

Road User Hazard Perception Tests: A Systematic Review of Current Methodologies

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Abstract

Hazard perception has been linked to crash risk with novice/younger road users poorer at hazard perception than experienced/older road users. Hazard perception testing is included in many licensing systems. This systematic review synthesises studies of hazard perception test methodologies in order to determine best practice. A search resulted in 48 studies that contained a hazard perception test methodology (video, static image, simulator, test-drive) and discriminated between road users (car drivers, motorcyclists, bicyclists, pedestrians) based on age and/or experience. Despite a high degree of heterogeneity, results suggest current driver hazard perception testing could be enhanced, with specific recommendations made for motorcyclists and vulnerable road users.

Background, Method, Results and Conclusions

Background: Driving is a complex task with drivers under 25 years of age over-represented in crash statistics (International Forum, 2018). A driving skill that is most consistently linked with crash risk is hazard perception, which is the ability to anticipate potentially dangerous traffic situations (Horswill & McKenna, 2004). Hazard perception testing is now part of licensing laws in many countries such as Australia (Australian Government, 2018). Hazard perception test methodologies have evolved from rudimentary driving simulators to computer-based tests using a range of stimuli such as live videos, response methods such as touch screen, and scenario types (McKenna & Crick, 1994; Quimby & Watts, 1981). Test validity was based on novice/younger road users having poorer hazard perception ability than experienced/older road users. Theoretical frameworks have guided test development such as Endsley's model of situation awareness (Endsley, 1995). Four key methodologies have evolved over time – video, static image, simulator and real-world test-drive. Hazard perception tests provide temporal (response times) and spatial (accuracy) measures, with the adjunct of eye tracking to capture visual scanning patterns and questionnaires to probe decision-making. To date, there is no consensus as to which methodology is best practice for assessing hazard perception skills.

Method: A search was conducted in April 2018 of published studies in Medline, PsychInfo and Scopus. Studies that included a hazard perception test methodology or comparison of methodologies, in non-clinical populations of road users (car drives, motorcyclists, bicyclists and pedestrians) that were discriminated based on age and/or experience, were included in the review.

Results: 48 studies met the inclusion criteria with all four methodologies – video, static image, simulator and test-drive – able to discriminate between road user groups based on age/or experience, on at least one measure of hazard perception. Video methodology using temporal measures was widely used, however results for spatial measures were inconsistent. Eye tracking measured visual scanning patterns but failed to enhance other temporal and spatial measures such as touch screen. Questionnaires were equally able to discriminate road user groups without a traditional temporal response. There were inconsistencies in categorising participants based on age

and experience, limited application of a theoretical framework and post-hoc changes made to tests with the deletion of scenarios that failed to discriminate between road use groups based on age and/or experience.

Conclusion: This systematic review found all four methodologies – video, static image, simulator and test-drive were able to discriminate between road users on at least one measure of hazard perception. Results were largely in the expected direction such that novice/younger road users were poorer at hazard perception than experienced/older road users. Future research is needed to resolve inconsistencies in categorising participants based on age and experience, the limited application of a theoretical framework and the association of scenarios with crash risk including those deleted post-hoc due to a failure to discriminate between road use groups. It is recommended that hazard perception testing be extended to motorcyclists as part of the licensing process, and further research to develop better methodologies to capture hazard perception in pedestrians and bicyclists.

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