TIRF Invited Testimony on:
Hands-Free Texting While Driving

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The Traffic Injury Research Foundation (TIRF)

The mission of the Traffic Injury Research Foundation (TIRF) is to reduce traffic-related deaths and injuries. TIRF is a national, independent, charitable road safety research institute. Since its inception in 1964, TIRF has become internationally recognized for its accomplishments in a wide range of subject areas related to identifying the causes of road crashes and developing programs and policies to address them effectively.

TIRF is often called upon by governments around the world to provide expert testimony, advice and guidance in relation to road safety policy and legislation.

Introduction

Distracted driving increases crash risk, and this safety concern has been well documented in the literature (GHSA, 2011; Hedlund 2006; NHTSA 2010b; Smiley, 2005; Ranney, 2008, Trombley, 2010). Research has also established that texting while driving is a cause of distraction, and this unsafe behavior is especially problematic for teen drivers who are inexperienced at driving, and have brains that are not fully developed making them more susceptible to distractions and poor judgment (Smiley et al. 2008; Tromblay 2010). Teenage and young drivers are also attracted to and first adopters of, new communication technologies (Lee et al. 2011). And in this regard, a recent nationally representative survey of distracted driving attitudes and behavior found that drivers under 25 are two to three times more likely than older drivers to send text messages or emails while driving (NHTSA 2012).

The crash risk associated with hands-free texting while driving is not as well understood because in-car voice-to-text technology is relatively new and few studies investigating this specific issue have been completed to date. What is known, however, supports the case that hands-free texting while driving poses significant distraction, and consequently, unacceptable crash risk (Tijerina, 2008). To put this traffic safety issue and public health concern into perspective, this paper shares insight into key facets of distracted driving that draws upon existing research.

What is distracted driving?

While a number of definitions exist (Tasca 2005), one of the most widely accepted in Canada and elsewhere is acknowledged in the proceedings from an international conference on distracted driving co-hosted by the Traffic Injury Research Foundation and the Canadian Automobile Association in 2005. It states:

"Distraction involves a diversion of attention from driving, because the driver is temporarily focused on an object, person, task, or event not related to driving, which reduces the driver's awareness, decision-making, and/or performance, leading to an increased risk of corrective actions, near-crashes or crashes"(Hedlund 2006, p.2).

This definition incorporates three important aspects of the problem – the source, the effects, and the consequences. A more recent working definition of distracted driving comes from a Governors Highway Safety Association's (GHSA) report on the distracted driving research:

"Distraction occurs when a driver voluntarily diverts attention away from driving to something not related to driving that uses the driver's eyes, ears, or hands."

A lot of the early focus on distracted driving was generated by concerns over cell phone use. For much of the driving public, distracted driving is synonymous with cell phone usage, but the reality is this is just one small but important part of the problem. Distracted driving encompasses a wide range of activities, many of which have become typical in our daily driving environment.

Cars themselves are continuously being equipped with new and potentially distracting "convenience technologies" (entertainment systems, navigation systems, multifunction controllers, talking cars). These are on top of the ubiquitous distractions – minding kids, talking to passengers, eating, grooming, reading billboards, and rubbernecking at stopped vehicles. A recent in-car technology that has arrived is hands-free voice texting, which only adds to the potential sources of in-vehicle distractions.

What causes distraction?

Humans are serial processers of information. They are only capable of consciously focusing attention on one task at a time (Smiley 2005). The fact that people can rapidly switch their attention back and forth across tasks leads many of them to believe that they can "multi- task". The reality is that they can't, and, by trying to do so, neither task may receive optimal attention or focus.

The way in which information is processed is important, since driving is a "divided attention" task involving continuous interaction of manual, visual, and cognitive components. As well, the amount of attention that drivers must allocate to driving is a function of the driver's experience, the complexity of the driving task and the nature of the driving environment. To illustrate, inexperienced drivers must consciously focus on remaining within their lane while for experienced drivers this is very reflexive (Smiley 2005). Someone inexperienced in driving a car, particularly a technologically complex car, has to focus far more on controls and systems than someone familiar with the vehicle.

Biology is the fundamental limitation. Drivers can suffer from cognitive overload, at which point the brain must decide what information will receive attention. Some of these decisions are conscious and can be controlled whereas other decisions are subconscious (Tromblay 2010).

