FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION

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Distraction in Commercial Trucks and Buses: Assessing Prevalence and Risk in Conjunction with Crashes and Near-Crashes

The aim of this project was to use an existing naturalistic data set to document the prevalence and risk of commercial truck and bus drivers' activities or actions that distract their attention away from the driving task. This naturalistic data set involved thousands of commercial motor vehicles (including trucks and buses) and provided a wealth of data, including driver behavior during safety-critical events. The data set was provided by DriveCam® a vendor of onboard safety monitoring systems (OBMS) aimed at reducing risky driving behaviors. The OBMS contains video recordings and data from kinematic sensors (e.g., vehicle speed) in order to study driver behavior in driving conditions in the presence of real world daily pressures. These video recordings and kinematic data are used by fleet safety managers to provide feedback on safe and at-risk driving behaviors. Note that the authors of this study did not receive any video recordings, but rather kinematic data and driver behavior data that did not identify the driver.

Summary of the Data Sets

The vendor provided two data sets collected over a consecutive 1-year period: data set A, the first 273 days, and data set B, the last 92 days. The data sets did not include continuous data, but only recorded events that met or exceeded a kinematic threshold (i.e., greater than or equal to |0.5 g|). These recorded triggers included both safety-critical events (e.g., hard braking in response to another vehicle) and non-safety triggered events (e.g., vehicle traveled over train tracks, which exceeded the kinematic threshold). The non-safety triggered events served as baselines in the analyses. Note that only data set B, collected June 6, 2009–September 5, 2009, contained baseline events that allowed the calculation of odds ratios. Data set B was derived from 183 truck and bus fleets comprising 13,306 vehicles. A total of 1,085 crashes, 8,375 near-crashes, 30,661 crash-relevant conflicts, and 211,171 baselines were captured in data set B.

Key Results

Texting/e-mailing/accessing the Internet was associated with a very high odds ratio. An odds ratio is a measure of association (not unlike a correlation). In this case, the odds ratio was high due to the finding that 90 of the 93 instances where truck and bus drivers were using a mobile device for texting/e-mailing/accessing the Internet while driving were involved in a safety-critical event. The results of the odds ratio analysis for data set B are shown in Table 1.

A second noteworthy finding was that when "cell phone use" was treated as a "yes" or "no" variable, the odds of being involved in a safety-critical event were 1.14 times greater while the driver was using a cell phone than

Programs of the Federal Motor Carrier Safety Administration (FMCSA) encompass a range of issues and disciplines related to motor carrier safety and security. FMCSA's Office of Analysis, Research and Technology defines a "research program" as any systematic study directed toward fuller scientific discovery, knowledge, or understanding that will improve safety, and reduce the number and severity of commercial motor vehicle crashes. Similarly, a "technology program" is a program that adopts, develops, tests, and/or deploys innovative driver and/or vehicle best safety practices and technologies that will improve safety and reduce the number and severity of commercial motor vehicle crashes. An "analysis program" is defined as economic and environmental analyses done for agency rulemakings, as well as program effectiveness studies, state-reported data quality initiatives, and special crash and other motor carrier safety performance-related analyses. A "large truck" is any truck with a Gross Vehicle Weight rating or Gross Combination Weight rating of 10,001 pounds or greater.

Currently, the FMCSA Office of Analysis, Research and Technology is conducting programs in order to produce safer drivers, improve safety of commercial motor vehicles, produce safer carriers, advance safety through information-based initiatives, and improve security through safety initiatives. The study described in this Tech Brief was designed and developed to support the strategic objective to produce safer drivers. The primary goals of this initiative are to ensure that commercial drivers are physically qualified, trained to perform safely, and mentally alert.

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Table 1. Odds ratios for each tertiary task in data set B.

Tertiary Task	Odds Ratio	LCL	UCL	Frequency of Safety-Critical Events	Frequency of Baselines
Any Cell Phone Usage	**1.14***	1.06	1.23	895	4,262
Dialing Cell Phone	**3.51***	2.89	4.27	165	256
Talking/Listening Hands Free Cell Phone	**0.65***	0.56	0.76	194	1,626
Talking/Listening Hand Held Cell Phone	0.89	0.80	1.00	372	2,266
Reaching for Headset/Earpiece Device	**3.38***	2.64	4.31	104	168
Reaching for Cell Phone	**3.74***	2.97	4.71	122	178
Texting/E-mailing/ Accessing the Internet	**163.59***	51.77	516.73	90	3
Consuming Food/Drink	1.11	0.97	1.26	268	1,320
Other Distraction	**511.64***	296.20	883.79	1,220	13
Passenger Distraction	–	–	–	30	0

* Asterisk indicates a significant odds ratio.

when the driver was not using a cell phone. However, the results indicated the talk/listen cell phone sub-tasks alone did not have a significant odds ratio. In fact, in this analysis, talking/listening on a hand-held or hands-free cell phone had a protective effect. Although talking on the cell phone did not show an increased risk, a driver must take several risk-increasing steps such as reaching for and dialing the cell phone in order to use the electronic device for conversation. The use of a cell phone, however, involves a variety of sub-tasks, including reaching for and holding the phone, dialing the phone, and talking. Reaching for the phone and dialing the phone do show increased odds of involvement in a safety-critical event. In other words, although talking on the cell phone did not show an increased risk, a driver must take several risk-increasing steps in order to use the electronic device for conversation.

