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Texting while driving: A study of 1211 U.S. adults with the Distracted Driving Survey

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ABSTRACT

Texting and other cell-phone related distracted driving is estimated to account for thousands of motor vehicle collisions each year but studies examining the specific cell phone reading and writing activities of drivers are limited. The objective of this study was to describe the frequency of cell-phone related distracted driving behaviors. A national, representative, anonymous panel of 1211 United States drivers was recruited in 2015 to complete the Distracted Driving Survey (DDS), an 11-item validated questionnaire examining cell phone reading and writing activities and at what speeds they occur. Higher DDS scores reflect more distraction. DDS scores were analyzed by demographic data and self-reported crash rate. Nearly 60% of respondents reported a cell phone reading or writing activity within the prior 30 days, with reading texts (48%), writing texts (33%) and viewing maps (43%) most frequently reported. Only 4.9% of respondents had enrolled in a program aimed at reducing cell phone related distracted driving. DDS scores were significantly correlated to crash rate ($p < 0.0001$), with every one point increase associated with an additional 7% risk of a crash ($p < 0.0001$). DDS scores were inversely correlated to age ($p < 0.0001$). The DDS demonstrated high internal consistency (Cronbach's alpha = 0.94). High rates of cell phone-related distraction are reported here in a national sample. Distraction is associated with crash rates and occurs across all age groups, but is highest in younger drivers. The DDS can be used to evaluate the impact of public health programs aimed at reducing cell-phone related distracted driving.

1. Introduction

Texting and other cell phone use while driving is a major risk factor for motor vehicle collisions and associated injury and death (Wilson & Stimpson, 2010). In 2012, distracted driving was associated with 3300 deaths and 421,000 injuries in collisions in the US; there is evidence that smartphone use is increasingly contributing to these numbers (US Department of Transportation National Highway Traffic Safety Administration, 2014).

Simulation and instrumented vehicle studies have shown that drivers who are viewing information on or writing with cell phones have significantly increased risk of collision or near-collision events, (Yannis et al., 2014; Owens et al., 2011; Caird et al., 2014) and the problem is exacerbated in younger drivers (Caird et al., 2014; Hosking et al., 2009). Rigorous instrumented vehicle naturalistic studies have confirmed these results (Klauer et al., 2014; Olson et al., 2009).

In spite of the risk, texting and driving is widespread; among US adults 18 to 64 years old, 31% reported reading or sending text messages or emails while driving in prior last 30 days (Centers for Disease Control and Prevention (CDC), 2013). The issue is even more pronounced in younger drivers with nearly half of young drivers reporting texting in just the past 30 days (Olsen et al., 2013). Observational studies on college campuses have also confirmed high rates of texting and driving (Cook & Jones, 2011). In our prior work, 59.2% and 71.5% of young adults wrote and read text messages, respectively, while driving in the last 30 days (Bergmark et al., 2016).

The purposes of this study were to describe the frequency of cell phone related distracted driving behaviors and self-reported accident rate by relevant demographic subgroups and confirm reliability in a national sample of drivers of all ages.

2. Methods

2.1. Metrics

The cell phone focused Distracted Driving Survey (DDS, ©Massachusetts Eye and Ear, 2013, Table 1, with responses) is an 11-item validated driver-reported questionnaire assessing common cell phone reading and writing tasks, such as writing and reading text messages and email, social media site use, and GPS use (Bergmark et al., 2016). The DDS includes questions about the speeds at which drivers have completed each task in the past 30 days as well as a question about

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Table 1
Distracted Driving Survey and responses ($N = 1211$ drivers, 2015, responses as percentage).

Do you think that you can safely text and drive?	Always 4	Most of the time 4	Some of the time 10	Rarely 17	Never 65
	Every time I drive	Most of the times I drive	Some of the times I drive	Rarely	Never
In the last 30 days have you written text messages while driving?[a]	2	3	9	19	67
In the last 30 days have you read text messages while driving?[a]	2	5	18	24	52
In the last 30 days have you written email messages while driving?[a]	1	1	2	8	88
In the last 30 days have you read email messages while driving?[a]	1	3	7	11	79
In the last 30 days have you viewed maps or directions on your phone while driving?[a]	3	7	20	13	57
In the last 30 days have you read messages or viewed information on social media apps or sites while driving? (e.g. Facebook, Twitter, Snapchat, etc.)[a]	1	4	7	10	78
	Driving at any speed	Driving at low speeds	In stop-and-go traffic	Stopped at a red light	Never
In the last 30 days, when have you written texts while driving?[b]	5	5	8	22	60
In the last 30 days, when have you read TEXTS while driving?[b]	9	7	9	26	49
In the last 30 days, When have you written email messages while driving?[b]	2	3	3	8	84
In the last 30 days, when have you read Email messages while driving?[b]	3	3	5	13	76

