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Cell Phone Use While Driving: Prospective Association with Emerging Adult Use

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Abstract

Secondary task engagement such as cellphone use while driving is a common behavior among adolescents and emerging adults. Texting and other distracting cell phone use in this population contributes to the high rate of fatal car crashes. Peer engagement in similar risky driving behaviors, such as texting, could socially influence driver phone use behavior. The present study investigates the prospective association between peer and emerging adult texting while driving the first year after high school. Surveys were conducted with a national sample of emerging adults and their nominated peers. Binomial logistic regression analyses, adjusting for gender, race/ethnicity, parental education, and family affluence, showed that participants (n=212) with peers (n=675) who reported frequently texting while driving, were significantly more likely to text while driving the following year (odds ratio, 3.01; 95% CI, 1.19 to 7.59; P=0.05). The findings are consistent with the idea that peer texting behavior influences the prevalence of texting while driving among emerging adults.

Keywords

Driving behavior; Peer influence; Cell phone use; Secondary task engagement; Peer-reported cell phone use

1. Introduction

Motor vehicles crashes are the leading cause of death in teens, and highest among 16–19 year olds (1). Drivers who are 15–20 years of age constitute 6.4% of all drivers, but account for 10% of all motor vehicle deaths, and 14% of police-reported crashes (2). In 2014, 3,179 people were killed, and 431,000 were injured in motor vehicle crashes involving distracted

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drivers (3). Distraction has been implicated in an estimated 10% of fatal crashes among drivers 15–20 years old, which is higher than for other age groups (4). One prevalent form of distracted driving is secondary task engagement, such as eating, talking to passengers, tuning the radio, and using a cell phone or similar device. A range of distracting secondary tasks, have been demonstrated to contribute to crash/near crash likelihood among teenagers and young adults (5). Driving performance while engaging in secondary tasks may depend on factors such as driver experience, task demands, and the manner in which resources are allocated between the two tasks (6,7). Hence, engaging in secondary tasks can distract the driver, deteriorate driving performance, and increase crash risk.

The likelihood of a crash or near miss increases when performing secondary tasks while driving largely to the extent they take the driver's eyes off the road so he or she cannot see and respond to unexpected hazards; additionally, secondary tasks can increase cognitive load and otherwise divert attention from the driving task (6,7). Crash risk increases when the duration of eye glances >2 seconds away from the roadway while engaged in a secondary task (3,4,8). Given its ubiquity and nature, cell phone tasks have been of particular concern. Dialing, answering, texting, searching for, and possibly talking on a phone can all distract drivers. In one study, teen drivers using a cell phone (operating, talking, and listening) had eyes-off-road times as long as 4 seconds, with slower responses to hazards than drivers not engaged in potentially distracting behaviors (9). Another study with novice drivers found the association between eye glance duration and crash risk increased with duration of single longest glance during secondary tasks, and was higher for wireless tasks such as cell phone use (talking, dialing, texting, and reaching for phone) than other tasks (8).

In addition to taking the driver's eyes off the road, cell phone use can be cognitively demanding and distract the driver from devoting full attention to the road in front of them (5). Notably, texting may be a particularly distracting secondary task. Hosking et al. found that young novice drivers spent up to 400% longer time looking away from the road when texting than when not texting (10). The magnitude of cognitive demands that non-driving tasks place on drivers is associated with the driver performance (11,12). While drivers may elect to engage in secondary tasks in relatively safer road conditions, a driving simulator study indicated that even when drivers increased their distance between them and the vehicle ahead of them while processing emails using a speech-based email system, braking for hazards were slow (13).

According to the results of a 2015 US national survey, the percentages of drivers ages 19–24 reporting engaging in the following behaviors at least once while driving in the past 30 days were as follows: 59% read a text/email, 45% typed/sent a text/email, 77% talked on a cell phone, all increased from results of the same survey conducted in 2014 (14). Nearly half of high school students aged 16 and older reported texting while driving during the past 30 days, and were more likely than non-texting drivers to engage in additional risky driving behaviors (15). In addition, one in three teens reported texting while driving, somewhat more than the 26% of all American teens who report texting while driving (16). One study among 4,964 college students revealed that about 90% of participants talked on the phone and texted while driving (17). Another survey indicated that teens recognize that secondary task engagement, particularly cell phone use such as texting, and mobile application use (such as

Twitter, Snapchat, Instagram) contribute to driver inattention; however, they and their peers often engage in these behaviors while driving (18). Texting among young drivers may increase with age and experience and vary according to the age of passenger (19).

