

Distracted Driving: How can we prove it's a problem?

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Introduction

This paper examines some of the issues related to the task of proving that distracted driving is a problem – it focuses on how research can show that distracted driving increases the risk of collision and how it can show that this increased risk is sufficient to warrant making it a traffic safety priority.

In this respect, the paper provides a bridge to others presented at the conference but most directly to those in the session on “How risky is distracted driving”, that review what the research tells us about the risks imposed by distracted driving. Each of those papers is based on different research approaches that provide a different perspective on the problem. This paper provides an overview of those research approaches, focussing in particular on their strengths and limitations.

In doing so, the purpose is not to be nihilistic, suggesting that given the limitations of the various research approaches, very little is known about the problem of distracted driving. Rather, it is designed to provide a context that helps us understand why it is so hard to answer such seemingly simple and fundamental questions as, “How many crashes result from distracted driving?”; or “How risky is it?”.

Particularly for researchers in the traffic safety field, much of what is contained here is not new. The issues raised are fundamental to the quest for knowledge, and basic to understanding the risks imposed by any factor or variable – whether it is the consumption of alcohol, the effects of aging, tire pressure, or potholes. Researchers have a set of tools at their disposal that provide insights into how big the problem is (e.g., how many deaths and injuries result from it), and how risky it is (e.g., compared to a sober driver, how much more likely is someone to crash if their blood alcohol is 3 times the legal limit). These research tools have strengths and limitations and knowing what they are is critical for informed decision-making.

Accurate information provides the basis for setting priorities and allocating resources; it provides the basis for prevention measures that target the problem – i.e., measures that have more than just face validity or public appeal -- and, it provides the data needed to monitor changes in the problem so we can tell if the prevention measures are having any effect.

The matrix of research methods traditionally used in traffic safety include: surveys, observations, crash-based studies, and experimental designs. Briefly, in surveys the researcher asks people to provide information about their practices, experiences, opinions and concerns – for example, how often they see drivers doing things they think are distracting, how often they do it themselves, how concerned they are about this problem, and what they think should be done about it.

Observational studies focus on what people actually do rather than on what they say they do. Using trained observers or electronic recording devices, the researcher monitors real-world driving situations to see what distractions arise and how drivers react.

Crash-based studies are retrospective. They begin with the outcome (the collision itself) and endeavour to reconstruct what factors were associated with, or contributed to, the collision. Various levels of analysis have typically been used to achieve this, ranging from reliance on police accident reports to more in-depth multi-disciplinary investigations by a team of experts.

Laboratory-based research, much of which recently has relied on simulators, typically uses experimental research designs that allow the investigator to systematically introduce conditions to the driver in a controlled environment and monitor a wide range of performance measures.

Each of these approaches is important. Each provides a slightly different window on the problem, and no one approach can give us all the information needed for rational decision-making. It is through the convergence of evidence arising collectively from all approaches that solid facts emerge.

The following review of the research approaches described briefly above is designed to provide a general common platform for appreciating how investigators attempt to estimate the extent of risk imposed by some factor.

Surveys

Survey data are self-reports usually obtained from questionnaires administered to groups of drivers, often by telephone. The purpose is to obtain estimates about the prevalence of the problem (e.g., how often people say they engage in behaviours that might be distracting; how often they see other drivers engaging in these behaviours), estimates about how concerned they are about the issue, and suggestions about what they think needs to be done to solve it. Surveys addressing all these areas are covered in other papers presented at this conference (see the papers by Beirness, Rudin-Brown, and Walker).

The primary limitations of survey research arise from the fact they involve self-report. It is well known that, for various reasons, people are often not honest in the answers they provide. For example, they will give answers that are consistent with socially desirable behaviour rather than saying what they actually do (consider how someone might respond if asked whether they ever drive after drinking alcohol; or if they have ever caused a collision because they were distracted). Surveys can also suffer from problems of recall – e.g., asking someone to remember the types of distractions they encountered while driving over the past month.

Other difficulties arise from the very nature of the questions that are asked and how they are asked – it is possible to phrase a question in such a way that the answer is all but predetermined (e.g., consider the question “The majority of Canadians want a ban on cell phone use by drivers: Do you agree?”). Finally, a persisting and growing problem involves non-respondent bias. Surveys, whether mail-out or telephone, are never successful in getting a 100% response rate. Indeed, response rates can often be extremely low, raising questions about how representative the sample is, and, therefore, how applicable the responses are. Of more contemporary concern, there is evidence that response rates are diminishing because of such things as new limitations on the acquisition and use of phone lists, and call displays on telephones.

