Author's response to reviews

Title: Progression of lower and higher-order aberrations: longitudinal study

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Author's response to reviews: see over
Editor’s Comments:

Key reviewer recommendations:

1) Authors have used near work related questionnaire from Mutti et al for calculating near work magnitude. More details are necessary related to this information. Did both myopic and non-myopic group spent the same hours of near work? Any intermittent outdoor activities? Did they take breaks during near work? A detailed table tabulating the number of hours spent for various near activities is important.

Reply: Authors had adopted the questionnaire used by Mutti et al. Subjects were questioned at the initial and final visit regarding the number of hours spent outside school with activities that included studying, reading for pleasure, watching TV and playing video games/computer. The total number of hours were calculated, and there was a significant difference between the initial and final visit for both the myopic and non-myopic group. In addition, there was a statistically significant effect between the myopic and non-myopic group at the final visit only. Subjects were not questioned about any intermittent outdoor activities. Subjects reported that they took a break approximately every hour after near work. A table has been included in the manuscript that summarizes the number of hours spent for various near activities.

2) There are few studies in the literature that tested effect of reading on ocular aberrations (e.g. Buehren et al., 2005, Vision Research). How do these studies relate to the present study?

Reply: The present study investigated the effect of near work on refractive error and optical aberrations of the eye as a longitudinal study. Many other studies referenced in this manuscript were also longitudinal investigations. There are other studies like Buehren et al. that investigated similar effect after 2 hours of near work only, and was not a longitudinal study. In addition, first author’s another study on near work and corneal aberrations (Vasudevan and Ciuffreda, 2005, published in Cornea) is also not referenced in this manuscript for the above mentioned reason.

3) Do authors have any pilot data on the effect of near work on aberrations immediately following the near task?

Reply: This is a study that aims to investigate the effect of near work on longitudinal progression of myopia and aberrations. Short-term effects were not investigated in this study. This has been published in the past on different subjects (e.g., Vasudevan and Ciuffreda, 2007, published in Cornea).

4) On page 11, line 231, authors state that there is an inverse correlation. However, from the Figures, it seems that the higher the refractive error, the larger the aberrations. How is this an inverse correlation?

Reply: There is no inverse correlation, and that sentence has been removed from the manuscript.

5) Throughout the discussion section, authors talk about various other studies:
myopia progression with near work, relation between higher-order & lower-order aberrations, temporal variations in aberrations, etc.; however, authors have failed to discuss their relevance to the present study findings in detail.

Reply: The manuscript is now expanded with comparisons to these topics.

6) The additional claim is made that total HOA and coma are correlated with refraction in the myopic group (both at baseline and at the final test). I’m skeptical about this, since the mean HOA and coma values for the non-myopes are higher than those for many of the myopes. Why not plot both sets of data (myopes and non-myopes) in the same graph? My guess is that the apparent correlations would be much less convincing. How do these results compare with the findings of earlier investigators re aberration/refraction correlations?

Reply: All the 4 figures have been updated as suggested by the reviewer and are updated in this reply only. Our results demonstrate that myopes had a higher mean magnitude of HOA and coma than non-myopes. Many previously published investigations have demonstrated a mixed response. This has been well reviewed by Charman (2005, Ophthalmic and Physiological Optics). The discussion section has been updated with this information.
Correlation of optical aberrations and final refraction

![Graph showing correlation between Total HOA (microns) and final refraction. Non-myopes have a correlation coefficient of -0.64, p<0.01, while myopes have a correlation coefficient of 0.09, p=0.64.]

Correlation of optical aberrations and initial refraction

![Graph showing correlation between Coma (microns) and initial refraction. Non-myopes have a correlation coefficient of 0.024, p=0.9, while myopes have a correlation coefficient of -0.30, p=0.15.]

Correlation for Non-myopes and Myopes:
- Total HOA (microns) vs. final refraction: $r=-0.64$, $p<0.01$
- Coma (microns) vs. initial refraction: $r=0.024$, $p=0.9$
- Total HOA (microns) vs. initial refraction: $r=-0.30$, $p=0.15$
7) Lines 199-208 Most of this information is given in Table 1. Why not expand the Table to include mean differences between baseline and final, together with information as to whether these differ significantly from zero, and then just state major conclusion in the text (no change in aberration but change in SE)?

Reply: Table 2 (old Table 1) now contains the information as suggested. The descriptive information is now eliminated from the paper.

Additional reviewer recommendations:

(1) Abstract. Specify pupil diameter for which aberrations were measured

Reply: Pupil diameter is now included in the abstract

(2) Lines 144-146. “……were advised not to do any near work activities. Subject’s refractive error was not corrected when the iTrace measurements were obtained, but were able to maintain accurate fixation on the fixation target.” Is something missing here? – subjects were still able to maintain???

Reply: Most of the subjects with lesser myopia were able to fixate on the 20/200 letter at 20ft distance. Subjects with higher myopia were asked to look straight ahead at the target. While the optotype was not clear, they were able to identify the outline and fixated. Accurate fixation was not possible in them and is now eliminated from the manuscript.
(3) Lines 155-156. “The total RMS is the amount the measured wavefront differs from the ideal or perfect wavefront. The higher the RMS value, the more the aberrations present in the eye.” This seems a bit redundant for the readership involved? (and not entirely accurate)

Reply: These sentences are eliminated from the manuscript.

(4) Line 164 Non-cycloplegic refractions were only used for analysis. I think that only should come first “Only non-cycloplegic refractions were used for analysis.”???

Reply: The manuscript is now updated with this information.

(5) Lines 168-169 “… using paired t-test, ANOVA and multiple correlation analysis. Conservative p-values were taken into consideration …” What do you mean by “conservative”? What were the values?

Reply: The word conservative is now removed. Results with p-values<0.05 was considered as a significant effect.

(6) Lines 178-179. “There was no significant correlation between the difference in myopic refraction and the difference in non-myopic refraction between baseline and final visit (r=0.21, p>0.05).” I’m not sure what this means – please expand and explain.

Reply: The difference in refraction among myopes between the baseline and final visit was compared to the difference in refraction among non-myopes. There was no significant correlation. This was done to see if there was a correlation in ‘the change in refractive error’ between the two groups as a function of time. This information is now updated in the manuscript.

The authors thank the reviewers and the editorial team for their valuable suggestions to improve this paper.