Young drivers have an inflated perception of positive driving skills (20), potentially overestimating their ability to safely accommodate their driving and the additional demand of using their phone. While there is a paucity of research on individual variability in secondary task engagement and their risks, one study found that greater perceived self-efficacy for multitasking while driving and observing distracted driving behaviors in others (social norms) increased the probability that college students report engaging in secondary tasks while driving (17). Driver inattention due to cell phone use among emerging adults is a recognized critical problem for novice drivers and a serious public health issue (21). Therefore, research is needed on factors associated with the prevalence of distracting cell phone use.

Peer influences are associated with many risky behaviors such as substance use/abuse among youth, and may be associated with risky driving behaviors. Notably, 18–22 year old study participants who drove a game console simulator took more risks, focused more on the benefits than the costs of risky behavior, and made riskier decisions when in peer groups than alone (22). It seems unlikely that drivers engage in secondary tasks as a purposeful form of risk taking, but these behaviors may be socially mediated. Walsh, White, and Young (23) found that group norms were associated with adolescents' mobile phone behaviors. A prospective survey that assessed constructs from the Theory Planned of Behavior (TPB), showed that attitudes were associated with intentions to both send and read texts while driving, while subjective norms (how much a person feels social pressure to perform a behavior) and behavioral control (how easy or difficult a person perceives performing the behavior to be) among peers were associated with the prevalence of sending texts while driving (24).

Previous research has shown that emerging adults select peers within their social networks similar to themselves based on parallel traits, characteristics, and behaviors, as well as conform to the norms of their peer group (25). Young adults often befriend peers with similar demographic, behavioral and social characteristics as well, such as drinking and substance use patterns (26). Similarly, research has shown that young drivers engage in risky driving behaviors when exposed to risk-accepting peers compared to risk-averse peers (27). Hence, it is of interest to examine the relations between peer and emerging adult cell phone use behavior.

The research on the association of engaging in secondary tasks, such as cell phone while driving, among young adults and their peers is limited; therefore, the purpose of this research is to examine the prospective association of peer-reported secondary task engagement with emerging adult-reported secondary task engagement one year later. Analyses examined the association between survey data on cell phone use (made/answered call, read/sent text, read/sent email, checked websites) while driving reported by a sample of peers the year after high school with participant-reported cell phone use while driving a year

later. This analysis fills a gap in the distracted driving research on peer-reported data associated with participant cell phone use while driving.

2. Methods

2.1 Participant & Peer Sample

The NEXT Generation Health Study is a longitudinal study of a cohort of 10th-grade U.S. students using multistage sampling. Randomly selected schools and students within those schools agreed to participate in the study (28,29). Participants were surveyed annually, with a school-based assessment in the spring semester of 10th grade and web-based assessments in 11th and 12th grade, and the first two years after high school. At W4 (the first year after high school) we asked NEXT Plus participants (henceforth referred to as “participants”) to recruit their romantic partner and up to 5 of their close friends who were at least 15 years old to complete a survey similar to the NEXT survey. Study participants received \$25 for each nominated peer who completed the survey; participating peers received \$25. Participants and peers over 18 years of age provided consent. Those under 18 provided assent and parents provided consent for participation, with consent being obtained from participants and peers upon their turning 18. At Wave 1 a subsample (n=567) was established (NEXT Plus) to participate in additional annual measurements. Among the NEXT Plus sample, participation during the first two years after high school (Wave 4 in 2013 and Wave 5 in 2014) was 456 and 449 respectively. To be included in these analyses participants (n=212) had to have a permit allowing supervised or independent driving and have driven at least one day out of the past thirty days, in addition must have nominated at least one peer. NEXT Plus participants provided a total of 1128 peers, among which 130 aged over 35 and were eliminated from these analysis, resulting in a 998 peers. A total of 675 peers were matched to the eligible participants. The data of interest for this research were collected on peers the year after high school (W4) and participants the first two years after high school (W4 & W5). Please see Figure 1 for a detailed description of the sample. The protocol was approved by Institutional Review Board of the *Eunice Kennedy Shriver* National Institute of Child Health and Development.

