An Investigation of Peer Influences on Risky Child and Adolescent Pedestrian Road Crossing

SAFETY RESEARCH USING SIMULATION

UNIVERSITY TRANSPORTATION CENTER

J. Plumert, PhD
Professor
Department of Psychology
The University of Iowa

M. Abdel-Aty, PhD
Pegasus Professor, Chair
Department of Civil, Environmental and Construction Engineering
University of Central Florida

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J. Plumert, Ph.D.
Professor
Department of Psychology
The University of Iowa

M. Abdel-Aty, Ph.D.
Pegasus Professor, Chair
Department of Civil, Environmental and
Construction Engineering
University of Central Florida

P.A. Hancock, Ph.D.
Pegasus Professor, Provost Distinguished
Research Professor, and Trustee Chair
The Department of Psychology
University of Central Florida

B. Sawyer, Ph.D.
Research Associate
Department of Psychology
University of Central Florida

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Table of Contents

List of Figures

1 Introduction

One of the most important elements of vehicle-pedestrian collisions emanates from distracted driving. Our mandate in the present project sub-element was to examine and evaluate such distraction as it affects the latter collision configuration.

Research on distracted driving has a long and involved history (see, e.g., Brown et al., 1969; Hancock et al., 2003). From the first introduction of externally supportive aids (such as windshield wipers), to later in-vehicle entertainment systems (such as the introduction of the car radio), concern has been continuously expressed about disruptions to driver roadway attention. These concerns have increased exponentially with the introduction of numerous in-vehicle devices from OEMs to hand-carried PDAs, as well as external distractions such as variable message sign and advertising boards. The underlying imperatives that pertain to distracted driving are complex and reflect the various mores and philosophical foundations for performance assessment in varying cultures across the globe (Hancock, 2013; Hancock et al., 2008). Much of what is identified as distraction is contingent upon what is socially mandated that the driver *should* be paying attention to (i.e., a normative model of driving). However, such a normative model is neither fully articulated, fully available, nor fully accepted in the research community. In light of this lacuna, the behavioral transportation scientists are currently approaching the issue using examinations of individual systems and their respective effects.

One of the primary goals of our sub-project was to bring some order to these respective lines of research. We have distilled and codified the present state of the art as a major product of the present sub-project. In this work, we divided the world into tasks that are relevant to driving versus those that are largely irrelevant to driving. We have labelled this axis as either related or unrelated, respectively, to the vehicle. The second

taxonomic axis relates to the source of the distraction being either internal or external to the vehicle. This provides us with the matrix illustrated in Figure 1. In keeping with the theme of the overall project that is concerned with the age of the involved individual, we subsequently divided the extant literature according to driver age; it was categorized into four differing groups.

