# Effect of Computer-based Cognitive Training on indicators of unsafe driving in older adults: study design

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## Abstract

There is insufficient knowledge on effective methods to increase older driver skill. A major contributor to driving safety in older populations is the effect of age-related brain changes on driving skills. These brain changes affect a driver's ability to attend to multiple events, make decisions, and rapidly respond to hazards. A critical question is whether training can reduce the underlying age-related changes that impact on driving. Here, we design an intervention to investigate whether computer-based training of attention and speed will translate to other tests known to predict unsafe driving in older adults.

## Background

Previous work that has looked at cognitive training (or 'brain training') in relation to driving, has focused on training the ability to rapidly perceive multiple objects in one's visual field known as "Speed of Processing Training" (SOPT) (Ball et al. 2013). Training on SOPT can improve performance on a variety of similar tasks (Rebok et al. 2013; Wolinsky et al. 2013), and reduce self-restriction of driving frequency (Ross et al. 2015), however, its effect on either on-road driving performance (Roenker et al. 2003), or simulated driving performance (Cassavaugh and Kramer 2014) has been mixed. A range of cognitive and sensory tests have been developed that are shown to predict unsafe driving in older adults, and are commonly used by clinicians when determining an older drivers' risk (e.g., Ball et al. 2013; Horswill et al. 2008; Wood et al. 2008). Our previous research has also led to the development of a screening battery called the Multi-D, which measures cognitive control of fast reactions, motion perception, and postural stability and is strongly associated with older driver risk (Wood et al. 2008). While it is unclear what specific cognitive functions relate to driving difficulties in older adults, a large body of neuroscience data indicates that normal ageing of the brain primarily impacts frontal networks that subserve a set of skills called 'executive functions'(Buckner 2004; DeCarli et al. 2012; Hedden and Gabrieli 2004). If SOPT training improves underlying attention, speed and executive functions in older adults, then these improvements may also be seen in older driver screening tests that tap into these areas.

## Aim

We will test whether cognitive training will lead to improved performance on off-road measures associated with driving safety when compared with a matched wait-list control group.

## Method

Fifty older drivers (aged $\geq$65 yrs) will be recruited from the community and be assessed on a range of older driver screening tests: the Trail Making Test B, UFOV, Multi-D, Hazard Perception Test. They will then be given access to a commercial online SOPT training program to be undertaken at home. Participants will complete a log-book of training hours and training levels with the aim of completing 2 hours of training per week for 5 weeks (or a total of 10 hours). A researcher will monitor each participant's training through weekly phone calls. At the end of the training period, all participants will be re-assessed on the older driver screening tests. A control group with participants matched in age, gender and test-retest interval will undergo the same protocol but will not engage in any brain training.

## Results

Proximal effects of SOPT training will be assessed by comparing the change in UFOV scores between the control and intervention groups. Distal effects and translation of training will be examined by comparing change in each of the older driver screening tests between the control and intervention groups.

## Conclusion

If SOPT training leads to distal effects on non-trained off-road driver screening measures, it will justify its use in future trials as an intervention for improving on-road performance, and whether it can be combined with tailored driver refresher courses to enhance older driver safety and maintain mobility for longer.

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