3. Measures

3.1 Participant-reported cell phone use while driving at W5

The number of days in the last 30 days participants used their cell phone while driving at W5 was assessed with seven questions: (1) made a call, (2) answered a call, (3) read a text message, (4) sent a text message, (5) read an email, (6) sent an e-mail, and (7) checked a website, or social network such as Facebook or Twitter. In the peer survey, a single question was asked about each type of cell phone use. To make the measures consistent, we merged the paired questions into three outcomes: made/answered call, read/sent text, and read/sent email by taking the higher of the two responses. We chose to use the higher of the two values as it will more closely estimate the frequency of the behaviors. For example, a participant who read 6 texts and sent 2 texts engaged in the behavior up to 8 times (assuming no overlap in calling and answering occasions). Taking the higher value would be the equivalent of how the participant would respond if all of the occasions overlapped (i.e. the

two sent texts were in response to read texts, therefore counted by the participant as one). Taking the average of the two questions, resulting in 4, likely underestimates the response to the combined question. The fourth outcome is checking a website, assessed by a single item. Lastly, the number of days each participant drove in the last 30 days was recorded to reflect the time at risk of cell phone use.

3.2 Peer-reported cell phone use while driving at W4

Peer cell phone use was assessed by asking the number of days in the last 30 (whole number) have you done the following while driving: “made/answered a call, read/sent a text message, read/sent an email, and checked a website, or social network such as Facebook or Twitter?” Since a participant may have recruited multiple peers, peer responses were aggregated at the participant level. For each participant, an aggregated score was created for each behavior by taking the total days engaged in cell phone use reported by that participant’s peers divided by the total days driven by that participant’s peers. The aggregated score is interpreted as the proportion of driving days peers used their cell phone across all of the participants’ driving peers. A value of -1 was assigned in cases where the participant had no peers who drove (“non-driver”), as this group was considered potentially different from peers who drove but did not engage in the behaviors. The aggregated scores were then categorized (see Table 3): made/answered call and read/sent text were categorized as follows: a) non-driver; b) non-tasker (peers drove, but did not engage in the behavior); c) infrequent tasker (aggregated score was greater than 0 days, but less than the median of days the behavior occurred); and d) frequent tasker (aggregated score was greater or equal to the median of days behavior occurred). For example, infrequent tasker peer group on average engaged in making/answering calls at least once but less than one-third of the days driven. Because “read/sent email” and “checked website” were relatively less frequent behaviors, those variables were categorized as follows: a) non-driver; b) non-tasker; and c) tasker (aggregated score greater than 0 days).

3.3 Participant Demographic Covariates

Demographic variables include the following: gender, race/ethnicity (White, African American, Hispanic, other), parent-reported parental education (high school or less, some college or technical school, bachelor’s degree or higher), and participant perception of family affluence (low, medium, high). Adolescents reported perceived affluence using the family affluence scale accounting for material ownership: the number of cars the family owned, whether the adolescent had their own bedroom, number of phones the family owned, etc. The scale was then collapsed into a three category ordinal scale (30).

4. Analyses

Summary statistics for participant sample ($n=212$) and peer sample ($n=675$) are presented in Table 1 and Table 2, respectively. Each of the four types of cell phone use was analyzed separately in relation to the same peer-reported behavior. The unit of analyses was participant, with peer exposures aggregated at the participant level. Binomial logistic regressions estimated the odds ratio of W5 participant cell phone use while driving when exposed to different levels of W4 peer cell phone use. Because of the number of participants

not driving at W4 who would have been removed from the analyses, we did not adjust for W4 cell phone. Thus these analyses test prospective associations and cannot be interpreted examining causation. Cell phone using days and total driving days constituted binomial-type outcomes, where the former is the number of “events” and the latter is the number of “trials”. The binomial-type regression accounts for the participant’s total driven days by estimating the probability by dividing the number of “events” by the number of “trials”. The models were adjusted for the demographic covariates. The robust standard error estimates for the regression coefficients were calculated to account for over-dispersion in the binomial distribution (31). The referent group for each outcome was the participants who “never” engaging in the behavior; the referent group for peer behavior was “non-tasker” peers who drove but did not engage in the behavior.

5. Results

As shown in Table 1, the participant sample (n=212) included 64% females, 53% White, 26% Hispanic, and 17% African Americans. Most participants’ parents (41%) had some college or technical school training and majority (51%) of participants reported being at the medium family affluence level. The participants’ driving characteristics are also reported in Table 1. Participants had a higher prevalence of reading/sending text messages (40.2%) than any other cell phone behavior.

The peer sample (n=675), described in Table 2, consisted of 59% females, 54% White, 22% Hispanic, and 15% African Americans. Most (70%) peers were similarly aged (19–20) to the participants in W4; 76% were friends, 15% were siblings, and 10% were other family members or romantic partners. Peer cell phone use is described in Table 3. The range of aggregated scores for each category of peer cell phone use is presented, as well as the percent of participants whose aggregated score was in the category. For example, approximately 43% of participants had an aggregated made/answered a call score of 0.33 or higher, indicating that peers of participants in that category made calls on average one-third or more of the days they drove. However, for read/sent email and checked website, respectively, 38% and 53% of participants had a driving peer who reported ever engaging in that task.