[a] Question phrased, "For each of the following questions, please choose the answer that best applies".
[b] Question phrased, "For each question below, please indicate the highest speed that you have performed the action (meaning, the column furthest to the left that is applicable) in the last 30 days".

perceived risk. It has been validated among drivers 18–24 years old (Bergmark et al., 2016). A scoring algorithm is used to produce a score 0–44, with 44 being the highest risk survey result. The details of the questionnaire and scoring algorithm have been previously published (Bergmark et al., 2016).

Additional questions covering topics such as crash rates, driving while intoxicated, and demographic information were also described in the initial validation study. Crash rate reporting has been previously described (Bergmark et al., 2016) and was self-reported according to a single question, "In the last 12 months, have many car accidents have you been in with you as the driver? (Answers 0, 1, 2, 3, 4, 5 or more)." The colloquial term "accident" rather than the more modern term crash" was used based on our pilot testing.

2.2. Study design and oversight

The DDS was used to capture major reading and writing activities associated with smartphone use while driving. (Bergmark et al., 2016) Items to evaluate driving while intoxicated, use of smartphone applications aimed at reduction of texting while driving, self-reported crashes in the previous 12 months, and demographic information were included.

The questionnaire was set up as a web-based survey using standard, Health Information Portability and Accountability Act compliant software, SurveyGizmo (Boulder, CO). After submitting the survey, the system was set up to provide a 'thank you' page that included the derived DDS score for that participant.

Sample size calculations were based on the ability to compare 4 major US Census divisions with 95% confidence and estimated 267 respondents per group or 1068 in total. The study was approved by the Massachusetts Eye and Ear Institutional Review Board.

2.3. Study population

Subjects were recruited using a third party survey panel (SurveyGizmo, Boulder, CO) and enrolled online through a generic link. Subjects received nominal incentives to participate (i.e. participation in sweepstakes) and were informed that through participation they would receive their DDS scores. Subjects who chose not to continue after reviewing the consent or who reported not having driven a motor vehicle in the prior 30 days were disqualified. Preset limits on subjects based on age cohorts, U.S. Census division and gender were also in place to ensure representativeness. These limits were established with demographic questions. For example, only the first 400 respondents per geographic area were allowed to complete the full survey. Other respondents were excluded, leading to a large number of excluded participants.

In all, 6370 people responded to the survey; 5117 respondents were disqualified primarily to obtain appropriate geographical diversity and 42 were eliminated for partial responses (survey was never finished or submitted). The remaining 1211 respondents constituted the analytical sample.

2.4. Survey reliability

Internal consistency was measured with the method of Cronbach (reported as Cronbach's alpha coefficient). Each item was further evaluated for its contribution to Cronbach's alpha (based on the overall DDS Cronbach's alpha coefficient with each variable deleted).

2.5. Statistical analysis

All data from the testing were transferred to SAS v. 9.0 (Cary, NC) for analysis. The Distracted Driving Survey score was generated as described previously (Bergmark et al., 2016). Logistic regression was performed to evaluate the relationship between the DDS score and other variables as independent variables with a dependent variable of self-reported accidents. All items demonstrating correlations to DDS scores were evaluated using the Wilcoxon test. As there were many respondents with scores of zero or low scores as expected per our validation study, a nonparametric test was selected for analysis. Demographic questions were used to compare the sample to the 2010 U.S. Census for assessment of representativeness and to complete correlation analysis. Due to the infrequency of multiple crashes, analysis was performed comparing respondents with any crashes to respondents with no crashes, and therefore logistic regression was used for analysis.

2.6. Survey reliability and timing

In this study, Cronbach's alpha for the survey was excellent at 0.94 and demonstrates high levels of internal consistency at the individual and population levels. No individual item significantly changed Cronbach's alpha with deletion indicating the relatively equal contribution of each item. This result was similar to the initial validation study of