MPC-407
September 1, 2012 – December 31, 2012

Project Title:
The Effect of Multi-tasking on Self-Assessments of Driving Performance
Center for the Prevention of Distracted Driving

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University of Utah

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Research Needs
Research from the Center for the Prevention of Distracted Driving at the University of Utah has demonstrated that cell phone use contributes to accidents, slower reactions, and more dangerous driving patterns (e.g., Strayer, Drews, & Johnston, 2003). Further studies have shown that cell phone conversation disrupts visual scanning and change detection (McCarley et al., 2004), and causes a form of inattention blindness whereby observers fail to see information that falls directly in their line of gaze (Strayer & Drews, 2007). Although a great deal is known about the detrimental effects of cellular communication on driving, little is known about why people engage in this dangerous behavior. Drivers persist despite overwhelming evidence documenting the hazards associated with such use. Ironically, there is often wide spread support for regulating the use of wireless devices while driving, in many cases by individuals who regularly engage in these activities. People appear to be sensitive to the risks of others' cell phone use, but blind to the risks associated with their own use (Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2012). We hypothesize that the cognitive distraction caused by the use of a cell phone impairs drivers' ability to notice their own impaired driving. That is, cell phone use may induce a form of inattention blindness that not only diminishes drivers' ability to detect important information in the driving environment but that also impairs their ability to self-regulate (e.g., Carver & Scheier, 1998) their driving performance. Drivers generally monitor their performance to ensure that they are driving safely. However, when they are distracted by the mechanics of using their phones and conversation, they may be less cognizant of the errors and mistakes they make on the road. Consequently, they may maintain the illusion they can drive safely while talking on the cell phone and continue to engage in this risky multi-tasking activity. Because their ability to monitor their driving is impaired, their performance assessments are likely to be guided by their beliefs and expectations rather than actual observations.

Research Objectives

The purpose of the proposed research is to further understanding of the effects of cell phone use on driving safety. Our study directly tests the hypothesis that cell phone use impairs drivers' self-assessments of their driving performance. Additionally, the research explores why people persist in using cell phones while operating vehicles. Recent evidence from our laboratory (Sanbonmatsu et al., 2012) suggests that overconfidence (e.g., Dunning, Heath, & Suls, 2004) rather than actual ability drives the proliferation of multitasking on the roadway. Specifically, our research has shown that drivers are overconfident about their personal abilities to drive safely while multi-tasking and that this confidence is positively correlated with their usage of cell phones while operating a motor vehicle. The proposed study will provide evidence that one of the important sources of this overconfidence is drivers' lack of awareness of how badly they drive when they are using a cell phone.

Research Methods

Phase 1. One hundred participants begin by completing questionnaires assessing their perceptions of their ability to drive safely while using hand-held and hands-free cell phones, and their perceptions of others' ability to drive safely under these conditions. They will also report their frequency of cell phone use while driving and their support for legislation restricting the usage of cellular communications while driving.

Phase 2. Participants drive on a high-fidelity driving simulator featuring three high-resolution displays providing a 180-degree field of view. The simulator incorporates proprietary vehicle dynamics, traffic scenario, and road surface software to provide realistic scenes and traffic conditions. Participants perform three 12-minute driving tasks; they drive in a single-task baseline condition, a dual-task hand-held cell phone condition, and a dual task hands-free cell phone condition. Driving speed, following distance, brake reaction time, turn signal use, the safeness of transitions, and the overall number of driving errors (e.g., running a red light) are measured. After each task, participants rate the safeness of their driving, and report any errors and unsafe actions. Participants are randomly assigned to either a Feedback condition or a No Feedback condition. Participants in the Feedback condition are notified of their mistakes through the sounding of the car horn every time an error such as an unsafe lane change is made.

Phase 3. Participants complete the same questionnaires that were administered in Phase 1. By directly comparing the measures obtained before (Phase 1) and after driving (Phase 3), we will be able to determine the extent to which participants' simulator performance and their driving errors altered their self-assessments of their multitasking ability, their intentions to use cell phones in the future, and their support for legislation restricting such use. Participants' perceptions of their driving performance will be compared to their actual driving in the simulator in each of the three conditions. This will serve as our measure of the accuracy of participants' perceptions of their errors, unsafe actions, and performance. We will contrast the degree to which participants indicate that their driving was impaired by hand-held vs. hands-free cell phones with their actual simulator performance in these distraction conditions. This latter comparison is of interest because people commonly assume that hands-free cell phones are a safer alternative, whereas the empirical evidence indicates that there is no safety advantage for hands-free phones over hand-held phones.