All variables were included initially in the regression model and indicated participant cell phone use did not differ by gender or race/ethnicity. The adjusted odds ratios from the binomial logistic regression models are shown in Figure 1. Participants whose W4 peers were categorized as frequent texters had 3.01 (95% CI: 1.19–7.59) greater odds of W5 reading or sending a text message while driving, compared to participants whose peers reported never texting while driving. Participants had elevated future risk of making/answering calls, and checking websites if their peers had the same behaviors, but the associations were non-significant.

6. Discussion

The NEXT Generation Health Study provided the unique opportunity to examine the prospective association between peer-reported and participant-reported cell phone use while

driving. Texting was the most frequent type of distracting cell phone use among study participants, on average texting on 40.2% of driving days. In prospective analyses we found that W4 texting among peers was significantly associated with W5 texting among participants. Viewed from another perspective, study participants with peers who never texted while driving were also unlikely to text while driving, suggesting that peers can be risk protecting as well as risk promoting. Compared to the 44.3% of participants with frequent texting peers, only 14.6% of participants with non-texting peers texted.

Other research found that younger drivers, 18–24 years old were cited more for texting while driving than engaging in any other risky cell phone behavior (32). Text messaging has become a main form of communication among adolescents and their social network. Maintaining constant contact with peers through mobile phone use enhances feelings of belongingness among youth, and group norms influence texting behaviors (23). With the development of new technology and advances to various communication channels, texting while driving has become a common behavior among young drivers. Prior research shows that the visual, manual, and cognitive distractions associated with text messaging while driving could contribute to higher crash rates, especially for younger drivers (33). Research shows that regardless of laws banning hand-held cell phone use (talking, texting, etc.) while driving, younger drivers have a high prevalence of mobile phone adoption, and consider talking on either handheld or hands-free mobile devices to be relatively low risk (34).

Like other risky health behaviors, engaging in secondary tasks while driving may be subject to social influence. Peer influence on cell phone use while driving could be driven by perceived social norms, modeling, or peer pressure, given the importance of social networks among youth. The theory of normative social behavior provides an understanding for how young adult risk taking and peer influences shape distracted driving behavior (20). Observed social norms contribute to acceptable beliefs and attitudes towards risky driving behaviors.

The significant prospective association between frequent-texting while driving peers and young adult texting while driving extends the existing literature on social norms and conformity among adolescents and peers. Notably, a simulation experiment that showed that texting while driving led to significant decreases in mean speed, increased headway distance from cars, and increased accident probability among young adults, attributed texting with young people's need to communicate constantly with peers, even while driving (35). Previous research has accounted for peer cell phone use while driving by assessing adolescent's perceptions of their peer's behavior (36,37), but not actual peer-reported behaviors. Texting while driving was found to be the most common of electronic device secondary task behaviors among peers, suggesting that prevention strategies should be tailored to target texting while driving. Prevention programs aiming to reduce risky driving should include peers and those within similar social networks as adolescents. Intervention efforts should discourage texting while driving, and should focus on creating social norms around deterring other risky driving behaviors.

The current study has many strengths, including the diverse subsample of NEXT Plus participants that were systematically sampled from a nationally representative population accounting for variability in race and location. This study was prospective in nature, and

utilized data from two waves from the NEXT Generation Study. It is quite unique to have a large peer sample within a longitudinal cohort study. In addition, the peer sample was comprised primarily of similarly aged friends of the participants, and they reported their driving behaviors independently from the participants. The strength of the matched peer sample represents same-aged friendship groups and accounts for young adults susceptibility to the influence of those in their social circles (38).

