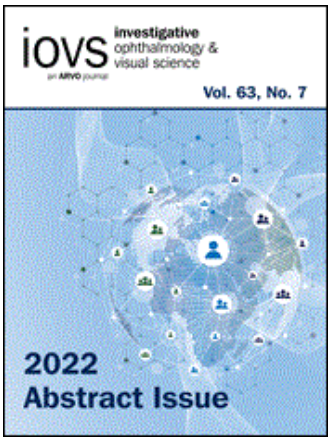

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Effect of varying levels of optical blur on performance of a Hazard Perception Test for driving

Frederick Afum Asare; Pádraig J. Mulholland; Roger S. Anderson; Julie-Anne Little

Author Affiliations & Notes

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Abstract

Purpose : Appropriate detection of, and reaction to, hazards are important components of safe driving, and for drivers with reduced vision, this skill can become compromised. However, the level of blur that significantly impairs hazard perception performance has not been fully determined. This study examined varying levels of optical blur and their effect on response time to hazards during a computer-based Hazard Perception Test (HPT).

Methods : Five healthy drivers aged 24-56 years with a binocular visual acuity <0.00 LogMAR (range: -0.18 to -0.22 LogMAR) undertook 14 computer-based HPT assessments. These high-quality, first-person CGI video clips require viewers to respond to real-world hazards and

undertaken with participants being optimally corrected for the viewing distance and with optical blur induced using +1.00, +2.00 and +3.00-diopter spherical lenses. Baseline and blur testing were conducted over four visits with blur levels and video clips being randomized to minimize memorization effects. Participants' response time to hazards was collected with a Cedrus RB540 response box. Data were analysed using a two-factor repeated measures ANOVA and post-hoc pairwise comparisons of means with Holm-Bonferroni correction as appropriate.

Results : The mean visual acuity at baseline, and with +1.00, +2.00 and +3.00-diopter spherical lens was -0.20±0.02, 0.04±0.12, 0.47±0.09 and 0.69±0.1.00 LogMAR respectively. Compared to baseline (1.40±0.16s), response time was significantly ($p<0.001$) delayed by the introduction of a +3.00-diopter lens (mean difference: 0.78s, 95% CI:0.30-1.24). The +2.00-diopter and +1.00-diopter blur lenses delayed responses by 0.40±0.20s (95% CI:-0.06-0.85) and 0.14±0.20s (95% CI:-0.34-0.61) respectively, but these differences were not statistically significant (both $p>0.05$). There was no statistically significant interaction effect of optical blur and hazard perception video type on response time ($p=0.99$).

Conclusions : Simulation of optical blur with a +3.00-diopter spherical lens significantly impairs detection of hazards during hazard perception tests. Lower levels of blur, despite being visually compromising to acuity, did not have a significant effect on HPT.

This abstract was presented at the 2022 ARVO Annual Meeting, held in Denver, CO, May 1-4, 2022, and virtually.

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