

# Cell-Phones, Distracted Driving, Bans, and Fatalities



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## INTRODUCTION

Despite its impressive processing power and remarkable flexibility, the human brain is known to have severe bottlenecks of information processing that limit our ability to consciously perceive, hold in mind, and act upon immediate visual information (Duncan, 1980; Marois & Ivanoff, 2005). Neuroimaging studies have shown that when two conflicting streams of information must be processed simultaneously, they dispute for processing capacity, leading to what is known as the “dual-task interference” (Klinberg & Roland, 1997; Watanabe & Funahashi, 2014). As a result, the performance of each concurrent attention task tends to decrease, compared to when each task is performed alone.

Since such conclusions have countless implications on almost all of our everyday paradigms, this results have been shifting the attention of many applied sciences to dual-task related problems; mainly with the purpose of enlightening policy debates and keeping safety protocols up to prominent social changes. Among those changes resides the striking proliferation of the use of mobile phones. To put things into perspective, the average use per subscriber has risen from 140 to 740 minutes a month since 1993 (Bhargava & Pathania, 2013). In the United States alone, the number of mobile phone subscribers increased in

more than 94,541% in the last three decades (CTIA – The Wireless Association, 2011), completely changing the way people deal with information and manage attention.

We see not only tremendous growth in cell phone subscribers but also an increase in usage of these devices over time by drivers (Loeb et al., 2009). Still in 2004, it was estimated that about 85% of those use one while driving (Clayton, Helms & Simpson, 2006). The abrupt modification it brought to our everyday life made applied researchers engage in determining whether cell-phone conversations could undermine people’s safety during activities that require continuous periods of attention, as is driving. In this article we provide an overview of the current scientific knowledge regarding the interaction between cell-phones, distracted driving, bans and fatalities.

To all appearances, Brown, Tickner and Simmonds, from the Medical Research Council, a publicly funded government agency in the United Kingdom, were the first researchers to publish a recognized article in this area (Brown, Tickner & Simmonds, 1969). At the other end of the spectrum, with the relatively recent advent of driving simulators, David Strayer (Strayer & Johnston, 2001; Strayer et al., 2003), at the University of Utah, is undoubtedly the most renowned author in this field nowadays.

## OVERVIEW

In this article we provide an overview of the current scientific knowledge regarding the interaction between cell-phones, distracted driving, bans and fatalities. We first review the literature analyzing the effect of using cell-phones while driving on distraction. Although most studies in this literature rely on driving simulators, which have been criticized, evidences are in favor of a negative relation between cell-phone use and driving performance. Secondly, we analyze the relationship between using cell-phones and the probability of being involved in a car crash. Generally, recent evidences document that crash rates are significantly affected by mobile phone use while driving. Finally, we review a growing literature that analyzes the effects of cell-phone and texting bans while driving on cell-phone use and fatalities. Evidences are still inconclusive, with a few papers documenting a negative relation between bans and cell-phone use and fatalities, while others document a short lived or inexistent relation.

## CURRENT SCIENTIFIC KNOWLEDGE

### Cell-Phones and Distraction

Although the interference between conversation and a concurrent visuomotor task is broadly known (for an overview, see Boiteau et al., 2014), there is a remarkable difference between cell-phone conversations and in-person conversations with other occupants of the vehicle. In-person conversations are modulated by driving difficulty, so that as the demands of driving increase, participation by all participants in the conversation decreases (Parks, 1991). More traditional distracting activities, such as consuming beverages or food, can also be modulated by ongoing driving conditions. In contrast, one of the participants in a cell-phone conversation is unaware of the current driving conditions, and could even be unaware of the fact that the other cell-phone user is driving, what

makes the conversation less likely to be modulated as a function of the real-time variations in driving difficulty (Strayer & Johnston, 2001). This peculiarity brought an urge to find answers on whether cell-phone conversations while driving could significantly increase the odds of undesirable outcomes, as property damage, personal injury or even death.

Brown, Tickner, and Simmonds (1969) were probably the first to investigate whether cell-phone conversations while driving could significantly impair driver's performance. In this pioneer experiment, drivers were given the task of judging whether to drive through gaps, which might be larger or smaller than the car, while carrying out a telephoning task of checking the accuracy of short sentences. The authors concluded that concurrent driving and telephoning might critically impair perception and decision-making, since judgments of "impossible" gaps were degraded. However, driving and telephoning appeared to have a minimal effect on the more automatic driving skills.

Those findings quickly caught the attention of the researching community, leading to a rapid development of the field. In the following decades, many studies started to use driving simulators in order to better understand the effects of mobile communication on driving performance (Ostbaum, 1976; Drory, 1985; Stein, Parseghian & Wade Allen, 1987). Analysts kept searching for changes that could be associated with the use of cell-phone in factors such as looking behavior, speeding, positioning on the road, positioning relative to other traffic (anticipation), and reactions to maneuvers of other traffic participants. Nevertheless, no serious performance decrement was found, except when the driver had to dial a number manually (Brookhuis, de Vries, & de Waard, 1991).

Subsequently, in an elaborate work, Brookhuis et al. (1991) submitted 12 drivers to real (on road) traffic conditions in an instrumented car, where they had to operate a mobile telephone for a short while. Although they have found that telephoning while driving had little or no effect on automatic

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