



# 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

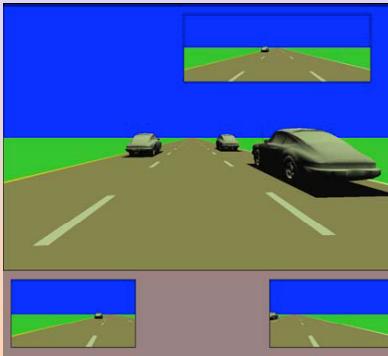
- A leading cited cause of traffic collisions is inattention (e.g. 6), which can occur when talking on a mobile phone while driving (TMWD).
- TMWD also increases mental workload (e.g. 2), which has been shown to decrease driving performance (e.g. 1).
- Somewhat surprisingly, a 2004 survey revealed 21% 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 were 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

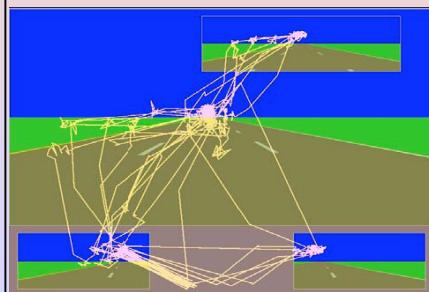
- 16 university students viewed 24 simulated driving scenes (30 seconds each) using a low fidelity driving simulator.
- Half of the participants viewed the scenes while performing a simulated talking-on-a-mobile-phone task.
- The scenes contained either 4 or 7 other vehicles.
- The participants looked 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.



Low fidelity driving simulation which depicted scenes with potentially hazardous events. The simulation contained rearview and both side mirror views.



Percentage of post-scenario questions answered correctly by condition



A sample scan path over a trial.

## 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.

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