Mobile Phone Use in a Driving Simulation Task: Differences in Eye Movements

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The Problem
- It is known that talking on a mobile phone while driving decreases driving performance (e.g. 5).
- It is not known exactly which aspects of good driving are disrupted when talking on a mobile phone while driving.

Background
- A leading cited cause of traffic collisions is inattention (e.g. 6), which can occur when talking on a mobile phone while driving (TMWD).
- TMWD also increases mental workload (e.g. 2), which has been shown to decrease driving performance (e.g. 1).
- Somewhat surprisingly, a 2004 survey revealed 21% of self-reported crashes, or near crashes, involved at least one driver using a mobile phone (3).
- Eye tracking data has been useful in understanding what people look at while driving (e.g. 4).
- A recent study showed people TMWD where less likely to recall objects in a driving environment, even when the objects were fixated upon (4).
- However, previous research has neglected to look at differences in observing/monitoring driving relevant objects when TMWD.

Purpose
- To determine how eye movements change when talking on a mobile phone while driving.
- To determine fixation and vehicle monitoring differences when TMWD.

Methods
- 16 university students viewed 24 simulated driving scenes (30 seconds each) using a low fidelity driving simulator.
- Half of the participants viewed the scenes while performing a simulated talking-on-a-mobile-phone task.
- The scenes contained either 4 or 7 other vehicles.
- The participants looked for potentially hazardous events in the scenes (e.g. collision course, tailgating).
- Participants answered multiple choice questions about hazardous events after the completion of each driving scene.
- The scenes were presented on a 17” LCD Tobii 1750 eye tracker which also collected eye movement data.
- A 5 point calibration was performed at the beginning and middle of each session.

Results
- Overall, more questions corresponding to scenes with 4 vehicles (60.9%) were answered correctly than with 7 vehicles (44.3%).
- People in the TMWD condition answered fewer post-scene questions correctly than people in the driving-only condition (38.5% vs. 66.7%).
- The percentage of fixations on the vehicles involved in hazardous events throughout the trial was greater for the driving-only condition (40% vs. 29%).
- The mean time spent looking at the hazardous vehicles was greater for the driving-only condition (9574.5 ms vs. 6523.4 ms).
- The people who performed the TMWD task had fewer fixations on the hazardous vehicles while the hazardous event occurred (118 vs. 186).
- The total time spent fixating on the hazardous vehicles during the event was longer for those people in the driving-only condition (M = 4755.3 ms) than in the TMWD group (M = 3514.8 ms).

Conclusions
- People are better able to recall events in a driving scenario when not talking on a mobile phone while driving.
- When talking on a mobile phone people remain able to sample the driving environment. However, sufficient visual attention is not directed to potentially hazardous events in order to recall them accurately.
- Although the TMWD group answered fewer questions correctly, it is likely due to an increased mental workload and not necessarily because the hazardous events were not seen.
- The results indicate that when hazardous events take place on the roadway, people not talking on a mobile phone are able to direct more visual attention, and continue to direct attention, to hazardous vehicles after the events have occurred.

References:

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