Chapter 56
Cell Phone Conversation and Relative Crash Risk Update

Richard A. Young
Driving Safety Consulting, LLC, USA

ABSTRACT

This chapter reviews key findings since 2014 that are relevant to estimating the relative crash risk of conversing via a cell phone during real-world and naturalistic driving in passenger vehicles. It updates Chapter 102 in the previous edition of this Encyclopedia. The objective is to determine if recent data confirms the conclusion that engaging in a cell phone conversation does not increase crash risk beyond that of driving without engaging in a cell phone conversation. In particular, a recent estimate is presented of the relative crash risk for cell phone conversation in the strategic highway research program 2 (SHRP2) naturalistic driving study data. This estimate is compared with five other estimates in a meta-analysis, which shows that cell phone conversation reduces crash risk (i.e., has a protective effect). A recent experimental study will also be discussed, which supports the hypothesis that driver self-regulation gives rise to the protective effect by compensating for the slight delays in event response times during cell phone conversation.

INTRODUCTION

A few brief definitions of basic terms will facilitate understanding the research updates reviewed in this chapter. This chapter uses the same definitions of terms as in the corresponding article in Chapter 102 in the previous edition of this Encyclopedia (Young, 2015a), except for the following additions and enhancements.

- **Confidence Interval:** In this paper, the 95% Confidence Interval (abbreviated CI). "If the underlying statistical model is correct and there is no bias, a CI derived from a valid analysis will, over unlimited repetitions of the study, contain the true RR with a frequency no less than 95% of the time" (Porta, 2008, p. 49).
- **Demand Terms:** The metrics characterizing driver performance during secondary tasks can be grouped into the two orthogonal dimensions of *Physical* and *Cognitive* demand (Young, 2016a,

2016b). *Physical* demand concerns the aspects of secondary tasks which place demands on the eye glances, hands, or feet of the driver. *Cognitive* demand concerns the aspects of secondary tasks that place demands upon the attentional resources of the driver.

- **Driver Distraction:** "Driver distraction is the diversion of attention away from activities critical for safe driving toward a competing activity, which may result in insufficient or no attention to activities critical for safe driving" (Regan et al., 2011, p. 1776). As pointed out by Young (2015a, Section 6), a secondary task with a relative risk confidence interval that encompasses one, or that is entirely below one, is not a driver distraction according to this definition, because the secondary task does not impair activities critical for safe driving.

- **Epidemiological Terms:** *Case window.* In naturalistic driving studies, a short time period (often 6 seconds) near the time of the precipitating event, which in turn immediately precedes the time of the crash. *Control window.* A time period with the same duration as the case window, but during driving on some day before the crash, when there was no safety-related incident. *Homogeneous.* Assume the population under study is divided into two or more categories or strata (e.g., defined by exposure and confounder levels). The homogeneous assumption is that within each analysis subgroup, "the probability (risk) of an outcome event arising within a unit of person-time is identical for all person-time units in the stratum" (Rothman et al., 2008, pp. 239-240). That is, the effect is constant or uniform across strata. If so, the strata can be pooled or combined (e.g., crashes and near-crashes can be combined into one group). If the effect is not equal across strata, then epidemiologists say that the effect measure is *heterogeneous,* meaning that it is modified or varies across strata (Rothman et al., 2008, p. 63). Strata that are heterogeneous cannot properly be pooled to create a single estimate. Standard tests for homogeneity exist in epidemiology and should always be used before combining strata. *Confirmation bias* is "a form of bias that may occur when evidence that supports one's preconception is evaluated differently from evidence that challenges those convections" (Porta, 2008, p. 49). *Selection bias* refers to "a distortion in the estimate of the effect due to the manner in which subjects are selected for the study" (Porta, 2008, p. 225). An example of a potential reason for selection bias is if all drivers with a safety-critical event are chosen for the exposed group, and only at-fault drivers with a safety-critical event are chosen for the unexposed group (Young, 2013a). Another example of selection bias is if drivers engaged in a cell phone conversation accompanied by other secondary tasks are chosen for the exposed group, and drivers without any secondary tasks are chosen for the unexposed group (Young, 2017a).

- **Naturalistic Driving:** An example of non-experimental driving, as is real-world driving. Vehicles are specially equipped with video cameras that record the driver's behavior, and other instruments such as inertial sensors that record the vehicle's behavior. These measurements occur in real time, while the vehicles are driven in everyday fashion over a prolonged period, from months to several years. A naturalistic driving study (NDS) also allows for exact timing of crashes and calls, at least those using hand-held phones. Many naturalistic driving studies do not have audio recordings, only video, so determining whether a driver is engaging in a hands-free conversation, or just singing or talking to themselves, is difficult. Hence, only hand-held cell phone conversations are evaluated in some naturalistic driving studies.

- **Real-World Driving:** Another example of non-experimental driving, as is naturalistic driving. Real-world driving refers to driving a vehicle in an everyday manner, without experimental instructions or special instrumentation. In real-world driving, tasks such as engaging in a cell phone conversation that are secondary to primary driving, if performed at all, are performed at times and

Related Content

A 3D Virtual Space for the E-Commerce Strategy Model

Gong Cheng, Changrui Yuand Kecheng Liu (2018). *Mobile Commerce: Concepts, Methodologies, Tools, and Applications (pp. 243-258).*

www.irma-international.org/chapter/a-3d-virtual-space-for-the-e-commerce-strategy-model/183289

The Pedagogy of Mobility

Kathy M. Stewartand John G. Hedberg (2011). *Mobile Technologies and Handheld Devices for Ubiquitous Learning: Research and Pedagogy (pp. 259-278).*

www.irma-international.org/chapter/pedagogy-mobility/46568

Intelligent Bandwidth Allocation of IPTV Streams with Bitstream Complexity Measures

Sandro Moiron, Rouzbeh Razavi, Martin Fleuryand Mohammed Ghanbari (2013). *International Journal of Handheld Computing Research (pp. 41-62).*

www.irma-international.org/article/intelligent-bandwidth-allocation-of-iptv-streams-with-bitstream-complexity-measures/84826

Secure-Aware Multipath Routing Using Atom Search Rider Optimization Algorithm in Wireless Sensor Networks

M. B. Shyjith, C. P. Maheswaranand V. K. Reshma (2021). *International Journal of Mobile Computing and Multimedia Communications (pp. 36-55).*

www.irma-international.org/article/secure-aware-multipath-routing-using-atom-search-rider-optimization-algorithm-in-wireless-sensor-networks/277231

Research on Soft Computing Techniques for Cognitive Radio

Subhashree Mishra, Sudhansu Sekhar Singh, Bhabani Shankar Prasad Mishraand Prabin Kumar Panigrahi (2016). *International Journal of Mobile Computing and Multimedia Communications (pp. 53-73).*

www.irma-international.org/article/research-on-soft-computing-techniques-for-cognitive-radio/161756