"Choking Under Pressure" in Older Drivers

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Abstract

Aging can impair executive control and emotion regulation, affecting driver decision-making and behavior, especially under stress.

We used interactive driving simulation to assess left-turns across oncoming traffic under pressure in 13 older (> 65 yo) and 16 middle-aged (35-56 yo) drivers.

Over 4 uncontrolled intersections, subjects made 2 left turns while a vehicle honked aggressively behind (pressure condition) and 2 left-turns without the honking vehicle (control condition). Gaps between oncoming vehicles gradually increased from 2 s to 10 s.

Results showed that middle-aged drivers made more cautious turning decisions under pressure (by waiting for larger and safer gaps), but older drivers did not. Further, older driver turning paths deviated under pressure compared to the control condition, but the middle-aged group did not.

Across all drivers, better executive function correlated with larger increases of accepted gap size from control to pressure.

The findings suggest that older drivers are more sensitive to traffic challenges associated with environmental pressure.

Background

Being honked at may cause annoyance, stress, anger or panic that interferes with safe decision-making and driving. To mitigate this threat, drivers must minimize distracting negative emotions, focus on the road ahead, appraise the situation and respond safely.

Aging is associated with decline of neural systems for executive control and emotion regulation (Tucker et al., 2012; Mather, 2012; West, 1996).

We hypothesized that increased age is associated with poorer driver response to pressure from a honking vehicle.

Methods

Subjects

13 older and 16 middle-aged active drivers (Table 1). All had normal or corrected-to-normal vision and were free from psychiatric and neurological conditions.

Left-turn Task

NADS MinSim™ (Figure 1A) was used.

The task involved an rural driving through 4 target (and 5 non-target) uncontrolled intersections (Figure 1B).

In each target intersection, subjects had to make a left-turn across a stream of oncoming vehicles. Gaps between oncoming vehicles varied and gradually increased from 2 s to 10 s (e.g., 2, 3, 4, 5, 6, and 2, 4, 2, 5) (Figure 1C).

At 2 target intersections, a vehicle applied pressure by honking aggressively behind the drivers as they contemplated the left-turn. The other 2 target intersections had no honking vehicle behind the drivers (control condition) (Figure 1B).

[Table 1. Demographic background, neuropsychological test scores, and DULA dangerous driving index.]

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<th>Demographic Background, Neuropsychological Test Scores, and DULA Dangerous Driving Index</th>
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<td>Age</td>
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Results

SCR. Exposure to pressure was associated with higher SCR (compared to control condition) in middle-aged drivers (p < 0.04). A similar trend was found in older drivers (p < 0.06), Figure 2A.

Gap Acceptance. Middle-aged drivers took larger gap under pressure than in control condition (p < 0.01). Older drivers did not show this pattern, Figure 2B.

Conclusion

In this study, middle-aged drivers displayed more cautious decision-making under pressure (by waiting longer for larger and safer gaps).

Increased caution may reflect a driver’s metacognitive awareness of potential adverse effects of pressure on decision-making.

Older drivers did not display this pattern. In contrast, their turning paths became worse, tantamount to a “choking under pressure” effect (DeCaro et al., 2011).

Declines in executive function and emotion regulation may contribute to “choking under pressure” in older drivers.

Findings suggest that common driver-to-driver conflicts can disproportionately affect decision-making, performance and safety in drivers with age-related cognitive decline. Factoring in age-related changes in executive control and emotional regulation should strengthen neural models of driving and interventions to improve older driver safety.

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References