The bottom-line is that surveys can and do provide valuable insights into the issue but it is important to recognize the limitations when interpreting the findings.

Observational Studies

Instead of asking people what they do, it is possible to observe them directly. A variety of techniques are employed to do this: for example roadside observations in which trained observers are posted at strategic locations to note certain behaviours (e.g., this is often how seat-belt usage rates are determined); or drivers are pulled to the roadside and certain measures of behaviour are taken (e.g., drinking and driving surveys use this approach); or electronic systems are used in the vehicle to record events (e.g., video taping of the driving environment and driving behaviours).

Direct observation overcomes some of the problems associated with surveys, and can also provide an extremely rich pool of data often gathered in a dynamic real-world environment.

Several papers at this conference (e.g., see Klauer and Strayer) describe the use of observational approaches.

To provide reliable information, it is, however, critical that the observational system (be that a person or some electronic device) is unobtrusive – otherwise, the process of measuring the behaviour can itself change the behaviour. For example, the observation process can actually become a distraction.

It is also important that the judgements being made about what constitutes a distraction are reliable over time and across observers. Definitions need to be established in advance as to what a distraction is and how it is measured, to overcome the problem of tautologies (e.g., why did the driver drift into the other lane? Answer, because they were distracted. How do you know they were distracted? Answer, because they drifted into the other lane). As well, apriori definitions help mitigate the effects of observer expectancies and bias – i.e., you are more likely to see something if you expect to see it.

In addition, to provide insights into the effects of other variable that enhance or minimize the effects of distraction, it is important to have large numbers of participants in observational studies that vary across important dimensions such as age and experience. Meeting such requirements can often be a challenge for observational studies.

Crash-based studies

Crash investigations have been a mainstay of traffic safety research for decades. The most common approach is to rely on secondary data – information gathered by someone else – for gaining insights into the causes of collisions. Very frequently, these secondary data are derived from police accident reports but

other sources are also used -- sources such as driving, medical or insurance records, or in the case of some distracted driving research, even phone records.

Alternatively, and less commonly, primary data are gathered by a specialized team of experts. In these more detailed investigations, specialists conduct an independent, onsite review of the collision environment, and in some cases interview the vehicle occupants and other witnesses.

The fundamental purpose of such work is to determine why the crash occurred – i.e., to isolate the human, vehicular and environmental factors that contributed to the collision. For example, in studying distraction, the researcher would try to determine in how many of the crashes driver distraction was a contributory factor, and determine what the sources of distraction were. In this way, the magnitude and characteristics of the problem can be estimated.

The fundamental assumption underlying crash-based research is that the evidence gathered at the scene, and subsequently, can reveal what the contributory factors were (and, if you watch CSI who could ever doubt such an assumption).

Using crash-based data, researchers also try to compare the prevalence of contributory factors across various types of drivers (drivers of different ages for example) and driving conditions. To make such comparisons meaningful, it is also common practice to standardize the raw data, using such denominators as populations estimates, licensed driver populations, and in more rare cases because reliable data are not readily available, quantitative exposure in terms of the amount of driving.

This genre of research forms part of an approach called epidemiology, borrowed from the study of epidemics in the public health field. Included in these research paradigms is the so-called case-control method in which the prevalence of a

factor (e.g., alcohol, medical conditions, distraction) in collisions is compared to the prevalence of that factor in the driving population at risk. Such comparisons show the extent to which the factor is overrepresented in collisions, establishing it as a risk factor. The first such pioneering study in traffic safety took place some 40 years ago and was instrumental in determining the relative risk of collision involvement for drinking drivers, and subsequently for helping set the legal limit in most countries. These are complex and costly investigations but the information gained from them can be extremely valuable. However, to my knowledge, no case-control study has yet been undertaken in the area of distracted driving.

Most of the limitations of crash-based studies are inherent in the data. Three issues warrant consideration – data availability, data quality, and data linkages.

Given that the researcher is trying to estimate the magnitude of the problem of distracted driving and the frequency with which various sources of distraction contribute to the crash, it is important that the sample of collisions being investigated is representative. Researchers usually address this either by sophisticated sampling procedures or by using the entire population of cases – e.g., all crashes occurring in a jurisdiction in a particular period. The problem is that not all crashes are investigated by the police – for example, it is well known that many collisions (even some involving treatment at the hospital) never come to the attention of the police. Moreover, in some jurisdictions, property damage collisions are never attended by the police and the accident report is completed by the drivers. Their reliability in reporting the involvement of such factors as alcohol or distraction is, of course, questionable. The point is that if there is no police report, the sample being studied could be biased.

