PUBLIC POLICY PERSPECTIVES

Are We Being Driven to Distraction?

While often reminded to pay full attention to driving, people regularly engage in a wide variety of multi-tasking activities when they are behind the wheel. Indeed, as the average time spent commuting increases, there is a growing interest in trying to make the time spent on the roadway more productive. Unfortunately, due to the inherent limited capacity of human attention, engaging in these multi-tasking activities often comes at a cost of diverting attention away from the primary task of driving. There are a number of more traditional sources of driver distraction. These "old standards" include eating, drinking, lighting a cigarette, applying make-up, listening to the radio, etc. However, over the last 5-10 years many new electronic devices have been developed and are making their way into the vehicle. In most cases, these new technologies are engaging, interactive information delivery systems. For example, drivers can now surf the internet, send and receive e-mail or fax, communicate via cellular device, and even watch television. There is good reason to believe that some of these new multi-tasking activities may be substantially more distracting than the old standards, because they are more cognitively engaging and because they are performed over longer periods of time.

Our laboratory has focused on how driving is impacted by cellular communication because this is one of the most prevalent exemplars of this new class of multi-tasking activity. It is currently estimated that over 100 million people in the United States use their cell phone while driving. Our research sought to determine whether cell phone use interferes with driving. If it does, how does this distraction compare with other multi-tasking activities commonly engaged in while driving and what are the cognitive processes that are responsible for the interference? For example, how much of this interference can be attributed to manual manipulation of the phone (e.g., dialing, holding the phone, etc.) and how much can be attributed to the demands placed on attention by the cell phone conversation itself? This question is of practical importance, because if the interference is primarily due to manual manipulation of the phone, then policies discouraging drivers from using hand-held devices while permitting the use of hands-free units would be well grounded in science. On the other hand, if significant interference is observed even when all the interference from manual manipulation of the cell phone has been eliminated, then these regulatory policies would not be supported by the scientific data.

Our research uses a high-fidelity driving simulator to provide a controlled laboratory environment for assessing the impact of cell phone conversations on driving. We have found that when drivers talk on a cell phone, their reactions to imperative events (e.g., braking in response to traffic lights, a decelerating vehicle, or pedestrians) were significantly slower than when they were not talking on the cell phone. In several cases, the driver's reactions were impaired to such an extent that they were involved in a traffic accident. By contrast, listening to radio broadcasts, books on tape, or prerecorded conversations of others did not impair driving performance. Moreover, our research has found that conversation with a passenger in the vehicle differs qualitatively from conversations on a cell phone. In the former case, both the driver and the passenger are often aware of the driving conditions and modulate their conversation based on the real-time demands of driving. In the latter case, such modulation is more difficult because the person conversing with the driver is unaware of the real-time driving demands. Together, these finding are important because they demonstrate that listening to auditory or verbal material, by itself, is not sufficient to produce the interference associated with using a cell phone while driving. The data indicate that when drivers become involved in a cell phone conversation, attention is withdrawn from the processing of the information in the driving environment necessary for safe operation of a motor vehicle.

We also found that cell phone conversations alter how well drivers perceive the driving environment. For example, cell-phone drivers were more likely to miss traffic signals and often failed to see billboards and other signs in the driving environment. In our studies, we used an eye-tracking device to measure exactly where drivers were looking while driving. We found that even when drivers were directing their gaze at objects in the driving environment that they often failed to see them because attention was directed elsewhere. Thus, talking on a cell

phone creates a form of inattention blindness, making drivers less aware of important information in the driving scene. An interesting by-product of this inattention blindness is that cell-phone drivers are often unaware of their own impaired driving, even though this impairment is obvious to those observing their behavior from afar. In fact, our data indicate that drivers are not processing the detailed information that would provide feedback that their own driving performance is impaired while using a cell phone.

We have also compared hand-held and hands-free cell phones and found that the impairments to driving are identical for these two modes of communication. There was no evidence that hands-free cell phones were any safer to use while driving than hand-held devices. In fact, we have consistently found significant interference even when we removed any possible interference from manual components of cell phone use (e.g., by having drivers place a call on a hands-free cell phone that was positioned and adjusted before driving began). Although there is good evidence that manual manipulation of equipment (e.g., dialing the phone, answering the phone, etc.) has a negative impact on driving, the distracting effects of cell phone conversation persist even when these manual sources are removed. Moreover, the duration of a typical phone conversation can be up to two orders of magnitude greater than the time required to dial or answer the phone. Thus, these data call into question driving regulations that prohibit hand-held cell-phones and permit hands-free devices, because no significant differences were found in the impairments caused by these two modes of cellular communication.

What is the real-world risk associated with using a cell phone while driving? An important epidemiological study by Redelmeier and Tibshirani (1997) found that cell phone use was associated with a 4-fold increase in the likelihood of getting into an accident and that this increased risk was comparable to that observed when driving with a blood alcohol level at the legal limit. Two new studies (one conducted in our lab at the University of Utah and one conducted in the United Kingdom) controlling for time on task and driving conditions found that driving performance was, in some cases, more impaired when drivers were conversing on a cell phone than when these same drivers were legally intoxicated. Taken together, these observations provide converging evidence indicating that driving while conversing on either a hand-held or hands-free cell phone poses significant risks both to the driver and to the general public.

We have found it useful to conceptualize the problem of driver distraction along several dimensions, because not all multi-tasking activities are equal in distraction. First, is the source of interference from manual manipulation of equipment or from cognitive distraction? While few activities are exclusively manual or cognitive, the primary source of interference often stems from one source or the other and methods to combat distraction are likely to differ for the two sources of interference. Second, is the multi-tasking activity relevant to the primary goal of driving or is the secondary task of lower relevance to driving? Some activities may be higher in task-relevance (e.g., interacting with an electronic navigation system) whereas others may be quite low in relevance to driving (e.g., surfing the internet). Third, what are the time constraints imposed by these multi-tasking activities? Some tasks can be accomplished quickly (e.g., changing radio stations using pre-set buttons) whereas others may take place over extended periods of time (e.g., cell phone conversations). The difference in timing can significantly compromise the ability of the driver to schedule these secondary activities during lulls in traffic.

In sum, our research indicates that the use of cell phones disrupts driving performance by diverting attention from the processing of the information immediately associated with the safe operation of a motor vehicle. Similar patterns of interference were observed for hand-held and hands-free cell phones. This finding suggests that policies that restrict hand-held devices but permit hands-free devices are not well grounded in science. We are often asked what our position is on regulatory issues concerning cell-phone induced driver distraction. Clearly, the safest course of action is to pull over and park in a safe location before one makes or takes a call. However, regulatory issues are best left in the hands of legislators who are provided with the latest scientific evidence. We caution, however, that as more cognitively engaging technology makes it way into the vehicle, the potential for even more severe driver distraction will increase. In the long run, skillfully crafted regulation and better driver education addressing driver distraction will be essential to keep our roadways safe.

David L. Strayer, Frank A. Drews, & William A. Johnston, University of Utah, Department of Psychology

Reprints of our work can be found on-line at http://www.psych.utah.edu/AppliedCognitionLab.