The study also has limitations. The driving data is self-reported for both participants and peers, which may be subject to recall bias. In addition, participants nominated a limited number of peers during W4 who may not have fully represented their peer network. Participants had different numbers of peers contributing to their aggregated score, some having only one or two peers meeting the eligibility criteria, thus may not be a comprehensive assessment of sources of peer influence. In addition, the similar age range of the matched peers to the participants within the analysis may be a limitation as well as social influences of older or younger peers may be somewhat different. It was not known if the participating participants and peers were texting each other, only that frequent peer texting was associated with emerging adult texting. Additionally, the NEXT Plus participants were a subsample of the national sample. Wave 4 participant data was not controlled for due to the nature of how peer data was handled. Participant sample size would have decreased or participants who are not driving at W4 would have been assigned zero on previous wave behavior; therefore lumping participants who did not do the behavior with those who did not have the opportunity to do the behavior would be inconsistent. In addition, the analysis examined prospective associations and not causation. Lastly, the variable of interest for “Checked a website or social network such as Twitter or Facebook” measure may not have fully captured the use of mobile applications, or “apps”, for social media. With new technology emerging for smartphones, more adolescents and young adults utilize specific applications within their phone for social media purposes and may not perceive those as checking a website. Future research is needed to better understand the nature of peer and young driver texting while driving behavior, and include a sample scheme with peers that accounts for the social norms young adults experience. Moreover, research is needed to determine how best to shape norms and behavior with respect to adolescent texting and other cell use while driving.

6.1 Conclusions

Frequent texting while driving among peers was associated with increased likelihood of future texting while driving by participating young drivers. The findings are consistent with theory of normative social behavior and empirical research on social influences on health-related behaviors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Young driver secondary task engagement can be influenced by peer-reported engagement.
- Participants with peers who texted while driving were more likely to text and drive.
- Peer texting behavior influences the prevalence of texting among emerging adults.

Figure 1.

Participant and Peer Flowchart

* Eligibility: Permit for supervised or independent driving, driven in the past 30 days at Wave 5, nominated at least 1 peer.

Figure 2.

Adjusted* Odds Ratios (95% CIs) of likelihood of W5 Participant Cell Phone Use by W4 Peer Cell Phone Use**

*Adjusting for gender, race, parental education, and family affluence level

**p=0.05,

Peer Referent Group = Non-Taskers

Table 1

Participant Sample Characteristics at W5

Participants Characteristics (N= 212)			
		N*	%
Gender	Male	77	36.6
	Female	135	63.7
Race/Ethnicity	Hispanic	54	25.5
	African American	35	16.5
	White	112	52.8
	Other	11	5.2
Parent Education	High School or less	55	25.9
	Some College/Technical School	86	40.6
	Bachelor's degree or higher	62	29.2
Family Affluence Level	Low	43	20.3
	Medium	109	51.4
	High	60	28.3
Number of Peers Included in Aggregated Score	1	50	23.6
	2	39	18.4
	3	26	12.3
	4	37	17.5
	5	33	15.6
	6	27	12.7
Participants Driving and Cell Phone Use in the Last 30 days			
	Median (25 th Percentile, 75 th Percentile)	Phone Use Driving Days (%)	
Days driven	28 (18, 30)	--	
Days make/answered call	5 (0, 15)	36%	
Days read/sent text message	5 (0, 20)	40.2%	
Days read/sent email	0 (0, 0)	11.7%	
Days checked website	0 (0, 2)	17.8%	

* May not add to 212 due to missing values

Table 2

Peer Sample Characteristics

Peer Network Demographic Characteristics (N =675)			
		N	%
Gender	Male	275	40.7
	Female	400	59.3
Race/Ethnicity	Hispanic	148	21.9
	African American	104	15.4
	White	365	54.1
	Other	49	7.3
Age of Peers	18	58	8.5
	19–20	470	69.6
	21–24	128	19.0
	25+	19	2.6
Peer Relationship to Participant	Friend	510	75.6
	Sibling	99	14.7
	Other family member	60	8.9
	Romantic Partner	6	0.9

Table 3

Number and Percent of Participants at W5 in Each Category of Aggregated Scores for W4 Peer Cell Phone Use

		Participants at W5	
Peer Category at W4	Range ^a	# ^b	%
Made/Answered Call			
Non-Driver	-	25	11.8
Non-Tasker	0	23	10.8
Infrequent Tasker	0.02–0.32	72	34.0
Frequent Tasker	0.33–1.00	91	42.9
Read/Sent Text			
Non-Driver	-	25	11.8
Non-Tasker	0	31	14.6
Infrequent Tasker	0.02–0.44	62	29.2
Frequent Tasker	0.45–1.00	94	44.3
Read/Sent Email			
Non-Driver	-	25	11.8
Non-Tasker	0	106	50.0
Tasker	0.01–1.00	80	37.7
Checked Website			
Non-Driver	-	25	11.8
Non-Tasker	0	75	35.4
Tasker	0.01–1.00	112	52.8

^a Range of aggregated scores (sum of days peers reported cell phone use divided by sum of peers driving days) included in category

^b May not add to 212 due to missing values