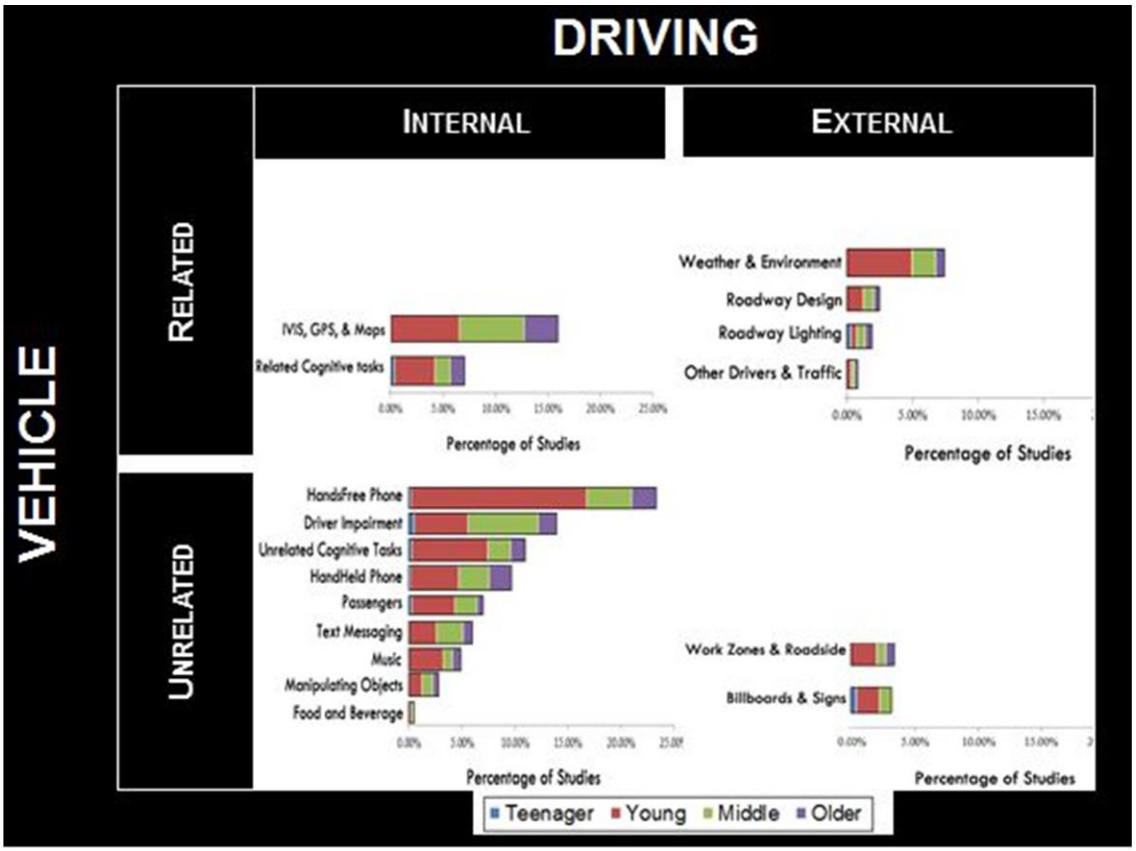

Figure 1.1 – Results of an analysis of the present state of driver distraction research parsed by age of driver (i.e., teenage, young drivers, middle age, and older drivers), as well as the source of the distraction (i.e., whether internal or external to the vehicle, and whether relevant or irrelevant of the driving task.

As is evident in Figure 1.1, the vast majority of current studies have examined distraction effects within the vehicle that are unrelated to the driving task. Relatively little

work has addressed issues in the other quadrants, some of which is especially pertinent to vehicle-pedestrian collisions. (We wish to thank Mr. Michael Rupp for his distillation of this material).

As our outcome results indicate, the overwhelming focus has been on in-vehicle sources of distraction that are not relevant to the immediate driving task. This has left the other elements of the possible universe of distraction somewhat weakly evaluated at the present time. As a result of our summary, we can here recommend that a more consistent and coherent research strategy be undertaken to address these respective shortfalls.

2 Addressing Distraction Methodology

One persistent problem that continues to inhibit our collective progress concerning driver distraction is the issue of a common methodology. That is, even if we can identify shortfalls in the panoply of extant literature, we still have to establish a common and agreed method of assessment. During our research conducted above, such a common framework was offered by Strayer and his colleagues (Strayer et al., 2015; Strayer & Cooper, 2015). In what follows, we examine and evaluate this proposal for a common approach and point out its advantages and shortfalls as a basis for our subsequent research recommendations.

We must first address the founding predicate of this overall area of distraction since it can, in part, be addressed by ongoing epidemiological information (Redelmeier & Tibshirani, 1997). If in-vehicle devices are the major cause of distracted driving, then we should see evidence of a parallel increase in collision frequency with ever-greater numbers of such in-vehicle systems. However, these coincident growth trends are often not observed. That is, distraction-associated collisions have not grown with the increase of hand-held devices. As with all epidemiological evaluations, there are so many involved factors that available degrees of post hoc rationalization can always be posited as explanations for significant trends observed or not observed. However, we should note that this often-asserted association is not ubiquitously found and may be evidence of intrinsic driver adaptation capability. A fuller answer may lie in the acute observations of Herbert Simon (1969). He noted that individuals can perform under two differing imperatives. Sometimes the real-world demands our very best effort. At such moments, each individual must seek to *optimize* his or her response. Such demands occur in highly stressful situations, in which existence itself is put at peril. These occasions are, fortunately, rare. The vast majority of the time individuals *satisfice* task demands