Expected Outcomes

Based on prior research (e.g., Strayer & Drews, 2007), we predict that driving performance will degrade in both of the cell phone conditions (relative to baseline driving) and that there will be no difference between hand-held and hands-free conditions. We predict that when participants do not receive feedback, their assessments of their driving performance and general confidence in their

abilities will be decoupled from their actual performance (i.e., inaccurate) when they are talking on the phone. Specifically, drivers are expected to overrate the safeness of their driving and display a lack of awareness of their driving errors in the cell phone conditions. Consequently, their confidence in their ability to multi-task safely is expected to remain unrealistically high despite unsafe driving when talking on a phone. We also expect participants to rate their driving performance to be superior when using a hands-free as opposed to a hand-held cell phone. When participants are provided with feedback, they are expected to be more accurate in their assessments of their driving while multi-tasking and less confident about their ability to drive safely while talking on a phone. This is expected to diminish their intentions to talk on a cell phone while driving in the future.

The research will further understanding of the effects of cell phone use on driving performance. Multi-tasking behind the wheel may not only affect driving safety, it may affect the awareness of driving safety. In addition, the research addresses the important disconnect between self-perceptions of multitasking ability while driving with drivers' actual abilities to multi-task and their perceptions of other drivers engaged in multitasking. We hypothesize that the failure to notice one's own impaired driving is a major contributor to the willingness to multi-task in the automobile. Because drivers are unaware of how badly they drive while distracted, they may remain overconfident in their driving ability and persist in using cell phones behind the wheel. In addition, we predict that the degree to which perceptions differ for the self and others will translate into actual differences in behavior on the road (e.g., the willingness to use cell phones and other technology while driving), and the willingness to modify their multitasking behavior behind the wheel and to support legislation governing these sources of driver distraction. Finally, the study will demonstrate the utility of performance feedback to developing awareness of the hazards of using a cell phone while driving.

Relevance to Strategic Goals

Studies suggest that millions of drivers in the United States talk or text on cell phones while they drive. This is a major public safety issue because of the number of accidents and fatalities that are attributable to distracted driving and the substantial body of empirical evidence showing the impairments from talking on a cell phone. The proposed research investigates why people multi-task while operating vehicles, as well as the general effects of multi-tasking on driving performance. Thus, consistent with the goals of the MPC, the research examines important factors and processes affecting transportation safety. The findings of the research will aid in the development of educational programs and communications to promote safe driving and to address peoples' overconfidence in their ability to multi-task while on the road. The information should also be valuable to governmental agencies such as the National Highway Transportation Safety Administration in their policy recommendations.

Educational Benefits

A graduate student will receive support and training in experimentation and data analysis. A small cadre of undergraduates will gain research experience through their assistance with the data collection. Students serving as participants will learn about behavioral research and distracted driving through their participation in the study and debriefing.

Work Plan

Phase 1

Months 1-2: Development of procedures and measures Drs. Strayer and Sanbonmatsu will design the planned measures and procedures, and program the simulator.

Months 3-6: Data collection The experiment will be administered by a team of undergraduate assistants supervised by a graduate student from one of the investigator's laboratories. Dr. Sanbonmatsu will train the team and oversee the collection of the data.

Phase 2
Months7-8: Completion of data collection
Month 9: Data analysis Dr. Sanbonmatsu and the graduate student will analyze the data.
Months 10-12: Report generation An initial report will be written for MPC in accordance with guidelines. The investigators will write up the findings for publication in a top tier, peer reviewed journal and submit the findings for presentation at a national conference.

Project Cost – Phase 1

Total Period 1 Project Costs: $59,531	MPC Funds Requested: $29,765
Matching Funds: $29,765	Source: AAA Foundation for Traffic Safety

Dr. Strayer has current funding from the American Automobile Association Foundation for Traffic Safety that will provide 100% matching funds for the proposed project. The sponsor award number for the matching funds is AAAFTS51108 with University of Utah project code 51002540.

Keywords: Driving, Distraction, Multitasking, Cellular Telephones, Attention Lapses, Driver Errors,

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