

Validation of a virtual driver assessment tool for older drivers

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Abstract

Few studies have developed and validated a driving simulator for use with older drivers. As the population ages and demand for maintaining mobility in late-life increases, so will demand for efficient, safe and cost-effective methods of assessment and training that is suitable for older drivers. We compared simulator-based driving in older drivers against on-road driving with matching route and scoring procedure. We found that errors on the simulator predicted general driving safety. This has implications for the use of simulator technology for identifying at-risk older drivers.

Background

Road safety is an ongoing public concern and recent data indicate a need for further research into injury prevention focusing on the growing population of older drivers (e.g., Betz et al, 2014). Driving simulators provide a safe, economic and repeatable measure for determining safety in at-risk drivers. However, few studies have examined the acceptability and validity of simulator-based assessment in older drivers (e.g., Lee et al, 2003). Most validation studies also tend not to match their simulator measure with their on-road criterion in terms of driving environment and scoring method (Mullen et al., 2011). Furthermore, existing virtual set-ups are costly and require technical expertise – reducing their potential for translation and clinical utility.

Aim

Here, we develop a cost-effective, desktop virtual driving assessment for older adults, and validate it against an on-road assessment using matching environment, route and scoring methodology.

Method

Sixty-three drivers (mean age=75.6 (5.87) years) recruited from the community, were screened for motion sickness susceptibility before completing a simulated driving session. The simulator test comprised four instructor-guided and one self-navigation scenario. Standard scoring criteria were used by the experimenter to identify errors in observation, indication, brake/acceleration, lane position, gap selection and approach. Participants also underwent an on-road assessment with a driver-trained Occupational Therapist (OT) using the same standard criteria for scoring errors as used in the simulator test. The OT rated errors for each section of the on-road route that matched the simulated scenarios, as well as general safety (1(unsafe) to 10(safe)) based on the participants' driving performance over the whole 45-minute route.

Results

Fifty-four of 63 volunteers were screened eligible (85% of volunteers), and seven (13%) withdrew due to simulator sickness. Data from the remaining 47 were analysed. Bivariate correlation indicated that the simulator errors were moderately correlated with OT rated on-road safety: $r = -0.398$ (95% CI: -0.212 to -0.592), $p < 0.01$. Regression analysis indicated that the relationship remained after adjustment for simulator sickness and age ($B = -0.063$ (SE=0.02), $p < 0.01$). Simulator errors also predicted pass/fail on the on-road test - classifying on-road fails with a sensitivity of 69.2% and specificity of 100%.

Discussion and Conclusion

The findings show that around 74% of older adults can tolerate a short simulator-based driving assessment. The simulator set-up is low cost and easy to score, and is a valid predictor of overall driving safety. Further analysis will determine whether the error rate and type of errors made on-road corresponds to those on the simulator. The findings suggest that, for those able to tolerate the simulator, this type of set-up may be useful as an older driver screening tool.

References

- Betz, M.E., Jones, J., Genco, E., et al (2014) Perspectives on tiered older driver assessment in primary care settings. *The Gerontologist* doi: 10.1093/geront/gnu038
- Lee, H.C., Cameron, D., Lee, A.H. (2003) Assessing the driving performance of older adult drivers: on-road versus simulated driving. *Accident Analysis and Prevention* 35: 797-803.
- Mullen, N., Charlton, J., Devlin, A., Bedard, M. (2011) Simulator Validity: Behaviors Observed on the Simulator and on the Road. In D.L. Fisher, M. Rizzon, J.K. Caird, J.D. Lee (Eds) *Handbook of Driving Simulation for Engineering, Medicine and Psychology* (pp. 13-18) Boca Raton, FL: CRC Press.