To illustrate, a simulator study conducted at Carnegie Mellon University examined MRI pictures of the brain while subjects drove on a simulator and listened to spoken statements. Participants had to determine if these statements were true or false. The results showed that activity in the brain's parietal lobe (an area associated with navigation and spatial sense) decreased 37% and activity in the occipital lobe (associated with processing visual information) also decreased (Just et al.2008).

In a more recent study, Schweizer et al. (2013) placed a driving simulator with a fully functional steering wheel and pedals in a 3.0 Tesla functional magnetic resonance imaging (fMRI) system. The authors found that during distracted driving, brain activation shifted dramatically from the posterior, visual and spatial areas to the prefrontal cortex. They conclude that their "findings suggest that the distracted brain sacrificed areas of the posterior brain important for visual attention and alertness to recruit enough brain resources to perform a secondary, cognitive task." In this experiment, participants were distracted with concurrent audio tasks consisting of general knowledge true or false questions and requiring them to press corresponding buttons embedded on the steering wheel – which according to the authors is similar to modern vehicle designs for answering hands-free devices or volume controls. Although based on a small sample size (16 participants) and young adults (between the ages of 20 and 30), this study provides further confirmatory evidence based on neuroimaging that multitasking while driving may potentially compromise visual attention and alertness, both cognitive functions critical to safe driving.

So, as drivers focus more of their attention on secondary tasks unrelated to driving they begin to suffer from "inattention blindness", particularly as secondary tasks become more complex. They may look but not "see" what is happening in the driving environment. It is estimated that drivers using a cell phone may fail to see up to 50% of the available information in their driving environment (Strayer 2007).

To illustrate changes in drivers' visual inspection patterns on the roadway while distracted, Transport Canada conducted an on road study involving 21 drivers driving an 8km city route using a hands-free technology. Drivers were required to perform no additional cognitive task, an easy cognitive task, and a difficult cognitive task. Results revealed that drivers spent less time looking in peripheral areas and more time looking centrally ahead. Reductions in the visual monitoring of instruments and mirrors by some drivers was apparent; other drivers stopped doing this entirely. Drivers also glanced less frequently at traffic lights compared to the No Condition task and reduced their scanning of intersection areas to the right. Drivers' control of the vehicle was also affected in that there were more occurrences of hard braking during the most difficult cognitive tasks (Harbluk et al. 2007).

What is the importance of the source of distraction?

A number of simulator and observational studies have measured the effects of distracted driving. While the focus has tended to be on cell phone distractions, the results are illustrative for distraction generally and hands-free texting specifically.

A Canadian simulator study in Calgary involving both novice and experienced drivers using cell phones revealed that both types of drivers restricted their visual scanning

while using a phone. However, while experienced drivers also slowed down, novice drivers drove at similar speeds whether on or off the phone. Novice drivers also wandered more in their lane when on the phone. Of note, experienced drivers' perceptions and response times to pedestrian hazards deteriorated to novice levels when they were talking on the phone (Smiley et al. 2008).

In 2006, the 100-Car Naturalistic Driving study conducted by the Virginia Tech Transportation Institute examined data from 69 crashes and 761 near-crashes in conjunction with baseline data from 20,000 randomly selected, uneventful driving segments. It revealed that distraction resulting from a secondary task was reported in 33% of crashes and 27% of near-crashes. Using these data to calculate the relative risk of crashing, researchers concluded that performing a complex secondary task (e.g., reaching for a moving object, applying makeup or dialing) exposed drivers to approximately three times the risk of involvement in a crash or near-crash; moderate secondary tasks (talking/listening, eating, inserting a CD) were approximately twice the risk, and for simple secondary tasks (e.g., drinking, smoking) there was no appreciable increase in risk (Klauer et al. 2006). It should be noted that there are limitations to this study; most importantly, only a small number of crashes were studied, and many of the distraction-related crashes involved minor damage and would not have resulted in a police report (Ranney 2008).

Few studies have considered the distracting effects of operating vehicle entertainment systems because these secondary tasks are generally considered harmless. However, studies that have examined in-vehicle technologies have demonstrated that tuning or simply listening to a radio can degrade driving performance (Young et al. 2003). With regard to navigational systems, destination entry (cognitive and physical distraction) is considered the most distracting component of their use (Tijerina et al. 1998; Young et al., 2003).

A meta-analysis by Caird et al. (2008) found that either talking on a cell phone or with a passenger had approximately equal effects on driving performance. Conversations increased reaction time to events and stimuli around and within the vehicle. A similar meta- analysis of 23 experimental studies of distraction effects of phone use was conducted by Horrey and Wickens (2006). It found similar distraction impacts from handheld and hands free cell phone use, concluding that the main effect was the cognitive distraction, not the physical use of the phone.

