

## **LABORATORY STUDY OF HANDS-FREE CONVERSATIONS IN A DRIVING SIMULATOR**

National survey data for 2002 indicate that more than 60 percent of drivers have a cellular phone, and 30 percent use their phones while driving. An observational study in 2000 indicated that 3 percent of drivers are using a hand-held cell phone at any given time.

From an information-processing perspective, using a phone while driving requires the driver to divert at least some attention away from the driving task, and the level of distraction involved has not been well understood. Prior to this study, we did not know whether there are “practice effects”— that is, whether people improve with practice at attending to the driving task while talking on a cell phone.

A study conducted for the National Highway Traffic Safety Administration examined whether the distracting effects of having a conversation while driving diminish with practice.

The researchers used a computer-based STISIM Drive™ driving simulator. The driver’s field of view was projected on an 8-foot by 6-foot screen located in front of the car. The STISIM is a fixed-base simulator with an interactive steering wheel, brake pedal, and accelerator. The simulator allows flexibility in types of traveling routes and traffic patterns. For this study, the roadway was a relatively straight two-lane highway with few turns and little traffic. There were cars that occasionally came towards the subject vehicle in the opposite lanes, and other cars that passed the subject vehicle.

The 30 subjects were all drivers who had previously used cell phones while driving. Subjects were broken down into three age categories to examine a possible age effect. Subjects were either 18 to 22 years old, 30 to 33 years old, or 60 to 71 years old.

To simulate the cognitive demands of a hands-free cellular phone conversation, subjects participated in discussions with an experimenter who was outside the room. All the conversations were through a speaker on the simulator’s dashboard. Two different kinds of conversations were conducted:

### **Math Computations Conversation**

The drivers were presented with a sequence of numbers and operations and asked to provide the final answer. For example:

$$[(3 + 6 + 9 - 2 + 4) \times 2 + 6] / 2 = ?$$

(The answer is 23).

### **Emotionally-Involving Conversation**

As part of the background interview, the subject was asked about school or work, social habits, and interests. Based on these discussions, questions were developed to generate conversations that would be emotionally challenging for each driver. For example, if the driver was an avid sports fan of a specific team, then a conversation could be about that team’s recent losses. As in a real phone conversation, the experimenter could not see the driver or the driving environment during the conversation; thus the experimenter led the pace of the conversation.

Each subject participated in five sessions over several days. These sessions consisted of the three levels of conversations: no distraction (no conversation), math computation conversations, or an emotionally-involving conversation. The sessions also involved three different “speed conditions” for the driver to follow: driving while attempting to maintain a constant 50 mph, driving while attempting to maintain a constant 65 mph, and driving while following a car whose speed varied between 50 and 65 mph. The order of the conditions was counterbalanced within and between subjects.

Data were collected on the driver’s ability to keep the vehicle in the center of the lane, steering variability, the vehicle’s average speed and speed variance with other vehicles, number of crashes, and reaction time to a secondary detection task.

## Results

- In general, performance measures were poorest when the drivers were required to maintain a 65 mph speed rather than 50 mph.
- The math computations conversation was a significant distraction. The interference from the emotionally-involving conversation was less distracting, and – depending on the specific measure of performance – the distraction was sometimes not even significant.
- In general, older drivers performed worse than the two groups of younger drivers.
- The interference from the conversations decreased with practice, and this was most apparent in the more demanding 65 mph driving task and in the more demanding math computations conversation.

## Conclusion

Driving and conversing can be distracting when both tasks are very demanding. However, even then there is evidence of learning to combine the two tasks. The actual amount of learning and its implications for actual driving remain to be determined.

For a copy of *Effects of Practice on Interference From An Auditory Task While Driving: A Simulation Study (50 pages)*, write to the Office of Research and Technology, NHTSA, NTI-131, 400 Seventh Street SW., Washington, DC 20590, or send a fax to 202-366-7096.

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