

Effects of Lens-Induced Astigmatism at Near and Far Distances [Response to Letter]

Silvia Tavazzi^{1,2}, Natalia Vlasak³, Fabrizio Zeri^{1,2,4}

¹Materials Science Department, University of Milano-Bicocca, Milan, I-20125, Italy; ²University of Milano-Bicocca, COMiB Research Centre in Optics and Optometry, Milan, I-20125, Italy; ³Hoya Vision Care, Amsterdam, NX, 1043, the Netherlands; ⁴College of Health and Life Sciences, Aston University, Birmingham, B4 7ET, UK

Correspondence: Silvia Tavazzi, Email silvia.tavazzi@unimib.it

Dear editor

We thank Chaurasiya et al¹ for their interest in the paper “Effects of Lens-Induced Astigmatism at Near and Far Distances”,² for the positive comments, and also for highlighting some limitations that could serve as the starting point for further analysis.

Concerning sample size and generalizability, the paper highlights the general differences found within the inclusion criteria of the study itself.² We agree that diversified studies would be interesting because myopic presbyopes exhibit considerable variability in their visual characteristics. In the work,² it was possible to calculate a threshold value ($\Delta_{\text{threshold}}$) with statistical significance at 0.05 (and Bonferroni correction) for each investigated difference between groups (astigmatism-induced visual acuity (VA) worsening at far vs near distance, VA worsening induced by with-the-rule vs against-the-rule astigmatism, astigmatism-induced VA worsening in photopic vs mesopic conditions, astigmatism-induced VA worsening at high vs low contrast). These $\Delta_{\text{threshold}}$ values are the lower differences that could be proved statistically. The number of subjects does not allow the identification of potential differences between groups that are smaller than these specific thresholds reported in Tables 4–7.² Some differences exceeded these thresholds and were statistically significant. These are the differences discussed in the paper.

A further comment concerns the age-related changes.¹ The age (mean $\pm$ standard deviations) of the participants was (57.0 $\pm$ 5.1) years (Table 2).² A study on age-related variations was not possible with a sample that has this limited age variability. A paragraph in the introduction concerns the age dependence based on data taken from the scientific literature.² In the discussion section, the age of the recruited subjects is mentioned for the purpose of comparing the findings of the work with those available in the literature.²

Another comment concerns the methodological differences between near and far measurements. It is worth noting that the differences between far and near VAs were not present when considering the subjects’ best VA, although stimuli for measuring far and near VAs were different. On the contrary, the slopes of the defocus curves measured on the same subjects at far and near were found to be different. This can be attributed to varying levels of VA deterioration, but the following discussion taken from the paper² highlights potential confounders: “It must be said that, although the assessments were conducted on the same subjects in the same environment, some methodological differences between far and near measurements were present. The near test was on paper, while at a far the measurements were carried out with an LCD system. VA at far distance was measured using an isolated line of letters, while all lines of the chart were simultaneously visible during near measurements. Changes in the interpupillary distance were not taken into consideration between far and near conditions. The likely decrease in pupil size at near due to convergence was not compensated. Nevertheless, without any added cylinder, the data acquired at a near distance in photopic conditions and HC stimuli provided similar results as the corresponding analyses performed at a far distance (Table 2). Conversely, in the same experimental condition the slopes of the VA drop in the presence of astigmatism were significantly different. (Figure 3a and Table 4)”.²

In regard to the study design, a single masked crossover study was performed. Participants were masked to the randomisation scheme, but investigators were not. The number of conditions under which VA was measured was one hundred and four for each participant. The different conditions were selected in random order and the optometrists collected the data without seeing in real-time the defocus curves. The curves were constructed at a later time, after completing all the measurements at the end of the project. Subsequently, linear regressions of the data were performed to deduce the slopes. Although the optometrist was not blinded, this procedure makes it difficult to believe that the slopes of the defocus curves are influenced by the optometrist's awareness of the experimental conditions for each acquisition.

In conclusion, we sincerely thank once again Chaurasiya et al for paying attention to the details of the mentioned study¹ and we emphasize that their suggestions could serve as the starting point for further measurements and analysis.

Disclosure

The authors have no proprietary interest in any of the materials mentioned in this communication. Natalia Vlasak is an employee of Hoya Vision Care. The project was partially funded by Hoya Vision Care. The authors report no other conflicts of interest in this communication.

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