Odds ratios were also calculated to approximate the effectiveness of a fleet cell phone policy and State cell phone law regarding cell phone use while driving. These odds ratios did not look at odds of involvement in a safety-critical event, but rather evaluated the odds of cell phone usage given a fleet cell phone policy or State cell phone law versus the odds of cell phone usage given no fleet cell phone policy or State cell phone law. Table 2 shows the odds ratios for cell phone use while driving in each cell phone policy/law variable in the combined data set A and B. For truck and bus drivers the odds of using a cell phone while driving under a fleet cell phone policy were .83 times less, compared to no fleet cell phone policy. However, the existence of a State cell phone law did not significantly impact drivers’ likelihood of using their cell phone while driving compared to usage in a State that did not have a law prohibiting cell phone use (odds ratio = 0.97).

Table 2. Odds ratios for cell phone use while driving in each cell phone policy in the 365 day data set (safety-critical events).

Cell Phone Policy	Odds Ratio	LCL	UCL	Frequency of Cell Phone Use with Policy/Law	Frequency of No Cell Phone Use with Policy/Law
Fleet Cell Phone Policy	**0.83***	0.78	0.87	8,787	1,897
State Cell Phone Law	0.97	0.94	1.01	4,526	2,987

* Asterisk indicates a significant odds ratio.

Discussion

It is important to note this was an observational study that evaluated associations between various tertiary tasks (non-driving related tasks) and safety-critical event occurrence. The study did not evaluate cause and effect (i.e., whether cell phone use caused a safety-critical event), but rather showed which tertiary tasks increased the odds of commercial truck and bus drivers being involved in a safety-critical event if they engaged in those tertiary tasks while driving.

Tertiary tasks associated with the presumed greatest visual attention had the greatest risk (e.g., texting/e-mailing/accessing the Internet, dialing a cell phone, reaching for cell phone, and reaching for a headset/earpiece), while those tertiary tasks associated with the presumed least visual attention had no impact on the odds of being involved in a safety-critical event. It appears that a key difference between these high-risk and low-risk tertiary tasks involves the amount of visual distraction. Tertiary tasks associated with high visual attention have the highest odds of involvement in a safety-critical event.

Distracted driving is an important topic and many State and Federal organizations have passed and/or proposed bans on using cell phones while driving. A key question is, is it safe to use a cell phone while driving? If the question concerns the use of the cell phone in any manner, then the data in this study suggest that cell phone use in the commercial driver population significantly increases the odds of involvement in a safety-critical event by 1.14 times. However, if cell phone use is classified into specific cell phone tasks or sub-tasks, this changes. Certain cell phone sub-tasks are shown to increase significantly the odds of involvement in a safety-critical event (e.g., text/e-mail/web, dial a cell phone, reach for cell phone, and reach for a headset/earpiece), while others are not, and may, in fact, significantly decrease the odds of involvement in a safety-critical event (e.g., talking/listening on a hands-free phone). This approach, in addition to providing a more complete picture of driving safety issues associated with cell phone interaction, also provides important information to system designers pertaining to driver-system interface development.

Possible Limitations

There are six possible caveats or limitations in interpreting the results of this study:

- The purpose of collecting the data is to reduce risky driving behaviors. These data are used by fleet safety managers to provide feedback to drivers with the goal of changing risky behaviors to increase safety. Thus, the data sets may be skewed from

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normative driving data as safety managers have attempted to alter unsafe driver behaviors. This translates into potentially less risky behavior being recorded in this study, which would imply higher tertiary task involvement in the larger population.

- The fact that the truck and bus fleets in the data sets purchased an onboard safety monitoring system reflects a group of safety conscious carrier companies; thus, the prevalence of tertiary tasks may, in fact, be more pronounced in the larger population.
- The lack of continuous data collection or randomly collected video segments means there were no "true" baseline or control data. Baselines were used as a proxy measure of control data; however, the similarity in the odds ratios with Olson et al. (2009), which did use true baselines, suggests this likely had little or no influence on the findings.
- Data set B was collected during a time frame when intense media attention was devoted to the dangers of distracted driving. This media attention may have influenced safety manager and/or driver behavior. However, again, this would translate into potentially less risky behavior being recorded in this study, which would imply higher tertiary task involvement in the larger population.
- Driver exposure was not controlled in the study; thus, extremely unsafe drivers may have contributed far more safety-critical events than baselines. However, as the study included at least 13,000 drivers (from more than 13,000 trucks and buses), the affect of any outliers was minimized.
- The length of the video window during safety-critical events and baseline epochs was longer than in other naturalistic studies (8 seconds before the trigger and 4 seconds after the trigger). It is possible that some tertiary tasks coded as an associative factor during the safety-critical events had no influence on safety-critical event occurrence (if the truck or bus driver engaged in the tertiary task at the very beginning of the video window). However, and as noted previously, the similarity of the odds ratios with the Olson et al. study, which used a 6-second window, suggests this likely had minimal influence on the results.

The full final report may be found online: www.fmcsa.dot.gov/facts-research/art-public-reports.aspx.

Reference

Olson, R.L., Hanowski, R.J., Hickman, J.S., & Bocanegra, J. (2009). *Driver Distraction in Commercial Vehicle Operations* (Report no. FMCSA-RRR-09-042).Washington, DC: U.S. Department of Transportation, Federal Motor Carrier Safety Administration. Retrieved May 24, 2010: www.fmcsa.dot.gov/facts-research/research-technology/report/FMCSA-RRR-09-042.pdf