

Mobile Phone Distraction: Understanding the Inconsistencies between Simulator and Naturalistic Driving Study Findings

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Abstract

A major current controversy within the driver distraction community is the apparent mismatch between findings on the safety impact of mobile phone conversation found in driving simulators versus real-world naturalistic driving studies (NDS). To this end, the aim of this study was to undertake a critical appraisal of relevant literature and conduct targeted consultations with distraction experts to identify possible reasons for this apparent inconsistency in findings. The methods, results, findings from the study, and their theoretical and practical implications, are discussed.

Background

A current controversy within the driver distraction community is the apparent mismatch between findings on the safety impact of mobile phone conversation (both hand-held and hands-free) found in driving simulators versus findings from instrumented vehicles in real-world naturalistic driving studies (NDS). For example, it has been found that driving performance can be degraded significantly in driving simulators (e.g. Caird et al. 2008); however, with the exception of a recent NDS (Dingus et al. 2016), there is relatively little evidence of significant degradation in safety in naturalistic driving studies (e.g. Klauer et al. 2006). Some naturalistic driving studies have even yielded data suggesting that conversing hands-free on a mobile phone may actually decrease crash risk (e.g. Olson et al. 2009).

In collaboration with Research Centre for Integrated Transport Innovation (rCITI) at the University of New South Wales, in Sydney, Australia, the Australian Road Research Board (ARRB) sought to investigate and explain these inconsistent findings regarding the impact of mobile phone conversations on driving performance and safety. To achieve this, the authors undertook a critical appraisal of relevant literature and conduct targeted stakeholder consultations, via teleconference, to identify possible reasons for the apparent inconsistency in findings between naturalistic driving studies (NDSs) and experimental simulator studies with regards to the impact on driving performance and safety of hands-free mobile phone conversation.

Method

Specifically, this presentation will present the findings from:

1. a targeted review of relevant literature; and
2. consultations, via teleconference, with international experts on driver distraction that were well versed in both simulated driving and NDSs methodologies

Results

The findings from the literature review and expert consultations suggest that there are several possible hypotheses for the apparent inconsistency in findings between NDSs and experimental/simulator studies with regards to the impact of mobile phone conversations. Given the word constraints of this abstract, only four of these hypotheses will be outlined:

- **self-regulation** - in NDSs, drivers have some latitude to decide whether to engage in phone conversation, and therefore may choose not to do so in situations that they perceive to be risky (i.e., to self-regulate) (see for review Cunningham & Regan, 2018). In experimental conditions, however, in which experimenters force participants to engage in phone conversation to understand its effects, participants may be instructed to engage in a phone conversation in situations they normally would not in the real world (and therefore ‘force’ impaired driving to occur).
- **controlled versus automatised performance** – according to the Cognitive Control Hypothesis (Engstrom, Markkula, Victor, & Merat, 2017), cognitively loading tasks (e.g., a mobile phone conversation) will negatively impact controlled performances (i.e., those performances relying on executive functions such as working memory and attentional effort), but not automatised performances (i.e., those performances that are effortless, generally as a result of repetition). Therefore, it is postulated that, since experimental/simulated conditions often require the driver to perform tasks that rely on executive attention/cognitive control (e.g., responding to artificial stimuli, maximising performance on lane keeping), while real-world crash avoidance may be more governed by more automatised skills, such as braking in response to a looming braking lead vehicle, mobile phone conversations have increased potential to impact performance in the former, but not safety risk in the latter.
- **arousal from cognitive load** - mobile phone conversations may be more naturalistic and arousing in the real-world (compared to phone conversations used as stimuli in experimental conditions), and therefore help maintain alertness and counteract fatigue in NDSs (and, therefore, reduce safety risk) (Reimer & Mehler, 2011; Mehler et al., 2012; Engstrom, 2017);
- **gaze concentration** – cognitively loading tasks induce eye gaze concentration toward the forward central field of view (Victor et al., 2005; Reimer, 2009; Wang et al., 2014 and may therefore lead to a greater chance of a driver detecting a sudden closing-in of a vehicle ahead (Engström et al., 2005; He et al., 2014; Boer et al., 2016). Since crashes in the real-world are most likely to be rear-end crashes, gaze concentration in the real-world may have a greater latitude to help avoid collisions compared to driving in experimental conditions which may present more hazards to drivers in their periphery (such as with peripheral detection tasks).

Conclusions

There are several hypotheses for why there exists a discrepancy between findings regarding the impact of mobile phone conversations on driving performance (in simulated driving studies) and safety risk (in NDSs). However, while the outputs of this research are informative, we acknowledge that this discrepancy is still poorly understood and requires further research.

Even though there have been instances of ‘protective’ properties (i.e. reduced crash risk) associated with mobile phone conversation presented in NDSs, the general consensus, based on available literature and expert opinion, across both NDSs and simulator studies, is that mobile phone conversation can still be a road safety risk.

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