Dual Task Performance during Driving Simulations in Older and Younger Drivers

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Abstract

Current studies have shown that older individuals have impaired performance on tasks that require divided attention. The purpose of this study was to determine how older (≥65 years) and younger (25-64 years) participants perform on a secondary task while driving in simulations of various levels of complexity. Participants were exposed to three different types of driving complexity, including low complexity (i.e., driving on straight ways), high complexity (i.e., turning left at intersection) and surprising events (i.e., unexpected car merge). The secondary task consisted in reacting to a diamond presented in the participant’s peripheral visual field. Detection accuracy and reaction time to the stimulus were measured. Across all driving simulations it was found that older drivers had significantly longer reaction times and significantly lower detection accuracy. It was also found that both young and older participants were significantly slower to react to the stimulus and were less accurate in detecting it when driving in the high complexity simulation and when facing surprising events.

Introduction

- Driving simulators have been shown to be a reliable and valid assessment tool for older driver competences (Lee, Drake et Cameron, 2002).
- Crash analysis studies indicate that older drivers often tend to be at fault when involved in collisions and that they are also over represented in multi-vehicle crash and crashes while turning left, which is when cognitive demands are likely higher (Hakamies-Blomqvist 1998; Parker, Reason, Maines, & Strawling, 1995).
- Drivers tend to commit errors that may lead to collisions when their attention is focused away from the driving task. The interference occurs at the level of central attentional processes that are especially susceptible to aging (Rizzo, Stierman, Skaar, Dawson, Anderson, & Vecera, 2004).
- Older individuals are impaired on tasks that require divided attention (Crossley, Hiscott, Foreman, 2004).
- This study examines the performance of older individuals on a dual task while driving in simulations of various complexity.

Objective

- We examined how older and younger drivers differed in their reactions to the dual task when confronted to normal, complex (i.e., making a left turn at an intersection), and surprising road situations in a simulated environment.
- The measures that were analyzed were reaction time and correctly identifying the dual task when it was presented (a diamond in the peripheral field of view).

Participants

Young Adults Older Adults Total Sample

Male 6 6 12
Female 9 9 18

All participants held a valid drivers license and had at least 5 years of driving experience.

Results

Reaction time to the presented diamond:

- Main effect of group
  F(1,28) = 54.275, p < .001
- Main effect of driving complexity
  F(2,56) = 42.098, p < .001
- No interaction

Correctly identifying the presented diamond:

- Main effect of group
  F(1,28) = 50.810, p < .001
- Main effect of driving complexity
  F(2,56) = 21.556, p < .001
- No interaction

Procedure

Participants were familiarized with the simulator through successive exposures to five training segments addressing: 1) speed control 2) steering control 3) braking accuracy 4) curve negotiating and 80 degree turns, and 5) executing a secondary task (detection of stimulus change in the periphery) while driving.

Participants were exposed to an 8 km scenario. Afterwards, participants repeated the run four times, each time encountering an unexpected event to which behavioural reactions were recorded. During these scenarios, participants were required to respond to a dual task, which consisted in detecting diamond placed in the participants peripheral field of view.

For the purpose of this analysis, only reactions to one unexpected event and the control scenario (no event) are described. The unexpected event consisted of a parked car suddenly pulling into the road in front of the participants’ car. Drivers could brake and/or swerve to avoid a collision.

Apparatus

PC-based STISIM Driving Simulator

Conclusions

Overall, older individuals were impaired in dual task performance compared to their younger counterparts. Across all driving simulations it was found that older drivers had significantly longer reaction times and significantly lower detection accuracy.

It was also found that both young and older participants were significantly slower to react to the stimulus and were less accurate in detecting it when driving in the high complexity simulation and when facing surprising events.

Therefore, older participants seem to partly disengage from the secondary task when the task load increased, which differs from the results obtained in the previous on-road study (Rizzo et al., 2004).

References


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For further information

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