Accident Analysis and Prevention 43 (2011) 187–193

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Differing types of cellular phone conversations and dangerous driving

Chris S. Dula*, Benjamin A. Martin, Russell T. Fox, Robin L. Leonard

Department of Psychology, East Tennessee State University, POB 70649, Johnson City, TN 37614-1702, United States

ARTICLE INFO

Article history:
Received 26 February 2010
Received in revised form 29 July 2010
Accepted 8 August 2010

Keywords:
Dangerous driving
Cell phone use
Conversation type
Risky driving
Aggressive driving
Distracted driving

ABSTRACT

This study sought to investigate the relationship between cell phone conversation type and dangerous driving behaviors. It was hypothesized that more emotional phone conversations engaged in while driving would produce greater frequencies of dangerous driving behaviors in a simulated environment than more mundane conversation or no phone conversation at all. Participants were semi-randomly assigned to one of three conditions: (1) no call, (2) mundane call, and, (3) emotional call. While driving in a simulated environment, participants in the experimental groups received a phone call from a research confederate who either engaged them in innocuous conversation (mundane call) or arguing the opposite position of a deeply held belief of the participant (emotional call). Participants in the no call and mundane call groups differed significantly only on percent time spent speeding and center line crossings, though the mundane call group consistently engaged in more of all dangerous driving behaviors than did the no call participants. Participants in the emotional call group engaged in significantly more dangerous driving behaviors than participants in both the no call and mundane call groups, with the exception of traffic light infractions, where there were no significant group differences. Though there is need for replication, the authors concluded that whereas talking on a cell phone while driving is risky to begin with, having emotionally intense conversations is considerably more dangerous.

1. Introduction

Research suggests it is as dangerous to use a cellular phone while driving as it is to drive while intoxicated (Strayer et al., 2006). Cell phone use has become ubiquitous in modern society, with 285.6 million cell phone service connections as of December of last year and an estimated coverage of 91% of the American population (Cellular Telecommunications Industry Association, 2010). In 2001, Utter estimated that about 54% of drivers used cell phones while in their vehicles. Two years later this figure was reported at 60% (Royal, 2003), and rates of driving while talking on a cell phone are likely rising steadily. Data from 1067 drivers (Dula, 2010, all undergraduate students, aged 17–55 with $M = 21.34$ and $SD = 5.61$ years, where 756 were female [67.4%] and 365 male), asked to estimate the number of times they had used a cell phone while driving in the previous two weeks, indicate that 81.5% admitted to doing so at least once. There may be differences in age groups in terms of rates of phone usage while driving, but there is no debate that it happens with great frequency in general.

The growing use of cell phones by drivers has sparked considerable scientific inquiry, mainly focusing on the effect on driver inattention. As early as a decade and a half ago and earlier, research showed a relationship between cell phone use and dangerous driving behaviors (e.g., Briem and Hedman, 1995; Brookhuis et al., 1991). Since then, many studies have added to the literature demonstrating the dangers of hand-held and hands-free cellular phone use while driving, where Rakauskas et al. (2004) noted ample research shows the danger is not so much the physical and visual effort needed to speak on a hand-held phone, as the mental effort needed to hold a conversation.

Researchers have observed that engaging in telephone conversations negatively affects the ability to drive safely in simulated situations as well as in real-world situations (Collet et al., 2010a,b; Drews et al., 2008; Goodman et al., 1997; Haigney et al., 2000; Irwin et al., 2000; McKnight and McKnight, 1993; Rakauskas et al., 2004; Redelmeier and Tibshirani, 1997; Strayer et al., 2001). Previous research has shown the deleterious effects of cell phone use on one's ability to stay focused (Strayer et al., 2003; McCarley et al., 2001; Vivoda et al., 2008). For example, Strayer et al. (2001) observed cell phone use during a word recognition memory task and a simulated driving course, and results demonstrated that ability to maneuver through a simulated driving course and to recognize or recall words was reduced by about half when participants were asked to talk on a cellular phone. However, when participants listened to music or audio books, performance was not diminished suggesting it is more demanding cognitive tasks that reduce driving performance (Strayer and Johnston, 2001). Moreover, studies clearly document that relative to driving without any

* Corresponding author. Tel.: +1 423 439 8307; fax: +1 423 439 5695.
E-mail address: dulac@etsu.edu (C.S. Dula).

0001-4575/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.aap.2010.08.008

phone use, cell phone use negatively impacts the ability to stay within one's lane and leads to an impairment in a navigation tasks, while conversations with passengers have few negative effects (e.g., McKnight and McKnight, 1993; Strayer et al., 2001; Dressel and Atchley, 2008).

Redelmeier and Weinstein (1999) reported that the risk of a crash when using a cellular phone was 4.3 times higher than when a cellular phone was not being used. The relative risk range was reported to be between 3 and 6.5 at a 95% confidence interval, so while the risk of crash could be slightly lower than the 4.3 times higher reported, it could actually be higher. Further, analyzing data from over 220,000 traffic crashes, Violanti (1998) estimated the risk for fatality was nine times higher in phone-involved collisions and that the fatality risk was two times higher given the presence of a cell phone in the vehicle. Interestingly, the risk of fatality while using a cell phone actually increased with age across the lifespan. Because of the risks involved across all groups, legislative efforts have been made to restrict cell phone use while driving (McCartt et al., 2003; Redelmeier and Weinstein, 1999). While it is clear talking on a cell phone while driving is dangerous and that due to overconfidence it is unlikely to be seen by drivers as being as risky as it is, it remains to be determined whether a particular type of conversation has an independent effect on dangerous driving behavior.