(Hancock, 2013). By this, Simon meant that individuals do well enough to succeed, but quite rationally they choose to invest no more effort than is necessary to “just get by,” there being strong evolutionary imperatives to do so (Hancock, 2015). Everyday driving is a predominantly satisficed task in which individual drivers get by. In normal driving, they retain much spare response capacity, which they employ on other tasks. It is this ‘margin’ of attention that is devoted to distracting demands, and since the individual driver is rarely maximized, the growth of collision rates is not commensurate with the growth of in-vehicle distractive devices. This means that methods that elicit distraction pattern by emphasizing ‘optimized’ strategies (i.e., responding as quickly and as accurately as possible) are liable to experience a theoretical and pragmatic shortfall as measurement methods. Methods that maximize or saturate driver capacity then offer a potentially chimerical illusion of quantification that simply does not transfer to everyday driving. This is a crucial issue to resolve for the measurement of distracted driving (Strayer et al., 2015).

3 Avenues of Progress

Having identified one critical barrier to progress, it is up to us to provide positive future directions (Hancock et al., 2008). We could pursue the driver 'maximization of effort' methods, searching for associated ways to attack the question of the 'soft' ceiling of performance capacity. This strategy stands in juxtaposition to the 'hard' ceiling foundation of the strong interpretation of all current secondary task techniques. However, we recommend proceeding in another direction. While drivers currently play critical roles in the etiology of collisions, we believe insufficient attention has been directed to the issue of driving context. In such an analysis, the driver 'proposes,' but it is the environmental conditions which dispose. Collective behavioral work on vehicle collisions has exhibited an insufficient theoretical foundation through which to assess the overall, systemic context of performance. While civil engineers have studied the physical configuration of roadways in order to optimize design, study of the structure of the 'affordance' of effective passage still lags behind other elements of a true systematic approach. Neither the "minimum stopping zone" (the engineering specification of the vehicle at hand) nor the "field of safe travel" (the momentary driver's affordances) are by themselves sufficient to capture the full dynamics of driving (Gibson & Crooks, 1938). In an age in which our roadways are better designed, created, and instrumented than ever before, and in which algorithmic solutions for route efficiency abound, it seems feasible that infrastructure tools can help researchers and designers understand all moment-to-moment interactions that underpin modern driving. Through such advances, the fracture of the invidious Markov chain of collision evolution may be possible (Hancock & de Ridder, 2003). It is, of course, also quite feasible that the same technologies that drive us toward full vehicle automation will render such observations moot. However, we do not envisage that this will be so immediately (Hancock, 2014).

4 Recommendations Going Forward

As a result of the foregoing observation and our overall sub-project effort, we can provide the following recommendations for future, follow-on funded work in this particular domain:

- The present body of literature is lacking in empirical research explorations of distraction derived from sources of attention capture that are external to the vehicle. In particular, the influence of, for example, digital signboards needs to be evaluated in the short term.
- More experimental capital needs to be devoted to the testing of task (driving) relevant, in-vehicle devices as they affect driver attention pattern.
- Ways in which information integration across the whole transportation system can be effected would be an especially valuable investment.
- Evaluative methods related to operator (driver) satisficing strategies need to be developed.
- The whole issue of vehicle-pedestrian collisions must be examined in light of the innovations in automated (driverless) vehicles, and the concomitant growth of autonomous systems (Hancock, 2016).

5 Fulfillment of Sub-Project Requirements:

Iowa Visit:	Dr. Hancock will visit with Professor Plumert at The University of Iowa. (Visit Accomplished, February/March, 2016).
Driver Distraction Evaluation:	Herein reported.
Paper Publication:	Hancock, P.A., & Sawyer, B.D. (2015). Judging thieves of attention. *Human Factors*, *57* (8), 1339-1342.

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Nota Bene

As a product of the present sub-project, some of the text of the present report is taken from our own prior published works.