

Waste Time or Lose Life: Assessing the Risk of Phoning While Driving

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INTRODUCTION

All of us who have learned to drive should remember how this task was demanding, requiring the coordination of actions and sustained attention. However, automation of motor and cognitive skills gradually mobilizes fewer resources on driving, making the driver more available without impairing safety. These resources are thus freed for related activities such as listening to the radio or chat with passengers. Managing two tasks simultaneously refers unambiguously to the field of dual-task research. Research then raised the question of whether we could perform two tasks simultaneously while maintaining the same efficiency. Early research on dual-task clearly evidenced that performance in either or both task was drastically impaired under these conditions (Welford, 1960). Reaction time (RT) may increase when two cognitive tasks are carried out simultaneously (Pashler, 1994). However, selective effects of dual-task are reported and the task clearly identified as the main task may relatively be preserved if the capacity of processing information is not exceeded. When this capacity is exceeded and when no priority is given, both tasks undergo the deleterious effect of being performed simultaneously (Kramer & Spinks, 1991). The same observation can be made on movement time. When two motor tasks are simultaneously performed the time to carry out both tasks is also increased. Thus, phoning may interfere with driving in terms of sensory inputs and motor outputs. Attention should be shared between visual road in-

formation and auditory conversation information. Similarly, holding a cell-phone may interfere with driving actions such as changing gears or keeping the driving-wheel. Research has thus considered phoning while driving as a dual task (Strayer & Johnston, 2001). Dual task generally increases the amount of information to be processed and the central nervous system works as if a bottleneck limits memory retrieval processes as well as motor planning and programming. Interference leads to multiple decision-making elements and has negative impact on driving performance when compared to driving without interference with only one decision-making element (Blanco et al., 2006). Conversely, being engaged in a dual-task is believed to have the potential to increase alertness and thus anticipation in traffic. The aim of this article is to give an overview on the risk of using a cell-phone while driving. Dr. Karel Brookhuis, at University of Groningen (Brookhuis et al., 1991) was among the first authors to publish an experimental study examining this topic. The famous *New England Journal of Medicine* published the epidemiological study by Drs. Donald Redelmeier and Robert Tibshirani at the University of Toronto (Redelmeier & Tibshirani, 1997). Drs William Horrey and Christopher Wickens at the University of Illinois (Horrey & Wickens, 2006) provided the first meta-analysis highlighting the impact of cell-phone conversations on driving. Dr. David Strayer (Strayer et al., 2011) at the University of Utah and Dr. Jeff Caird (Caird et al., 2007) at the University of Calgary are among the leading experts in this research area.

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OVERVIEW

The earliest articles or scientific reports studying the effects of mobile phone communication on driving performance were performed using driving simulators (Drory, 1985, Stein et al., 1987). Results did not report significant decrement in driving performance except when the drivers were requested to dial a phone number manually. This is a typical situation of motor interference likely to divert attention from the road and to cause hazardous situations. Apart from this particular condition, driving performance was not significantly impaired. Brown et al. (1969) concluded that phoning had a minimal impact on the more automated driving skills. Once cell-phones were available for the majority of people (around 1990), the question of whether these could be used during driving without impairing safety was asked. This issue is part of the broader field of distracted driving (Regan et al., 2009, Fix, 2001, Peters & Peters, 2001, Stutts et al., 2003). Peters & Peters (2001) considered automobile collisions caused by distracted drivers as a result of the rapid proliferation of electronic devices used within the vehicle while driving. Stutts et al., (2005) reported that distracted drivers exhibited specific behaviour as measured by higher levels of no hands on the steering-wheel, eyes directed inside rather than outside the vehicle, and lane wanderings or encroachments. They also underlined that distractions were frequently associated with decreased driving performance. There was thus a strong suspicion that phone use was likely to impact the quality of driving with potential consequences on safety. Among the first contributions related to the risk of using cell phone while driving, Redelmeier & Tibshirani (1997) studied behavior of about seven hundreds drivers involved in car-crash due to cell phone use (not leading to personal injury, however). They reported that the risk of collision was four times higher when using a cell-phone while driving than when it was not used.

Several other studies were conducted during the nineties highlighting the deleterious effects of

holding a phone conversation on driving performance. Alm & Nilsson (1995) reported a negative effect upon the drivers' choice reaction time with no compensation by increasing their headway during the phone task. Their results gave evidence of increased accident risk. Interestingly, McKnight & McKnight (1993) manipulated the nature and the intensity of distraction by comparing the effects of carrying on a casual cellular phone conversation or an intense cellular phone conversation. They concluded that both distractions led to significant impairments in driving. Briem & Hedman (1995) reported somewhat different results. They also tested the nature of phone conversation and showed that an easy telephone conversation was associated with the least performance decrement, and could have facilitating effects (for example, by keeping alertness at a level compatible with safety, with reference to previous studies by Drory, 1985 or Stein et al., 1987). They concluded that casual conversation over a hands-free telephone while driving was not likely to impair performance. However, a difficult conversation may adversely affect driving with prolonged phone manipulation as aggravating factor due to heavy demands on the driver's attention and skill. Brookhuis et al. (1991) took traffic conditions as another independent variable likely to affect driving performance. Drivers were tested while phoning during 3 driving sessions, the first on a quiet motorway, the second in heavy traffic on a four-lane ring-road and the third in city traffic. They first concluded that the basic control over the vehicle was rather unaffected due to automated action patterns. They however, pointed out several outcomes, i.e. phoning could have an alerting effect when driving on a quiet motorway. Conversely, they showed that drivers who received a call exhibited higher steering-wheel movements as compared to the control condition. Moreover, the resulting load assessed by heart rate recordings showed that phoning while driving was more demanding than driving alone, especially in heavy traffic.

At that time, there is ample evidence of the detrimental effect of holding a phone conversa-

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