylindrical power (Cyl≤ 2.50D) were recruited. An i.Profiler was used to measure the corneal and ocular higher-order aberrations (HOA) in 3mm pupil diameter. Internal HOA was calculated by subtracting the corneal HOA from ocular HOA. Compensation factor (CF) was calculated to indicate whether corneal HOA is counterbalanced by internal HOA to reduce the ocular HOA: CF = 1 – (RMS of ocular HOA/ RMS of corneal HOA). CF>0: the corneal HOA was compensated by the internal HOA; CF=0, no compensation; CF<0, the internal HOA accentuated ocular HOA.

Results
Slightly more participants showed positive (CF>0, 56.3%) than negative (CF<0, 43.7%) compensation (two proportions test, p=0.15). There were no significant differences in SE, Cyl, internal HOA, and age between these two groups of participants (p≥0.10). Intriguingly, participants with positive compensation exhibited lower RMS of ocular HOA (0.015±0.001 vs. 0.019±0.001 μm, p=0.003) but higher corneal HOA (0.019±0.001 vs. 0.015±0.001 μm, p=0.004) compared to those with negative compensation. Unlike SE (all p>0.35), high astigmatism was significantly correlated with an increased RMS of ocular HOA (Pearson’s r=0.30, p=0.01) and decreased CF (Pearson’s r=−0.25, p=0.04).

Conclusions
The presence of astigmatism appears to interfere with the normal coupling of the corneal and internal optics, leading to an increment of ocular HOA.
Aberration, Astigmatism, Myopia, Corneal optics, Internal optics