But even in cases where an officer attends the collision and completes a report, information on key factors such as distraction will only be included if there is a reporting requirement to do so (e.g., a check box on the accident report form). Although some jurisdictions now have officers collect information at the crash

scene regarding the role of distractions, such data collection started only recently in most places (see Sundeen 2005, for a summary of the practices in the United States).

However, even if the report form has a place for officers to record if distraction was, in their view a contributory factor, it is well known that officers vary greatly in their level of training and ability to identify the cause of a crash. Subjectivity and inferential weaknesses are a common problem with police reports. Moreover, if the officer has to rely on reports from crash-involved drivers to determine what might have happened, the biases from such information are obvious. The bottom-line is that research using secondary data sources must acknowledge the strengths and limitations of the evidence base. This is not as important when communicating with other researchers, who are familiar with the limitations, but very important when communicating with those who are less sophisticated. Inappropriate conclusions can easily be drawn.

To enhance the value of crash-based data and to verify its veracity, researchers often try to link collision reports to other data sources, such as driver records or insurance reports. Again, because these are secondary data, often created for purposes other than research, their limitations must be understood and acknowledged. As a noteworthy point, in the study of distracted driving, a novel approach (see the paper by Bellavance) has been to link phone records to cell phone use to determine usage at the time of crash. However, although phone records are very accurate with respect to time, crash records are usually not that accurate. Once again, the strengths and limitations of the data need to be understood in drawing conclusions.

Laboratory/experimental

Laboratory-based studies today commonly use simulators to mimic the performance skills used in driving. However, the simulator is simply a tool for measuring performance. What is critical about such studies is the experimental research design that governs the way the simulator is used. Borrowing from a long-standing tradition in the social sciences, particularly psychology, these studies examine changes in performance when some condition or conditions are varied systematically and all other sources of influence are controlled, through various means, including random assignment of subjects/drivers. For example, a researcher might examine the effects of varying lengths of time for a phone conversation on driving-related performance.

The high level of control that is inherent in the experimental approach is its primary advantage because it minimizes the possibility that the changes in performance arise from something other than what the research is doing. Technically speaking the design minimizes the effects of confounding variables. As a result, experimental designs reveal causal relationships between the inputs – called independent variables (e.g., distraction) and the outcomes – called dependent variable (e.g., performance decrements). Such designs also allow the researcher to apply systematically several variables simultaneously, providing insights into their interactive effects.

A fundamental issue with laboratory-based studies, and especially the performance measures they use, is the extent to which the relationships revealed have anything to do with actual real-world performance. This involves two related issues. First, it is important to establish that the performance being measured is relevant to the performance that occurs on the road. The measurements must have more than face validity and actually tap performance that occurs in the real-world driving situation. Second, it is important to establish that the changes in performance observed in the lab actually translate into increased risk of collision on the roadways. For example, extremely sensitive instrumentation can detect very slight decrements in performance on a highly

selected task, but this alone is not sufficient to show that such changes actually increase the risk of collision.

Summary

The extent and nature of the limitations outlined above suggest that research is awash in methodological problems and the findings simply cannot be trusted. This is certainly not the case. Most researchers in the field are highly sensitive to these issues – and others as well -- and most take precautions to guard against their impact. Moreover, most researchers routinely reference these limitations to help minimize the possibility that their findings will be misrepresented. The discussion in this paper of the research shortcomings is provided simply to underscore the fact that conclusive evidence is often more illusive than appears at first blush.

Put another way, there is no such thing as the definitive study because all studies have methodological and design limitations. There is also no single research approach or design that will answer all the questions about the magnitude and characteristics of the problem and the risks it poses. Each provides a slightly different window or perspective on the problem. It is the weight and convergence of evidence from various approaches that provides the basis for informed decision-making. As a result, it is important that the existing research using various approaches be synthesized and assessed, using techniques such as meta-analysis (see Smiley et al for example).

As the evidence presented at this conference and the research published elsewhere is examined, it is important to bear in mind the caveats presented here to avoid drawing inappropriate inferences, generalizations and conclusions. At the same time, it is inappropriate to take a cavalier approach and dismiss all research because of its inherent limitations. Where findings point in common

and converging directions, confidence should increase that a problem has been identified and that action is warranted to deal with it.