One important foray into this topic area was conducted by Irwin et al. (2000), where they set up a simple response latency measure for a simulated braking situation. After practicing the procedure, participants were randomly presented with five trials where they were engaged in various levels of conversational intensity using a wireless phone, ranging from no call, to listening to information, to giving basic information (e.g., name, answering yes/no questions), to describing a route, to answering questions about personal beliefs on topics likely to elicit emotional responses (e.g., gun control, abortion). They found use of a wireless telephone significantly increased response latency, but there were no significant differences in types of conversational intensity, though a trend was seen in the directions predicted, except that the emotional condition did not follow the increasing latency trend. The authors noted the results may have differed were the task more ".natural in terms of total demand on the participants' attention. . ." and suggested using a design which more ". . .closely mimicked the entire task of driving. . ." (p. 1133).

Rakauskas et al. (2004) looked at conversational intensity with a more realistic driving task using a simulator. They used a series of questions in two categories (easy and difficult) to manipulate cognitive workload to see the effect on driving behavior. While their study did not endeavor to elicit the same type of emotional arousal attempted by Irwin et al. (2000), they did demonstrate that conversations of both types produced slower average speeds, but there were otherwise no greater levels of dangerous driving behaviors as a function of conversation type. The slowing down of drivers, found in a number of other studies of simulated driving while talking on a cell phone (cf. Caird et al., 2008), was construed as indicating that drivers believe talking on a cell phone is more mentally demanding than it actually is, contrary to the overconfidence effect suggested above.

But, this interpretation does not account for the notion that drivers potentially engage in risk compensation or offsetting behavior (e.g., Calkins and Zlatoper, 2001; Houston and Richardson, 2007; Peltzman, 1975), which is a tendency to be more likely to take risks when drivers feel they have done some action (e.g., slow down) that seemingly affords a degree of protection. Nor does it account for the idea that slowing down in some situations may actually be dangerous in and of itself (e.g., producing traffic congestion) or the view that slowing down per se does not guarantee sufficient attention is being paid to driving itself. Also, a distinction needs to be made between mindful versus mindless slowing. Charlton (2009) showed beeping alerts which warned drivers of upcoming hazards, transmitted during cell phone conversations in simulated driving, increased hazard-related safety performance beyond that seen in no conversation, cell phone conversation and passenger conversation – a result likely due to a mindful slowing down. Drivers on phones without alerts were less likely to decelerate when approaching hazards, decelerated closer to hazards, and were more likely to crash. It was further noted that non-alerted cell phone drivers not only failed to prepare for an upcoming hazard, but frequently did not even react to near crashes or minor collisions and had no memory for a hazard after a crash/close call event. The interpretation was that they did not detect the hazard unless there was a significant collision.

Of more direct relevance here, Rakauskas et al. (2004) felt driving performance would be affected by attentional distraction produced by cell phone conversations without regard to the intensity of the conversation, which leaves open the question as to whether conversational types were sufficiently differentiated in past research. The current study sought to investigate performance differences as a function of cell phone conversation type, and this design resembles that called for by Irwin et al. (2000) and is similar to that used by Rakauskas et al. (2004), except that emotional topics were more specifically targeted to elicit greater arousal through greater intensity of discussion. Dangerous driving was operationally defined as speeding (total number of speeding occurrences and percent of driving time spent speeding), failure to stop at traffic lights, collisions (this included hitting other vehicles, pedestrians, any objects, or leaving the roadway), and crossing the road center line. It was hypothesized that participants in a "no call" or baseline condition would exhibit fewer dangerous driving behaviors in a simulated environment than would participants in a "mundane call" condition where the content of the conversation was about unemotional topics such as the weather, sharing basic demographic information, etc. It was in turn hypothesized that those in an "emotional call" condition would exhibit more dangerous driving behaviors than those in the mundane call condition. As similar decrements to driving performance have been found for both hand-held and hands-free phone types (e.g., Caird et al., 2008; Hendrick and Switzer, 2007), only one phone type, a hand-held model, was used so as to focus on the effects of conversation type.

2. Method

2.1. Participants

Students in various psychology classes responded to measures via an online database. All participants volunteered and received extra course credit as well as $15 for participation. No identifying information was collected, and all responses were confidential. Participants included 75 undergraduates at a Southeastern university in the United States where 32 (60.38%) were female and 21 (39.62%) were male and ages ranged from 18 to 43 (M = 21.74, SD = 5.14; Mdn = 20.00). The data for four participants were eliminated from the final analysis due to outlying scores on more than one dependent variable, leaving a total of 71 participants whose data were included in analysis (see *Linearity and Multivariate Outliers section below*). Participants signed up for time slots which had, unbeknownst to them, already been randomly assigned to three different groups: the "no call" condition contained 36 (50.7%) participants (M = 21.61 years, SD = 5.33, Mdn = 20; 17 females and 11 males, 8 missing age and sex data); the "mundane call" condition had 20 (28.2%) participants (M = 22.46 years, SD = 5.08, Mdn = 21.00; 8 females and 5 males, 7 missing age and sex data); and, the "emotional call" condition included 15 (21.1%) participants (M = 21.8