McCartt and colleagues (2006) published a comprehensive review in which they synthesized the results of 125 studies on driver distraction and cell phone use. Slowed reaction time was the most consistent finding and degraded performance was more pronounced among older drivers (age 50 to 80).

Does distraction affect crash risk?

It is generally believed that driver distraction is involved in 20-30% of road crashes (Hedlund 2006). This estimate is derived from a number of different sources including self-report data, crash data, and observational data from Canada and the U.S. In addition, according to the NHTSA, in 2008 there were an estimated 11% of vehicles whose drivers were using some type of phone (handheld or hands free) while driving at any given time (NHTSA 2009b).

In a recent meta-analysis of crash data and naturalistic studies on cell phone effects on crash risk, Elvik (2011) concluded that crash risk is about three times greater when using a cell phone. And, in a recent GHSA (2011) review of the distracted driving research, the report concludes that cell phone use increases crash risk to some extent but there is no consensus on the size of the increase."

Why ban hands-free texting while driving?

Research has established that cell phone use and texting while driving are serious crash risks. However, there is even some (conflicting) evidence that cell phone discussions are actually less disruptive than conversations with passengers or manipulating the music system (McCartt et al. 2006; Horry and Wickens 2006). And, a recent GHSA (2011) review of the distracted driving research concluded that "there is no conclusive evidence on whether hands-free cell phone use is less risky than hand-held use". Even given this state of evidence, the crash risks associated with cell phone use have been deemed serious enough that the National Transportation Safety Board (NTSB), at their national forum on "Attentive Driving: Countermeasures for Distraction" last March (NTSB 2012), concluded that any type of cell phone use in vehicle should be banned. The GHSA report also observed that "texting likely increases crash risk more than cell phone use" because texting requires both visual and manual distraction for a longer period of time than dialing a cell phone.

Although the relative crash risks of different sources of distraction are difficult to estimate, it is logical to believe that hands-free texting while driving should pose less crash risk than hand texting while driving. However, it is also logical that such a distraction will not reduce the risk to a level acceptable to safety advocates, and more importantly, the public who suffer the consequences of distracted-related crashes, serious injuries, and far too often premature deaths. In this regard, NHTSA (2012) reported from a national distracted driving telephone survey that 9 out of ten drivers support laws that ban texting. And, in a recent Canadian public opinion poll on distracted driving, Robertson et al (2011) found that 13% of those surveyed believe they can drive safely while texting. This suggests that although public support for a texting

ban is high, in the absence of such a ban some drivers would implicitly believe it is safe, and this is a false and risky assumption.

There are several reasons for the concern about hands-free texting while driving. First, hands-free texting while driving is still "multitasking" as it increases the cognitive load requiring the driver to shift their attention from the complex task of driving. Second, in-car hands-free texting still requires the driver to take their eyes of the road by glancing down because the technology often fails to transcribe the spoken word accurately into text. Third, and most importantly, there is substantial evidence to illustrate that the inexperience of young and novice drivers places them at much higher risk of crashing even without the distractions of cell phones and other devices – e.g., the presence of teen passengers pose an especially significant risk factor for teen drivers; Williams et al. 2012.

In summary, research has established that distractions of all types, adversely affect driving performance, and this may be especially problematic for teenage drivers who are much more likely to be crash involved than drivers in other age groups. There is a growing body of research that suggests that distraction affects crash risk, and that texting may be riskier than cell phone use. Hands-free texting while driving poses a distraction which will also affect crash risk, although the absolute and relative magnitude of that risk has to be established in future research. And in this regard, the National Highway Traffic Administration (NHTSA) has implemented a multi-year Distraction Plan and Research Agenda that will further examine driver communications and entertainment devices and will also continue to monitor the research on this subject (NHTSA 2010c). NHTSA has also recently issued proposed guidelines for automobile manufactures to encourage them to limit distraction risk for in-vehicle electronic devices. The proposed voluntary guidelines would apply to communications, entertainment, information gathering and navigation devices or functions that are not required to safely operate the vehicle. They would establish specific recommended criteria for electronic devices installed in vehicles at the time they are manufactured that require visual or manual operation by drivers. And, the Phase 3 NHTSA guidelines may address voice-activated controls "to further minimize distraction in factory-installed aftermarket and portable devices" (NHTSA 2012).

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