UTC Project Information	
Project Title	MPC-467 – Self-Regulation and Distraction
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Brief Description of Research Project	Experimental studies using driving simulators or instrumented vehicles (Caird, et al., 2008; Horrey & Wickens, 2006; Strayer & Johnston, 2001, Strayer, Drews, & Johnston, 2003; Strayer et al., 2013,) have produced strikingly different estimates of driving impairment and crash risk than the correlation-based naturalistic studies of driving (Klauer et al., 2014; Dingus et al., 2006). However, an important limitation of both of these approaches is that the video equipment and instrumentation in the vehicle (or the driving simulator itself) may alter the behavior of the driver – the *Heisenberg Principal*, whereby the act of measurement may alter the behavior in question. Epidemiological studies have circumvented this problem by obtaining the cell phone records of drivers involved in a crash with significant property damage (Redelmeier & Tibshirani, 1997) or a crash with an injury requiring hospitalization (McEvoy et al., 2005) and determining the odds of a crash compared to a control period. The epidemiological studies' estimate of crash risk is comparable with the experimental research. More recently, an observational study of over 56,000 drivers coordinated by the Center for the Prevention of Distracted Driving at the University of Utah verified the detrimental effects of cellular

	communication on driving outside of the laboratory. This new observational research found that drivers using a cell phone were more than twice as likely to fail to make a legal stop at an intersection (i.e., the odds ratio of failing to stop for cell phone drivers was 2.21). Although there are several potential reasons for the discrepant results from the different methods, one untested hypothesis is that it stems from a driver's self–regulation of the secondary-task activities based on driving demand. Following Braver, Gray, and Burgess (2007), we differentiate between two forms of self-regulation: *proactive* and *reactive*. An example of the proactive self-regulation is when a driver decides in advance not to use a cell phone when they are operating a motor vehicle. An example of the reactive self-regulation is when a driver moderates their usage in *real-time* based upon driving difficulty or perception of driving errors. Reactive self-regulation may also involve trading off different aspects of driving performance when multitasking. For example, a driver may slow down when they are talking on the cellphone and this change in behavior may be a manifestation of self-regulation. The conflicting findings necessitate further research on the consequences of cell phone use during actual driving. The "naturalistic" work suggests that cell phone use may not uniformly impair driving and in some instances (e.g., low density traffic) drivers may be able to talk on a cell phone with a lower crash risk. This suggests that it is important to examine when cell phone use impairs driving and if and how drivers self-regulate the use of cell phones. **Research Objectives:** We believe an important next step is to examine the actual traffic and weather conditions under which drivers use cell phones and the impact of cell phone use and other distractions in favorable as opposed to unfavorable driving environments. We speculate that drivers may attempt to reduce the risk of an accident by regulating the use of cell phones. Specifically, many drivers may limit cell phone usage in adverse driving conditions characterized by slick roads, limited visibility, or heavy traffic. Of course, not all drivers are likely to be sensitive to the risks presented by different road conditions. Our research shows that people tend to be overconfident in their capacity to multi-task (Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013) and their ability to drive safely while distracted (Sanbonmatsu, Strayer, Medeiros-Ward, Behrends, and Watson, 2014). Consequently, many drivers may believe they can safely use a cell phone in virtually any road conditions. A second major aim of the proposed research is to demonstrate that even in the most adverse driving environments, a significant proportion of individuals use a cell phone while operating their vehicles with predictable negative effects on their driving.

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	Through months of testing, we learned a great deal about recording driver behavior and traffic movement. Specifically, we learned that no matter what sorts of lenses, filters, camera angles and locations we utilized, we were are not able to reliably record the characteristics and activities of drivers with a camera. Consequently, we resorted to having an observer code driver attributes and distracting behaviors. We used a camera to record the movements of the vehicles at intersections including failures to stop and any other dangerous maneuvers. After completing data collection, we had two assistants code the vehicular movements and driving behaviors in the videotapes. Unfortunately, we lost about half of the video recordings because of a computer crash and improper back up, which limited the size of our data set. The data were hugely disappointing. We did not find that vehicular movements and driving behavior differed when drivers were engaged in distracting activities. Moreover, we did not show that the likelihood of cell phone use and other distracting activities was affected by driver attributes, the time of day, or the weather. Part of the problem is that, regardless of the conditions, the baserate levels of cell phone use were very low on the roads where the observations were made. While we were carrying out the naturalistic study of the self-regulation of distractions, we also conducted an investigation of consumer attitudes toward fully automated vehicles. Self-driving cars are an emerging technology that will radically reshape transportation in our communities. These vehicles will be safer and more energy efficient than current automobiles, and reduce traffic congestion. The attitudes that consumers are forming of self-driving vehicles and the confidence with which these views are held are important because they will determine the willingness to adopt the technology, and the support for the legal and physical infrastructure needed to put these vehicles on our roads. While prior studies have examined consumer opinions about driverless vehicles, they have not examined the cognitive underpinnings of these views. In addition, they have not examined consumers' confidence in their views. Using the support we received from MPC, we administered a survey on Mechanical Turk to examine the role of knowledge, perceived knowledge, belief in self, and trust in technology in attitudes and confidence in attitudes toward fully automated vehicles. Following previous research, our study found that attitudes toward fully automated vehicles are mixed. Importantly, the findings show that the consumers who have the most negative views tend to have the least real knowledge of them. Consumers across the board are confident in their opinions about fully automated vehicles. However, the findings indicate that their certainty is driven more by perceived knowledge of self-driving vehicles and general self-confidence rather than real expertise. Attitudes toward driverless

	vehicles were also found to be strongly associated with general trust in technology. The study suggests that misconceptions and ignorance are responsible for much of the negativity toward self-driving vehicles. Consequently, education and the communication of the facts about fully automated vehicles may be effective in changing consumer attitudes. However, the high levels of confidence of consumers harboring negative views of these vehicles suggest that they may be resistant to persuasion. Theoretically, the study shows that judgmental confidence tends to be grounded in general self-confidence, and perceived rather than real knowledge. Thus, confidence is often based on factors that are superfluous to the soundness of a judgment.
Impacts/Benefits of Implementation (actual, not anticipated)	Sanbonmatsu, D. M., Strayer, D. L., Yu, Z., Biondi, F., & Cooper, J. M. (2018). Cognitive underpinnings of beliefs and confidence in beliefs about fully automated vehicles, *Transportation Research Part F: Traffic Psychology and Behaviour*, 5*5(May)*, 114–122. https://doi.org/10.1016/j.trf.2018.02.029 Yu, Z., Sanbonmatsu, D. M., Strayer, D. L., Biondi, F., & Cooper, J. M. (2018). *Cognitive Underpinnings of Beliefs and Confidence in Beliefs about Fully Automated Vehicles.* Poster presented at the Annual Meeting of the American Psychological Science Association. San Francisco, CA.
Web Links • Reports • Project Website	https://www.ugpti.org/resources/reports/details.php?id=947